CPA: 6001906

CONTRACT FOR PW-7003
LIVERNOIS STREETSCAPE IN THE CITY OF DETROIT

ANGELO IAFRATE CONSTRUCTION COMPANY
26300 SHERWOOD
WARREN, MI 48091
$15,682,921.42

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SPECIAL NOTICE TO BIDDERS

1. GENERAL PURPOSE

The Special Notice to Bidders contains information and requirements applying specifically to this particular Contract. The Special Notice to Bidders supplements the Standard Instructions to Bidders and, in case of any discrepancy between the requirements in the former and latter, the provisions in the Special Notice to Bidders shall govern.

The published advertisement for the proposed Contract also contains information necessary to the bidders and is to be considered a part of the Special Notice to Bidders as if fully herein repeated.

2. DESCRIPTION OF WORK

The project consists of concrete paving and streetscape work on approximately 1.25 miles of Livernois Ave from Eight Mile Rd to Margareta Ave, including removal of existing medians, full depth reconstruction from Eight Mile Rd to Seven Mile Rd, replacement and widening of sidewalk, raised asphalt bike lanes, landscaping, green stormwater infrastructure, utility relocations, and traffic signal replacements.

3. BITUMINOUS MATERIAL PLANT

It is not necessary that the Contractor's plant be owned and operated by the successful bidder. However, it will be necessary that the materials be obtained from an existing plant which meets all Contract requirements. Further, any bidder not operating his own plant shall indicate in his Proposal the owner and the locations of the plants from which the bituminous materials will be obtained.

4. MATERIAL STORAGE YARDS

The City Zoning Ordinance provides for the restriction of material storage yards in certain residential areas. Bidders proposing to use such yards should satisfy themselves that the locations contemplated can be used, and if a permit is required, shall obtain such permit from Department of Buildings and Safety Engineering and pay all costs in the connection therewith.

5. CONTRACT DOCUMENTS

The Contract Documents are composed of those individual parts as named by title in Article 2 of the Standard Instructions to Bidders.

Section I contains the Standard Contract Forms.

Section II consists of the City of Detroit "Standard Specifications for Paving and Related Construction," **dated March 2009** as amended by Bulletin together with any other Detailed Specifications included in these Documents and indicated in the Abridged Table of Contents.

Section III consists of supplemental specifications and special provisions prepared by the design consultant.

Construction drawings prepared by the design consultant.

6. SPECIAL FORMS

Bidders will note that a copy of each of the following pages has been included:

Equalization Requirements, Eligibility Form and Affidavit of Eligibility
Slavery Era Records & Insurance Disclosure Ordinance and Affidavit
Hiring Compliance Policy & Affidavit
Proposal Signature Pages
Agreement Signature Page
Resolution of Corporate Authority
Certificate of Partnership Authority

Each set of the applicable documents is to be completed, signed, and returned with the proposal. These will later be used in preparing the executed Contract for the accepted bid.

7. HUMAN RIGHTS CLEARANCE

Attached is a copy of the Covenant of Equal Opportunity from the Human Rights Department of the City of Detroit. Both the low and the second bidder will be required to furnish the information, to the DPW-City Engineering Division for submission to the Human Rights Department, prior to award of the Contract.

A Human Rights review of employment goals may be required for each project, regardless of prior clearances.

8. CONTRACTOR AUTHORITY TO START WORK

The Contractor will have no authority to start work, no payments will be authorized by the Finance Department, and the City of Detroit will not be liable for reimbursement for any materials purchased or payment for any services rendered by the Contractor prior to the award of this Contract by resolution of the City Council and execution of this instrument by the Purchasing Director.

9. INDEPENDENT CONTRACTOR

The relationship of the Contractor to the City of Detroit is and shall continue to be that of an independent contractor, and no liability or benefits, such as workers' compensation, pension rights or liabilities, insurance rights or liabilities, or other provisions or liabilities arising out of or relating to a Contract for hire of employer/employee relationship shall arise or accrue to either party or either party's agent or employee with respect to the City of Detroit as a result of the performance of this Contract, unless expressly stated in this Contract.

10. WAIVER

The Contractor shall not hold the City liable for any personal injury incurred by any employee, agents, or consultants while working on this project which is not held in a court of competent jurisdiction to be directly attributable to the gross negligence of the City or any employee of the City acting within the scope of their employment and hereby agrees to hold the City harmless from any such claim by its employees, agents or consultants.

11. AUDIT

Nothing contained in this Contract shall be construed or permitted to operate as any restriction upon the power granted to the City Council by the City Charter to audit and allow all accounts chargeable against the City.

12. INDEMNITY AND DAMAGES

A. The Contractor agrees to save harmless the City against and from any and all liabilities, obligations, damages, penalties, claims, costs, charges, losses and expenses including without limitation, reasonable fees and expenses for attorneys (at the prevailing market rate for such legal services, expert witnesses and other consultants), which may be imposed upon, incurred by or asserted against the City by reason of any of the following occurring during the term of this Contract:

1. Any negligent or tortuous act, error or omission of the Contractor or any of its Associates for whose acts any of them might be liable, regardless of whether or not it is caused in part by a person indemnified hereunder.

2. Any failure by the Contractor or any of its Associates to perform its obligations, either expressed, or implied under this Contract.

The Contractor also agrees to hold the City harmless from any and all injury to the person or damage to the property of, or any loss or expense incurred by an employee of the City which arises out of or pursuant to the Contractor's performance, or that of its Associates under this Contract.

B. The Contractor undertakes and assumes all risk of dangerous conditions, if any, in and about any City premises and agrees to make an examination of all places where it will be performing the Services in order to determine whether such places are safe for the performance of the Services. The Contractor also agrees to waive and release any claim or liability against the City for personal injury or property damage sustained by it or its associates for personal injuries or property damage while performing under this Contract on premises which are not owned by the City.

12. INDEMNITY AND DAMAGES (Continued)

C. In the event any action or proceeding shall be brought against the City by reason of any claim covered hereunder, the Contractor, upon notice from the City, will at its sole cost and expense, resist and defend the same with counsel of the Contractor's choice which is acceptable to the City.

D. The Contractor agrees that it is its responsibility and not the responsibility of the City to safeguard the property and materials that it or any of its Associates use or have in their possession while performing this Contract. Further, the Contractor agrees to hold the City harmless for any loss of such property and materials used by any such person pursuant to the Contractor's performance under this Contract or which is in their possession.

E. The indemnification obligation under this Article shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor under Workers Compensation Acts or other employee benefit acts. In addition, the Contractor agrees to hold the City harmless from the payment of any deductible on any insurance policy.

F. The Contractor agrees that this Article 12 Indemnity and Damages shall apply to all matters described in Article 12-A, Indemnity and Damages, (whether the matter is litigated or not) which occur or arise between the Contractor or its Associates, and the City, and agrees to save the City harmless there from as provided in this Article 12.

13. TERMINATION FOR CONVENIENCE

The City may terminate this Contract without cause at any time, without incurring any further liability whatsoever, other than as stated in this provision, by giving written notice to the Contractor of such termination, specifying the effective date thereof, at least fifteen (15) days prior to the effective date of such termination. If the Contract is terminated, the City will pay the Contractor only for the services rendered prior to termination, including any holdback. The amount of the payment shall be computed by the City on the basis of the services rendered, and such other means which, in the judgment of the City, represents a fair value of the services provided, less the amount of any previous payments made, which final payment the Contractor agrees shall constitute full and complete payment and satisfaction under this Contract. Should the City or the City's designee undertake any part of the services which are to be performed by the Contractor, to the extent such services are being performed by the City or its designee the Contractor shall not be entitled to any compensation for the services so performed. This section is subject to the maximum sum payable provision of this Contract.

14. RIGHTS, REMEDIES AND JURISDICTION

The rights and remedies set forth herein are not exclusive and are in addition to any of the rights and remedies provided by law or equity. All actions arising under this Contract shall be governed by, subject to, and construed according to the laws of the State of Michigan. The Contractor agrees, consents and submits to the personal jurisdiction of any competent court in Wayne County, Michigan, for any action brought against it arising out of this Contract. The Contractor agrees that service of process at the address and in the manner specified in this Contract will be sufficient to put the Contractor on notice. The Contractor also agrees that it will not commence any action against the City because of any matter whatsoever arising out of or relating to the validity, construction, interpretation and enforcement of this Contract, in any courts other than those in the County of Wayne, State of Michigan.

15. COMPARABLE OR EQUIVALENT TERMS

The Contractor warrants that all of the prices, terms, warranties, and benefits granted to the City herein are comparable to or better than the equivalent terms being offered by the Contractor to any present customer for like or similar services. In addition to the other remedies, which the City may invoke herein for the Contractor's breach, it may demand repayment of any overpayment plus interest.

16. BASIS OF PROPOSAL

The Proposal is on a unit price basis in accordance with Article 7E of the Standard Instructions to Bidders.

17. CITY OFFICER

The title and post office address of the officer named in the Agreement as acting on behalf of the City is:

Director - Department of Public Works
Coleman A. Young Municipal Center
2 Woodward Avenue, Suite 611
Detroit, Michigan 48226

18. BOND REQUIREMENTS

The amount of the Performance and Payment Bonds required shall be as follows:

TYPE OF CONTRACT	PERFORMANCE BOND	PAYMENT BOND
City of Detroit financed contracts of $50,000 and under	25% of contract price	25% of contract price
City of Detroit financed contracts over $50,000 but under $1,000,000	50% of contract price	50% of contract price
All contracts over $1,000,000 or those financed by Federal funds	100% of contract price	100% of contract price

19. INSURANCE

The Contractor shall maintain, at its expense, during the term of this contract the following insurance:

TYPE	AMOUNT NOT LESS THAN
A. Worker's Compensation Insurance Employer's Liability Insurance	Statutory limit **$500,000** minimum each accident/each disease/disease each employee
B. Commercial General Liability Insurance (Coverage to include blanket contractual liability)	**$1,000,000** minimum combined single limit per occurrence **$2,000,000** minimum aggregate limit
C. Automobile Liability Insurance (covering all owned, hired and non-owned vehicles with personal and property protection insurance to comply with the provisions of the Michigan No-Fault Insurance Act, including residual liability insurance)	**$1,000,000** minimum combined single limit
D. Umbrella Excess Liability Insurance	**$4,000,000** minimum combined single limit per occurrence/aggregate

19. INSURANCE (Continued)

The commercial general liability insurance policy shall name as an additional insured: "The City of Detroit" and shall state that the Contractor's insurance is primary, as respect to the City of Detroit as an additional insured, and not excess over any insurance already carried by the City of Detroit.

The commercial general liability insurance shall provide blanket contractual liability insurance for all written contracts or in the alterative, shall contain a specific endorsement worded substantially as follows:

"During the effective period of the policies mentioned herein, it is agreed that this insurance specifically covers liability assumed by the insured under the provisions of **CPA No. 6001906** dated _____ entered into by the insured and the City of Detroit".

If the Commercial General Liability policy does not contain the standard ISO (Insurance Services Office) wording of "definition of insured" which reads essentially as follows: "The insurance afforded applies separately to each insured... except with respect to limits, then, in the alternative, the public liability insurance policy shall contain the following cross liability endorsement:

"It is agreed that the inclusion of more than one (1) insured under this policy shall not affect the rights of any insured as respects any claim, suit or judgment made or brought by or for any other insured or by or for any employee of any other insured. This policy shall protect each insured in the same manner as though a separate policy had been issued to each, except nothing herein shall operate to increase the insurer's liability beyond the amount or amounts for which the insurer would have been liable had only one (1) insured been named."

19.01 If during the term of this Contract changed conditions or other pertinent factors should in the reasonable judgment of the City render inadequate the insurance limits, the Contractor will furnish on demand such additional coverage or types of coverage as may reasonably be required under the circumstances. As such, insurance shall be effected at the Contractor's expense, under valid and enforceable policies, issued by insurers of recognized responsibility which are well-rated by national rating organizations and are acceptable to the city.

19.02 All policies shall name the Contractor as the insured except as otherwise stated and shall be accompanied by a commitment from the insurer that such policies shall not be canceled, or reduced without at least thirty (30) days' prior written notice to the City. Certificates of insurance evidencing such coverage shall be submitted to the **Finance Department, Accounts Payable Section, Coleman A. Young Municipal Center, 2 Woodward Avenue, Suite 805, Detroit, MI 48226** prior to the commencement of performance under this Contract and at least fifteen (15) days prior to the expiration dates of expiring policies.

19.03 If any work is sublet in connection with this Contract, the Contractor shall require each Subcontractor to effect and maintain the types and limits of insurance as requested by the City and shall require documentation of same, copies of which documentation shall be promptly furnished the City.

19.04 The Contractor shall be responsible for payment of all deductibles contained in any insurance required hereunder. The provisions requiring the Contractor to carry the insurance required under this Article shall not be construed in any manner as waiving or restricting the liability of the Contractor under this Contract.

19.05 The Commercial General Property Damage Insurance shall provide coverage for the so called AX"- explosion, AC" - collapse, and AU" - underground damage hazards or exposures.

19. INSURANCE (Continued)

Automobile Insurance covering all owned, non-owned or hired automobiles, with a minimum **$1,000,000** combined single limit for Bodily Injury and/or Property Damage for each accident. Such insurance shall comply with the provisions of the Michigan No-Fault Insurance Law, and shall provide coverage for personal protection insurance, property protection insurance, and residual liability insurance, and shall name the City of Detroit as an additional insured.

Fire Insurance - Not Required.

19.06 The Contractor shall hold the City harmless for payment of any deductibles required pursuant to any such policies.

20A. TIME OF STARTING AND COMPLETING WORK

The stipulated time for fully completing the entire work has taken into account, and an allowance made for, the time normally required for a "punch list" and final cleanup, and also for inclement weather during the months in which work will be in progress. It also includes an allowance for the concrete curing period.

The Contractor shall schedule the various operations so that each contract may be fully completed within the time allowed. Completion of the application of the resurfacing materials themselves will not be considered in compliance with the Contract provisions requiring full completion within the time stipulated.

A. Single Contract: A bidder who has been awarded only a single pavement resurfacing contract, shall begin his operations at the site of the work on the date ordered in the written notice of the Engineer, and shall fully complete the entire work thereunder within **90 calendar days** after the issuance of the start work notice in accordance with the provisions of Article 3 of the Agreement. **The contract will terminate on December 31, 2021.**

B. Multiple Contracts: A bidder who currently has two or more awarded pavement resurfacing contracts on which work has not been started, may be permitted to start work on such contracts on dates selected by him provided that such dates are first submitted to and approved in writing by the Engineer. The City, however, through the Engineer, may order the starting of any particular Contract or Contracts on specific dates when, in the judgment of the Engineer, so doing is in the best interest of the City.

The contractor's request for approval of a selected date for start of work on a specific contract shall be on forms provided by the City and shall be submitted to the Engineer at least three working days, exclusive of Saturday and Sunday, prior to the selected date.

When a selected date has been approved by the Engineer, the contractor will be expected to start work on such date and the time allowed for date, unless a revised request is submitted to and approved by the Engineer. A revised request will, ordinarily, be favorably considered and approved only when the contractor's other Detroit pavement resurfacing work makes the previously selected and approved date impractical or impossible.

The time of starting and completing work on multiple pavement resurfacing contracts shall be predicated on:

1. Construction operations being carried on at a rate of progress to ensure completion within the stipulated time allowed for completion.

20A. TIME OF STARTING AND COMPLETING WORK (Continued)

2. Construction operations being carried on without unnecessary delays and no phase of the work on other contracts to be started to the prejudice of the same phase on a contract previously started.

3. There being no unnecessary delay between the completion of one contract and the starting of the next.

4. The work on all contracts being fully completed by not later than **November 1st** of the current calendar year. Carry over work, if permitted, to the following calendar year construction season shall be at no change in contract proposal unit prices.

C. Single Contract - Containing Multiple Streets

A bidder who has been awarded a single contract containing multiple streets, may be permitted to start work on such streets on dates selected by him, provided that such dates are first submitted to and approved in writing by the Engineer.

A bidder who has been awarded a single contract containing multiple streets, may be permitted to start work on such streets on dates selected by him, provided that such dates are first submitted to and approved in writing by the Engineer.

The City, however, through the Engineer, may order the starting of work on any particular street or streets on specific dates when, in the judgment of the Engineer, so doing is in the best interest of the City.

The contractor's request for approval of a selected date for start of work on a specific street shall be on forms provided by the City and shall be submitted to the Engineer at least three working days, exclusive of Saturday and Sunday, prior to the selected date.

When a selected date has been approved by the Engineer, the contractor will be expected to start work on such date and the time allowed for fully completing the work on each specific street will be computed from and include such date, unless a revised request is submitted to and approved by the Engineer. A revised request will, ordinarily, be favorably considered and approved only when the contractor's other Detroit pavement resurfacing work makes the previously selected and approved date impractical or impossible.

The time of starting and completing work on multiple street resurfacing contracts shall be predicated on:

1. Construction operations being carried on at a rate of progress to ensure completion within the stipulated time allowed for completion.

2. Construction operations being carried on without unnecessary delays and no phase of the work on other streets to be started to the prejudice of the same phase on a street previously started.

3. There being no unnecessary delay between the completion of one street and the starting of the next.

4. The work on all contracts being fully completed by not later than November 1st of the current calendar year. Carry over work, if permitted, to the following calendar year construction season shall be at no charge in contract proposal unit prices.

20A. TIME OF STARTING AND COMPLETING WORK (Continued)

It is contemplated that all work will be completed during the **2019** paving season. However, if for any reason, beyond the control of the City or the Contractor, this cannot be accomplished, the schedule of operations in the **Fall of 2019** shall be such that:

1. No concrete paving slabs are poured after November 1; and
2. No excavation of any paving area shall be started for which the pouring of the concrete slab cannot be completed on or before November 1.

C. Single Contract - Containing Multiple Streets (Continued)

When no further work can be done in the **Fall of 2019**, the remaining work shall, thereupon, be suspended on date stipulated in a written order of the City Engineer until suitable weather in the **Spring of 2020.**

Work shall be resumed in the **Spring of 2020** on a date ordered or approved in writing by the City Engineer and shall, thereafter, be fully completed within the number of calendar days remaining.

Whenever work is not completed within a given construction season and is scheduled to resume the following construction season(s), as described above, or whenever work cannot commence due to seasonal limitations and starting is delayed to a subsequent construction season(s), such starting delay and/or carry over to the following year(s) shall be done at no additional cost to the City of Detroit.

The unit prices or contract bid price shall remain firm and will not be changed due to the above reasons.

The Contractor shall prepare his bid taking the above detailed requirements into consideration.

20B. OTHER CONTRACTS

The work under this Contract is required to be coordinated with that of other contracts at the site. The bidder to whom this Contract is awarded shall fully cooperate with the other Contractors in such a manner as the Engineer may direct, so that the work on the entire project may be performed without delay or interference. The bidder shall take these requirements into consideration in preparing his proposal and arriving at his bid price, as no claim for additional costs or damages will be allowed for alleged interference or delay of his work by others.

21. ALLEY CLOSINGS

Prior to the temporary closing of any alley for construction purposes, the City must properly notify residents of the adjacent property, and alternate arrangements made for trash pick-up when required.

After issuance of a Start of Work Notice by the City, the Contractor shall submit for review by the City the proposed schedule of any work that would require the closing of such an alley. No construction necessitating the temporary closing of an alley shall begin without specific authorization by the City.

22. LIQUIDATED DAMAGES

The amount liquidating the damages referred to in Article 4 of the Agreement shall be assessed in accordance with Section 108.10.C entitled "Assessment of Liquidated Damages" of the 2012 MDOT Standard Specifications for Construction.

23. CONTRACT PAYMENTS

The City will make progress and final payments in accordance with the provisions of Articles 7 and 8 of the Agreement. Progress payments will include an allowance for materials stored at the site.

Contract payments are contingent upon receipt of grant funds. The City of Detroit reserves the right to delay payments until receipt of adequate funds from the grantor agency.

24. FEDERAL REGULATIONS

The Contractor shall fully comply with all requirements of the Federal Provisions as contained in the General Conditions - Part II, and the Affirmative Action Requirements contained in the General Conditions Part III.

25. INFORMATION TO BE SUBMITTED WITH BID

The Proposal requires certain information in addition to the price bid, to be furnished by the bidder and submitted as part of his proposal. The bidder is directed to Article 8D of the Standard Instructions to Bidders for general instructions as how such information is to be submitted.

The bidder is cautioned that any information, in whatever form submitted with his bid, which in any way modifies or changes the stipulated Contract Provisions may cause the rejection of the proposal. A bid will become conditional and unacceptable should a bidder include with his proposal, either intentionally or inadvertently, standard brochures, sales agreements, etc., containing contractual provisions differing substantially from those set forth in Contract Documents, unless the bidder definitely and positively indicates that such provisions are not part of his proposal.

26. CHANGES TO STANDARD CONTRACT DOCUMENTS

The following changes are hereby made and supersede standard provisions of the Contract Documents:

A. Standard Instructions to Bidders
Article 16 - "Bond Requirements"

Delete the third paragraph of this article, and substitute therefore the following:

"The surety company or companies shall be listed in the latest issue of U. S. Treasury Form 570 and shall be licensed to do business in the State of Michigan as evidenced by a copy of the 'Certificate of Authority", issued by the Michigan State Department of Insurance filed with the Director. Should any surety upon the Contract be deemed unsatisfactory at any time to the City, notice will be given to the Contractor to that effect by the City, and the Contractor shall forthwith substitute a new surety or sureties satisfactory to the City and without any additional cost to the City."

B. General Conditions

26. CHANGES TO STANDARD CONTRACT DOCUMENTS (Continued)

General Conditions No. 3 (continued)

1. Whenever Engineer is referred to, this shall be changed to read, "City Engineer, City Engineering Division - DPW".

2. Delete the second paragraph of Article 28, and substitute therefore the following:

   "The Contractor shall submit, with the Bid, a separate written request to the City Engineering Division - DPW for approval of each Proposed Subcontractor. Each request shall be on the forms provided by the City Engineering Division - DPW and shall give the name and address of the proposed Subcontractor, the portion and the approximate cost of the work to be sublet. Upon request of the City Engineering Division - DPW, the Contractor who is the apparent Low Bidder shall promptly furnish such additional information tending to establish that the Proposed Subcontractor has the necessary facilities, skill, integrity, part experience, and financial resources to perform the work in accordance with the terms and conditions of this Contract."

3. "No portion of the work may be sublet without the prior written approval of the City. In no case, however, will the Contractor be permitted to sublet any concrete street or alley paving. Concrete paving for the purpose of this condition shall be defined as follows: street and alley pavements with or without curbs, separate type curbs, integral curb and sidewalk, driveways, sidewalks, sidewalk ramps, parking lot pavements and minor pavement work if approved by the Engineer."

"Subcontracting of pavement items, other than streets and alleys, may be permitted after a review of the proposed Subcontractor and the scope of work to be sublet has been made by the City Engineering Division - DPW. The Contractor shall submit the necessary Subcontractor approval request forms, insurance certificates, and such other affidavits as may be required by the contract prior to the review by the City Engineering Division - DPW. Approval of any Subcontractor shall not relieve the prime Contractor of any responsibilities, duties, and/or liabilities as defined in other sections of this Contract. The bidder is particularly reminded that the prime Contractor is required to provide a competent superintendent or general foreman at the site of the work at all times work is in progress on the Contract. Such individual shall have full authority to act for the Contractor."

"Whenever possible, subcontracts shall be let to Detroit companies. Subcontractors must agree to do their work in Detroit, and to use Detroit labor where practicable to give the kind of work specified."

"The Testing Laboratory required to take the concrete cores, as specified in Article 2.IV.1 of the Detailed Specifications, is considered as a Subcontractor. Consequently, the selected laboratory shall be submitted for approval in the manner prescribed in Article 28, "Subcontractors", of the General Conditions. However, only one request for approval need to be made when the same laboratory will be used on all paving contracts awarded to the bidder. The insurance required to be carried by the laboratory shall be not less than that specified for the Contractor."

Article 36 - "FAIR EMPLOYMENT PRACTICES"
Delete this Article in its entirety and substitute the following:

26. CHANGES TO STANDARD CONTRACT DOCUMENTS (Continued)

Article 36 - "FAIR EMPLOYMENT PRACTICES" (Continued)

A. In accordance with the United States Constitution and all federal legislation and regulations governing fair employment practices and equal employment opportunity, including but not limited to Title VII of the Civil Rights Act of 1964 (P.L. 88-352, 78 STAT. 252), and the United States Department of Justice Regulations (28 C.F.R. Part 42) issued pursuant to the Title and in accordance with the Michigan Constitution and all state laws and regulations governing fair employment practices and equal employment opportunity, including but not limited to the Michigan Civil Rights Act P.A. 1976 No. 453 and the Michigan Handicappers Civil Rights Act (P.A. 1976 No. 220), the Contractor agrees that he will not discriminate against any person, employee, consultant or applicant for employment with respect to his/'her hire, tenure, terms, conditions or privileges of employment or hire because of his/her religion, race, color, national origin, age, sex, height, weight, marital status, or handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. The Contractor recognizes the right of the United States and the State of Michigan to seek judicial enforcement of the foregoing covenants against discrimination against itself or its subcontractors.

B. The Contractor agrees to comply with Chapter 2, Article 7, Ordinance No. 303-H as amended by Ordinance No. 330-H of the Detroit City Code, and those rules and procedures adopted by the Human Rights Department pursuant thereto.

The Contractor shall not discriminate against any employee or applicant for employment, training, education, or apprenticeship connected directly or indirectly with the performance of this Contract, with respect to his/her hire, promotion, job assignment, tenure, terms, conditions or privileges of employment because of race, color, creed, national origin, age marital status, handicap, public benefit status, sex, or sexual orientation.

The Contractor further agrees to take affirmative action to achieve reasonable representation of minority groups and women on its work force. Such affirmative action shall include, but not be limited to the following: employment, promotion, demotion or transfer, recruiting or recruitment, advertising, layoff or termination, rates of pay or other forms of compensation and selection for training or education, including apprenticeships. The Contractor shall promptly furnish any information required by the City or the Human Rights Department pursuant to this Section B.

C. In the event the Contractor fails to comply with the provisions of Section B above, or any affirmative action undertaking outlined in its proposal documents, if any, or with any rules, regulations or orders issued by the Human Rights Department, the City as the Human Rights Department may impose such contract sanctions as it may deem appropriate, including but not limited to:

1. Cancellation, termination or suspension of this Contract in whole or in part;

2. Recovering from the Contractor by set off, against the unpaid portion of the Contract price or as otherwise agreed by the parties to this Contract, liquidated damages in the amount of one-half of one percent (.005) of the Contract price not to exceed five hundred dollars ($500.00) per day for each day of non-compliance, as determined by the Human Rights Department; and

3. Law may provide such other remedies.

26. CHANGES TO STANDARD CONTRACT DOCUMENTS (Continued)

Article 36 - FAIR EMPLOYMENT PRACTICES (Continued)

D. The Contractor further agrees that he shall notify any Subcontractor of his obligations relative to non-discrimination and affirmative action under this Contract when soliciting same and shall include the provisions of this Article in any subcontract, as well as provide the City with a copy of any subcontract agreement. The Contractor further agrees to take such action with respect to any subcontract procurement as the City may direct as a means of enforcing such provisions including the aforementioned sanctions of non-compliance.

E. Breach of the terms and conditions of this Article may be regarded as material breach of this Contract.

Also, incorporate the following Federal provisions with those normally required under the above Article. During the performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this non-discrimination clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other Contract or understanding, a notice to be provided advising the said labor union or worker's representative of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by Secretary of Housing and Urban Development and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

26. CHANGES TO STANDARD CONTRACT DOCUMENTS (Continued)
Article 36 - FAIR EMPLOYMENT PRACTICES (Continued)
General Conditions E. (Continued)

6. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government Contracts or Federally-Assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The Contractor will include the portion of the sentence immediately preceding paragraph 1 and the provisions of paragraphs 1 through 7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Secretary of Housing and Urban Development, the Contractor may request the United States to enter into such
litigation to protect the interests of the United States.

F. Federal References

Whenever the term "Administrator, Housing and Home Finance Agency" occurs in the Specifications, this shall be changed to read: "Secretary of Housing and Urban Development", and the term "Housing and Home Finance Agency" shall be changed to: "Department of Housing and Urban Development".

G. City References

1. Whenever the "Environmental Protection and Maintenance Department" is referred to, this shall be changed to read, "Department of Public Works".

2. Whenever "Director" is referred to, this shall be changed to read, "City Engineer, City Engineering Division – DPW".

General Conditions: Article 40 - Contract Deductions for City of Detroit Personnel Overtime Pay.

Delete this Article in its entirely and substitute with the following:

26. CHANGES TO STANDARD CONTRACT DOCUMENTS (Continued)

Article 36 - FAIR EMPLOYMENT PRACTICES (Continued)

Add the following Article: General Conditions
Article 40 - Contract Deductions for City of Detroit Personnel Overtime Pay

Overtime shall be limited to the work days submitted on the progress schedule for the project. The workdays used to develop the progress schedule shall be Monday - Saturday and shall not include Sundays or City Holidays. Overtime work on Sundays and City Holidays shall be limited to emergency work necessary to safeguard the health and safety of the public.

The following are current City holidays: New Year's Day, Martin Luther King's Birthday, Good Friday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Friday after Thanksgiving, Christmas Eve, Christmas Day, New Year's Eve. The Contractor shall be responsible for confirming with the City Engineering Division, Coleman A Young Municipal Center. 2 Woodward Avenue, Suite 601, Detroit, MI 48226 any amendments to this list of calendar dates designated as paid holidays for City of Detroit employees.

"The unit rate per hour for the purpose of overtime pay deductions, as referred in Article 9, of the General Specifications "Hours of Work", shall be **$35.00/per hour** for each individual employee for project inspectors, plant inspectors, and laboratory personnel assigned to this project.

The overtime pay deductions shall be calculated according to the following schedule."

In excess of eight hours per day - Monday thru Friday

Excluding Holidays	.....	"1.5 times" unit rate per hour
Saturday	.....	"1.5 times" unit rate per hour
Sunday and Holidays	.....	"2.0 times" unit rate per hour

26A. CHANGES TO GENERAL SPECIFICATIONS

Article II - "Maintaining Traffic"

Add the following paragraph:

MAINTENANCE OF TRAFFIC

Walks, driveways, alleys and entrances to buildings shall not be blocked. The required number of lanes shall be maintained by plating of pavement. The paved surface shall be free of stored equipment, excavated material etc. during specified hours. Protection and temporary crossings shall be provided for pedestrians.

SPECIFIC REQUIREMENTS

Maintain one lane of through traffic in all directions, along with turning movement in all directions at all times.

26B. CHANGES TO SUPPLEMENTAL GENERAL SPECIFICATIONS

Article S-27, "Field Office" Delete this article in its entirety.

ARTICLE 2.111.19, P.L.D. Manhole and Handhole Adjustment
Delete this article in its entirety and substitute the following:

2.111.18 PUBLIC LIGHTING DEPARTMENT (P.L.D.) MANHOLE AND HANDHOLE ADJUSTMENT

The tops of existing P.L.D. manholes and handholes shall be adjusted to the new required grades and cross-sections in the same manner as specified for sewer manholes.

If adjusting the frame and cover to the proposed grade requires adjustment of the handhole or handhole roof, the Contractor shall notify the P.L.D. The work involved in the adjustment of the roof of the structure and adjustment of the frame and cover to the new pavement surface will be performed by P.L.D. at no cost to the Contractor.

Should existing castings require replacement, as determined by the Engineer, the Contractor shall furnish such casings.

The unit price of the castings includes all costs necessary to provide castings to the project. This cost includes shipping, handling, storage, markup and any other cost associated with providing this item of work.

Salvages castings shall become the Contractor's property and shall be promptly removed from the job site.

The Contractor must submit to the P.L.D. for their approval, manufacturers cut sheets for the manhole and handhole frames and covers and the brick to be used in adjusting the elevation of the frames. Installation shall be in accordance with P.L.D. specifications and subject to P.L.D. inspection and approval.

Specifications and detailed drawings for P.L.D. manhole and handhole frames and covers may be obtained from the Public Lighting Department.

26C. ADDITIONS OF DETAILED SPECIFICATIONS

Special Provisions and Supplemental Specifications for the HMA Project:

Maintaining Traffic
Removing Bituminous Surface
HMA Application Class C Streets
Bituminous Material Used to Adjust Low Driveways
Quality Control & Acceptance of Portland Cement Concrete
Acceptance of Hot Mix Asphalt Mixture on Local Agency Projects
Structure Cover, Adjustment, Reconstructing Structure and Water Shutoff Adjustment
Sidewalk with Tree Roots
Sidewalk, Sidewalk Ramp, ADA, Detectable Warning Surface, Driveway and Their Removal
Drawings, Sidewalk Ramp R-28-I
Mobilization
Typical Pavement Cross Section for Pavement Resurfacing of Class C Streets
Crosswalk Marking at Intersections in Residential Areas
Removal of Curb and Curb and Gutter
Modified Separate Type Curb
Working Area and Project Clean-up
Drainage Structure Cleaning and Sewer Lead Cleaning
Drainage Structures
DWSD Drawings

26C. ADDITIONS OF DETAILED SPECIFICATIONS (Continued)

These have been added as a supplement to the Standard Specifications for Paving and Related Construction, dated **March, 2009** as amended, and is attached to Part II of the documents.

27. PRE-PERFORMANCE CONFERENCE

Before the starting notice is issued, the City Engineer will call conference for the purpose of discussing the labor standards provisions of the Contract. The conference shall be attended by the prime contractor, subcontractors, and by representatives of the City and Federal Government.

28. SUBCONTRACTS

A. The Contractor shall not execute an agreement with any Subcontractor or permit any Subcontractor to perform any work included in this contract, until he has submitted a Non-Collusion Affidavit from the Subcontractor in substantially the form shown on the attached sheet, and has received written approval of such Subcontractor from the City.

B. No proposed Subcontractor should be disapproved by the City without cause.

29. ACCIDENT PREVENTION

A. The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his fault or negligence in connection with the prosecution of the work. The safety provisions of applicable laws and building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures as the City may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.

B. The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the City with reports concerning these matters.

30. SANITARY FACILITIES

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required by the sanitary codes of the State and Local Government. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulation.

31. REVIEW BY CITY AND HUD

The City, its authorized representatives and agents, and the HUD Representative for the Administrator (as defined under GENERAL CONDITIONS, PART II, Page LP-1) shall, at all times, have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, and other relevant data and records pertaining to this Contract, provided, however, that all instructions and approvals with respect to the work will be given to the Contractor only by the City through its authorized representatives or agents.

32. WORKING AREA

The Contractor will be required to submit to the Engineer written evidence indicating that the Contractor has secured permission to use for construction purposes the property adjacent to the public right-of-way that is owned by private individuals and/or the Community Development Commission. The Community Development Commission may grant the Contractor permission to use their property providing the Contractor complies with the following conditions:

1. Prior to starting the work, the Contractor shall prepare and submit to the Engineer a drawing indicating the limits of the work area required for his operations and said area is not to exceed twenty-five (25) feet beyond the existing curb of the street. The work area shall be sufficient for storage of materials and supplies, for hauling of materials and for parking of his employees' cars.

2. The Engineer, the Contractor, and a representative of the Community Development Commission will inspect the proposed working area and will note the condition of the area with regard to grade, type, and condition of surface, and existing vegetation.

3. After receiving approval of the work area, the Contractor shall place stakes, which shall define the limits of the work area. The Contractor shall inform his employees, subcontractors, and suppliers that all operations shall be restricted to the approved work area. The Contractor shall be responsible for restricting his work force from trespassing outside the limits of the approved work area.

4. Prior to completing the Contract, the Contractor shall restore the approved work area and any additional adjoining area that has been damaged by the operations of the Contractor, the Contractor's employees, subcontractors and suppliers. The restoration shall include removal of surplus soil and/or the furnishing and placing of additional fill if required, re-grading, preparation of soil for rye seeding, if required, and the furnishing and sowing of rye seed, if required. Concrete batch plant or materials for mixing concrete for paving are not to be located on the job site.

33. AFFIRMATIVE ACTION - INFORMATION TO BIDDERS

The bidder's attention is directed to the Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246).

Failure of Contractors or subcontractors to comply with Federal Rules and Regulations regarding Equal Employment Opportunity and Affirmative Action can result in the withholding of the advance of construction money until all deficiencies have been resolved.

Failure of Contractors or subcontractors to keep proper and adequate records and to submit proper and adequate reports can result in Federal action to withhold the advance of construction money until all deficiencies have been resolved.

33. AFFIRMATIVE ACTION - INFORMATION TO BIDDERS

A. Contracts Under $100,000

If the Contractor intends to utilize subcontractors, he shall make efforts acceptable to HUD to solicit minority subcontractors to bid and perform on this project. Assistance in this matter can be obtained from:

Michigan Minority Business Development Council
2990 West Grand Boulevard
Detroit, Michigan 48202
313- 873-3200 313-873-4783 Fax

B. Contracts Over $100,000

If the Contractor intends to utilize subcontractors, he shall make efforts acceptable to HUD to solicit minority subcontractors to bid and perform on this project. Such effort may include, but not be limited to, contacts with minority contractor organizations (such contacts shall be in person) and affirmative action steps taken to accomplish minority contractor involvement (e.g. split contracts, mini-contracts, etc.). A minority contractor organization located in this area is:

Michigan Minority Business Development Council
2990 West Grand Boulevard
Detroit, Michigan 48202
313- 873-3200 313-873-4783 Fax

All bidders who anticipate using subcontractors on this project shall submit evidence with their bids that acceptable efforts as minority Subcontractor solicitation have been made.

34. SECTION 3 CLAUSE **Not Used**

35. AUDIT ACCESS

If applicable, the Contractor shall keep and maintain all books, records and other documents relating directly to the receipt and disbursement of the corpus and any duly authorized representative of the Secretary of the United States Department of Housing and Urban Development or Comptroller General of the United States shall, at all reasonable times, have access to and the right to inspect, copy, audit and examine all such books, records and other documents of the Contractor until three (3) years after the completion of all close-out procedures respecting the use of such funds, and until the final settlement and conclusion of all issues arising out of the use of such funds.

36. COMPLIANCE WITH CLEAN AIR AND WATER ACTS

If applicable, the Contractor agrees to comply with all applicable standards, orders or requirements issued under Section 306 of the Clean Air Act (42 U.S.C. 1857 (h), Section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15).

The Contractor agrees to report violations to HUD and to the U.S.E.P.A. Assistant Administrator for Enforcement (EN-329). The Contractor recognizes mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (P.L. 94-163).

37. RETAINAGE REQUIREMENT STATE ACT 524 OF 1980

Notwithstanding anything contained herein to the contrary, if not in conflict with federal law or

regulation, the following terms and conditions shall apply to this contract to the extent required by Act No. 524 of Public Acts of 1980 (the "Act"):

A. As provided in the Act, the following persons are hereby designated to receive and submit, respectively, the requests for progress payments:

For the City: Engineer of Inspection

B. The following person is hereby designated as the "Architect or Professional Engineer": City Engineer, City Engineering Division - DPW

C. The City shall retain a portion of the progress payments otherwise due to the Contractor (The "Retainage") as follows:

1. The City shall retain ten percent (10%) of the dollar value of all work in place until work is fifty percent (50%) in place;

2. After the work is fifty percent (50%) in place, additional Retainage shall not be withheld unless the City determines that the Contractor is not making satisfactory progress, or for other specific cause relating to the Contractor's performance under this contract. If the City so determines that the Contractor is not making satisfactory progress or other specific cause relating to the Contractor's performance under his contract exists, the City may retain an additional amount of the progress payments otherwise due the contractor, which additional amount shall not exceed ten percent (10%) of the dollar value of work more than fifty percent (50%) in place. In any event, the Retainage withheld by the City pursuant to the Act shall not exceed the pro rata share of the City's matching requirements, provided, however, that if the provisions of any federal or state law or regulation provide for the retention of a different amount, the provisions of such other law or regulation shall govern.

D. All retained funds that are deposited in a regulated financial institution pursuant to the Act shall bear interest at the rate determined by the financial institution in which the retained funds are deposited.

E. Each progress payment requested shall be paid by the City to the Contractor within the following time period:

1. Thirty (30) days after the Engineer's or Architect's periodic Certified Payment Estimate; or

2. Fifteen (15) days after the City has received the funds with which to make the progress payment from a department or agency of the federal or state government, if any funds are to come from either of these sources.

In the event that the City fails to make a progress payment within the above stated period of time, and upon request by the Contractor to pay a reasonable interest charge, the reasonable interest rate payable by the City shall be six percent (6%). Interest will begin to accrue only on the thirty-first (31st) day, if payment was due according to paragraph (1) above, or on the sixteenth (16th) day if payment was due according to paragraph (2).

The actual "date of payment" of a progress payment shall be deemed to be the date on the check issued by the City for such payment.

37. RETAINAGE REQUIREMENT STATE ACT 524 OF 1980 (continued)

F. If at any time during the term of this contract a dispute arises between the City and the Contractor as to whether there has been a delay for reasons that were within the control of the Contractor, or as to the period of time that such delay for reasons that were within the Control of the Contractor, or as to the period of time that such delay has been caused, continued, or aggravated by actions of the Contractor; or if at any time after ninety-four percent (94%) of work time after ninety-four percent (94%) of work under the contract is in place, a dispute between the City and the Contractor arises as to whether there has been an unacceptable delay by the Contractor in performance of the remaining six percent (6%) of work under the contract; the City and the Contractor agree to submit the foregoing disputes to the decision of an agent, at the option of the City and in accordance with provisions of the Act. The City and the Contractor shall bear equally all costs of the agent to whom a dispute is submitted for a decision, which decision shall be made by the agent pursuant to, and in accordance with, the provisions of the Act.

38. PREVAILING WAGE

In accordance with CITY OF DETROIT ORDINANCE 01-04, the current schedule at the time of bidding of the prevailing wage and fringe benefits for all classes of construction trade workers shall be used in this contract.

The rate of wages and fringe benefits to be paid to each class of construction trade workers by the Contractor and all of his/her Subcontractors shall not be less than the wage and fringe benefits so specified.

39. SUBCONTRACTOR UTILIZATION (EXECUTIVE ORDER NO. 4)

In accordance with the City of Detroit Executive Order No. 4, this contract requires a minimum of 30% of the total contract dollar amount to be subcontracted to Detroit Based Businesses or Small Businesses.

40. PROMPT PAYMENT

The individual responsible for accepting performance under this Contract is:

Richard Doherty, P.E., City Engineer
DPW - City Engineering Division
2 Woodward Avenue, Suite 601
Detroit, MI 48226
313-224-3955 Telephone
313-224-3471 Fax
dohertyri@detroitmi.gov

STANDARD INSTRUCTIONS TO BIDDERS

1. GENERAL PURPOSE & INTENT

These Standard Instructions to Bidders contain information and requirements, which, in general, are common to all Contract Documents prepared by the City Engineer's Office of the City of Detroit in which these instructions are included. Such instructions and requirements apply to this Contract except as such may be modified and supplemented by specific instructions and requirements pertaining to this Contract contained elsewhere in these Contract Documents.

In addition to these instructions, the Advertisement and Special Notice to Bidders also contain information to bidders.

No effort is made to emphasize any particular provision of the Contract Documents, but bidders must familiarize themselves with every provision and its effect.

2. THE CONTRACT DOCUMENTS

The Contract Documents consist of the following, grouped as listed below:

PART I
- Advertisement
- Special Notice to Bidders
- Standard Instructions to Bidders
- Proposal
- Agreement
- Bond Forms
- Contract Forms

PART II
- General Specifications
- Detailed Specifications

PART III
- Contract Drawings, if any, when so stated in the "Special Notice to Bidders"

In addition to the above, any and all Bulletins issued become a part of the Contract Documents.

A "Table of Contents," bound in the front of Part I, lists the individual parts and major subdivisions for each individual part by title, and indicates the total number of pages in each individual part. When Contract Drawings prepared by the City Engineer are included, the individual drawing titles and numbers are also here listed.

In the process of assembling and binding the Contract Documents, individual pages or drawings may have been inadvertently omitted. Each bidder shall carefully and thoroughly examine his copy of the Contract Documents for completeness, for no claim of any bidder will be allowed on the basis that his copy of the Contract Documents was incomplete.

Titles, subtitles, headings, running headings and tables of content as used throughout the Contract Documents are merely convenience and in themselves are not a Contract provision or requirement and are not to be taken into account in any way in construing any of the rights or obligations of the parties to the Contract.

3. INTERPRETATION OF CONTRACT DOCUMENTS

Should any prospective bidder be in doubt as to the true meaning of any portion of the Contract Documents, or should he find any patent ambiguity, inconsistency, or omission thereon, he shall request the City Officer, in writing, for an official interpretation or correction. The person making the request will be held responsible for its prompt delivery.

Such interpretation or correction, as well as any additional Contract provision the City may decide to include, will be made only as a Bulletin which will be mailed or delivered to each person recorded as having received a copy of the Contract Documents. Any Bulletin issued by the City Officer shall become a part of the Contract Documents and shall be taken into account by each bidder in preparing his bid.

Only the Bulletin duly issued by the City Officer shall be binding, and prospective bidders are warned that no oral interpretation, information, or instructions by any officer or employee of the City is authorized.

4. BIDDER'S QUALIFICATION

Bids are solicited only form responsible bidders known to be skilled and regularly engaged in work of similar character and proportion to that covered by the Contract Documents.

After the opening of bids, when so requested by the City Engineer, the bidder shall promptly submit a certified written statement setting forth such information as the City may require concerning his prior experience and performance record, other work now under contract, financial condition, personnel, and qualifications of his working organization, available equipment and the major parts of the work proposed to be sublet

In addition to the above, and when so requested by the City Engineer, the bidder shall meet with the city's representatives and give further information in relation to his proposed tentative construction plan and schedule of operations and such other matters as the City may deem necessary in order to determine the bidder's qualifications, responsibility and ability to perform and complete the work in accordance with the Contract requirements

5. BIDDER'S EXAMINATIONS & INVESTIGATIONS

The prospective bidder shall carefully and thoroughly examine all parts of the Contract Documents and all maps, drawings, and other data mentioned therein as being on file in the City Engineer's Office for examination.

STANDARD INSTRUCTIONS TO BIDDERS

The bidder shall make an inspection of the site of the proposed work, as well as its adjacent area, and determine for himself all conditions under which he will be obliged to work.

The submission of a proposal shall, in itself, be conclusive evidence that the bidder has made all examinations and investigations he deemed necessary to properly prepare a proposal meeting all Contract requirements.

No plea of ignorance of conditions that may exist or that may hereafter exist, or of difficulties that may be encountered in the execution of the work under this Contract, as a result of the bidder's failure to make prudent examinations and investigations will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all requirements of the Contract Documents, or will be accepted as a basis for a claim for extra compensation, damages, or for an extension of the time of completion.

6. LABOR & MATERIALS

The City of Detroit will not furnish any labor, materials or supplies unless specifically provided for in the Contract.

A. Materials: All materials and equipment incorporated in the work of this Contract shall be new. No secondhand or salvaged materials or equipment will be permitted unless specifically specified.

B. Availability of Materials: The specified time of completion is based upon the availability of the required materials. It will be assumed by the City that each bidder will have made his own investigation and determination of the probable availability of the required materials in the amounts and at the times necessary to complete the work within the time allowed for completion.

If, during construction, certain materials cannot be obtained in the quantities and/or at time necessary to complete the work within the time allowed, then an extension of time of completion will be considered in accordance with the provisions of Article 18, "Delays and Extension of Time," of the General Conditions provided:

1) The materials which in the judgment of the Engineer were properly determined to be available at time of bidding, become unavailable during construction;

2) Diligent efforts have been made by the Contractor to secure the materials;

3) The Engineer has been notified sufficiently in advance so that available substitutions could have been considered.

4)

Delay in securing any specific materials shall not be used as the basis for delaying the construction of other parts of the work not dependent upon such delayed materials.

7. BASIS OF BID - PRICE REQUIRED

The Special Notice to Bidders designates the basis on which the price or prices are required. Such price or prices are to be submitted in accordance with the following provisions such as are applicable to the basis designated for this Contract.

In arriving at the price or prices bid, the bidder shall make his own estimates of the facilities and difficulties attending the performance of the proposed Contract, including local conditions, availability of materials, uncertainty of weather, and all other contingencies. It is the intent of the Contract Documents to provide for finished work and any miscellaneous items clearly necessary to this end shall be considered a Contract requirement whether or not specifically included in the Contract Documents.

A. Single Lump Sum Price: When proposals are invited on the basis of a lump sum price for the entire work included in the Contract, then only a single lump sum price shall be submitted.

B. Lump Sum Price for All or Parts of the Work: When proposals are invited on the basis of a lump sum price for the entire work included in the Contract with the option for separate bids on designated parts of the work, the bidder may submit a lump sum price for the entire work and or separate lump sum prices for such of the designated parts he is qualified to perform.

C. Lump Sum Prices for Designated Parts of the Work: When proposals are invited on the basis of separate lump sum prices designated for parts of related work with no provision for a single lump sum price for the entire work, the bidder may submit a lump sum price for each of the designated parts he is qualified to perform. No price shall be submitted for doing the entire work, or combination of parts thereof, as a single contract.

D. Lump Sum Price - Two or More Independent Contracts: When the Proposal is common to two or more Contracts for work which is distinctly separated but of the same general type, the bidder may submit a lump sum price for such Contracts as he selects, with the Proposal for each Contract to be considered independently. Unless the Proposal otherwise provides, it will be understood that the bidder considers himself qualified to perform concurrently each of the Contracts for which he submits a price and to perform each in accordance with its own specific Contract requirements.

When the Proposal so provides, a bidder, whose capacity for doing concurrent work prevents him from accepting all the contracts on which he may desire to submit proposals, may submit a lump sum price on such contracts as he selects with the understanding that he would be awarded only the total number of contracts which he stipulates in the Proposal that he has the capacity to accept and perform concurrently. However, the bidder shall not designate

which he submits a price and to perform each in accordance with its own specific Contract requirements.

When the Proposal so provides, a bidder, whose capacity for doing concurrent work prevents him from accepting all the contracts on which he may desire to submit proposals, may submit a lump sum price on such contracts as he selects with the understanding that he would be awarded only the total number of contracts which he stipulates in the Proposal that he has the capacity to accept and perform concurrently. However, the bidder shall not designate which particular contract or contracts he would accept in event he is the low bidder on more contracts than he has the capacity to perform concurrently. The determination of on what contract or contracts a bidder is considered to have submitted the actual low bid or bids will be made by the City on the basis of the bids which will result in the entire work of all contracts being done for the least cost to the City.

When the Proposal so provides, and not otherwise, the bidder may submit a lump sum price for doing as a single contract all the work of the individual contracts in such combination as listed in the Proposal.

E. Unit Price: When Proposals are invited on the basis of unit prices for various items, the bidder shall state a unit price for each and every item listed in the Proposal form, and such prices shall be extended and totaled. If, during the review of the Proposals, the City finds any errors in any extension or total, the City will make the necessary corrections and award the Contract on the basis of such corrections, since the unit prices shall govern.

Any proposal which does not contain a unit price for each item listed will be deemed incomplete and will not be considered in the award of the Contract.

Any work not specifically mentioned in the payment items listed in the Proposal shall be considered incidental to one or more of the payment items, and no claim for additional compensation will be allowed. The bidder shall not add to the listed items, or combine any of the items.

The quantities for the various items of work appearing in the Proposal, while stated with as much accuracy as possible in advance, are approximate only and given solely to provide a uniform basis for comparing bids and determining the amounts of the bonds. The actual quantities required to complete the work and for which payment will be made, may be more or less than those stated in the Proposal, and, if so, no claim for damages or loss of profits will be allowed.

The unit price for each of the several items in the Proposal shall include its pro rata part of overhead and be such that the whole of the unit prices will represent a balanced bid. Any proposal in which the unit prices bid for any of the several items are deemed by the City to be manifestly unbalanced may be rejected by the City and not considered in the award of the Contract and may cause the entire bid to be rejected.

8. PREPARATION OF PROPOSALS

Proposals shall be carefully prepared in strict accordance with the Contract requirements and these instructions, otherwise the bid may be rejected and not considered in the award of the Contract.

A. Form: The blank form of Proposal supplied by the City shall be used. The form shall not be detached, but shall be submitted intact as originally bound. No change shall be made in the wording of the form or in any of the items mentioned therein, nor shall any special conditions be made or included as part of the bidder's proposal. Proposals shall be filled out legibly in ink. Erasures or other changes in the bid shall be explained or noted over the signature of the bidder.

B. State of Prices: The price or prices bid shall be stated in figures only and in the proper space or spaces provided in the Proposal form.

C. Evaluated Bid: When the Proposal provides for evaluated bids, full information shall be supplied and computations shall be made by the bidder in accordance with the manner and method provided for in the Proposal. If, during the review of the Proposals, the City finds any errors in the bidder's computation, the City reserves the right to make the necessary corrections, including the changing of any values used in the computation found to be a variance with basic information or data furnished by the bidder. When information is required to supplement the statements made by the bidder, it shall be furnished in accordance with the next following section.

D. Information Required: When the Special Notice to Bidders or the Proposal form so requires, certain information, in addition to the price bid, shall be furnished as part of the bidder's proposal. Failure of the bidder to submit the required information or the submission of the information in an inaccurate or incomplete form may be cause for rejection of the entire Proposal.

1) Bidder's Drawings and Specifications: When bidder's drawings and/or specifications are required to be submitted, they shall be in sufficient detail to fully and distinctly show and describe the equipment which the bidder proposes to furnish, including the kind and quality of the material and workmanship that will be used in the various parts. If any general drawings, specifications, catalogs, or other literature are submitted which contain information or data not pertaining to the particular equipment proposed to be furnished, appropriate notations to that effect must be made.

STANDARD INSTRUCTIONS TO BIDDERS

2) Other Information: When the Proposal form provides space for inserting required information, such space is to be used. If the bidder finds such space insufficient, then the required information may be submitted on separate sheets properly identified as part of the bidder's proposal .

3) Supplemental Information: The bidder may submit such supplemental information, as he may desire, describing the equipment he proposes to furnish. However, the bidder is to completely fill out the Proposal form even though some of the information required to be stated in the Proposal may be contained in the supplemental information furnished.

E. Conditional Bids: Any stipulation or qualification contrary to the Contract requirements made by the bidder in or accompanying his proposal as a condition for the acceptance of the Contract will not be considered in the award of the Contract and may cause the rejection of the entire Proposal.

F. Waiver: The bidder's attention is called to the paragraph in the Proposal headed "Waiver." This is included for the purpose of avoiding any controversy over the claim of any bidder of the right to refuse to execute the Contract and demand the return of his bid deposit on the grounds of error, mistakes, or omissions made by him in his Proposal.

G. Name, Legal Status, and Bidder's Signature: Each bid shall contain, on page P. 4 of the Proposal form, the following information inserted in the respective places provided therefore:

1) Full business name of bidder together with Federal Treasury number.

2) Business address.

3) Signature of bidder. The person signing the Proposal shall use his usual signature, followed by his name legibly printed on the line next below.

4) Date of proposal.

The following are additional requirements, according to the bidder's legal status:

Individual

1) Legal status - place "X" in box for "Individual."

2) Home address and Social Security number

A bid by a person who adds to his signature the word "President," "Partner," "Agent," or other designation, without disclosing his principal, may be held to be the bid of the individual signing.

Doing Business Under An Assumed Name

1) Legal status - place "X" in box for "Doing business under an assumed name" together with Federal Treasury number.

2) County in Michigan in which assumed name is registered.

3) Home address of individual and Social Security number.

Co-Partnership

1) Legal status - place "X" in box for "Co-partnership."

2) County in Michigan in which co-partnership is registered.

3) Names and home address of all partners, together with Social Security numbers.

4) Signature of one of the partners, followed by the word "Partner" on the line "Title."

Corporation

1) Legal status - place "X" in box for "Corporation."

2) Name of state under whose laws the corporation is incorporated.

3) If not a Michigan corporation - indicate by "X" in appropriate box if the corporation is licensed to do business in Michigan. An out-of-state corporation will be required to have such license at the time the Contract is executed.

4) Full names, titles, and home addresses of corporation officers, and Social Security numbers.

5) Signature of authorized officer of corporation, followed by his title.

6) Corporate seal affixed.

7) "Certificate" for signature and seal - page P. 5 of Proposal - shall be executed by an officer other than the one signing the Proposal.

Agent

If the bid is signed by an individual acting as an agent for the principal in whose name the Proposal is submitted, the addition to the above applicable requirements, there shall be attached to the Proposal a power-of-attorney evidencing authority of the individual to sign and submit the bid in the name of the designated principal.

STANDARD INSTRUCTIONS TO BIDDERS

9. BID DEPOSIT When the Advertisement states that the security is required with the Proposal to insure the acceptance and execution of the Contract and Bonds, no bid will be considered complete unless so guaranteed.

A. Amount: The amount of the bid deposit shall be not less than that stipulated in the Advertisement. In case the Proposal contains alternates, the amount of the bid security, if stated as a percentage of the bid, refers to the Base Bid. If the Proposal contains two or more Contracts, the amount of the bid security required is determined on the total amount of the bids for such Contracts for which bids are submitted.

B. Form: The bidder, at his option, may furnish either a certified check, bank draft, irrevocable bank letter of credit, or guaranty (bidder's) bond. If the bid deposit covers two or more contracts contained in the same Proposal form, one check, draft, irrevocable bank letter of credit, or guaranty bond may be used if properly identified to cover all contracts for which a bid is submitted. Cash deposits will not be accepted.

Check: The certified check or bank draft shall be drawn on a solvent bank and made payable without condition to the "Detroit Building Authority."

Irrevocable Bank Letter of Credit: The irrevocable bank letter of credit shall be drawn on a solvent bank and made payable to "Treasurer, City of Detroit." The Irrevocable Bank Letter of Credit shall be given in compliance with and subject to the provisions and term of the Uniform Commercial Code which was adopted in Michigan in 1962 in Public Act 174. (Authorized by Common Council Resolution September 2, 1969, JCC 2208.) The Irrevocable Bank Letter of Credit must be submitted on a form acceptable to the City of Detroit.

Bond: The guaranty (bidder's) bond shall be on the form supplied by the City. The bond shall be executed by a surety company licensed to do business by the State of Michigan, and in accordance with the instructions contained on the bond form.

C. Submission: The bid deposit, in whichever form, shall be enclosed in the same envelope as that containing the bid and is not to be submitted separately.

D. Return: The bid deposit of all bidders may be held by the City until all bids have been canvassed and the award of the Contract recommended to and approved by the City Council.

The bid deposit of the bidder awarded the Contract will be held until the Contract is duly executed and confirmed. The bid deposits of other than the successful bidder will be returned after the award has been made by the City Council.

E. Forfeiture: If the bidder to whom the contract is awarded, refuses or neglects to properly execute the Contract, or fails to furnish the required surety bonds, within 10 calendar days after written notice to him, the amount of the deposit shall be forfeited, and retained by the City of Detroit as liquidated damages.

10. SUBMITTING BID

A. Form: The Bid Documents containing the Proposal, together with the required bid deposit, shall be securely sealed in a suitable envelope clearly labeled as a bid identified by the Contract number stated in the Advertisement, and showing the bidder's name, so as to guard against premature opening.

B. Place and Time: Bids will be received during the regular business hours at the place and up to the time stated in the Advertisement, or up to the time as extended by Bulletin. Any bid received after the stated hour, even through the mail, will be returned unopened to the bidder.

C. Withdrawal: Bids received prior to the scheduled time for receipt of bids will be kept securely, unopened. No bid after being received by the City will be returned to a bidder prior to the opening of bids. After the opening and reading of the bids, no bid may be withdrawn before the expiration of the number of days specified in the Advertisement, and then only in writing and in advance of the actual award. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid before or after it has been opened.

D. Modifications: No bid after being submitted may be modified or changed by letter, telegram, or other means, and if any such modification is received by the City, it will not be considered in the award of the Contract. No bidder will be permitted to submit more than one bid.

11. OPENING OF BIDS All bids received will be **publicly opened for identification, but not read** after the designated time at the place stated in the Advertisement or as extended by Bulletin, and bidders are invited to be present.

12. COMPARISON OF BIDS

A. Lump Sum Bids: Bids on lump sum contracts will be compared on the basis of the lump sum price bid, adjusted for alternate prices bid if any are called for in the Proposal.

B. Unit Price Bids: Bids on unit price contracts will be compared on the basis of a total estimated price, arrived at by taking the estimated quantities of each item stated in the Proposal, multiplied by the corresponding unit prices bid, and including any lump sum bids on individual items. Any

errors found in the bidder's extensions or addition will be corrected, since the individual unit prices govern, and the total estimated price will be adjusted accordingly.

C. Evaluated Bids: Bids on an evaluated basis will be compared on the basis of the net evaluated bid price. Any errors found in the bidder's computation will be corrected and the net evaluated bid price adjusted accordingly. The Contract, if awarded, will be awarded at the bid price to the responsible bidder having the lowest net evaluated bid price.

13. REJECTION OF BIDS

The City of Detroit reserves the right to reject any and all bids or to waive any irregularity in any bid should be deemed for its best interest so to do. Without being limited thereto, a bid may be rejected if:

A. The Proposal does not strictly conform to the requirements of the Contract Documents or law;

B. The Proposal contains unit prices which, in the judgment of the Engineer, are unbalanced;

C. The Proposal is conditional;

D. The bidder misstates or conceals any material fact in the bid;

E. The bidder fails or refuses to promptly furnish the City information requested as to his qualifications and responsibility;

F. A determination is made by the City that the bidder is not qualified or responsible to perform the work.

14. AWARD OF CONTRACT

The Contract will be awarded to the lowest responsible bidder complying with the requirements of the Contract Documents, provided his bid is reasonable and the best interest of the City of Detroit will be served by accepting it. The Contractor will not be subdivided among two or more bidders unless the Proposal provides for separate bids on designated parts of the work, and then only when the total of the lowest reasonable bids for the individual parts is less than the lowest responsible bid for the entire work when a combined bid is permitted.

The Contractor will be deemed to be awarded after the formal approval of the Common Council of the City of Detroit has been obtained, and written notice by the City has been sent to the intended awardee. The Contract will not, however, be valid or binding upon the City until the Contract Agreement has been duly executed by both parties, the required Surety Bonds furnished, and the executed Contract Documents have been endorsed and confirmed in accordance with the City of Detroit Charter.

15. CONTRACT EXECUTION

The bidder to whom the Contract is awarded, shall within 10 calendar days after the Contract forms are presented to him, enter into written contract with the City by properly executing the Agreement and furnishing the required Performance Bond and Payment Bond and other information and affidavits as are required by and in strict accordance with the City's instructions accompanying the Contract forms.

Any delay by the successful bidder beyond the ten calendar days stipulated for submitting to the City Engineer in complete and acceptable form and number, the Agreement, Bonds, and other required information and affidavits, will cause a like number of calendar days being deducted from the total time stipulated for fully completing the work.

This provision in no way affects the rights of the City to require forfeiture of the bid deposit as provided for in Article 9E.

16. BOND REQUIREMENTS

The successful bidder to whom the Contract is awarded shall furnish at his own expense and at the time he submits his executed copies of the Contract, surety company bonds, on forms furnished by the City, conforming to the applicable statutes of the State of Michigan in effect at the time of the date of the bonds, as follows:

A. *Performance Bond*, to insure construction and completion of the entire work according to the requirements of the Contract and within the time allowed.

B. *Payment Bond*, for the protection of claimants supplying labor and materials to the principal contractor or his sub- contractors in the prosecution of the work.

Each bond shall run to the City of Detroit, Michigan, and each bond shall be in the full amount of the Contract price unless otherwise specified in the Special Notice to Bidders.

The surety company or companies shall be listed in the latest issue of U.S. Treasury Form 570, and shall be licensed to do business in the State of Michigan as evidenced by a copy of the "Certificate of Authority" issued by the Michigan State Department of Insurance filed with the Director. Should any surety upon the Contract be deemed unsatisfactory at any time to the City, notice will be given to the Contractor to that effect by the City, and the Contractor shall forthwith substitute a new surety or sureties satisfactory to the City and without any additional cost to the City.

An executed copy of each bond will be required for each copy of the executed Contract. The date of the bonds shall be the same as the date of the Contract.

17. ASSIGNMENT OF CONTRACT

Bidder's attention is directed to Article 29 of the General Conditions, "Assignment." The City will not consider the assignment or transfer of the Contract unless an exigency occurs which was not known or could not have been foreseen by the bidder at the time of bidding. No assignment or transfer will be approved which is not in the best interest of the City.

18. SUBCONTRACTS

The bidder's attention is directed to Article 28 of the General Conditions, "Subcontracts." No portion of the work may be sublet without the prior written approval of the City. Bids shall be based on letting subcontracts, whenever possible, to Detroit companies. Subcontractors must agree to do their work in Detroit and to use Detroit labor where practicable to give the kind of work specified.

When the Proposal so provides, the bidder shall name the persons or firms he proposes to use as subcontractors for such parts of the work specifically listed in the Proposal. All persons or firms so named shall be acceptable to the City of Detroit and if any are not acceptable, the bidder will be required to name other persons or firms which are acceptable. Any such required substitutions will in no way otherwise change or modify the bidder's Proposal. After the award of the Contract, no substitutions will be allowed except for reasons deemed justified by and in the best interest of the City.

PROPOSAL

TO : CITY OF DETROIT
FINANCE DEPARTMENT
PURCHASING DIVISION
DETROIT, MICHIGAN 48226

PROJECT: PW-7003 LIVERNOIS STREETSCAPE BETWEEN CLARITA AND WEST EIGHT MILE ROAD, IN THE CITY OF DETROIT

PART I - BASE BID

I. PRICE BID

The undersigned hereby proposes to furnish all materials and supplies and to provide all labor, construction tools and equipment and to perform and fully complete all the work required for the construction of the above described project for which unit prices are hereinafter submitted.

The undersigned agrees that any incidental work required to perform the complete scope of work and not specifically mentioned in the payment items shall be considered as incidental to the payment items and that no claim for additional compensation will be made.

The undersigned understands that the quantities stated in the Unit Price Schedule are approximate only and are subject to increase or decrease and the undersigned hereby agrees to perform all quantities of work as either increased or decreased in accordance with the requirements of the contract documents at the unit prices bid in the Unit Price Schedule.

PROPOSAL

PART II CONDITIONS

II. BID DEPOSIT

A bid deposit accompanies this Proposal in the form checked below:

☒ Bid Bond by Surety Company

☐ Certified Check or Bank Draft

☐ Irrevocable Bank Letter of Credit

Such deposit is in an amount not less than called for in the Advertisement, and is given as a guarantee of the good faith of the Undersigned and that the Undersigned will enter into written contract as provided, if successful in securing the award thereof; and it is hereby agreed that if at any time other than as provided in the Contract requirements and conditions, the Undersigned should withdraw this Proposal, or if this Proposal is accepted and should there be a failure on the part of the Undersigned to execute the Contract and furnish satisfactory Bonds within 10 days after the date of notification of the acceptance of this Proposal, in either of such events, the bid deposit shall be forfeited to the City of Detroit as liquidated damages, and not as a penalty; otherwise the bid deposited shall be returned to the Undersigned upon confirmation of the Contract.

III. BIDDER'S EXAMINATIONS AND UNDERSTANDING

The Undersigned certifies that the Contract Documents listed in the Standard Instructions to Bidders, together with any and all Bulletins issued, have been carefully examined, and the site of the work has been inspected. The Undersigned declares that the amount and nature of the work is understood, and that at no time will misunderstanding of the Contract Documents be pleaded.

IV. BIDDER'S QUALIFICATIONS

The Undersigned declares that he has had prior experience in the type of work required by the Contract Documents and that he has the necessary finances, personnel and working organization, and equipment available to execute the proposed work in accordance with the requirements of the Contract Documents. The Undersigned further declares that he is prepared to and will promptly furnish a certified written statement regarding his qualifications, including finances, upon request of and on the forms provided by the City Engineer.

V. STARTING AND COMPLETING WORK

The Undersigned declares that if awarded the Contract, he is prepared to and will start the work and complete the entire project in accordance with the provisions set forth under "Time of Starting and Completing Work" in the Special Notice to Bidders.

VI. BID NON-COLLUSIVE

The Undersigned certifies that this Proposal is fair and genuine, and not collusive or sham, and that he has not in any manner, directly or indirectly agreed or colluded with any other person, firm, or association to submit a sham bid or to refrain from bidding, or in any way to fix the amount of this Proposal or that of any other bidder, or to secure any advantage against the City of Detroit.

PROPOSAL

The Undersigned further certifies that no officer or employee of the City of Detroit is personally or financially interested, directly or indirectly, in this Proposal, or in any contract which may be made under it, or in the purchase or sale of any materials or supplies for the work to which it relates, or any portion of any expected profits thereto.

VII. BIDDER NOT IN ARREARS

The Undersigned certifies that, as of the date of this Proposal, he is not in arrears to the City of Detroit for debt or contract or is in any way a defaulter as provided for in Sec. 21-3-15, City Code (Ordinance No. 52H).

VIII. WAIVER

The Undersigned certifies the price bid in this Proposal is correct and complete and stated as intended by the Undersigned for work covered by this Proposal, and, further, that all information given in or furnished with this Proposal is correct, complete, and submitted as intended by the Undersigned, and the Undersigned does hereby waive any right or claim he may now have or which may hereafter accrue to him, by reason of errors, mistakes, or omissions made by the Undersigned in this Proposal, to refuse to execute the Contract if awarded to him, or to demand the return of the Bid deposit, or to be relieved from any of his obligations as set forth in said Bid Deposit required with this Proposal.

IX. REJECTION OF BIDS

The Undersigned understands that the City of Detroit reserves the right to waive any irregularity in any bid, or to reject any or all bids.

PROPOSAL

PART III NAME, ADDRESS, LEGAL STATUS, AND SIGNATURE OF BIDDER

This Proposal is submitted in the name of:

Angelo Iafrate Construction Company (Print full legal name) 38-1894432 Federal ID Number

The Undersigned hereby designates below his business address to which all notices, directions, or other communications may be served or mailed:

Street: 26300 Sherwood

City: Warren Zip Code: 48091 State: Michigan

Telephone No: 586-756-1070 Fax No: 586-756-0467

Contact Name & Title: Hal G. Howlett - Vice President

E-Mail Address: hhowlett@iafrate.com

The Undersigned hereby declares that he had the legal status checked below:

☐ **INDIVIDUAL**

☐ **DOING BUSINESS UNDER AN ASSUMED NAME**, which is registered with the County of Clerk of the County of _____, Michigan

☐ **CO-PARTNERSHIP**, which is registered with the County Clerk of the County of _____, Michigan

☒ **CORPORATION**, incorporated under the laws of the State of Michigan (If other than Michigan Corp.)

Now licensed to do business in Michigan ☒ YES ☐ NO

☒ Certificate on P. 5 has been executed as evidence the person signing has the authority to commit the corporation to this Proposal

The names, titles and home addresses of all persons directly interested in this Proposal are as follows:

NAME AND TITLE	HOME ADDRESS (Include City, State & Zip Code)
Robert Adcock - President	26300 Sherwood, Warren, MI 48091
Hal G. Howlett - Vice President	
Michael A. DeFinis - Vice President	
Duane Laurila - Vice President	
Matt Milkovie - Secretary/Treasurer	

Signed and Sealed

This 25th day

of February, 20 19

By _____ (Signature)

Hal G. Howlett

Title Vice President (Printed Name of Signer)

PROPOSAL

(Note: Bidder, if a corporation, shall cause the following certificate to be executed, provided that the same officer shall not execute both the proposal and the certificates.)

CERTIFICATE

I, Hal G. Howlett, certify that I am the

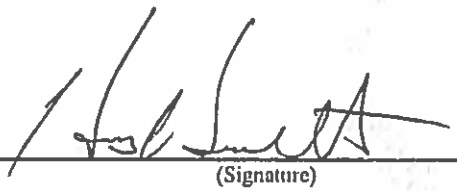
Vice President of the corporation named as Bidder herein;

that Hal G. Howlett who signed this Proposal on behalf of said

corporation, was then Vice President of said corporation;

that said Proposal was duly signed and the corporate seal affixed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

02/25/19
(Date)


(Signature)

PW-7003

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of Michigan

SS

County of Macomb

Hal G. Howlett being first duly sworn, deposes and says that:

1. He is Vice President of
(owner, partner, officer, representative, or agent)
Angelo Iafrate Construction Company, the bidder that has submitted the attached bid,

2. He is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;

3. Such a bid is genuine and is not a collusive or sham bid;

6981. Neither the said bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other bidder, firm or person to submit a collusive or sham bid in connection with the contract for which the attached bid has been submitted or to refrain from bidding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the attached bid or any other bidder, or to fix any overhead, profit or cost element of the bid price or the bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Detroit or any person interested in the proposed contract; and

5. The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed)

Vice President
Title

Subscribed and sworn to before me
this 25 day of February, 2019

Susan M. Niemczyk
Title

SUSAN M. NIEMCZYK
NOTARY PUBLIC, STATE OF MI
COUNTY OF MACOMB
MY COMMISSION EXPIRES Feb 27, 2021
ACTING IN COUNTY OF Macomb

My commission expires:

PROPOSAL FOR LIVERNOIS STREETSCAPE BETWEEN CLARITA AND WEST EIGHT MILE ROAD IN THE CITY OF DETROIT

UNIT PRICE SCHEDULE
ALTERNATE

Time allowed for completion:

NOTE: Unbalanced bids will be rejected. Each Unit Price quoted must accurately reflect the labor, equipment costs, and materials necessary to perform the described tasks. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services, taxes and incidentals; erection, application or installation of an item of the Work; overhead and profit. Unless noted otherwise, units are measured "in-place" and do not include any material such as scrap or overlap, which is considered incidental to the project. Unit price items shall include all materials, components, and incidentals to provide for a complete system installation for the specified item. The quantity depicted on the bid form is our best estimate of the anticipated work, but changing site conditions or other factors may contribute to deviations from the planned quantities. Quantities indicated in the Bid Form are for informational purposes. Contractor is to verify all quantities and bid the work to complete ALL WORK SHOWN OR DESCRIBED ON THE DRAWINGS. It is incumbent that the Bidder accurately reflect the actual costs of services for each unit price listed on this form.

#	PAY ITEM	DESCRIPTION OF ITEM	QTY.	PAY UNIT	UNIT PRICE	ITEM TOTAL
1	1027060	_Completion of Work Incentive, Modified	300,000	Dlr	$ 1.00	**$ 300,000.00**
2	1500001	Mobilization, Max 10%	1	LSUM	$ 1,500,000.00	**$ 1,500,000.00**
3	2027050	_Tree Rem, 6 inch to 18 inch, Modified	289	EA	$ 239.00	**$ 69,071.00**
4	2047001	_Ex Striping, Rem, Modified	20,500	Ft	$ 0.60	**$ 12,300.00**
5	2047001	_Curb and Gutter, Rem, Modified	23,025	Ft	$ 3.75	**$ 86,343.75**
6	2047010	_Median, Rem, Modified	112,500	Sft	$ 0.60	**$ 67,500.00**
7	2047011	_Pavt, Rem, Modified	51,200	Syd	$ 9.00	**$ 460,800.00**
8	2047011	_Sidewalk, Rem, Modified	18,363	Syd	$ 7.50	**$ 137,722.50**
9	2050010	Embankment, CIP	200	Cyd	$ 20.00	**$ 4,000.00**
10	2057011	_Subgrade Undercutting, Modified	12,400	Cyd	$ 47.00	**$ 582,800.00**
11	2057021	_Excavation, Earth, Modified	19,610	Cyd	$ 18.00	**$ 352,980.00**
12	2057021	_Non Haz Contaminated Material Handling & Disposal, LM, Modified	9,260	Cyd	$ 27.00	**$ 250,020.00**
13	2087050	_Erosion Control, Inlet Protection, Fabric Drop, Modified	146	EA	$ 125.00	**$ 18,250.00**
14	3027011	_Aggregate Base, 4 inch, Modified	80,300	Syd	$ 7.25	**$ 582,175.00**
15	4027001	_Sewer, CI IV, 12 inch, Modified	3,200	Ft	$ 75.00	**$ 240,000.00**
16	4037001	_Dr Structure Lead, Cleaning, Modified	1,500	Ft	$ 7.00	**$ 10,500.00**
17	4037050	_Dr Structure, Cleaning, Modified	20	EA	$ 150.00	**$ 3,000.00**
18	4037050	_Dr Structure Cover, Modified	20	EA	$ 615.00	**$ 12,300.00**

19	4037050	_Dr Structure Cover, ADA Compliant, Modified	61	EA	$ 500.00	**$ 30,500.00**
20	4037050	_Dr Structure Cover, Beehive	13	EA	$ 375.00	**$ 4,875.00**
21	4037050	_Dr Structure, 48 inch dia, Modified	68	EA	$ 3,600.00	**$ 244,800.00**
22	4037050	_Dr Structure, Tap, 12 inch, Modified	53	EA	$ 440.00	**$ 23,320.00**
23	4037050	_Utl. Structure, Adj, Modified	410	EA	$ 445.00	**$ 182,450.00**
24	4047001	_Underdrain, Subgrade, 6 inch, Modified	23,300	Ft	$ 9.50	**$ 221,350.00**
25	4047001	_Landscape Underdrain	250	Ft	$ 35.00	**$ 8,750.00**
26	5017011	_Cold Milling HMA Surface, Modified	2,600	Syd	$ 2.75	**$ 7,150.00**
27	5017031	_HMA, 5E3, Modified	330	Ton	$ 99.00	**$ 32,670.00**
28	5017031	_HMA, 4E3, Modified	441	Ton	$ 90.00	**$ 39,690.00**
29	6027011	_Conc Pavt, Nonreinf, 10 inch, Modified	38,250	Syd	$ 60.00	**$ 2,295,000.00**
30	8017011	_Driveway, Reinf Conc 8 inch, Modified	1,132	Syd	$ 76.00	**$ 86,032.00**
31	8017011	_Driveway, Nonreinf Conc 8 inch, Modified	2,772	Syd	$ 61.00	**$ 169,092.00**
32	8027001	_Curb, Conc, Type II, Modified	11,894	Ft	$ 20.50	**$ 243,827.00**
33	8027050	_Curb Cut, Modified	22	EA	$ 100.00	**$ 2,200.00**
34	8037010	_Detectable Warning Surface, Modified	1,238	Sft	$ 36.00	**$ 44,568.00**
35	8037010	_Sidewalk Ramp, Conc, 6 inch, Modified	5,480	Sft	$ 10.00	**$ 54,800.00**
36	8037010	_Sidewalk, Conc, 4 inch, Modified	254,491	Sft	$ 3.70	**$ 941,616.70**
37	8037010	_Sidewalk, Conc, 4 inch, Colored, Modified	48,402	Sft	$ 7.50	**$ 363,015.00**
38	8037010	_Sidewalk, Conc, 6 inch, Modified	17,114	Sft	$ 5.48	**$ 93,784.72**
39	8037010	_Decorative Sidewalk	89,447	Sft	$ 7.50	**$ 670,852.50**
40	8037050	_Decorative Metal Letters, Brass, 3 inch, Embedded in Conc	1,680	EA	$ 135.00	**$ 226,800.00**
41	8077001	_Plant Rail	4,222	Ft	$ 90.00	**$ 379,980.00**
42	8100010	Band, Sign	46	Ea	$ 65.00	**$ 2,990.00**
43	8100371	Post, Steel, 3 lb	76	Ft	$ 7.00	**$ 532.00**
44	8100402	Sign, Type III, Erect, Salv	173	Ea	$ 60.00	**$ 10,380.00**
45	8100404	Sign, Type IIIA	250	Sft	$ 17.00	**$ 4,250.00**

46	8100404	Sign, Type IIIB	35	Sft	$ 18.50	**$ 647.50**
47	8100511	Mast Arm Pole, Cat II	11	Ea	$ 4,827.55	**$ 53,103.05**
48	8100530	Mast Arm, 20 foot, Cat II	2	Ea	$ 4,862.74	**$ 9,725.48**
49	8100532	Mast Arm, 30 foot, Cat II	4	Ea	$ 6,161.75	**$ 24,647.00**
50	8100533	Mast Arm, 35 foot, Cat II	3	Ea	$ 6,545.55	**$ 19,636.65**
51	8100535	Mast Arm, 45 foot, Cat II	2	Ea	$ 7,320.80	**$ 14,641.60**
52	8100550	Mast Arm Pole Fdn, 6 Bolt	198	Ft	$ 568.70	**$ 112,602.60**
53	8107001	_Post, Steel, 3 lb, Rem, Modified	90	Ft	$ 15.00	**$ 1,350.00**
54	8107050	_Delineator Reflector, 36 inch, White, Modified	60	Ea	$ 168.55	**$ 10,113.00**
55	8110041	Pavt Mrkg, Ovly Cold Plastic, 12 inch, Crosswalk	810	Ft	$ 5.95	**$ 4,819.50**
56	8110044	Pavt Mrkg, Ovly Cold Plastic, 18 inch, Stop Bar	510	Ft	$ 9.50	**$ 4,845.00**
57	8110063	Pavt Mrkg, Ovly Cold Plastic, Lt Turn Arrow Sym	16	Ea	$ 175.00	**$ 2,800.00**
58	8110068	Pavt Mrkg, Ovly Cold Plastic, Only	20	Ea	$ 175.00	**$ 3,500.00**
59	8110071	Pavt Mrkg, Ovly Cold Plastic, Rt Turn Arrow Sym	8	Ea	$ 175.00	**$ 1,400.00**
60	8110075	Pavt Mrkg, Ovly Cold Plastic, Stop	10	Ea	$ 195.00	**$ 1,950.00**
61	8110078	Pavt Mrkg, Ovly Cold Plastic, Thru Arrow Sym	15	Ea	$ 160.00	**$ 2,400.00**
62	8110105	Pvmt Mrkg, Polyurea, Bike, Small Symbol	31	Ea	$ 150.00	**$ 4,650.00**
63	8110106	Pavt Mrkg, Polyurea, Directional Arrow Symbol, Bike	31	Ea	$ 160.00	**$ 4,960.00**
64	8110153	Pavt Mrkg, Sprayable Thermopl, 4 inch, White	19,050	Ft	$ 0.45	**$ 8,572.50**
65	8110154	Pavt Mrkg, Sprayable Thermopl, 4 inch, Yellow	14,900	Ft	$ 0.45	**$ 6,705.00**
66	8110400	Pavt Mrkg, Polyurea, Bus	10	Ea	$ 165.00	**$ 1,650.00**
67	8110415	Pavt Mrkg, Polyurea, Stop	10	Ea	$ 175.00	**$ 1,750.00**
68	8110534	Pavt Mrkg, Modified Urethane, 12 inch, Cross Hatching White	2,200	Ft	$ 5.95	**$ 13,090.00**
69	8110536	Pavt Mrkg, Modified Urethane, 12 inch, Cross Hatching, Yellow	750	Ft	$ 5.95	**$ 4,462.50**
70	8110537	Pavt Mrkg, Modified Urethane, 4 inch, Whte	10,850	Ft	$ 2.50	**$ 27,125.00**
71	8120022	Barricade, Type III, High Intensity, Lighted, Furn	34	Ea	$ 95.00	**$ 3,230.00**
72	8120023	Barricade, Type III, High Intensity, Lighted, Oper	34	Ea	$ 0.01	**$ 0.34**

73	8120026	Pedestrian Type II Barricade, Temp	4	Ea	$	250.00	**$ 1,000.00**
74	8120120	Lighted Arrow, Type A, Furn	9	Ea	$	950.00	**$ 8,550.00**
75	8120121	Lighted Arrow, Type A, Oper	9	Ea	$	0.01	**$ 0.09**
76	8120170	Minor Traf Devices	1	LSUM	$	525,000.00	**$ 525,000.00**
77	8120235	Pavt Mrkg, Wet Reflective, Type NR, Paint, 4 inch, White, Temp	26,200	Ft	$	0.55	**$ 14,410.00**
78	8120236	Pavt Mrkg, Wet Reflective, Type NR, Paint, 4 inch, Yellow, Temp	15,510	Ft	$	0.55	**$ 8,530.50**
79	8120250	Plastic Drum, High Intensity, Furn	784	Ea	$	30.00	**$ 23,520.00**
80	8120251	Plastic Drum, High Intensity, Oper	784	Ea	$	0.01	**$ 7.84**
81	8120255	Pavt Mrkg, Wet Reflective, Type R, Tape, 6 inch, Crosswalk	510	Ft	$	2.95	**$ 1,504.50**
82	8120257	Pavt Mrkg, Wet Reflective, Type R, Tape, Lt Turn Arrow	14	Ea	$	165.00	**$ 2,310.00**
83	8120340	Sign, Type A, Temp, Prismatic, Furn	2,150	Sft	$	7.00	**$ 15,050.00**
84	8120341	Sign, Type A, Temp, Prismatic, Oper	2,150	Sft	$	0.01	**$ 21.50**
85	8120350	Sign, Type B, Temp, Prismatic, Furn	190	Sft	$	7.00	**$ 1,330.00**
86	8120351	Sign, Type B, Temp, Prismatic, Oper	190	Sft	$	0.01	**$ 1.90**
87	8120370	Traf Regulator Control	1	LSUM	$	400,000.00	**$ 400,000.00**
88	8127010	_Pavt Mrkg, Polymer Cement Surface System (PCSS), Green, Modified	2,000	Sft	$	8.95	**$ 17,900.00**
89	8127010	_Pavt Mrkg, Polymer Cement Surface System (PCSS), Red, Modified	1,200	Sft	$	8.95	**$ 10,740.00**
90	8127050	_Pavt Mrkg, Wet Reflective, Type R, Tape, "ONLY"	7	Ea	$	165.00	**$ 1,155.00**
91	8150805	Cercis canadensis, 2 inch clump, 3 Stem	16	EA	$	405.00	**$ 6,480.00**
92	8157010	_Plant Bed Planting Mixture	20,129	Sft	$	7.60	**$ 152,980.40**
93	8157010	_Rain Garden Planting Mixture	3,620	Sft	$	7.60	**$ 27,512.00**
94	8157050	_Acer x freemanii Celebration, 6 inch	65	EA	$	1,275.00	**$ 82,875.00**
95	8157050	_Acer x freemanii Celebration, 3 inch	51	EA	$	765.00	**$ 39,015.00**
96	8157050	_Tilia cordata, 6 inch	24	EA	$	1,470.00	**$ 35,280.00**
97	8157050	_Tilia cordata, 3 inch	19	EA	$	765.00	**$ 14,535.00**
98	8157050	_Ulmus Frontier, 6 inch	19	EA	$	2,675.00	**$ 50,825.00**
99	8157050	_Ulmus Frontier, 3 inch	25	EA	$	765.00	**$ 19,125.00**

100	8157050	_Gymnocladus dioica, 6 inch	24	EA	$ 1,275.00	**$ 30,600.00**
101	8157050	_Gymnocladus dioica, 3 inch	12	EA	$ 645.00	**$ 7,740.00**
102	8157050	_Tree Grates and Frame	46	EA	$ 5,143.80	**$ 236,614.80**
103	8157050	_Bike Rack	45	EA	$ 655.00	**$ 29,475.00**
104	8157050	_Litter Receptacle	33	EA	$ 1,370.00	**$ 45,210.00**
105	8157050	_Street Bench	62	EA	$ 1,950.00	**$ 120,900.00**
106	8157050	_Bus Shelter	3	EA	$ 1,700.00	**$ 5,100.00**
107	8157051	_Watering and Cultivating, First Season, Modified	1	LSUM	$ 31,535.00	**$ 31,535.00**
108	8157051	_Watering and Cultivating, Second Season, Modified	1	LSUM	$ 9,501.00	**$ 9,501.00**
109	8167011	_Mulch, Modified	2,639	Syd	$ 4.00	**$ 10,556.00**
110	8167021	_Planting Soil	2,492	Cyd	$ 56.25	**$ 140,175.00**
111	8167021	_Rain Garden Soil	402	Cyd	$ 85.00	**$ 34,170.00**
112	8190006	Cable Pole, Sec, Disman	1	Ea	$ 126.95	**$ 126.95**
113	8190016	Cable, Rem	12,600	Ft	$ 1.30	**$ 16,380.00**
114	8190017	Cable, Sec, Rem	800	Ft	$ 3.00	**$ 2,400.00**
115	8190032	Conduit, DB, 2, 3 inch	1,760	Ft	$ 15.05	**$ 26,488.00**
116	8190140	Conduit, Rem	1,110	Ft	$ 2.00	**$ 2,220.00**
117	8190254	Hh, Rem	16	Ea	$ 487.05	**$ 7,792.80**
118	8190259	Hh, Round, 3 foot Dia.	3	Ea	$ 2,161.95	**$ 6,485.85**
119	8190260	Hh, Round	11	Ea	$ 1,289.15	**$ 14,180.65**
120	8190278	Light Std Arm, Rem and Salv	106	EA	$ 77.95	**$ 8,262.70**
121	8190280	Light Std Fdn, Rem	53	EA	$ 487.05	**$ 25,813.65**
122	8190306	Light Std Shaft, Rem and Salv	53	EA	$ 277.85	**$ 14,726.05**
123	8190360	Luminaire, Rem	166	EA	$ 48.75	**$ 8,092.50**
124	8190399	Cable, Sec, 600V, 1, 3/C#6	600	Ft	$ 6.00	**$ 3,600.00**
125	8190473	Wood Pole, Cl 4, 40 Foot	1	EA	$ 1,566.30	**$ 1,566.30**
126	8190489	Wood Pole, Fit Up, Metered Sec Elec Serv	4	EA	$ 2,335.40	**$ 9,341.60**

127	8190490	Wood Pole, Fit Up, Metered Sec Elec Serv with Photo Control	4	EA	$ 2,403.00	**$ 9,612.00**
128	8190495	Wood Pole, Fit Up, Sec Cable Pole	4	EA	$ 673.05	**$ 2,692.20**
129	8190505	Wood Pole, Rem	67	Ea	$ 277.85	**$ 18,615.95**
130	8197001	_Conduit, DB, 6, 3 inch	11,300	Ft	$ 20.55	**$ 232,215.00**
131	8197001	_Conduit, Directional Bore, 6, 3 inch	1,580	Ft	$ 31.85	**$ 50,323.00**
132	8197001	_Cable, Sec, Quadruplex	2,000	Ft	$ 3.95	**$ 7,900.00**
133	8197001	_Cable, Sec, 600V, 4, 1/C#4	2,500	Ft	$ 3.95	**$ 9,875.00**
134	8197050	_Bracket Arm, Bolt On, Rem	60	Ea	$ 48.75	**$ 2,925.00**
135	8197050	_Ground Rod, Install, Wood Pole	8	EA	$ 226.20	**$ 1,809.60**
136	8197050	_Light Std, Tapered Aluminum	116	EA	$ 3,061.00	**$ 355,076.00**
137	8197050	_Luminaire, 101W	116	EA	$ 477.15	**$ 55,349.40**
138	8197050	_Luminaire, 139W	116	EA	$ 593.70	**$ 68,869.20**
139	8197050	_Bracket Arm, Clamp On, Install	116	EA	$ 422.00	**$ 48,952.00**
140	8197050	_Bracket Arm, Bolt On, Install	116	EA	$ 211.00	**$ 24,476.00**
141	8197050	_Photo Control, Lighting	4	EA	$ 2,728.55	**$ 10,914.20**
142	8197234	_Cable, Equipment Grounding Wire, 1/C#4, Modified	17,200	Ft	$ 1.50	**$ 25,800.00**
143	8197250	_Hh, Polymer Conc, 13"x24", Modified	87	EA	$ 1,045.30	**$ 90,941.10**
144	8197250	_Hh, Polymer Conc, 30"x48", Modified	33	EA	$ 2,058.70	**$ 67,937.10**
145	8197279	_Light Std Fdn, Modified	116	EA	$ 1,155.55	**$ 134,043.80**
146	8197405	_Cable, Sec, 600V, 3, 1/C#4, Modified	31,400	Ft	$ 3.50	**$ 109,900.00**
147	8200019	Case Sign (LED), One Way, 12 inch by 27 inch	7	Ea	$ 850.15	**$ 5,951.05**
148	8200020	Case Sign, Rem	8	Ea	$ 68.55	**$ 548.40**
149	8200029	Case Sign (LED), One Way, 24 inch by 30 inch	1	Ea	$ 1,671.40	**$ 1,671.40**
150	8200030	Controller and Cabinet, Rem	5	Ea	$ 205.60	**$ 1,028.00**
151	8200045	Controller Fdn, Base Mount	3	Ea	$ 1,792.90	**$ 5,378.70**
152	8200046	Controller Fdn, Rem	3	Ea	$ 315.90	**$ 947.70**
153	8200065	Fdn, Rem	8	Ea	$ 487.05	**$ 3,896.40**

154	8200106	Pedestal Fdn, Rem	8	Ea	$ 466.00	**$ 3,728.00**
155	8200110	Pedestal, Rem	6	Ea	$ 92.15	**$ 552.90**
156	8200116	Power Co. (Est. Cost to Contractor)	3,000	Dlr	$ 1.00	**$ 3,000.00**
157	8200121	Pushbutton and Sign	26	Ea	$ 459.20	**$ 11,939.20**
158	8200122	Pushbutton, Rem	6	Ea	$ 68.55	**$ 411.30**
159	8200124	Pushbutton Pedestal, Rem	2	Ea	$ 68.55	**$ 137.10**
160	8200135	Serv Disconnect	3	Ea	$ 1,260.05	**$ 3,780.15**
161	8200141	Span Wire, Rem	8	Ea	$ 137.05	**$ 1,096.40**
162	8200145	Steel Pole, Rem	8	Ea	$ 586.30	**$ 4,690.40**
163	8200180	TS, Pedestrian, Bracket Arm Mtd, Rem	19	Ea	$ 85.00	**$ 1,615.00**
164	8200181	TS, Pedestrian, Pedestal Mtd, Rem	6	Ea	$ 82.25	**$ 493.50**
165	8200182	TS, Span Wire Mtd, Rem	25	Ea	$ 95.95	**$ 2,398.75**
166	8200314	TS, One Way Span Wire Mtd, FYA (LED)	2	Ea	$ 663.90	**$ 1,327.80**
167	8200333	TS, One Way Bracket Arm Mtd (LED)	12	Ea	$ 999.35	**$ 11,992.20**
168	8200336	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	6	Ea	$ 721.35	**$ 4,328.10**
169	8200339	TS, Pedestrian, Two Way Bracket Arm Mtd (LED) Countdown	1	Ea	$ 1,156.00	**$ 1,156.00**
170	8200345	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	15	Ea	$ 885.50	**$ 13,282.50**
171	8200347	TS, Pedestrian, Two Way Pedestal Mtd (LED) Countdown	1	Ea	$ 1,211.45	**$ 1,211.45**
172	8200359	TS, One Way Mast Arm Mtd (LED)	22	Ea	$ 819.50	**$ 18,029.00**
173	8200378	Bracket, Truss, With 18 Foot Arm	2	Ea	$ 1,240.80	**$ 2,481.60**
174	8200388	Bracket, Truss, Rem	3	Ea	$ 58.50	**$ 175.50**
175	8200393	Wireless Intercn, Closed Loop, Master	1	Ea	$ 2,990.60	**$ 2,990.60**
176	8200480	Casing	132	Ft	$ 140.00	**$ 18,480.00**
177	8207001	_Conduit, Encased, 2, 3 inch, Modified	1,090	Ft	$ 77.00	**$ 83,930.00**
178	8207001	_Conduit, Encased, 3, 4 inch, Modified	50	Ft	$ 121.65	**$ 6,082.50**
179	8207050	_Louvered Backplate	43	Ea	$ 223.85	**$ 9,625.55**
180	8207050	_St Name Sign, Two Way, (LED) 6 foot	4	Ea	$ 2,183.35	**$ 8,733.40**

181	8207050	_Street Name Sign, Two Way, Illuminated, Rem	3	Ea	$	97.45	**$ 292.35**
182	8207050	_Pedestal, Alum, Modified	26	Ea	$	588.15	**$ 15,291.90**
183	8207050	_Pededstal, Fdn, Modified	26	Ea	$	1,201.25	**$ 31,232.50**
184	8207050	_Universal Camera Bracket and Extension	1	Ea	$	332.05	**$ 332.05**
185	8207050	_Controller and Cabinet, Digital Type, ITS	3	Ea	$	27,102.70	**$ 81,308.10**
186	8207050	_Wireless Data Acquisition, Alerts and Analytics System	3	Ea	$	3,630.10	**$ 10,890.30**
187	8207050	_Cellular Data Service for 3 Years	3	Ea	$	2,919.25	**$ 8,757.75**
188	8207050	_Video Capture and Streaming System	3	Ea	$	4,955.35	**$ 14,866.05**
189	8207050	_Cellular Data Streaming for 2 hours per month and for 3 Years	3	Ea	$	1,557.05	**$ 4,671.15**
190	8207050	_Video Detection and Analytics System	3	Ea	$	6,011.90	**$ 18,035.70**
191	8237001	_Water Main, DI, 6 inch, Modified	450	Ft	$	195.00	**$ 87,750.00**
192	8237050	_Hydrant, Rem, Modified	21	EA	$	850.00	**$ 17,850.00**
193	8237050	_Fire Hydrant, Modified	21	EA	$	1,325.00	**$ 27,825.00**
194	8237050	_Hydrant, Relocate, Case 2, Modified	5	EA	$	3,675.00	**$ 18,375.00**
195	8237050	_Gate Valve and Box, 6 inch, Modified	26	EA	$	2,000.00	**$ 52,000.00**
TOTAL BASE BID PRICE, ITEMS 1-195							**$ 15,682,921.42**
NAME OF CONTRACTOR: **Angelo Iafrate Construction Company**							

Quote unit prices in **US dollars, 2 decimal places ONLY**. Quantities are approximate, actual quantities may vary.

AGREEMENT

CONTRACT TITLE	CONTRACT NUMBER
PW-7003 LIVERNOIS STREETSCAPE BETWEEN CLARITA AND WEST EIGHT MILE ROAD IN THE CITY OF DETROIT	**PW- 7003**
PARTY OF THE FIRST PART (The City) City of Detroit, Michigan, a municipal corporation acting through the **DIRECTOR, DEPARTMENT OF PUBLIC WORKS** **COLEMAN A. YOUNG MUNICIPAL CENTER** **2 WOODWARD AVENUE, SUITE 611** **DETROIT, MICHIGAN 48226** **DIRECTOR, HOUSING AND REVITALIZATION DEPARTMENT** **COLEMAN A. YOUNG MUNICIPAL CENTER** **2 WOODWARD AVENUE, SUITE 908** **DETROIT, MICHIGAN 48226**	DATE OF AGREEMENT
PARTY OF THE SECOND PART (Contractor) **ANGELO IAFRATE CONSTRUCTION CO.** **26300 SHERWOOD AVENUE** **WARREN, MI 48091**	
CONTRACT PRICE **FIFTEEN MILLION, SIX HUNDRED EIGHTY-TWO THOUSAND, NINE HUNDRED TWENTY-ONE DOLLARS AND FORTY-TWO CENTS ($15,682,921.42).**	

Agreement made on the date as shown above, between the above named party of the first part, City of Detroit, hereinafter called the City, and the above named party of the second part, hereinafter called the Contractor.

Whereas, the City, by due advertisement, has invited proposals for doing the work hereinafter specified; and the Contractor has submitted a proposal which has been accepted, and the City Council has approved this Contract, the parties hereto do hereby, in consideration of the mutual covenants hereinafter contained, agree with each other as follows:

1. THE CONTRACT

The Contract Documents are composed of the individual parts as named by title in Article 2 of the Standard Instructions to Bidders, including the number of Bulletins above indicated issued by the City prior to the receipt of bids, and together form the Contract and are as fully a part of the Contract as if fully herein repeated. In case any question arises as to the identity of the Contract Documents or any individual parts thereof, the City Engineer shall identify them.

2. WORK INCLUDED

The work included consists of that contained and described in the proposal for the Contract above named by title and number.

3. TIME PROVISIONS

The Contractor shall begin work under this Contract at the time stipulated in the written notice of the City Engineer, acting for the City, issued in accordance with the provisions of the Article, "Time of Starting and Completing Work", in the Special Notice to Bidders. Time being of the essence of this Contract, the Contractor shall thereafter prosecute the work diligently so as to assure the completion of the entire work not later than the time prescribed therefor, or the date to which the time of completion may have been extended pursuant to the provisions of the Article, "Delays and Extension of Time", of the General Conditions. The Contractor shall, if necessary to complete the work within such time, work nights, Sundays and holidays without any change in the Contract price.

4. LIQUIDATED DAMAGES

The Contractor guarantees that he can and will complete the work within the time limit stated in the Contract Documents, or within the time as extended as provided elsewhere in the Contract Documents. Inasmuch as the damage and loss to the City which will result from the failure of the Contractor to complete the work within the stipulated time, will be most difficult or impossible of accurate determination, it is mutually agreed that the damages to the City for such delay and failure on the part of the Contractor shall be liquidated in the amount stated in the Article, "Liquidated Damages", in the Special Notice to Bidders, for each and every calendar day by which the Contractor shall fail to complete the work or any part thereof within the provisions hereof, and such liquidated damages shall not be considered as a penalty .

The City will deduct and retain out of any money due or to become due hereunder the amount of the liquidated damages, and in case those amounts are less than the amount of liquidated damages the Contractor shall pay the difference upon demand of the City.

AGREEMENT

C. *Verified Statement of Claims:* The Contractor must also submit a final verified statement of any and all alleged unliquidated claims against the City in any way connected with or arising out of this Contract, including those as to which details may have been furnished pursuant to Articles 21 and 22 of the General Conditions, setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each such item; and if the alleged unliquidated claim be one of delay, the alleged clause of each such delay, the period or periods of time, giving the dates when the Contractor claims the performance of the work, or a particular part thereof, was delayed, and an itemized statement and breakdown of the amount claimed for each such delay. With reference to each such claim, the City shall have the same right to inspect, and make extracts or copies of, the Contractor's books, vouchers, records etc., as is referred to in said Articles 21 and 22. Nothing contained in this Article is intended to or shall relieve the Contractor from the obligation of giving timely notice of claims pursuant to said Articles 21 and 22. The Contractor is warned that unless such claims are completely set forth as herein required, the Contractor upon acceptance of the final payment, pursuant to "F" herein, will have waived any such claims.

D. *Engineer's Inspection and Final Estimate*: Upon receipt of the Contractor's written notification, the Engineer will promptly thereafter make such inspection.

If the Engineer finds the entire work not fully completed or portions thereof not acceptable under the terms of the Contract, he will so notify the Contractor in writing, itemizing what work is uncompleted and/or unacceptable. The Contractor shall then promptly complete and/or correct the work so itemized, and again notify the Engineer as required in "A" above.

When the Engineer finds the entire work fully completed and acceptable under the terms of the Contract and the Contract fully performed, he will prepare and certify a final estimate as to the whole amount of the work done by the Contractor and the value thereof under and according to the terms of the Contract, and will determine the unpaid balance due hereunder other than the amount of alleged unliquidated claims. Any and all prior progress estimates prepared by the Engineer under the provisions of Article 7 herein, upon which progress payments were made, being merely estimates made to determine the amount of progress payments to enable the Contractor to prosecute the work more advantageously, shall be subject to correction in the certified final estimate

E. *Approval of Final Payment*: Upon approval of the Engineer's certified final estimate by the City Officer, a copy of the approved final estimate will be furnished the Contractor. The City Officer will certify to the Common Council that all work required of the Contractor in the performance of the Contract has been completed and accepted by said City Officer under the terms and conditions thereof, and the total value of such work.

After audit and allowance by the Common Council, the total amount of the value of the work done will be paid to the Contractor by the City, less the total amounts previously paid on any or all progress payments when such were allowed and paid, less any deductions authorized to be made by the City under the terms of the Contract or by law. Such final payment shall be final and conclusive upon the Contractor.

F. *Acceptance of Final Payment:* The acceptance by the Contractor, or by anyone claiming by or through him, of the final payment, based on the Engineer's final estimate and the amount allowed by the Common Council, whether such payment be made pursuant to any judgment of any court, or otherwise, shall constitute and operate as a release to the City from any and all claims of and liability to the Contractor for anything theretofore done or furnished for or relating to or arising out of this Contract, and for any prior act, neglect or default on the part of the City or any of its officers, employees or agents, excepting only a claim against the City for amounts deducted or retained in accordance with the terms and provisions of this Contract or by law, and excepting a claim, not otherwise waived, which is contained in the verified statement filed by the Contractor pursuant to "C" above.

The Contractor is warned that his acceptance of the final payment with any reservation either orally or in writing, purporting to reserve claims other than those herein specifically excepted from the operation of this Article, or those deducted by the City from the final estimate as certified to by the Engineer, shall not be effective to reserve such claims, anything stated to the Contractor orally or in writing by any officer, employee or agent of the City to the contrary notwithstanding.

Should the Contractor refuse to accept the final payment as tendered by the City, it shall constitute a waiver of any right to interest thereon.

G. *Substantial Completion Payment*: When the work, in the judgment of the Engineer, has been substantially but not entirely completed, and full completion thereof is materially delayed through no fault of the Contractor, and the Engineer so certifies, the City may, upon certificate of such substantial completion made by the City Officer, make payment to the Contractor of any part or all of the balance due under the Contract, including amounts retained from any previous progress payments, less the value of work still to be done, as the Engineer shall judge to be fair and equitable, for that portion of the work certified as substantially complete and accepted, and less any deductions authorized to be made by the City under the terms of the Contract or by law. Such payment shall be made under the terms and conditions governing final payment.

AGREEMENT

IN WITNESS WHEREOF, the *City* and the *Contractor*, by and through their authorized officers and representatives, have executed this *Contract* as of the date first above written.

CONTRACTOR:

BY: _____
(Signature)

HAL G. HOWLETT
(Print Name)

ITS: VP
(Title)

CITY OF DETROIT – DPW

BY: _____
(Signature)

Ron Brundidge

ITS: **DIRECTOR**

PW-7003 LIVERNOIS STREETSCAPE BETWEEN CLARITA AND WEST EIGHT MILE ROAD IN THE CITY OF DETROIT

THIS CONTRACT WAS APPROVED BY THE CITY COUNCIL ON:

_____

APPROVED BY LAW DEPARTMENT PURSUANT TO §7.5-206 OF THE 2012 CHARTER OF THE CITY OF DETROIT

_____
Purchasing Director Date

_____
Corporation Counsel Date

THIS CONTRACT IS NOT VALID OR AUTHORIZED UNTIL APPROVED BY RESOLUTION OF THE CITY COUNCIL AND SIGNED BY THE CHIEF PROCUREMENT OFFICER

CORPORATION CERTIFICATE OF AUTHORITY

I, Matthew Milkovie, Corporate Secretary of
(name of corporate secretary)

Angelo Iafrate Construction Company, a Michigan
(complete name of corporation) (state of incorporation)

Profit corporation (the "Corporation"), **DO HEREBY CERTIFY** that the
(non-profit or for profit)
following is a true and correct excerpt from the minutes of the meeting of the Board of Directors

duly called and held on 12/06/18, and that the same is now in full force and effect:
(date of meeting)

> "**RESOLVED,** that the Chairman, the President, each Vice President, the Treasurer, and the Secretary and each of them, is authorized to execute and deliver, in the name of and on behalf of the Corporation and under its corporate seal of otherwise, any agreement or other instrument or document ('Contract') in connection with any matter or transaction that shall have been duly approved; and the execution and delivery of any Contract by any of the aforementioned officers shall be conclusive evidence of such approval."

FURTHER, I CERTIFY that Robert Adcock is Chairman
Robert Adcock is President,
Hal G. Howlett, Michael DeFinis, and Duane Laurila is/are Vice President(s),
Matthew Milkovie is Treasurer,
Matthew Milkovie is Secretary,
Robert Adcock is Executive Director, and
- is -.

FURTHER, I CERTIFY that any of the aforementioned officers or employees of the Corporation are authorized to execute and commit the Corporation to the conditions, obligations, stipulations and undertakings contained in the foregoing Contract between the City and the above-referenced Corporation and that all necessary corporate approvals have been obtained in relationship thereto.

IN WITNESS THEREOF, I have set my hand this 25 day of February, 2019.
CORPORATE SEAL
(if any)

Matthew Milkovie
Corporation Secretary

PLEASE NOTE THAT THE PERSON WHO SIGNS THE CONTRACT ON BEHALF OF YOUR CORPORATION MUST BE ONE OF THE INDIVIDUALS LISTED ABOVE

BID BOND **City of Detroit** **Construction Contract**	Contract Number: PW- 7003
Principal: Angelo Iafrate Construction Company	Date of Bid: February 25, 2019
Surety: The Continental Insurance Company	Date Bond Executed: February 25, 2019
Amount of Bond (express in words and figures) Five Percent of the Amount of Bid----------(5%)	

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, The Principal above named has submitted to the City of Detroit, Michigan, a municipal corporation, hereinafter called the City, a proposal or bid, dated as shown above, on the above numbered contract.

NOW THEREFORE, We the Principal and Surety, bind ourselves to the City in the amount of the bond stated above, that if the above proposal is accepted, the Principal will promptly enter into contract in accordance with the proposal, otherwise the Principal and/or Surety will pay the amount stated above unto the City of Detroit as liquidated damages.

SIGNED AND SEALED on the date indicated above.

In Presence of: Witness		Individual Principal
1. _____	as to	_____ (L.S.)
2. _____	as to	_____ (L.S.)
3. _____	as to	_____ (L.S.)
4. _____	as to	_____ (L.S.)

Attest Erica Gazay - Witness	Corporate Principal: Angelo Iafrate Construction Company Business Address: 26300 Sherwood Ave., Warren, MI 48091 By: [signature] Title: VP	AFFIX CORPORATE SEAL
Attest [signature]	Corporate Surety: The Continental Insurance Company Business Address: 151 N. Franklin Street, Chicago, IL 60606 By: Holly A. Nichols Title: Holly A. Nichols, Attorney-in-fact	AFFIX CORPORATE SEAL

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, Matthew Milkovie, certify that

I am the Angelo Iafrate Construction Company secretary

Of the corporation named as principal in the within bond:

that Hal G. Howlett, who signed the said bond

on behalf of the principal, was then Vice President

of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed and attested for and in behalf of said corporation by authority of its governing body.

(CORPORATE)
(SEAL)

Instructions

1. This form shall be used for construction work wherever a Bid Bond is required. There shall be no deviation from this form except as authorized by the Corporation Counsel of the City of Detroit.

2. The surety on the bond may be any corporation licensed by the State of Michigan to act as surety and satisfactory to the City of Detroit.

3. The name, including full Christian name, and business or residence address of each individual party to the bond shall be inserted in the space provided therefor, and each party shall sign the bond with his usual signature on the line opposite the scroll seal.

4. If the principals are partners, their individual names shall appear in the space provided therefor, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bonds as individuals.

5. If the principal as well as the surety is a corporation, the name of the state in which each is incorporated shall be inserted in the spaces provided therefor, and said instrument shall be executed and attested under corporate seal for each as indicated on the form.

6. The official character and authority of the person or persons executing the bond for the principal, if a corporation, shall be certified by the secretary or assistant secretary, according to the form herein provided. In lieu of such certificate, there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary or assistant secretary under the corporate seal, to be true copies.

7. The date of this bond must not be prior to the date of instrument in connection with which it is given.

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That The Continental Insurance Company, a Pennsylvania insurance company, is a duly organized and existing insurance company having its principal office in the City of Chicago, and State of Illinois, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Robert D Heuer, Paul M Hurley, Anne M Barick, Holly A Nichols, Nicholas Ashburn, Mark T Madden, Individually

of Troy, MI, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the insurance company and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Board of Directors of the insurance company.

In Witness Whereof, The Continental Insurance Company has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 2nd day of July, 2018.

The Continental Insurance Company

Paul T. Bruflat — Vice President

State of South Dakota, County of Minnehaha, ss:

On this 2nd day of July, 2018, before me personally came Paul T. Bruflat to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of The Continental Insurance Company, a Pennsylvania insurance company, described in and which executed the above instrument; that he knows the seal of said insurance company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said insurance company and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said insurance company.

J. MOHR NOTARY PUBLIC SOUTH DAKOTA

My Commission Expires June 23, 2021

J. Mohr — Notary Public

CERTIFICATE

I, D. Johnson, Assistant Secretary of The Continental Insurance Company, a Pennsylvania insurance company, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the insurance company printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said insurance company this 25th day of February, 2019.

The Continental Insurance Company

D. Johnson — Assistant Secretary

Form F6850-4/2012

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.

BOARD RESOLUTION OF ANGELO IAFRATE, INC. & ANGELO IAFRATE CONSTRUCTION COMPANY

DULY PASSED December 6, 2018

APPOINTMENT OF OFFICERS

RESOLVED, by the Board of Directors of Angelo Iafrate, Inc. ("AIC") and Angelo Iafrate Construction Company ("AICC") the following persons are elected to the office(s) indicted next to their names to serve until their successor(s) shall be duly elected, unless he or she resigns, is removed from office or is otherwise disqualified from serving as an officer of AIC/AICC, to take their respective offices immediately upon such appointment:

Office	Name
President	Robert Adcock
Vice President	Hal G. Howlett
Vice President	Michael A. DeInis
Vice President	Duane Laufla
Secretary/Treasurer	Matt Milkovic

RESOLVED FURTHER, that the officers of AIC/AICC are, and each acting alone is, hereby authorized to do and or perform any and all such acts, including execution of all documents and certificates, as such officers shall deem necessary or advisable, to carry out the purposes and intent of the foregoing resolution

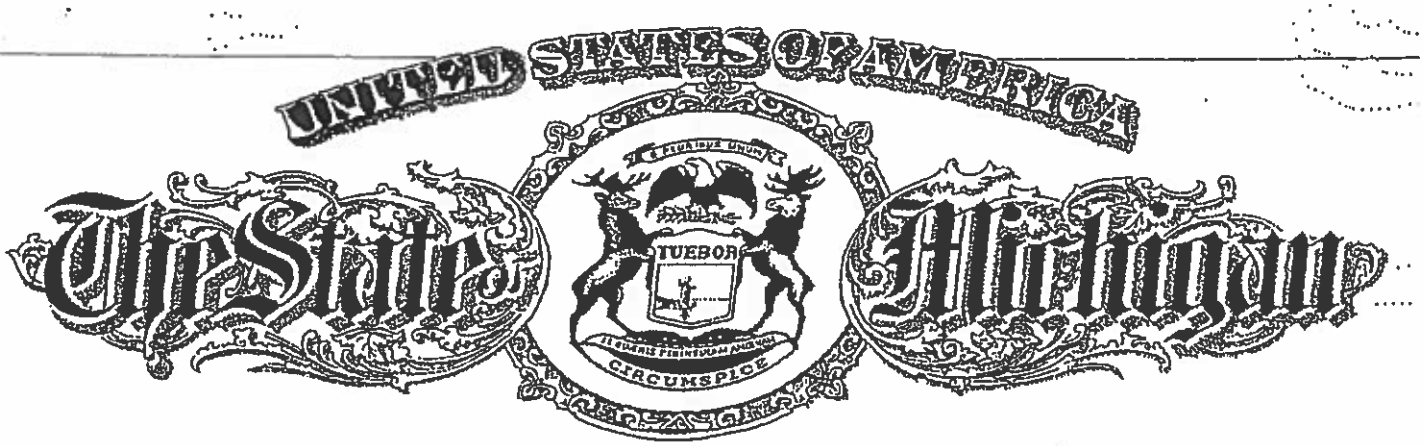
RESOLVED FURTHER, that any actions taken by such officers prior to the date of the foregoing resolution adopted hereby that are within the authority conferred are hereby ratified, confirmed and approved as the acts and deeds of AIC/AICC

It is hereby certified by the undersigned that the foregoing resolution was duly passed by the Board of Directors of Angelo Iafrate, Inc. and Angelo Iafrate Construction Company on December 6, 2018, in accordance with the Bylaws and that the said resolution is in full force and effect.

Robert Finstman

Robert Adcock

Michael Neville



Department of Licensing and Regulatory Affairs

Lansing, Michigan

This is to Certify That

ANGELO IAFRATE CONSTRUCTION COMPANY

was validly incorporated on September 18 , 1969 as a Michigan DOMESTIC PROFIT CORPORATION, and said corporation is validly in existence under the laws of this state.

This certificate is issued pursuant to the provisions of 1972 PA 284 to attest to the fact that the corporation is in good standing in Michigan as of this date and is duly authorized to transact business and for no other purpose.

This certificate is in due form, made by me as the proper officer, and is entitled to have full faith and credit given it in every court and office within the United States.



In testimony whereof, I have hereunto set my hand, in the City of Lansing, this 9th day of March , 2018.

Julia Dale, Director

Corporations, Securities & Commercial Licensing Bureau

Sent by electronic transmission

Certificate Number: 18033816860

Verify this certificate at: URL to eCertificate Verification Search http://www.michigan.gov/corpverifycertificate.

Bond #30027220

PERFORMANCE BOND (See Instructions on Reverse Side)	CONTRACT NO. PW- 7003
PRINCIPAL (Name, and legal status) ANGELO IAFRATE CONSTRUCTION COMPANY	DATE OF CONTRACT
SURETY The Continental Insurance Company	DATE BOND EXECUTED

AMOUNT OF BOND (Express in words and figures)

FIFTEEN MILLION, SIX HUNDRED EIGHTY-TWO THOUSAND, NINE HUNDRED TWENTY-ONE DOLLARS AND FORTY-TWO CENTS ($15,682,921.42)

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL and SURETY above named, are held and firmly bond unto the City of Detroit, Michigan, a municipal corporation, hereinafter called the City, in the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the City, numbered and dated as shown above and hereto attached, and which shall be deemed a part hereof as fully as if set out herein.

AND WHEREAS, This bond is given in compliance with and subject to the provisions of Act No. 351 of the Public Acts of Michigan, for the year 1972, and the provisions of the City of Detroit Charter.

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the City, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

PRINCIPAL: ☐ INDIVIDUAL ☐ DOING BUSINESS UNDER ASSUMED NAME ☐ PARTNERSHIP

NAMES OF ALL PARTNERS	BUSINESS ADDRESS:

IN PRESENCE OF: WITNESS	PRINCIPAL - INDIVIDUAL/PARTNER - SIGNATURE
1. _____ AS TO	1. _____ (L.S.)
2. _____ (5-74) AS TO	2. _____ (L.S.)

CORPORATE PRINCIPAL

STATE IN WHICH INCORPORATED	BUSINESS ADDRESS:	
Michigan	26300 SHERWOOD AVENUE WARREN, MI 48091	
EXECUTE CORPORATE CERTIFICATE ON REVERSE SIDE	OFFICER'S SIGNATURE	AFFIX CORPORATE SEAL
	TITLE VP	

CORPORATE SURETY

STATE IN WHICH INCORPORATED	BUSINESS ADDRESS:	
Pennsylvania	151 N. Franklin Street, Chicago, IL 60606	
ATTEST: Jill E Moon	OFFICER'S SIGNATURE	AFFIX CORPORATE SEAL
	TITLE Holly A. Nichols, Attorney-in-fact	

C of D-171-BO (Rev. 5-74)

INSTRUCTIONS

1. This form shall be used wherever a performance bond is required under the provisions of Act No. 351 of the Public Acts of Michigan for the year 1972, and the provisions of the City of Detroit Charter. There shall be no deviation from this form except as authorized by the Corporation Counsel of the City of Detroit.

2. The surety on the bond may be any corporation licensed by the State of Michigan to act as surety and satisfactory to the City of Detroit.

   The full business name of the corporation surety, business address, and the name of the state in which incorporated shall be inserted in the space provided therefor. The bond shall be executed and attested under corporate seal as indicated on the form.

3. The principal shall be identified by inserting in the space provided therefor the following information according to the principal's legal status, and the bond executed by the principal in accordance with the following requirements.

   Individual. The name including full Christian name, business or residence address, with the recital that the principal is an individual. The bond shall be signed by the individual on the line opposite the scroll seal (L.S.), using the same form of signature as used in the Contract, and the signature duly witnessed.

   Individual Doing Business Under an Assumed Name. The name of the individual, business or residence address; with the recital that the principal is doing business under an assumed or trade name, naming it. The bond shall be signed by the individual on the line opposite the scroll seal (L.S.), using the same form of signature as used in the Contract, and the signature duly witnessed.

   Co-partnership. The names of the individual partners, their business address, with the recital that such individuals are partners composing a firm, naming it. The bond shall be signed on line opposite the scroll seal by the same partner who signed the Contract, using the same form of signature, and the signature duly witnessed.

   Corporation. The full business name of the corporation, business address, with the recital that the principal is a corporation, and the name of the state in which incorporated. The bond shall be signed by an authorized officer of the corporation, followed by his title, and the corporate seal affixed.

   The official character and authority of the person executing the bond for the corporation shall be certified by the secretary or assistant secretary, according to the Certificate provided below. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary, under the corporate seal, to be true copies.

4. The date of this bond must not be prior to the date of instrument in connection with which it is given.

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, Matthe Milkovic, certify that I am the Secretary/Treasurer

Of the corporation named as principal within the bond; that Hal Howlett,

Who signed the said bond on behalf of the principal, was then Vice - President of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed and the corporate seal affixed for and in behalf of said corporation by authority of it's governing body.

C of D-171-BO (Rev. 5-74)

Matthew Milkovic

Bond #30027220

PAYMENT BOND (See Instructions on Reverse Side)	CONTRACT NO. PW- 7003
PRINCIPAL (Name, and legal status) ANGELO IAFRATE CONSTRUCTION COMPANY	DATE OF CONTRACT
SURETY The Continental Insurance Company	DATE BOND EXECUTED

AMOUNT OF BOND (Express in words and figures)
FIFTEEN MILLION, SIX HUNDRED EIGHTY-TWO THOUSAND, NINE HUNDRED TWENTY-ONE DOLLARS AND FORTY-TWO CENTS ($15,682,921.42)

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL and SURETY above named, are held and firmly bond unto the City of Detroit, Michigan, a municipal corporation, hereinafter called the City, in the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the City, numbered and dated as shown above and hereto attached, and which shall be deemed a part hereof as fully as if set out herein.

AND WHEREAS; This bond is given in compliance with and subject to the provisions of Act No. 351 of the Public Acts of Michigan, for the year 1972, and the provisions of the City of Detroit Charter.

NOW, THEREFORE, if the principal shall well and promptly make payment to all persons supplying labor and material in the prosecution pf the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

PRINCIPAL: ☐ INDIVIDUAL ☐ DOING BUSINESS UNDER ASSUMED NAME ☐ PARTNERSHIP

NAMES OF ALL PARTNERS	BUSINESS ADDRESS:

IN PRESENCE OF: WITNESS		PRINCIPAL - INDIVIDUAL/PARTNER – SIGNATURE
1. _____	AS TO	1. _____ (L.S.)
2. _____ (5-74)	AS TO	2. _____ (L.S.)

CORPORATE PRINCIPAL

STATE IN WHICH INCORPORATED	BUSINESS ADDRESS:	
Michigan	26300 SHERWOOD AVENUE WARREN, MI 48091	AFFIX CORPORATE SEAL
EXECUTE CORPORATE CERTIFICATE ON REVERSE SIDE	OFFICER'S SIGNATURE	
	TITLE VP	

CORPORATE SURETY

STATE IN WHICH INCORPORATED	BUSINESS ADDRESS:	
Pennsylvania	151 N. Franklin Street, Chicago, IL 60606	AFFIX CORPORATE SEAL
ATTEST: Jue Moore	OFFICER'S SIGNATURE Holly A. Nichols	
	TITLE Holly A. Nichols, Attorney-in-fact	

C of D-170-BD (Rev 5-74)

INSTRUCTIONS

1. This form shall be used wherever a Payment bond is required under the provisions of Act No. 351 of the Public Acts of Michigan for the year 1972, and the provisions of the City of Detroit Charter. There shall be no deviation from this form except as authorized by the Corporation Counsel of the City of Detroit.

2. The surety on the bond may be any corporation licensed by the State of Michigan to act as surety and satisfactory to the City of Detroit.

   The full business name of the corporation surety, business address, and the name of the state in which incorporated shall be inserted in the space provided therefor. The bond shall be executed and attested under corporate seal as indicated on the form.

3. The principal shall be identified by inserting in the space provided therefor the following information according to the principal's legal status, and the bond executed by the principal in accordance with the following requirements.

   Individual. The name including full Christian name, business or residence address, with the recital that the principal is an individual. The bond shall be signed by the individual on the line opposite the scroll seal (L.S.), using the same form of signature as used in the Contract, and the signature duly witnessed.

   Individual Doing Business Under an Assumed Name. The name of the individual, business or residence address; with the recital that the principal is doing business under an assumed or trade name, naming it. The bond shall be signed by the individual on the line opposite the scroll seal (L.S.), using the same form of signature as used in the Contract, and the signature duly witnessed.

   Co-partnership. The names of the individual partners, their business address, with the recital that such individuals are partners composing a firm, naming it. The bond shall be signed on line opposite the scroll seal by the same partner who signed the Contract, using the same form of signature, and the signature duly witnessed.

   Corporation. The full business name of the corporation, business address, with the recital that the principal is a corporation, and the name of the state in which incorporated. The bond shall be signed by an authorized officer of the corporation, followed by his title, and the corporate seal affixed.

   The official character and authority of the person executing the bond for the corporation shall be certified by the secretary or assistant secretary, according to the Certificate provided below. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the secretary, under the corporate seal, to be true copies.

4. The date of this bond must not be prior to the date of instrument in connection with which it is given.

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, Matthew Milkovic, certify that I am the Secretary/treasurer

Of the corporation named as principal within the bond; that Hal Howlett,

Who signed the said bond on behalf of the principal, was then Vice. President of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed and the corporate seal affixed for and in behalf of said corporation by authority of it's governing body.

C of D-170-BO (Rev. 5-74)

Matthew Milkovic

MAINTENANCE BOND

Bond No 30027220

KNOW ALL MEN BY THESE PRESENTS, that we Angelo Iafrate Construction Company

as Principal, (the "Principal"), and The Continental Insurance Company , a corporation organized and existing by virtue of the laws of the State of Pennsylvania , as Surety, (the "Surety"), are held and firmly bound unto

City of Detroit

as Obligee (the "Obligee"), in the penal sum of Seven Hundred Eighty-four Thousand One Hundred Forty-six and NO/100----------($784,146.00)

for the payment of which sum well and truly to be made, the Principal and the Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above named Principal has entered into a written contract with City of Detroit

dated this _____ day of _____, A.D. , wherein the said Principal covenanted and agreed as follows, to-wit:

Concrete Pavement for Contract No. PW-7003

Which contract is by reference made a part hereof.

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall remedy without cost to the Obligee any defect which may develop during a period of 5 year(s) from the date of completion and acceptance of the work performed under the Contract provided such defects are caused by defective or inferior materials or workmanship, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect.

SIGNED, SEALED AND DATED as of this 14 day of March 2019

Witness

Angelo Iafrate Construction Company

VP

Witness

The Continental Insurance Company

Holly A. Nichols, Attorney-in-fact

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That The Continental Insurance Company, a Pennsylvania insurance company, is a duly organized and existing insurance company having its principal office in the City of Chicago, and State of Illinois, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Robert D Heuer, Paul M Hurley, Anne M Barick, Holly A Nichols, Nicholas Ashburn, Mark T Madden, Individually

of Troy, MI, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the insurance company and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Board of Directors of the insurance company.

In Witness Whereof, The Continental Insurance Company has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 2nd day of July, 2018.

The Continental Insurance Company

Paul T. Bruflat — Vice President

State of South Dakota, County of Minnehaha, ss:

On this 2nd day of July, 2018, before me personally came Paul T. Bruflat to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of The Continental Insurance Company, a Pennsylvania insurance company, described in and which executed the above instrument; that he knows the seal of said insurance company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said insurance company and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said insurance company.

J. MOHR
NOTARY PUBLIC SOUTH DAKOTA

My Commission Expires June 23, 2021

J. Mohr — Notary Public

CERTIFICATE

I, D. Johnson, Assistant Secretary of The Continental Insurance Company, a Pennsylvania insurance company, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the insurance company printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said insurance company this _____ day of _____.

The Continental Insurance Company

D. Johnson — Assistant Secretary

Form F6850-4/2012

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.

Authorizing Resolutions

ADOPTED BY THE BOARD OF DIRECTORS OF THE CONTINENTAL INSURANCE COMPANY:

This Power of Attorney is made and executed pursuant to and by authority of the following By-Law duly adopted by the Board of Directors of the Company at a meeting held on May 10, 1995.

> "RESOLVED: That any Group Vice President may authorize an officer to sign specific documents, agreements and instruments on behalf of the Company provided that the name of such authorized officer and a description of the documents, agreements or instruments that such officer may sign will be provided in writing by the Group Vice President to the Secretary of the Company prior to such execution becoming effective."

This Power of Attorney is signed by Paul T. Bruflat, Vice President, who has been authorized pursuant to the above resolution to execution power of attorneys on behalf of The Continental Insurance Company.

This Power of Attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the Company by unanimous written consent dated the 25th day of April, 2012:

> "Whereas, the bylaws of the Company or specific resolution of the Board of Directors has authorized various officers (the "Authorized Officers") to execute various policies, bonds, undertakings and other obligatory instruments of like nature; and
>
> Whereas, from time to time, the signature of the Authorized Officers in addition to being provided in original, hard copy format, may be provided via facsimile or otherwise in an electronic format (collectively, "Electronic Signatures"); Now therefore be it resolved: that the Electronic Signature of any Authorized Officer shall be valid and binding on the Company."

EXECUTIVE ORDER 2016-1

TO: **ALL BOARDS, COMMISSIONS, DEPARTMENT DIRECTORS, CITY COUNCIL MEMBERS, CITY CLERK, DEVELOPERS, CONTRACTORS, AND DETROIT ECONOMIC GROWTH CORPORATION (DEGC).**

FROM: **MICHAEL E. DUGGAN, MAYOR**

SUBJECT: **UTILIZATION OF DETROIT RESIDENTS ON PUBLICLY-FUNDED CONSTRUCTION PROJECTS**

DATE: **December 16, 2016**

WHEREAS, it is the policy of this Administration to encourage and maximize the utilization of Detroit residents on all City contracts and all projects benefited by City subsidies. An important component of the economic revitalization of Detroit is the employment of Detroit residents. Accordingly, this Executive Order directs any entity entering into a publicly-funded construction project to implement specific residency targets for its workforce, as follows:

1. A "publicly-funded construction project," for purposes of this Executive Order, means (a) any construction contract for more than $3,000,000.00 (Three Million Dollars) made by the City with any person or entity; and (b) any construction project for which the City, affiliated public or quasi-public entities of the City, or any of their agents or contractors provides funds or financial assistance via any of the following methods, where total assistance from the City or its affiliated entities is over $3,000,000.00 (Three Million Dollars):

(1) The sale or transfer of land below its appraised value;

(2) Direct monetary support;

(3) Public contributions originated by the State of Michigan or its agencies, the United States government or its agencies, or any other non-City government entity, and for which City approval is required and obtained; or

(4) Tax increment financing. For purposes of calculating the total assistance directly provided through tax increment financing, tax revenue that would have accrued to all government entities shall be counted.

Other persons or entities doing business with the City, but not covered by this section, may voluntarily agree to be bound by some or all of the substantive requirements of this Executive Order.

2. A "bona-fide Detroit resident," for purposes of this Executive Order, means an individual who can demonstrate residency in the City of Detroit as of a date at least thirty (30) days prior to the date the person seeks to be employed for work on a publicly-funded construction project. Residency shall be established by the address listed on (a) any one of the following: State of Michigan identification card, State of Michigan driver's license, or Detroit municipal ID; plus (b) any one of the following: Voter Registration Card, Motor Vehicle Registration, most recent federal, state, or City of Detroit tax returns, Lease/Rental agreement, the most recent utility bill (or utility affidavit signed by a landlord with respect to a leased residence), or most recent municipal water bill. Other forms of proof-of-residence may be accepted under certain circumstances.

3. All publicly-funded construction contracts shall include a provision providing that at least 51% of the workforce on the publicly-funded construction project shall be bona-fide Detroit residents. This requirement shall be referred to as the "Workforce Target." The Workforce Target shall be measured by the hours worked by bona-fide Detroit residents on the publicly-funded construction project.

4. Developers, general contractors, prime contractors and subcontractors are all required to comply with the terms of this Executive Order. Collectively, these entities are hereinafter referred to as "contractors." It is, however, the sole responsibility of the person or entity contracting with the City of Detroit to require all of its subcontractors either to (a) meet the Workforce Target; or (b) make the required contribution to the City's Workforce Training Fund, as provided in Paragraph 6 of this Executive Order. Contractors may utilize local unions, Detroit Employment Solutions Corporation, or other entities to help meet the Workforce Target. Failure to satisfy the requirements of this Executive Order shall constitute a breach of contract and may result in the immediate termination of the contract.

5. Upon execution of a publicly-funded construction contract, the City of Detroit's Civil Rights, Inclusion and Opportunity Department ("CRIO") shall determine whether the Workforce Target in the contract shall be measured periodically either (a) monthly or (b) quarterly. This period shall be referred to as the "measurement period." Thereafter, for the duration of the construction project, the contractor shall, at the end of each measurement period, submit to CRIO a report indicating:

(1) The total hours worked on the project during the preceding measurement period ("total work-hours");

(2) The total hours worked on the project by bona-fide Detroit residents during the preceding measurement period; and

(3) If applicable, the amount by which the contractor fell short of meeting the Workforce Target. A contractor falling short of the Workforce Target shall report both (a) the raw number of total work-hours by which the contractor fell short of the Workforce Target; and (b) the percentage of total work-hours by which the contractor fell short of the Workforce Target.

6. A contractor who does not meet the Workforce Target in any measurement period shall help strengthen Detroit's workforce by making a monetary contribution to the City's CRIO-administered Workforce Training Fund, thereby supporting the skill development of Detroit residents. The required contribution for any contractor who does not meet the Workforce Target shall be the sum of the following:

(1) For each work-hour comprising the first 0-10% of total work-hours by which the contractor fell short of the Workforce Target, 5% of the average hourly wage paid by the contractor on the publicly-funded construction project during the preceding measurement period.

(2) For each work-hour comprising the second 0-10% of total work-hours by which the contractor fell short of the Workforce Target (if applicable), 10% of the average hourly wage paid by the contractor on the publicly-funded construction project during the preceding measurement period.

(3) For each work-hour comprising the remaining 0-31% of total work-hours by which the contractor fell short of the Workforce Target (if applicable), 15% of the average hourly wage paid by the contractor on the publicly-funded construction project during the preceding measurement period.[1]

7. If a contractor contracts for labor through a union which is meeting the goals set for it under the Detroit Skilled Trades Employment Program, that contractor will be deemed to have met the Workforce Target with respect to the employees for which it contracted through such a union.

Specifically: CRIO will make a periodic determination whether a union participating in the Detroit Skilled Trades Employment Program is meeting its established goals under that Program. For purposes of calculating a contractor's compliance with the Workforce Target, a union which, as of the date a contractor executes its publicly-funded construction contract or subcontract, is meeting its goals under the Program shall be deemed to have no less than 51% of the hours worked by its members on the publicly-funded construction project worked by bona-fide Detroit residents. If bona-fide Detroit residents actually account for more than 51% of the hours worked by union members on a publicly-funded construction project, that actual percentage may be used for purposes of calculating compliance with the Workforce Target.

8. If CRIO determines a contractor is in non-compliance with the requirements of this Order, CRIO will notify the contractor, in writing, of the contractor's non-compliance.

If a contractor wishes to challenge a finding of non-compliance, the contractor may, within fifteen (15) days of the notice of non-compliance, file with CRIO a written notice challenging the finding of non-compliance, and detailing the reasons for that challenge. The challenge will then

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[1] Thus, for example, if 25% of the total work-hours performed on a publicly-funded construction project were performed by bona-fide Detroit residents, the contractor will have fallen short of the Workforce Target by 26% of the total work-hours. That contractor's minimum required contribution would be the sum of (1) 5% of the average hourly wage for 10% of the total work-hours; (2) 10% of the average hourly wage for 10% of the total work-hours; and (3) 15% of the average hourly wage for 6% of the total work-hours.

be forwarded to a panel comprising of (1) the City's Corporation Counsel or his or her designee; (2) the head of the Department of Administrative Hearings or his or her designee; and (3) the Director of the Buildings, Safety, Engineering, and Environment Department, or his or her designee. The panel shall adjudicate the challenge and issue a written decision. The panel may, but need not, schedule an oral hearing on the challenge.

If, following written notice of non-compliance and the adjudication of any challenge, the contractor fails or refuses to take corrective actions within thirty (30) days, the City of Detroit may do any of the following:

(1) withhold from the contractor all future payments under the construction contract until it is determined that the contractor is in compliance;

(2) refuse all future bids on city projects or applications for financial assistance in any form from the city or any of its departments, until such time as the contractor demonstrates that it has cured its previous non-compliance;

(3) debar the contractor from doing business with the City of Detroit for a period of up to one year.

In addition, the City of Detroit reserves the right to re-bid the contract, in whole or in part, or hire its own workforce to complete the work.

9. All applicable construction contracts, construction contract amendments, change orders and extensions shall include the terms of this Executive Order. CRIO shall have the responsibility for preparing administrative guidelines related to this Executive Order, and for monitoring and enforcing the provisions of this Executive Order.

* * *

Pursuant to the powers vested in me by the 1963 Michigan Constitution and by the 2012 Detroit City Charter, I, Michael E. Duggan, Mayor of the City of Detroit, issue this Executive Order. This Executive Order is effective upon its execution and filing with the City Clerk and supersedes Executive Order No. 2014-4 issued by me on August 22, 2014. Provided, however, that this Executive Order shall not supersede the operation of any prior Executive Order with respect to any publicly-funded construction project on which construction activities have commenced as of the date of this Executive Order.

Michael E. Duggan
Mayor, City of Detroit

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EXECUTIVE ORDER NO. 2014-5

TO: ALL BOARDS, COMMISSIONS, DEPARTMENT DIRECTORS, CITY COUNCIL MEMBERS AND THE CITY CLERK

FROM: MICHAEL E. DUGGAN, MAYOR

SUBJECT: UTILIZATION OF DETROIT HEADQUARTERED BUSINESSES AND DETROIT BASED BUSINESSES FOR CITY OF DETROIT CONTRACTS

DATE: AUGUST 22, 2014

WHEREAS, it is the policy of this Administration to encourage and increase the utilization of Detroit Headquartered Businesses and Detroit-Based Businesses. An important component of the economic revitalization of Detroit is the utilization of Detroit Headquartered Businesses and Detroit-Based Businesses in the City of Detroit's contracting. The City government is a major purchaser of goods and services. A substantial percentage of the City of Detroit's budget will be used to purchase foods and services to meet the needs of Detroit and its citizens.

WHEREAS, this Executive Order directs City departments and agencies to implement specific purchasing goals for the utilization of Detroit Headquartered Businesses and Detroit-Based Businesses. The goal of this Administration is to award **thirty percent (30%)** of the total dollar value of City contracts to Detroit Headquartered Businesses and Detroit-Based Businesses. The ability of individual departments to achieve this goal may vary as a function of the types of goods and services required and the availability of Detroit Headquartered Businesses and Detroit-Based Businesses to perform any given contract. However, all departments shall make their best efforts to meet this goal. All city departments and agencies are directed to review their contracting practices and procedures for the implementation of this Executive Order.

WHEREAS, the purchasing ordinance, Detroit City Code Section 18-5-4, provides equalization factors to be applied to the bids of Detroit Headquartered Businesses and Detroit-Based Businesses. All city departments and agencies shall encourage such businesses to participate in the bidding for their contracts.

CITY CLERK 27 AUG 2014 AM11:01

WHEREAS, the purchasing ordinance, Detroit City Code Section 18-5-33, provides that professional services contracts are to be open to competition utilization requests for proposals, requests for qualifications, or requests for quotations. It provides that a firm's status as a Detroit-Based Business, Joint Venture, or Mentor Venture shall be one of the evaluation criteria used to select professional service contractors. All city departments and agencies shall encourage such businesses to participate in the bidding for their professional services contracts.

WHEREAS, one of the goals of this Executive Order is to encourage more Detroit-Based Businesses to locate their headquarters in Detroit. That will be an important part of the economic revitalization of Detroit.

WHEREAS, for the purposes of this Executive Order "Headquarters" and "Detroit Based" shall have the definition assigned to them in Section 18-5-1 of the 1984 Detroit City Code.

Pursuant to the powers vested in me by the 1963 Michigan Constitution and by the 2012 Detroit City Charter, I, Michael E. Duggan, Mayor of the City of Detroit, issue this Executive Order. This Executive Order is effective upon its execution and filing with the City Clerk and supersedes Executive Order No. 4 issued by Dennis Archer on October 28, 1994, and reissued by Mayor Kwame M. Kilpatrick on November 1, 2003.

Michael E. Duggan
Mayor, City of Detroit

CITY CLERK 27 AUG 2014 AM11:01

Certified Payroll

PW-7003

Certified Payrolls

Weekly certified payrolls covering the contractor's and subcontractor's· workforce shall be submitted to the engineer on all contracts. Certified payrolls are required for all covered laborer and mechanic work regardless of the contracting method used such as subcontract, purchase order, invoice, or other contractual arrangement. Certified payroll information may be submitted in any format provided that all information requested on form **WH-347** is included, and the compliance statement has original signatures. This is a USDOL form and a link is available on the MDOT Web site at http://mdotwasl.mdot.state.mi.us/public/webforms/index.cfm.

Submittal Requirements

The first certified payroll is to be received by the engineer within three weeks from the start of the work for the prime contractor and/or subcontractor(s). The three week period is to allow for processing and review of the certified payrolls by the prime contractor. The first pay estimate can be made prior to the submission of the first certified payrolls. The three week grace period allows the first estimate to be paid in good faith assuming the contractor and subcontractor(s) will submit certified payrolls in a timely manner. Subsequent certified payrolls shall be submitted on a weekly basis thereafter. In certain circumstances, the time frame for submittal of the first payroll is two weeks for shorter duration projects as discussed at the end of the section titled "Notice of Delinquent Certified Payrolls". Certified payroll submissions not meeting the above time requirements will be considered delinquent.

Notice of Delinquent Certified Payroll

When weekly certified payrolls are delinquent as defined above, the engineer is to provide the prime contractor a first written notice of delinquent certified payrolls by certified mail or other method which establishes the date the first notice was received by the prime contractor, with a copy by regular mail to the offending subcontractor. The notice informs the contractor that payment for work is suspended as of the date the certified payrolls became delinquent for the work items of the offending contractor(s). When the pay estimate is generated, the statement "Items withheld-Delinquent payrolls" should be entered in the comments area. In addition, the notice is to state that if certified payrolls remain delinquent after 30 calendar days from receipt of the first notice, noncompliance damages will be assessed retroactive to the date the contractor received the first notice. The damages will be assessed on a calendar day basis until complete and accurate certified payrolls are submitted and are current.

If the certified payrolls continue to be delinquent after 30 calendar days from receipt of the first notice by the prime contractor, the engineer is to implement the actions from the first notice. Concurrently, the engineer is to send the prime contractor a second written notice of delinquent certified payrolls by certified mail or other method which establishes the date the second notice was received by the prime contractor, with a copy by regular mail to the offending" subcontractor. The City Engineer should also receive a copy by regular mail. The notice is to state if the certified payrolls remain delinquent for 30 days from the receipt of the second notice, the engineer will rescind all previous payments for work completed by the offending contractor(s). In addition, the engineer will complete interim Contractor Performance Evaluations for the offending contractor. If certified payrolls have not been received from the contractor after 30 calendar days from receipt of the second notification, the engineer is to implement the actions from the second notice. In all circumstances, the withholding of payments, assessment of noncompliance damages, and rescinded payments are to continue until all delinquent certified payrolls are current, complete and correct.

The notification sequence previously described would be as follows:

Initiate Notice	Notice Sequence	Contractor Notice of Action	Allotted Time For Response/ Resolution	If No Response/ Resolution
First payroll has not been received within 3 weeks	First Notice (See Note 1)	Payment is being withheld for offending contractor's work items. Non-payment will continue until complete and accurate payrolls are received. Intent to assess non-compliance damages until all payrolls are complete, accurate and current (See Notes 2 and 3)	30 days from receipt of first notice by the the first prime contractor	Implement actions from the first notice. Send second notice
Payroll remains delinquent 30 days after first notice received by prime contractor	Second Notice (See Note 1)	Intent to rescind all prior payment for the offending contractor's work items. Intent to submit interim Contractor Performance Evaluation(s) for the offending contractor(s). (See Note 2)	30 days from receipt of second notice by the prime contractor	Implement actions from the second notice

Note 1: Notice is to be signed by the engineer and delivered by certified mail or other method which establishes the date received by the prime contractor. The City Engineer is to be copied on the first notice to the prime contractor. The City Engineer and the Director of DPW are to be copied on the second notice to the prime contractor.

Note 2: Prior to generating an estimate on which payment is being withheld or deducted, the following statement will be entered in the comment box: "Items withheld - Delinquent payroll".

Note 3: See Table 1 Schedule of Non-Compliance Damages

Table 1 Schedule of Non-Compliance Damages

Contract/Subcontract/P.O./Invoice Amount	Non-compliance damages per calendar day
$0 to 49,999	$200
50,000 to 99,999	$400
100,000 to 499,999	$600
500,000 to 999,999	$900
1;000,000 to 1,999,999	$1,300
2,000,000 to 4,999,999	$1,550
5,000,000 to 9,999,999	$2,650
10,000,000 and above	$3,000
Trucker	$200

"Contract" amount if offending contractor is the prime contractor. "Subcontract/P.O./Invoice" amount if offending contractor is a subcontractor/vendor.

Certified Payroll

PW-7003

Certified Payroll Status Record

The engineer is to maintain a current (updated weekly) log documenting the submittal status of certified payroll for each contract. The Certified Payroll Status Record (MDOT form 1954) is available for this purpose. The record is to show whether the contractor and/or subcontractor worked during the weekly period, and the date the certified payrolls were received from the prime contractor. In addition, the status record should document the date any notifications are sent to the prime contractor (via certified mail) of delinquencies and/or deficiencies with certified payrolls, and the dates when the revised/corrected certified payrolls were received. All certified payrolls are to be date stamped upon receipt from the prime contractor. The envelope in which the certified payrolls arrive should be attached to the payroll and saved as part of the project file records.

The certified payroll is to include the following information:

- The firm's name and address with the prime or subcontractor(s) identified.
- Payroll number, week ending, project location and contract ID (contract identification).
- The employee's full name and only the last four digits of their social security number. If a contractor or subcontractor submits certified payrolls with complete social security numbers, the engineer is not to take possession of the certified payrolls and will return them to the prime contractor. This is the only instance where certified payrolls are to be returned to the prime contractor. Failure by the contractor or subcontractor to submit certified payrolls with only the last four digits of the social security number shall not change the time frames for the consideration of delinquent and deficient certified payrolls and resulting actions by the engineer.
- Information identifying minority and female employees. The following ethnic code notation is to be used: Black (B), Hispanic (H), Native American Indian or Alaskan Eskimo (N/A), and Asian or Pacific Islander (A). For female use (F).
- The employee's classification and group number. (DBRA Laborer example: LABO0465-001, Group 1)
- Identification of trainees and apprentices, and program levels.
- The employees daily and weekly hours worked in each classification, including actual overtime worked.
- The total weekly hours worked on all jobs (prevailing and non-prevailing wage)
- The basic hourly rate, overtime rate (if applicable) and the method by which fringe benefits are paid (By checking Box(4)(a) approved programs, Box (4)(b) paid in cash, or a combination of the above methods with an explanation in Box (4)(c). If fringe benefits are paid to an approved plan, a detailed breakdown of the type of benefits and hourly dollar values must accompany the first certified payroll. In addition, plan administrator contact information shall be included. If there is a change to the fringe benefits payment after submittal of the first certified payroll, the fringe benefit information must be resubmitted. This information is to be used to verify the benefits being paid are "bona fide" and that the total compensation is in compliance with the required prevailing wage in the contract.
- The itemized deductions - miscellaneous itemized deductions must be explained on the certified payroll. (Space provided after paragraph (1) on the compliance statement)
- The gross job wages paid.
- The gross weekly wages paid for all jobs.
- The net weekly wages paid for all jobs.
- The compliance statement with original signature.

Certified Payroll

PW-7003

Certified Payroll Review

The engineer is to closely review the certified payrolls from the prime contractor and subcontractor(s) that work on the project. Once it is established that a contractor/subcontractor is submitting complete and accurate certified payrolls, subsequent payrolls need to be spot checked during the remainder of the project for that contractor/subcontractor. The review should verify that the information described above is included on the certified payroll. Form 1952, Certified Payroll Review Checklist, is available on MDOT's forms Web site to assist in checking the payrolls for completeness. In addition, the total combination of base wage and fringe benefit reported on the certified payroll should be at least the prevailing wage contained in the wage rate decision in the contract or applicable addendum.

The review should compare information contained in the certified payrolls with information on the Inspectors Daily Reports (IDRs), including number of workers, hours worked, type of work and equipment on the job. It is important that the information is accurately recorded on the IDR each day so the proper review can be completed on the certified payrolls. The review should verify that the appropriate work classifications are reported to support the type of work being done on the job. For example, when concrete curb and gutter is being placed on a job covered by DBRA, there are finishers (cement masons, PLAS0016-016); laborers (form/line setters,LABO0-65-001,Group 6); laborers (unskilled laborers, LABO0465-001, Group 1); and operators (if using a" slipform curb machine, ENGI0324-006, Group 1); Compliance with prevailing wage requirements can only be deterinined once this comparison is made and any inconsistencies are brought to the attention of the contractor.

The rules for payment of· overtime should be considered during the certified payroll review. Overtime rates are a combination of the base rate plus a premium amount. However, there are significant differences between overtime requirements when federal prevailing wages apply and when state prevailing wages apply.

Contracts with State Prevailing Wage:

- The time and one-half rate is stated in the prevailing wage schedule.
- The prevailing wage schedule for each contract will need to be referenced to determine the specific overtime payment requirements." In general, overtime is applied as follows:

  For hours worked in excess of eight hours in a day.

  For most classifications, the contractor may choose to work four tens (4 – 10 hour days) where overtime would be required after the tenth hour in a day and any time worked over forty hours in a week.

  Some classifications require double time in certain situations.

  The classification of iron worker has its own overtime requirements.

Deficient Certified Payroll

During the review, if the weekly certified payrolls are found to be incomplete, inaccurate, or inconsistent with the other project records, they are considered deficient. The engineer is to notify the prime contractor of the deficiencies in writing by certified mail or other method which establishes the date the notice is received by the contractor with a copy by regular mail to any subcontractor(s) that may be involved and the City Engineer.

The notice is to inform the contractor(s) that if the deficiencies are not corrected and revised certified payrolls are not received by the engineer in 30 calendar days from receipt of the notice by the prime contractor, payment for the offending contractor's work items will be withheld until corrected and revised payrolls are received by the engineer. In addition, the notice will state the intent to assess non-compliance damages retroactive to the date the prime received the first notice until all issues are resolved. The offending contractor is to submit revised certified payrolls correcting all deficiencies and/or errors through the prime contractor.

If the issues are not resolved within 30 calendar days from the receipt of the first notice, the engineer will implement the action from the first notice. Concurrently, the engineer is to send a second notice to the prime contractor by certified mail or other method which establishes the date the notice was received by the contractor, with a copy by regular mail to any subcontractor(s) that may be involved. The second notice is to state that if corrected and revised certified payrolls are not received within 30 calendar days of the receipt of the second notice by the prime contractor; the engineer will rescind all payments for the offending contractor's work items previously paid. In addition, the notice is to inform the contractor the engineer will complete interim Contractor Performance Evaluations for the offending contractor. The City Engineer and the Director of Public Works are also to receive a copy of the second notice.

If the deficient certified payrolls are not corrected and revised certified payrolls received by the engineer within 30 calendar days of the second notice, the engineer is to implement the actions in the second notice and prepare the appropriate Contractor Performance Evaluations to report the continued non-compliance with prevailing wage requirements.

Assessment of non-compliance damages, withholding of payments, and rescinded payments will continue until all corrected and revised certified payrolls are received by the engineer.

The original certified payrolls submitted by the contractor/subcontractor(s) are to remain in the project files. Do **not** return certified payrolls to the contractor/subcontractor(s), except in the following circumstance. In the event the prime contractor submits certified payrolls containing full social security numbers, the engineer shall not take possession of the payrolls and shall return them to the prime contractor. This is the only instance where certified payrolls are to be returned to the prime contactor. This action is to protect the security of the employee social security numbers. Certified payrolls should **never** be altered, revised, corrected, amended or changed by project personnel (except for the date stamp).

The notification sequence previously described would be as follows:

Initiate Notice	Notice Sequence	Contractor Notice of Action	Allotted Time For Response/ Resolution	If No Response/ Resolution
Payroll deficiencies	First Notice (See Note 1)	Intent to withhold for offending contractor's work items. Intent to assess non-compliance damages from the date the first notice was received by the prime contractor (See Note 3)	30 days from receipt of first notice by the the prime contractor	Implement actions from the first notice. Send second notice
Payroll Issue not resolved 30 days after first notice	Second Notice (See Note 2)	Intent to rescind payment for all work items of offending contractor(s). Intent to submit interim Contractor Performance Evaluations	30 days from receipt of second notice by the prime contractor	Implement actions from the second notice

Note 1: Written notice is to be signed by the engineer and delivered by certified mail or other method which establishes the date the notice was received by the prime contractor. The offending subcontractor(s) and the City Engineer are to be copied by regular mail.

Note 2: Written notice is to be signed by the engineer and delivered by certified mail or other method which establishes the date the notice was received by the prime contractor. In addition, the offending subcontractor(s), the City Engineer, and the Director of the Department of Public Works are to be copied by regular mail.

Note 3: See Table 1 Schedule of Non-Compliance Damages

GENERAL CONDITIONS

(Revised as of June 1, 1964)

1. DEFINITIONS

The following words and expressions, or pronouns used in their stead, shall wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

"***Bulletin***" shall mean any additional contract provisions, or change, revisions, or clarification of the Contract Documents issued in writing by the City Engineer, on behalf of the City, to prospective bidders prior to the receipt of bids.

"***City***" shall mean the City of Detroit, a municipal corporation, party of the first part, acting through that Official, Board, or Commission named in the Agreement as acting on behalf of the City.

"***City Engineer***" shall mean the City Engineer of the City of Detroit acting personally or, in his absence, through the then acting City Engineer.

"***Engineer***" shall mean the City Engineer of the City of Detroit acting directly, or indirectly through his authorized representatives acting within the limits of the respective authority delegated to them.

"***City Engineer***" shall mean the officer currently holding the office named in the Agreement as acting on behalf of the City in this Contract in accordance with the provisions of the Charter of the City of Detroit.

"***Common Council***" shall mean the City Council of the City of Detroit.

"***Contract***" or "***Contract Documents***" shall mean each of the various parts of the Contract referred to in Article 1 of the Agreement hereof, both as a whole and severally.

"***Contractor***" shall mean the party of the second part hereto, whether corporation, firm, or individual, or any combination thereof, and its, their, or his successors, personal representatives, executors, administrators and assigns, and any person, firm, or corporation who or which shall at any time be substituted in place of the party of the second part under this Contract, and shall include in their respective capacities, the President, Manager, or other officer or agent for the time being, representing or locally managing the work of any corporation contracting herein.

"***Other Contractors***" shall mean any contractor, other than the party of the second part or his subcontractors, who has a direct contract with the City of Detroit for work on or adjacent to the site of the work.

"***Contract Work***" shall mean everything expressly or impliedly required to be furnished and done by the Contractor by any one or more parts of the Contract Documents, except "extra work" as hereinafter defined; it being understood that, in case of any inconsistency between any part of parts of this Contract, the City Engineer shall determine which shall prevail.

"***Extra Work***" shall mean work other than that which is expressly or impliedly required by the Contract Documents at the time of execution of the Contract.

"***Drawings***" or "***Contract Drawings***" shall mean only those drawings specifically entitled as such and as listed in the Contract, or in any Bulletin, or any detailed drawing furnished by the City Engineer, pertaining or supplemental thereto.

"***Implied Work***" shall mean any work, except "Extra Work" that may have been omitted in the description of said work, but the use of which is implied or necessary, and shall be deemed to be included in this Contract and shall be furnished by the Contractor as if the same had been stated specifically, without any additional charge to the City.

"***Inspector***" shall mean any representative of the Engineer designated to inspect the work.

"***Materialman***" shall mean any person, firm, or corporation, other than employees of the Contractor, who or which contracts with the Contractor, or any of his subcontractors, to fabricate or deliver, or who actually fabricates or delivers, plant, materials, or equipment to be incorporated in the work.

"***Notice***" shall mean written notice.

"***Specifications***" or "***Contract Specifications***" shall mean all of the directions, requirements, and standards of performance applying to the work as hereinafter detailed and designated under the General Specifications and the several divisions of the Detailed Specifications.

"***Site***" shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

"***Subcontractor***" shall mean any person, firm, or corporation, other than employees of the Contractor, who or which contracts with the Contractor to furnish, or actually furnishes, labor, or labor and materials, or labor and equipment, at or about the site, but shall not include one who merely furnishes materials or equipment.

"***The Work***" shall mean all structures, equipment, plant, labor, materials, and facilities or things now or hereafter required to be furnished, installed, or done by the Contractor under or pursuant to this Contract, including extra work; and "performance of work" and words of similar import shall mean the furnishing, installation, or doing thereof.

"***Directed***", "***Required***", "***Approved***", and words of like import whenever they apply to the work or its performance; the words "directed," "required," "permitted," "ordered," "designated," "establish," "prescribed," and words of like import used in the Contract, Specifications, or upon the Drawings, shall imply the direction, requirement, permission, order, designation, or prescription of the Engineer; and "approved," "acceptable," and words of like import shall mean approved by or acceptable to the Engineer.

"***Approved Equal***" shall mean materials, articles, or methods which have been approved by the Engineer as being equal to those specified or shown on the Drawings.

2. CORRELATION & INTENT OF DOCUMENTS

The Contract Documents are complementary and what is called for by any one shall be binding as if called for by all. The intent of the documents, unless otherwise specifically provided, is to produce complete and finished work. No verbal conversation, understanding, or agreement with any officer or employee of the City, either before or after the execution of the Contract, shall affect or modify any of the terms, conditions, or obligations contained in the Contract Documents.

A. Contract Drawings & Specifications: The Engineer will furnish the Contractor, without charge, such copies of the Contract and any Supplemental Drawings and Specifications reasonably necessary for the proper execution of the work. The Contractor shall keep on the site of the work at least one copy of all Drawings and Specifications which shall be accessible at all times to the Engineer.

Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown on or mentioned in both. In case of any apparent difference between the Drawings and Specifications, the Contractor shall refer the matter to the Engineer for a decision as to which, in accordance with the intent of the Contract Documents, shall govern. Procedure without such decision shall be at the Contractor's own risk and expense.

B. Supplemental Drawings & Specifications: In order to carry out the intent of the Contract Documents and to assist the Contractor in performing his work, the City Engineer, after the execution of the Contract, may, by Supplemental Drawings, Specifications, or otherwise, furnish additional instructions, enlarged-scale, additional, or revised details, as may be necessary for construction purposes.

All such Supplemental Drawings, Specifications, or instructions are intended to be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom. Therefore, no extra costs will be allowed by the City on a claim that particular Supplemental Drawings, Specifications, or instructions differ from the requirements of the Contract Documents, incurring extra costs, unless the Contractor has first brought the matter, in writing, to the City Engineer's attention for proper adjustment before proceeding with the work covered by such.

If the City Engineer shall decide that there is no departure from the requirements of the Contract Documents, the Contractor shall then proceed with the work as shown, specified, or directed. If the City Engineer shall decide that extra work is involved, he will so modify the Supplemental Drawings, Specifications, or instructions to eliminate the extra work, or cause a City's written order to be issued in accordance with Article 19 herein.

C. Errors and Corrections in Drawings & Specifications: The Contractor shall not be allowed to take advantage of any manifest errors, omissions, or discrepancies in the Drawings or Specifications, as full instructions will be issued by the City Engineer for correction in accordance with the original intent of the Contract Documents. In case of any errors, omissions, or discrepancies in the Drawings or Specifications, the Contractor shall promptly submit the matter to the City Engineer who, in turn, shall promptly make a determination and issue the necessary instructions in writing. Any adjustment by the Contractor without this determination and instructions shall be at the Contractor's own risk and expense.

The work is to be made complete as intended by the Contract Documents, notwithstanding minor omissions in the Drawings & Specifications.

3. CONTRACTOR'S WARRANTIES & UNDERSTANDING

In consideration of, and to induce the award of the Contract to him, the Contractor represents and warrants:

A. That he is financially solvent, and sufficiently experienced and competent to perform the work; and
B. That the facts stated in the Proposal and the information given by him pursuant to the Bidding Documents are true and correct in all respects; and
C. That he has read, understands, and complied with all the requirements set forth in the Bidding Documents; and
D. That he has, by careful examination, satisfied himself as to the nature, amount, and location of the work, the character of construction equipment and facilities needed to perform the work, the general and local conditions, and all other matters which may in any way affect the work under this Contract.

Unless otherwise specifically provided for in the Contract Documents, the Contractor shall do all the work and shall furnish all the tools and appliances except as herein otherwise specified, necessary or proper for performing and completing the work required by this Contract, in the manner and within the time herein prescribed.

4. CONTRACTOR'S RESPONSIBILITIES

In addition to those matters elsewhere expressly made the responsibility of the Contractor, the Contractor shall have the full and direct responsibility for the performance of the work under this Contract. He shall take all precautions for safely conducting the work and preventing injuries or damage to persons or property on or about the work. He shall bear all losses, if any, resulting to him on account of the amount and character of the work, or because the conditions under which the work must be done are different from what were estimated or anticipated by him, or because of weather, floods, elements, or other causes. He shall assume the defense and save harmless the City of Detroit and its individual officers, employees, or agents from any and all claims arising out of the work performed or to be performed, and for any act or neglect of the Contractor, his agents or employees.

The mention of any specific responsibility or liability of the Contractor in this or in any part of the Contract Documents shall not be construed as a limitation or restriction upon the general responsibility or liability imposed on the Contractor by the Contract Documents.

5. COMPLIANCE WITH LAWS

The Contractor shall fully comply with all local, state and federal laws, ordinances, and regulations applicable to this Contract and the work to be done hereunder.

The Contractor shall secure all permits and licenses necessary for the prosecution of the work and shall fully comply with all their terms and conditions. All required permits and licenses shall be secured by the Contractor without additional cost to the City.

It is the intent that all work required to be done under this Contract comply with the applicable permits and licenses as issued to the Contractor. Should any applicable permit or license be issued with special supplemental requirements pertaining specifically to this Contract which are in variance with express Contract requirements, the Contractor shall immediately report the matter in writing, to the City Engineer for determination and adjustment as may be found necessary. The City Engineer will cause a written order to be issued in accordance with the Articles 19 and 20 herein covering such changes in the work as may be necessary to comply with such special supplemental conditions or requirements, unless the City Engineer secures a written waiver covering the difference from the issuing department or agency.

Should Contractor fail to observe the foregoing provisions and construct work in variance with any special supplemental requirements of the applicable permit or license pertaining specifically to the work under this Contract, or with such as amended by waiver, notwithstanding the fact that such construction is in compliance with the Drawings and Specifications, the Contractor shall remove such work without cost to the City, but the City's written order will be issued only to cover the excess cost, if any, that the Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the items involved.

Should the issuing department or agency after issuing the permit or license later require changes in the work constructed in accordance with the Drawings & Specifications, or the special supplemental requirements of such permits or licenses, the City Engineer will cause a written order to be issued in accordance with Articles 19 and 20 herein covering such changes in the work as may be necessary to conform to the later requirements.

6. PROTECTION OF WORK & OF PERSONS AND PROPERTY

During the performance and up to date of final acceptance, the Contractor shall be under absolute obligation to protect the finished and unfinished work against any damage, loss, or injury. In event of such damage, loss, or injury, the Contractor shall promptly replace or repair such work, whichever the Engineer shall determine to be preferable. The obligation to deliver finished work in strict accordance with the Contract prior to final acceptance shall be absolute and shall not be affected by the Engineer's approval of or failure to prohibit means and methods of construction used by the Contractor.

During performance and up to the date of final acceptance, the Contractor shall take all reasonable precautions to protect the persons and property of City and others on or adjacent to the site of the work from damage, loss, or injury from his or his subcontractors' operations under this Contract, except such property as the owners thereof may themselves be under a legal duty to protect. The Contractor's obligation to protect shall include the duty to provide, place, and adequately maintain at or about the site, suitable guards, lights, barricades, enclosures, danger signals, provide watchmen and such other facilities for protection required by public authority, local conditions, or by order of the Engineer. In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor, without special instruction or authorization of the Engineer, shall take such action necessary to prevent threatened damage, loss, or injury.

Within three days after notice to him of the happening of any such damage, loss, or injury to persons, work, or property, the Contractor shall make a full and complete report thereof in writing to the City Engineer.

If the persons or property of others on or adjacent to the site sustain damage, loss, or injury resulting directly or indirectly from the work of the Contractor, or his subcontractors, in the performance of this Contract, or from his or their failure to comply with any of the provisions of this Contract or law, the Contractor shall defend, indemnify, and hold the City harmless from any and all claims and judgments to which the City may be subjected or which it may suffer or incur by reason thereof.

The provisions of this Article shall not be deemed to create any new right of action in favor of third parties against the Contractor, or the City.

7. PROTECTION FOR LABOR & MATERIAL

The Contractor for himself or any of his subcontractors shall pay all indebtedness which may become due to any person, firm, or corporation having furnished labor, materials, or both in the performance of this Contract. The "Payment Bond" furnished by this Contract is pursuant to Act 351 of the Public Acts of Michigan for the year 1972, as it may be amended to date. It shall be the responsibility of each person, firm, or corporation claiming to have furnished labor, materials, or both, in connection with this Contract, to protect his or its interests in the manner prescribed by the Act 351.

8. INSURANCE

During performance and up to the date of final acceptance of the work, the Contractor shall effect and maintain the following types of insurance, when so required by the Standard Notice to Bidders and in amounts not less than those stated therein. Such insurance shall be carried by financially responsible insurance companies, licensed in the State of Michigan, and satisfactory to the City. Before commencing work, the Contractor shall submit the original or certified copies of his policies to the Engineer for review and approval. Any policy found not satisfactory shall be corrected or replaced by a new policy and, if necessary, from another company. Insurance policies covering operations under this Contract which expire before final acceptance of the work shall be renewed and the new policies submitted to the Engineer for review and approval. All policies which are subject to cancellation shall be endorsed to provide that such cancellation shall not become effective without twenty days' prior notification to the City Engineer for Workmen's Compensation and ten day's prior notification for all other types of insurance. Certificates of insurance shall also be filed with the City Engineer.

A. Workmen's Compensation Insurance: All employees of the Contractor and his subcontractors engaged in work at the site shall be covered by Workmen's Compensation Insurance, in accordance with the Michigan State Compensation Law. In case any work is sublet, the Contractor shall require each subcontractor to similarly provide Workmen's Compensation Insurance for his respective employees, unless such employees are covered by the insurance provided by the Contractor.

B. Public Liability and Property Damage Insurance: Public Liability Insurance and Property Damage Insurance shall protect the Contractor against his liability because of injury, sickness, or disease, including death at any time resulting therefrom sustained by any person, not employees, and against his liability because of injury to or destruction of property of others, including the loss or use thereof, respectively, caused by any and all operations under this Contract, including, but not limited to, the use of any and all types of construction equipment and methods used on the work.

In case any work is sublet, the Contractor shall effect and maintain Protective or Contingent Public Liability and Property Damage Insurance, in amounts not less than those fixed for Public Liability and Property Damage Insurance, to protect him against his liability arising out of the operations at the site of such subcontractors.

In addition to the above requirements, if any work is sublet, the Contractor shall require each subcontractor not fully protected under the Contractor's Public Liability and Property Damage Insurance Policies, to effect and maintain during the period of his respective operations at the site, Public Liability and Property Damage Insurance. The amounts of such insurance, if not in the same amounts as fixed for the Contractor, shall be determined by the Engineer based on the nature and potential hazards of the operations of the respective subcontractors, and shall not necessarily be based on the amount of the subcontract. In no case, however, shall the amount of such coverage for Public Liability be less than $100,000 for one person and $300,000 for each accident or occurrence, nor the amount for Property Damage be less than $100,000 for each accident and $300,000 for aggregate operations, and may be fixed up to and including the amounts fixed in the Special Notice to Bidders.

C. Fire Insurance: Fire Insurance with Extended Coverage and Vandalism & Malicious Mischief endorsements shall be at 100 per cent value, and shall include items of labor and materials connected therewith whether in or adjacent to the structure insured; materials in place, or to be used as part of the permanent construction, including surplus materials, shanties, protective fences, bridges, or temporary structures; miscellaneous materials and supplies incident to the work; and such scaffolding, stages, towers, forms, and equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. This insurance shall not cover any tools owned by mechanics, any tools, equipment, scaffolding, stages, towers, and forms owned by the Contractor, the capital value of which is not included in the cost of the work.

The policy shall be secured in the name of the City of Detroit for the benefit of the Contractor and/or the City, as the City Engineer shall find their respective interests to appear. The original of the policy shall be filed with the City Engineer for transmittal to the City Controller, who shall retain it until the work has been physically completed and found, by the City Engineer, to be acceptable under the terms of the Contract. The policy shall not be canceled or permitted to expire without the consent of the City Engineer in writing.

The loss, if any, when paid, except such portion or portions thereof which may be applied for loss or damage to the Contractor's temporary plant and equipment, shall be retained by the City as security for the performance by the Contractor of his obligations under the Contract, and shall be released to the Contractor in periodical payments as such performance progresses.

D. Other Insurance: Other types of insurance, if any, shall be in the amounts as fixed in the Special Notice to Bidders. All applicable provisions of this Article shall also apply to such additional insurance.

9. MATERIALS & WORKMANSHIP

Unless otherwise expressly provided in the Contract Drawings or Specifications, the work shall be performed in accordance with the best modern practice with materials and workmanship of the highest quality for the particular purpose. The Engineer shall judge and determine the Contractor's compliance with these requirements.

Where materials, equipment, or articles are specified by a particular brand, or name of a proprietary product, or "approved equal," the Engineer shall decide the question of quality of other materials, equipment, or articles proposed by the Contractor. Materials, equipment, or articles specified by reference to the number of a specific standard, such as an A.S.T.M. Standard, a Federal Specification, or similar standard, shall comply with such standard, except as limited to type, class or grade, or modified in such reference. The Standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in full therein.

The Contractor shall be free to secure the approved materials, equipment, and articles from sources of his own selection. However, if the Engineer finds that the work will be delayed or adversely affected in any way because a selected source of supply cannot furnish a uniform product in sufficient quantity and at the time required, or the product is not suitable for the work, the Engineer shall have the right to require the original source of supply changed by the Contractor. The Contractor shall have no claim for extra cost or damage because of this requirement.

10. INFORMATION BY THE CONTRACTOR

The Contractor shall submit to the Engineer for approval, information concerning the materials, equipment, and articles which he proposes to furnish and the manner or arrangements for incorporating them in the work. This information shall be complete to the extent necessary that the Engineer may intelligently determine if the proposed materials, equipment, articles, manners, and arrangements are acceptable and will meet the Contract requirements. The information shall be in the form and submitted in the manner prescribed in the General Specifications or as directed by the Engineer.

The information shall be submitted on dates sufficiently in advance of requirements to afford the Engineer ample time to check it, including time for correcting, resubmitting, and recheck, if necessary, and no request for an extension of the Contract time for completion will be granted to the Contractor by reason of his failure in this respect.

Any work done by or for the Contractor prior to the Engineer's required approval of materials, equipment, articles, and their arrangements, based on the information submitted by the Contractor, shall be at the Contractor's own risk and subject to subsequent rejection.

The approval of the Contractor's information covering materials, equipment, articles, manners, and arrangements by the Engineer shall be general and shall not relieve the Contractor from responsibility for adherence to the Contract, nor shall it relieve him of responsibility for any errors which may exist.

11. MEANS AND METHODS OF CONSTRUCTION

Unless otherwise expressly provided in Contract Drawings, Specifications, or Bulletins, the means and methods of construction shall be such as the Contractor may choose; subject, however, to the Engineer's right to prohibit means and methods proposed by the Contractor which in the Engineer's judgment:

A. Will constitute a hazard to the work, or to persons or property, or violate express requirements of applicable laws or ordinances; or
B. Will cause unnecessary or unreasonable inconvenience to the public; or
C. Will not produce finished work in accordance with the requirements of the Contract Documents; or
D. Will not assure the work to be completed within the time allowed by the Contract.

The Engineer's approval of the Contractor's means or methods of construction, or the Engineer's failure to exercise his right to prohibit such means or methods, shall not relieve the Contractor of his obligation to accomplish the result intended by the Contract; nor shall the exercise of such right to prohibit create a cause of action for damages.

Where the Contract Drawings, Specifications, or Bulletins require the use of specific means or methods of construction, the Contractor shall submit his proposed plan of procedure to the Engineer sufficiently in advance to permit a reasonable time for determining the adequacy and safety of the proposed plan. Failure to so submit the proposed plan within a reasonable time shall not create a cause of action for damages for the resulting delay in the work or be a cause for extension of time by the City for completion of the work.

12. SUPERINTENDENCE BY CONTRACTOR

The work under this Contract shall be under the direct charge and superintendence of the Contractor. Except where the Contractor is an individual and gives his personal superintendence to the work, the Contractor shall provide a competent superintendent or general foreman on the work at all times during progress with full authority to act for him. The Contractor shall also provide an adequate staff for the coordination and expediting of his work.

The superintendent and staff shall be satisfactory to the Engineer. The superintendent or general foreman shall not be changed during this Contract except with the written consent of the City Engineer unless the superintendent or general foreman proves unsatisfactory to the Contractor and ceases to be in his employ.

13. EMPLOYEES

The Contractor shall employ only competent, efficient workmen and shall not use on the work any unfit person or one not skilled in the work assigned to him, and shall at all times maintain good order among his employees.

Whenever the Engineer shall inform the Contractor, in writing, that, in his opinion, any employee is unfit, unskilled, disobedient, or is disrupting the orderly progress of the work, such employee shall be removed from the work and shall not again be employed on it.

Neither party shall employ or hire any employee of the other party without the latter's consent.

14. WORKING AREA

The Contractor shall confine his equipment, storage of materials, and construction operations to the area shown on the Contract Drawings or stated in the Specifications, prescribed by ordinance, laws, or permits, or as may be directed by the Engineer, and shall not unreasonably encumber the site or public rights-of-way with his construction equipment, plant or materials.

Such area shall not be deemed for the exclusive use of the Contractor. Other contractors of the City may enter upon and use such portions of the area and for such times as determined necessary by the Engineer for all purposes required by their contracts. The Contractor shall give to such other contractors all reasonable facilities and assistance to the end that the work on this and the other contracts will not be unduly or unreasonably delayed. Any additional grounds desired by the Contractor for his use shall be provided by him at his own cost and expense.

15. OTHER CONTRACTORS

The City of Detroit may award other contracts for additional work on this project, or contiguous thereto, and the Contractor shall fully cooperate with such other contractors and shall coordinate and fit his work to be done hereunder to such additional work as may be directed by the Engineer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor.

If the City Engineer shall determine that Contractor is failing to coordinate or fit his work with the work of other contractors or City forces as directed by him or his authorized representative:

A. The City shall have the right to withhold payments due hereunder until such time as the Contractor complies; and
B. The Contractor shall indemnify and hold the City harmless from any and all claims of judgment from damages and from costs and expenses which the City may suffer, incur, or be subjected to by the Contractor's failure to carry out the Engineer's directions; and

C. The City shall have the right to retain such monies as provided for in Article 33 herein as the City may decide necessary to protect itself with respect to claims which may be made for damages caused by the failure to carry out the Engineer's directions.

Upon receiving written notice from the Contractor that another contractor is failing to coordinate his work with the work under this Contract as directed by the Engineer, the City Engineer will promptly investigate the charge and take such necessary action as the situation may require. However, the City shall not be liable to the Contractor for damages suffered by this Contractor through failure of another contractor to carry out the directions of the Engineer, or by reasons of another contractor's default in performance, as the City makes no warranty as to the responsibility or continued ability of another contractor.

If the Contractor suffers damage by reason of any act or omission of such other contractor, the Contractor shall have no claim against the City, but shall have the right to recover such damages from the other contractor under the provision similar to the following provision which has or will be inserted in the contracts with such other contractors who are or who will be performing work upon the site of the work to be performed hereunder.

Should any other contractor having, or who shall hereafter have, a contract with the City of Detroit for the performance of work upon the site of the work to be performed hereunder, suffer any damage through the act or omission of the Contractor hereunder, or through any act or omission of any subcontractor of the Contractor, the Contractor agrees to reimburse such other contractor for all such damages and hold the City harmless from all such claims.

16. CITY'S RIGHTS TO SUSPEND WORK

The City shall have the right by written order to require the Contractor to suspend the whole or part of the work whenever, in the judgment of the City Officer, such suspension is required:

A. In the interest of the City generally;

B. Due to Government controls or orders which make performance of this Contract temporarily impossible or illegal;

C. To coordinate the work of the various contractors engaged on this project;

D. To expedite the completion of the entire project even though the completion of this particular Contract may be thereby delayed.

The written order of the City Officer to the Contractor shall state the reasons for suspending work and the anticipated periods for such suspension. Upon receipt of the City Officer's written order, the Contractor shall suspend the work covered by the order and shall take such means and precautions as may be necessary to properly protect the finished and partially finished work, the unused materials, and uninstalled equipment. Work shall not be again be resumed on that part of the work ordered suspended until ordered by the City Officer in writing so to do.

No additional compensation shall be paid to the Contractor for such suspension other than:

A) Extending the time for the completion of the work, as much as it may have been delayed by such suspension, as determined by the City Engineer;

B) The actual and necessary costs of properly protecting the finished and partially finished work, unused materials, and uninstalled equipment during the period of the ordered suspension as determined by the City Engineer as being beyond the Contract requirements. Such costs, if any, shall be determined on the basis set forth in Article 20 herein.

If the City Engineer does not give the Contractor a written order to resume work within 60 days from the date fixed in the written order to suspend work, then the Contractor shall be entitled to receive any money retained by the City on all work done on the portions ordered delayed. Such money so released will be included in the next succeeding progress payment.

If the City Engineer does not issue the written order to resume work within 90 calendar days from the date fixed in the written order to suspend work, then the Contractor may at any time thereafter notify the City Officer, in writing, with a copy to the City Engineer, of his intention to terminate the Contract within a stipulated time from the date of such notification, which time shall not be less than 30 days, unless the written order to resume work is issued by the City Officer within such stipulated time. If, at the expiration of the time stipulated in the Contractor's written notification, the written order to resume work has not been issued by the City Officer, the Contract will be considered terminated. Final settlement with the Contractor for the work performed will be made in accordance with the provisions of Article 27 herein.

17. USE OF COMPLETED PORTIONS OF WORK

The City may, after written notice by the City Officer to the Contractor, take over and use any completed portion of work prior to the final completion of the entire work included in the Contract, and notwithstanding that the time allowed for final completion has not expired. The Contractor shall not object to, nor interfere in any way with, such occupancy or use after receipt of the City Officer's written notice.

Immediately prior to such occupancy and use, the Engineer will inspect such portion of the work to be taken over and will furnish the Contractor a written statement of the work, if any, still to be done on such part. The Contractor shall promptly thereafter complete such unfinished work to permit occupancy and use on the date specified in the City Officer's written order, unless the Engineer shall permit specific items of work to be finished after the occupancy and use by the City.

The Contractor shall not be responsible for any damage or maintenance costs due directly to the occupancy and use of such part by the City. The period of guarantee, if any, for such portion of the work shall begin on the date of occupancy and use by the City. If the occupancy and use of such portion directly causes a delay in completion of the balance of the work beyond the time allowed for final completion of the entire work, then the Contractor will be allowed an extension of time commensurate with such delay as determined by the City Officer in accordance with the provisions of Article 18 herein.

When the Contract requires that the Contractor provides fire insurance in accordance with Article 8 herein, such insurance shall not be cancelled or reduced in amount by reason of the occupancy and use by the City of any completed portion of the work. The insurance in the full amount as required by the Contract shall be kept in force and at the Contractor's expense until final acceptance of the entire Contract.

18. DELAYS AND EXTENSION OF TIME

An extension of time for completion of the work under the Contract may be granted by the City Officer, subject to conditions of this Article, but only upon the written application of the Contractor.

In general, an extension of time will be granted by the City Officer only if the delay is unavoidable and substantial, not the fault of the Contractor, and could not be reasonably anticipated or adequately guarded against. The Contractor will not be liable for liquidated damages during the period for which time of completion is extended by the City.

A. Grounds for Extension: The Contractor shall be entitled to a reasonable extension of time for unavoidable delay in completion caused solely by:

1) Any acts or omissions of the City, its officers, or employees;

2) Any acts of other public authority;

3) Causes not reasonably foreseeable by the parties at the time of execution of this Contract and which are entirely beyond the control and without the fault or negligence of the Contractor, including, but not limited to, acts of God, or the public enemy, war or other national emergency making performance temporarily impossible or illegal, acts or omission of other contractors, strikes and labor disputes not brought on by any act or omission of the Contractor, fires, floods, epidemics, quarantine restrictions, freight embargoes, weather of unusual severity such as cyclones or tornadoes, or excessive abnormal weather.

B. Concurrent Causes of Delay: The Contractor shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the work as determined by the City Officer, irrespective of the number of the causes contributing to produce the delay. If one of the several causes of delay operating concurrently results from any act, fault, or omission of the Contractor or his sub- contractors or materialmen, and would of itself, irrespective of the current causes, have delayed the work, no extension of time will be allowed for the period resulting from such act, fault, or omission.

C. Delays of Subcontractors or Materialmen: Delays caused by the Contractor's subcontractors or materialmen will, in themselves, not be causes for an extension of time by the City Officer. Such delays to warrant an extension of time must be occasioned by the same causes specified in "A" above, "Grounds for Extension".

D. Delays by Other Contractors: If several contracts are entered into by the City for performance of work on the site of this contract and the specified time of completion of the work under the several contracts is predicated on the work being carried on concurrently, the Contractor will not be entitled to any extensions of time because of necessary interruptions to or suspensions of his work, required to enable the other contractors to perform their work on the site, as such necessary interruptions to or suspension of his work where taken into consideration in fixing the Contract time for completion.

E. Contractor's Application: The Contractor shall submit his written application to the City Engineer within five days from the beginning of the claimed delay, unless the City Engineer should grant additional time if, in his judgment, circumstances so justify, but in any event prior to the Contract date for final completion. Should the delay claimed be for acts or omissions of the City which the City might have rectified or mitigated had the Contractor more promptly submitted his application, the Contractor shall not be entitled to an extension of time for such period of delay as determined by the City Officer resulted from failure of the Contractor to more promptly submit his application. The Contractor's application shall set forth in detail the nature of each alleged cause of delay, the date upon which each such cause of delay began and, if not still continuing, when ended, with the number of days delay attributable to each of such causes. The application shall also give the reason why, in the Contractor's opinion, the delay was unavoidable and beyond his control.

If the Contractor claims that a proposed change in or modification of the Contract will require an extension of time of final completion of the work under the Contract, the Contractor shall submit, as part of his proposal for the proposed change or modification, the extent of additional time required and reasons therefor. Such application will be considered in the same manner as other applications for an extension of time and the determination made by the City Officer will be incorporated in the City Officer's written order, if issued, for the change or modification.

F. City Engineer's Recommendation: The City Engineer will review the Contractor's application and shall ascertain the facts, and the cause and extent of delay and make a recommendation to the City Officer. The City Engineer shall have the authority to request the Contractor to furnish additional information to substantiate any statements or claims made in the application. Failure of the Contractor to promptly and fully furnish the additional information requested shall be deemed a waiver on the part of the Contractor for an extension of time requested. The City Engineer shall be under no obligation, however, to request additional information and may confine his review and base his decision solely on the statements made in the Contractor's original written application.

G. City Officer's Determination: The City Engineer will make a determination based, based on the ascertained facts and the terms of this Contract, if an extension of time is justified, and, if so, will extend the time for completing the work for a period commensurate with the period of excusable delay. The determination made by the City Officer shall be binding and conclusive on the Contractor.

If the City Officer determines that the causes of delay justify an extension of time but the period of such extension can not be simultaneously determined due to the delay still continuing, the City Officer, will extend the time of completion for the delay attributable to such causes, with the proviso that the commensurate period of the extension of time will be later determined when the period of excusable delay can be definitely established. Such extension of time, without the actual period being initially determined, shall in no wise tend to modify or abrogate the Contract provision that time is of the essence, nor permit claim for additional time because of avoidable consequential delays.

H. Permitting Continuation of Work:
Permitting the Contractor to continue with the work after the time fixed in the Contract has expired, or after the time to which such completion may have been extended has expired, or the making of any payments to the Contractor after such time, shall in no wise operate as a waiver on the part of the City of any of its rights under this Contract and shall not in any way release the sureties hereunder.

I. No Damages for Delay: The Contractor agrees to make no claim for damages for delay in the performance of this Contract occasioned by any act or omission of the City and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the work, as provided for herein.

19. CHANGE OR MODIFICATION OF CONTRACT

The City Officer may, from time to time, by written order to the Contractor, change or modify this Contract, provided the general character of the work as a whole is not materially affected thereby. Such changes or modifications shall not invalidate the Contract or the surety bonds, nor relieve or release the Contractor or Surety from any of their respective obligations or liabilities under the Contract or bonds. Drawings in themselves shall not be considered as a written order.

The written order shall be valid only when signed by the City Officer and, in addition, if the change or modification results in an increase of $1,000 or more in Contract price, the approval of the Common Council has been obtained. The written order shall designate the amount of the adjustment, if any, in the Contract price and stipulate any extension in time for completion of the Contract.

When, in the judgment of the Engineer, circumstances necessitate, but time does not permit the prior determination of the adjustment in the Contract price or in the time of completion, if any, the Engineer shall have authority to issue, on behalf of the City Officer, the required written order, designated as an "emergency order." Such emergency order shall be later confirmed in writing by the City Officer when the adjustment in the Contract price or time of completion, if any, has been determined.

The Engineer shall also have authority to issue a written order on behalf of the City Officer for changes or modifications not involving adjustments in the Contract price or in the time of completion.

20. METHODS FOR DETERMINING ADJUSTMENTS IN CONTRACT PRICE

Adjustments, if any, in the Contract price, either additive or subtractive, by reason of a change or modification in the Contract ordered in writing by the City Officer, shall be limited to the amount stated in the written order. Adjustment in price shall be determined by one or more of the following methods, the City Engineer having the right to select the method or methods used:

A. Lump Sum Amount: By this method, the amount of the adjustment will be the amount of an acceptable lump sum proposal from the Contractor. To facilitate checking and acceptance, the City Engineer shall have the right to require the Contractor's lump sum proposal to be itemized with quantities and prices for the various items.

B. Unit Price: By this method, the amount of the adjustment will be computed by applying acceptable unit prices to the various items. The unit prices may be those for which there are applicable unit prices in the original Proposal, the approved Detailed Estimate, or may be those fixed by subsequent agreement between the City and Contractor.

C. Cost-Plus-Limited Amount: By this method, the amount of adjustment will be determined by (a) the actual, necessary, and reasonable costs directly incurred by the Contractor or subcontractor, plus (b) a fixed percent, and (c) with the total amount limited to the maximum amount stated in the City Officer's written order.

The total amount of the adjustment will be determined as follows:

"Actual Cost" will consist of:

1) Labor: Being the amount shown on the Contractor's payroll for direct labor used, with payroll taxes or contributions for Unemployment Insurance Compensation and Federal Social Security, etc., added, when same have been incurred. In no case, however, shall the wage rates charged for labor exceed the wage rates paid for the same class of labor employed on the original Contract work; plus

2) **Materials:** Being the net cost of materials, including the cost of transportation to the site, as shown by invoices; plus

3) **Equipment:** Being the actual cost of equipment rental, or rental value if contractor-owned, but not to exceed the prevailing rentals charged in the Detroit district for equipment of like size and condition, plus the actual incurred costs for necessary supplies and repairs for operating the equipment; plus

4) **Insurance:** Being the net additional cost of insurance premiums which are incurred and which are determined from the labor payrolls, limited, however to such types of insurance required by the Contract.

To the total sum of Items 1 through 4 shall be added the following percent:

5) **For Work Done by Contractor's Forces:** Fifteen percent as compensation for all other items of expense, including superintendence, use of ordinary tools, general overhead, bonds, and profit.

6) **For Work Done by Subcontractor's Forces:** Ten percent of the subcontractor's "actual costs," computed in accordance with Items 1 through 4, as full compensation for all other items of expense and profit of the subcontractor, plus an additional five percent of the subcontractor's "actual costs" as full compensation for all the other items of expense and profit of the Contractor.

7) **When Both Extra and Omitted Work: When** the City Engineer's written order involves both extra work and omitted Contract work in a lump sum contract, or a part of a lump sum item in a unit price contract, the difference between the actual cost of the extra work, obtained pursuant to Items 1 through 4, and the estimated net cost, exclusive of overhead and profit, of the omitted Contract work shall be determined. The estimated net cost of the omitted Contract work shall be taken at 87 percent of the total cost shown in the Detailed Estimate or lump sum amount for the item in the Proposal, or, if such is not applicable, by estimate according to Items 1 through 4.

The total adjustment in the Contract price shall then be determined as follows:

A) **Net Increase:** If the actual cost of the extra work exceeds the estimated net cost of the omitted Contract work, the Contract price shall be increased by the net difference, plus the applicable percent in Items 5 or 6.

B) **Net Decrease:** If the estimated net cost of the omitted work exceeds the actual cost of the extra work, the Contract price shall be reduced by the net difference, plus five percent of the estimated net cost of the omitted work. When the City's written order involves both extra work and omitted work covered by Contract unit prices, the cost of the extra work shall be determined in accordance with Items 1 through 6 and the cost of the omitted work shall be obtained by Contract unit prices. The adjustment in the Contract price shall be the difference, either additive or subtractive, between the cost of the extra work and the omitted work.

8) **Maximum Limit of Cost:** The total amount of the adjustment in the Contract price shall be limited to the maximum amount stated in the City Officer's written order to the Contractor to perform the work. The final amounts that are to be allowed will be as computed pursuant to Items 1 through 7 or the stated maximum amount, whichever is the lesser amount.

9) **Records of Costs:** The Contractor and his subcontractors shall keep accurate, complete, daily records of the net actual cost incurred for the extra work performed, and shall present such information in the form and times as directed by the Engineer, as provided for in Article 22 herein.

21. DISPUTED WORK, DETERMINATION, OR ORDER

If the Contractor is of the opinion that (a) the work necessary or required to accomplish the result intended by this Contract, or (b) any work ordered to be done as Contract work by the Engineer, is extra work and no contract work, or (c) any determination or order of the Engineer or City Officer violates the terms and provisions of this Contract, the Contractor shall promptly, either before proceeding with such work or complying with such order or determination, or simultaneously therewith, notify the City Engineer in writing of his contentions with respect thereto and request a final determination thereof.

Such determination of the City Engineer shall be given in writing to the Contractor. If the City Engineer determines that the work in question is extra work and not Contract work, or the determination or order complained of requires performance by the Contractor beyond that required by the Contract or violates the terms and provisions of the Contract, thereupon the City Engineer shall cause either (a) the issuance of a written order by the City covering the extra work as provided for in Article 19 hereof, or (b) the determination or order complained of to be rescinded or so modified so as to not require performance beyond that required by or so as not to be in violation of the terms and provisions of the Contract.

If the City Engineer determines that the work in question is Contract work and not extra work, or that the determination or order complained of does not require performance by the Contractor beyond that required by the Contract or violates the terms and provisions of the Contract, he will direct the Contractor to proceed and the Contractor must promptly comply. However, in order to reserve his right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within five days after receiving the City Engineer's determination and direction, notify the City Engineer in writing that the work is being performed, or that the determination and direction is being complied with, under protest.

If the Contractor fails to so appeal to the City Engineer for a determination or, having so appealed, should the Contractor thus fail to notify the City Engineer in writing of his protest, the Contractor shall be deemed so have waived any claim for extra compensation or damages therefor. No oral appeals or oral protests, no matter to whom made, shall be deemed even substantial compliance with the provisions of this Article.

If the Contractor shall claim to be sustaining damages by reason of any acts or omissions of the City, its officers, or employees, he shall within five days after such acts or omissions occur, notify the City Officer in writing, with a copy to the City Engineer, except that if the claim is of a continuing character and the notice of claim is not given within the five days of its commencement, the claim will be considered only for a period commencing five days prior to the receipt by the City Officer of the notice thereof. Within 30 days after the date of notification, or within such additional time as may be granted in writing by the City Engineer upon the Contractor's written request therefor, the Contractor shall submit to the City Engineer verified detailed statements of the damages sustained together with documentary evidence of such damages. On failure of the Contractor to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist.

In addition to the foregoing statements, the Contractor shall, upon notice from the City Officer, produce for examination at the Contractor's office, by the representatives of the City, all his books of record, showing all of his acts and transactions in connection with or relating to or arising by reason of this Contract. At such examination a duly authorized representative of the Contractor may be present.

Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination, the City shall be released from all claims arising under, relating to, or by reason of this Contract, except for the sums certified by the City Officer to be due under the provisions of this Contract. It is further stipulated and agreed that no person has power to waive any of the foregoing provisions, and that in any action against the City to recover any sum in excess of the sums certified by the City Officer to be due under or by reason of this Contract, the Contractor must allege in his complaint and prove, at the trial, compliance with the provisions of this section.

In connection with the examination provided for herein, the City Engineer, upon demand therefor, will also produce for inspection by the Contractor such records as the City may have with respect to such disputed work or work performed under protest pursuant to order of the City Officer, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the Contractor's claim.

22. PERFORMANCE OF EXTRA OR DISPUTED WORK

While the Contractor or his subcontractor is performing extra work in accordance with the City Officer's written order, the cost of which is to be determined by method "C" of Article 20 hereof, or is performing disputed work or complying with a determination or order under protest in accordance with Article 21 hereof, in each case the Contractor shall daily furnish the Engineer's representative at the site with three copies of verified statements showing:

A. The name and number of each workman employed on such work or engaged in complying with such determination or order, the character of work each is doing and the wages paid to him, including the rate and amount of payroll taxes and contributions for Unemployment Insurance and Federal Social Security; and

B. The nature and quantity of any materials, plant, or construction equipment furnished or used in connection with the performance of such work or in complying with such determination or order, and from whom purchased or rented.

A copy of such statements will be signed by the Engineer's representative, noting thereon any items in question, and will be returned to the Contractor within two working days after submission. This signature shall not be construed as the City's agreement and acceptance of items not questioned since all items are subject to subsequent review and audit by City representatives.

The Contractor, and his subcontractors, when required by the City Officer or the Engineer, must also produce for inspection and audit by designated City representatives, any and all of his books, vouchers, records, daily job diaries and reports, cancelled checks, etc., showing the nature and quantity of labor, materials, and equipment actually used in the performance of the work, and the amounts expended therefor, and the costs incurred for insurance premiums and other items of expense directly chargeable to such work. The Contractor must permit the City's representatives to make extracts therefrom or copies thereof as may be desired.

Failure of the Contractor to comply strictly with these requirements shall constitute a waiver of all or part of any claim for extra compensation on account of the performance of such work.

23. THE ENGINEER

The work under this Contract shall be under the general supervision and control of the City Engineer and shall be subject to his determination, direction, and approval, except where the determination, direction, or approval of someone other than the City Engineer is expressly called for herein.

Without implying any limitation upon the power of the City Engineer, and in addition to those matters elsewhere delegated to the City Engineer and expressly made subject to his determination, direction, or approval, the City Engineer shall have the authority and power:

A. To determine the amount, kind, quality and acceptability of the work to be paid for hereunder, and to reject such work which does not conform to Contract requirements;

B. To determine all questions in relation to the work, to interpret the Contract Drawings, Specifications, and Bulletins, and to resolve all patent inconsistencies or ambiguities therein;

C. To amplify the Contract Drawings and Specifications, add explanatory information and furnish Supplemental Drawings and Specifications consistent with the intent of these Contract Documents;

D. To make changes in the work as he deems necessary provided that such changes do not result in a net change in the cost to the City or the Contractor of work to be done under the Contract or increase the time required for completion;

E. To determine the adequacy of the Contractor's construction methods, plant, and facilities;

F. To require the application of the Contractor's forces to any portion of the work, or the forces increased or diminished, or the work temporarily stopped when, in his judgment, such may be necessary to assure proper performance of the Contract;

G. To determine how the work of this Contract shall be coordinated with the work of other contractors engaged simultaneously on the project of which this Contract is a part, including the power to temporarily stop the work.

The City Engineer, or any of his representatives have no power to change or modify any of the terms and provisions of this Contract in any respect.

A. City Engineer's Representatives: Where the contract Documents expressly provide that certain determinations, directions, or approvals shall be made by the "City Engineer", this shall mean by the City Engineer of the City of Detroit acting personally or, in his absence, by the duly acting City Engineer.

When the Contract Documents provide that the determinations, directions, or approvals shall be made by the "Engineer", this shall mean by the City Engineer acting directly or through duly authorized representatives acting within the limit of authority delegated to them. Any determination, direction, or approval of such authorized representatives shall be subject to review by the City Engineer.

B. **Field Engineer:** The Field Engineer shall be the authorized representative of the City Engineer at the site of the work, and, subject to the review by the City Engineer, shall have the power, in the first instance, to inspect, supervise, and control the performance of the work. The Field Engineer shall not have the power to issue an extra work order, other than an "emergency order" in accordance with Article 19 herein, and performance of such work by the Contractor on order of the Field Engineer without thereafter obtaining written confirmation thereof from the City Officer in accordance with the provisions of Article 19 hereof, shall constitute a waiver of any right to extra compensation therefor. The Field Engineer has no power to change or modify the terms and provisions of this Contract in any respect.

C. **City Engineer's Final Determinations:** The City Engineer's determinations shall be final relative to the proper performance of the work and the materials used, and the Contractor is bound thereby.

It is hereby covenanted and agreed between the two parties of this Contract that the City Engineer shall review and determine all disputes, controversies, or claims of either party in relation to this Contract or its performance. Such determination shall be made in writing by the City Engineer within a reasonable time and shall be final and conclusive upon both the Contractor and the City. It is further covenanted and agreed between the two parties to this Contract that the determination by the City Engineer shall be a condition precedent to the right of any legal action at law or in equity that either party may have against the other.

24. INSPECTION AND TESTS

During the progress of the work and up to the date of final acceptance, all materials, equipment, and workmanship shall be subject to such inspections and tests by the Engineer, inspectors, or his agents as will give due assurance that all Contract requirements are being fulfilled in all respects. However, neither inspection, testing, approval nor acceptance of the work in whole or in part, by the Engineer, inspectors, or his agents shall relieve the Contractor of full responsibility for materials or equipment furnished, or work performed not in strict accordance with the Contract requirements.

The Contractor shall at all times afford the City's representatives every reasonable, safe, and proper facility, furnish promptly all materials reasonably necessary for testing, and give all necessary information and assistance for inspection and tests of the work done or being done at the site, and also at the places where materials and equipment for the work are being manufactured or prepared. Such inspections and tests by the City's representatives will be performed in such manner as not to delay the work unnecessarily.

A. Required Inspections: Where the Contract Specifications, laws, ordinances, permits, licenses, or the Engineer's instructions require certain work to be specifically inspected, tested, or approved, the Contractor shall give the Engineer timely notice of its readiness for such inspection, test, or approval. If the inspection, test or approval is by others than the Engineer or his inspectors, the Contractor shall give the Engineer sufficient advance notice so that the Engineer, in turn, may make the arrangements with others for the required inspection, tests, or approval. The inspections and tests will be promptly made after a reasonable advance notice.

B. Inspection and Tests Away from Site: Where the Contract Specifications expressly provide for inspection, test, or acceptance of specific materials or equipment, or where the quantities justify, at the place of production, manufacture, or shipment, the Contractor shall give the Engineer ample advance notice to permit such inspection, test, or acceptance. The Contractor shall furnish the Engineer with copies of the purchase orders, shop orders, and such other information as necessary to acquaint the Engineer with the location and intended use of the material or equipment. The Contractor shall make all necessary arrangements with the producers or manufacturers to enable the City's representatives to make the required test, inspection, or acceptance.

Inspections, tests, or acceptance at the place of production, manufacture, or shipment, unless otherwise stated in the Contract Specifications, shall be final, except as regards (a) latent defects, (b) departure from specific Contract requirements, (c) damage or loss in transit, or (d) fraud or such gross mistakes as amount to fraud. Subject to the requirement contained in the preceding sentence, the inspection and test of materials, equipment, and workmanship for final acceptance as a whole or in part will be made at the site.

C. Rejection of Defective Materials and Workmanship: The Engineer, inspectors, or his agents shall have the authority to reject defective materials, equipment, or workmanship or require correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected materials or equipment shall be segregated and promptly removed from the site and replaced with proper materials or equipment.

If the Contractor fails to promptly proceed with the replacement of rejected material or equipment and/or the correction of defective workmanship, the City may, by contract or otherwise, replace such material or equipment and/or correct such workmanship and charge the cost thereof against the Contractor, or may terminate the Contractor's right to proceed as provided in Article 26 herein, the Contractor and Surety being liable for any damage to the same extent as provided in said Article 26 for termination thereunder.

D. Examination of Completed Work: If at any time before final acceptance of the entire work, the Engineer should require an examination of work already completed, by removing or tearing it out, the Contractor shall furnish all necessary facilities, labor and materials. If the Engineer finds the work to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, the Contractor shall stand all the expense of such examination, the satisfactory reconstruction of the work, and for any resulting delay. However, if the work is found by the Engineer to meet the Contract requirements, the additional work imposed on the Contractor shall be considered an item of extra work to be paid for in accordance with Article 20, hereof, and if the completion of the work of the entire Contract has been delayed thereby, the Contractor shall be granted a suitable extension of time on account of the extra work involved.

However, if the Contractor is required to remove or tear out completed work for examination due to the Contractor's failure to give timely notice to the Engineer of the readiness for such examination, the Contractor shall stand all expenses even though the work is found to meet Contract requirements.

E. Cost of test: Inspections and tests made by the Engineer, inspectors, or his agents will ordinarily be made without cost to the Contractor unless otherwise expressly specified herein. The Contractor shall furnish without additional cost to the City such materials for testing as may be reasonably necessary.

Should, however, the preparation or manufacture of the materials or equipment be at fair distant or inaccessible points, or should it be separated into unreasonably small quantities, or widely distributed to an unreasonable extent, or should the percentage of rejected material or equipment be unreasonably large, the additional cost of such inspection and tests resulting therefrom shall be borne by the Contractor. The City Engineer shall judge what is extra inspection and shall determine the additional cost incurred thereby.

25. NO ESTOPPEL

The City of Detroit, or any officer, employee or agent thereof, shall not be estopped, bound, or precluded by any determination, return, decision, approval, order, letter, payment or certificate made or given by the Engineer or other officer, employee or agent of the City, at any time, either before or after final completion and acceptance of the work and payment therefor from:

A. Showing the true and correct amount, classification, quality, and character of the work done and materials furnished by the Contractor or any other person under this Contract, or from showing at any time that any determination, return, decision, approval, order, letter, payment, or certificate is untrue and incorrect, or improperly made in any particular, or that the work or the materials or any parts thereof, do not in fact conform to the Contract requirements; and

B. From demanding the recovery from the Contractor of any overpayment made to him, or such damages as the City of Detroit may sustain by reason of his failure to perform each and every part of this Contract in strict accordance with its terms; or both.

26. CITY'S RIGHT TO DECLARE CONTRACTOR IN DEFAULT

A. Conditions for Declaring Contractor in Default: In addition to those instances referred to in other Articles herein, the City shall have the right to declare the Contractor in default of the whole or any part of the work if:

a) The Contractor fails to begin work in accordance with the written notice of the City Engineer, acting on behalf of the City.

b) The Contractor refuses, neglects, or fails to supply a sufficiency of properly skilled workmen or proper amount of materials of the specified quality.

c) The Contractor, without just cause, reduces his working force to a number which, if maintained, would be insufficient, in the judgment of the City Engineer, to complete the work in accordance with the approved Progress Schedule, and fails to sufficiently increase such working force when ordered to do so by the City Engineer.

d) The Contractor, in the judgment of the City Engineer, is unnecessarily or unreasonably or willfully delaying the performance and completion of the work, or the awarding of necessary subcontracts, or the placing of material or equipment orders.

e) The Contractor refuses to proceed with work when and as directed by City Engineer.

f) The Contractor abandons the work.

g) The City Engineer be of the opinion that the work can not be completed within the time herein provided or within such time as the completion may have been extended; provided, however, that the impossibility of timely completion is, in the City Engineer's judgment, attributable to conditions within the Contractor's control.

h)The work is not completed within the time herein provided or within the time to which the Contractor may be entitled to have such completion extended.

i) The Contractor shall sublet, assign, transfer, convey, or otherwise dispose of the Contract in whole or in part without prior approval of the City.

j) Contractor fails to make prompt payment for labor/materials or to subcontractors.

k) The Contractor makes an assignment for the benefit of creditors pursuant to the statutes of the State of Michigan.

l) A receiver or receivers are appointed to take charge of Contractor's property or affairs.

m) The Contractor becomes insolvent.

n) Any City Officer or employee becomes directly or indirectly interested in the Contract.

o) The Contractor willfully or in bad faith violates any of the provisions of this Contract, disregards applicable laws, ordinances, permits, licenses, instructions or orders of the Engineer or the City Officer, or is not executing same in good faith in accordance with the Contract provisions.

p) The Contractor, or any of his subcontractors, fail in any of the agreements herein contained.

B. Notice of Intent to Declare Contractor in Default: Before the City shall exercise its right to declare the Contractor in default by reasons of conditions set forth in Sub-Article "A" hereof, the City Officer will give the Contractor and the Surety written notice of the City's intent and the ground or grounds thereof, and designate a time, which may be within two days, at which the Contractor will be given an opportunity to be heard.

C. Exercise of Right to Declare Contractor in Default: If the City Officer finds the Contractor in default for any of the grounds specified or referred to in Sub-Article "A" hereof, he will declare the Contract in default by a written notice to the Contractor and Surety, signed by the City Officer, setting forth the grounds for such default.

In lieu of the above, the City Officer may decide, but is under no obligation to do so, to allow the Contractor a specific number of calendar days, but usually not more than ten, to take such remedial measures to make arrangements satisfactory to the City Officer to remove or eliminate the ground or grounds for declaring default.

D. Quitting the Site: Upon receipt of such notice the Contractor shall immediately discontinue all further operations upon this Contract and shall immediately quit the site, leaving untouched and intact all plant, materials, equipment, tools, supplies, and other construction facilities then on the site.

E. Completion of the Work after Default: The City, after declaring the Contract in default, may then have the work completed by such means and in such manner, by contract with or without public letting, or otherwise, as the City may deem advisable, utilizing for such purpose such of the Contractor's plant, materials, equipment, tools, supplies, and other construction facilities remaining on the site, and also such subcontractors and materialmen as may be deemed advisable.

F. Partial Default: If the City Officer finds the Contractor in default on only a part of the work, the City Engineer shall so declare the Contractor in default as to that part only, by sending a written notice to the Contractor and the Surety. Upon receipt of such notice the Contractor shall discontinue such part which is declared in default, and shall continue to perform the remainder of the work in strict conformity with the terms of the Contract, and shall in no wise hinder or interfere with any other contractors or persons whom the City may engage to complete the work as to which the Contractor was declared in default.

The provisions of this article herein relating to declaring the Contractor in default as to the entire work shall be equally applicable to a declaration of partial default, except that the City shall be entitled to utilize for completion of the part of the work as to which the Contractor was declared in default, only such plant, materials, equipment, tools, supplies, and other construction facilities as had been previously used or were intended to be used by the Contractor on such part.

G. Variance of Contract in Performance of Uncompleted Work: In completing the whole or any part of the work which the City Officer has declared in default, the City shall have the right to depart from or change or vary the terms and provisions of this Contract, provided, however, that such departure, change, or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change, or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the Engineer's final estimate of the cost of completion referred to in Article 8 of the Agreement, nor shall it constitute a defense for action to recover the amount by which such certificate exceeds the amount which would have been payable to the Contractor hereunder but for his default.

H. Contractor's Liability for Cost of Completing Work: The Contractor shall not be entitled to receive any further payments on the work declared in default until such work has been fully completed. After such completion, the City Engineer shall make a certified statement of the expense incurred by the City in such completion, which shall include the cost of re-letting the Contract, additional engineering and administrative services, and also the total amount of liquidated damages, if any, at the rate stipulated herein, from the date when the work should have been completed by the Contractor in accordance with the terms hereof to the date of actual completion of the work.

In event the amount of work required for completion has been reduced in accordance with the provisions of Sub-Article "G", herein, the estimated cost of the original work shall be estimated by the City Engineer and the Contract price adjusted accordingly.

Such certificate shall be binding and conclusive upon the Contractor, his surety, and any person claiming under the Contract, as to the amount thereof. The expense of such completion, as certified to by the City Engineer, shall be charged against and deducted out of such monies as would have been payable to the Contractor if he had completed the work. The balance of such monies, if any, subject to other provisions of this Contract, will be paid to the Contractor without interest after such completion. Should the expense of such completion, so certified by the City Engineer, exceed the total sum which would have been payable under this Contract if the Contract had been completed by the Contractor, any such excess shall be paid by the Contractor to the City on demand.

Other Remedies: The previous provisions outlined herein shall be in addition to any and all other legal or equitable remedies, permissible in the premises.

27. TERMINATION OF CONTRACT DUE TO SPECIAL EMERGENCY

In entering into this Contract, it is clearly understood and recognized by both parties that conditions may subsequently

arise, due to Governmental controls on construction or Court orders which are entirely beyond the control of either party and could not have been reasonably anticipated or guarded against by either party and could not have been reasonably anticipated or guarded against by either party at the time of entering into this Contract, that may hinder, delay, or render temporarily impossible the performance of this Contract in accordance with its terms and conditions.

It is therefore, mutually understood and agreed, anything elsewhere contained in the Contract notwithstanding that if the Contractor shall be specifically prevented by any Federal law, order, or regulation, or stopped by order or injunction issued by a Court of proper jurisdiction, from proceeding with the performance of this Contract, the following procedure shall govern:

The contractor shall notify, in writing, the City Officer and City Engineer, of his inability to continue to perform stating in full the cause therefor and the probable duration of such inability, and why, in his opinion, the cause is entirely beyond his control.

If it is determined, in the judgment of the City Engineer, that the cause of the Contractor's inability to continue to perform arose after the Contract was entered into, and is due solely because of Government controls on construction which specifically apply to the work to be done under this contract, or by a Court order or injunction, and is entirely beyond the control of the Contractor, the City shall have a period of 120 days, or longer by mutual consent of the parties, after receipt of the Contractor's notification to:

A. If lawfully within its power, remove or have removed the cause which prevents performance.

B. Make changes in the work or the conditions under which it must be done, pursuant to Article 19 herein, which will permit performance by the Contractor.

If and when the cause preventing performance has been removed, the time for completion shall be extended by the City Officer, in accordance with the provisions of Article 18 herein, commensurate with the time the Contractor was unable to perform the Contract.

If at the end of 120 days or the longer period mutually agreed to, the cause of inability to perform the Contract has not been removed, the Contract shall be considered terminated by written notice of either of the parties hereto to the other. The Contract may also be terminated prior to the 120 days by mutual consent of the parties.

If the Contract should be terminated, it is the City's intent that an equitable settlement be made with the Contractor. No claim, however, for damages or anticipated profits shall be made or allowed. All completed or partially completed work will be paid for at Contract unit prices, or at unit prices contained in the approved Detailed Estimate when, in the judgment of the City Engineer, such unit prices are deemed applicable. For any necessary work required by the Contract deemed by the City Engineer as not compensated for by applicable unit prices, the Contractor shall be paid the actual costs incurred by him, plus 15 percent to cover superintendence, use of ordinary tools, bonds, overhead expense and profit. "Actual costs" as herein used, shall be determined in accordance with Article 20C herein. The payment shall be made under the terms and conditions governing final payment as provided for in "Acceptance and Final Payment" of the Agreement.

28. SUBCONTRACTS

The Contractor shall not make any subcontracts for performing any portion of the work included in the Contract without the written approval of the Engineer. This Contract having been made pursuant to the bid submitted by the Contractor and in reliance upon the Contractor's personal qualifications and responsibility, the City reserves the right to withhold approval of subcontracting such portions of the work which the City may deem would not be in the City's best interest.

The Contractor shall, as soon as practical after signing the Contract, submit a separate written request to Engineer for approval of each proposed subcontractor. Each request shall be on the forms provided by the Engineer and shall give the name and address of the proposed subcontractor, the portion and the approximate cost of the work to be sublet, and evidence of insurance coverage carried by the proposed subcontractor. Upon request of the Engineer, the Contractor shall promptly furnish such additional information tending to establish that the proposed subcontractor has the necessary facilities, skill, integrity, past experience, and financial resources to perform the work in accordance with the terms and conditions of this Contract.

If the Engineer determines that the proposed subcontractor is acceptable to the City, he will so indicate his approval by signing and returning one copy of the form to the Contractor. If the determination is to the contrary, however, the City Engineer will so notify the Contractor, who may thereupon submit another proposed subcontractor unless the Contractor decides to do the work himself.

Each subcontract entered into shall provide that the provisions of this Contract shall apply to such subcontractor and his officers and employees in all respects as if he and they were employees of the Contractor. The Engineer's approval of any subcontractor shall not relieve the Contractor of any of his responsibilities, duties, and liabilities hereunder. The Contractor shall be solely responsible to the City for the acts or defaults of his subcontractor and of such sub-contractor's officers, agents, and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the Contractor to the extent of his subcontract.

The Contractor agrees to bind each subcontractor, and each subcontractor agrees to be bound by the terms of the Contract Documents insofar as applicable to his work. The Contractor and each subcontractor jointly and severally agree that no approval by the City of any proposed subcontractor, nor any subcontract, nor anything in the Contract Documents shall create or be deemed to create any rights in favor of a subcontractor and against the City, nor shall be deemed or construed to impose upon the City any obligation, liability, or duty to a subcontractor, or to create any contractual relation whatsoever between a subcontractor and the City.

The provisions contained herein shall likewise apply to subletting of any portion of the work included in a previously approved subcontract.

29. ASSIGNMENTS

The Contractor shall not assign, transfer, convey, or otherwise dispose of this Contract, or his right to execute it, or his right, title or interest in it or any part thereof without the previous written consent of the Surety Company and the written approval of the City Officer, and then only with the prior approval of the City Council. The City Officer will ordinarily not favorably consider an assignment, transfer, or conveyance of the Contract unless an exigency occurs which was not known or could not have been foreseen by the Contractor at the time of bidding, or which is not judged to be in the best interest of the City.

The Contractor shall not assign, either legally or equitably, by power of attorney or otherwise, any of the monies due or to become due under this Contract or his claim thereto without the prior written consent of the Surety Company and the written approval of the City Officer and the Finance Department.

The approval by the City Officer of a particular assignment, transfer, or conveyance shall not dispense with such approval to any further or other assignments.

The approval of the City Officer of any assignment, transfer, or conveyance shall not operate to release the Contractor or Surety hereunder from any of the Contract obligations.

30. CLAIMS AGAINST CITY AND ACTION THEREON

No claim against the City for damages for breach of contract or compensation for extra work shall be made or asserted in any action or proceedings at law or in equity, unless the Contractor shall have strictly complied with all requirements relating to the giving of notice and information with respect to such claims all as hereinbefore provided.

31. NO CLAIMS AGAINST THE CITY ENGINEERS, EMPLOYEES, OR AGENTS:

No claim whatsoever shall be made by Contractor against any officer, employee, or agent of the City of Detroit for, or on account of, anything done or omitted to be done in connection with this Contract.

32. PATENTS:

The Contractor shall pay all royalties and license fees and shall hold and save the City and its officers, employees, and agents harmless from all liability of any nature or kind, including cost and expenses, for, or account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the City, unless otherwise specifically stipulated in Contract Documents. In this respect the Contractor shall defend all suits or claims for infringement of any patent or license right.

In the event that any claim, suit, or action at law or in equity of any kind, whatsoever, is brought against the City, or its officers, employees, or agents, involving any such patents or license rights, then the City shall have the right to, and may, retain from any money due or to become due to the Contractor, such sufficient sum as is considered necessary to protect said City, or its officers, employees, or agents against loss, and such sum may be retained by the City until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished the City.

33. MONIES RETAINED AGAINST CLAIMS

If any claim shall be made by any person, firm, or corporation, including other contractors with the City on this project, against the City, or against the Contractor and the City for:

a) Alleged loss, damage, or injury of the nature referred to in Article 5 hereof which, in the opinion of the Corporation Counsel, may not be covered by the public liability, property damage or contingent liability insurance policies, or, which, together with previously filed claims is in excess of the amount payable under such policies; or

b) All infringement of patents or use of patented articles, tools, or other things, as referred to in Article 32 hereof; or

c) Damage claimed to have been caused directly or indirectly by the failure of the Contractor to perform the work in strict accordance with this Contract;

the amount of such claim or so much thereof as the City Officer may deem necessary, may be withheld by the City, as security against such claim, from any money due hereunder, until such time as the commencement of an action thereon would be barred by law or until final adjudication of such action by a court of competent jurisdiction. The Corporation Counsel, in his discretion, may permit the Contractor to substitute other satisfactory security in lieu of the monies so withheld.

If no action is commenced upon such claim within a time limited therefor by law, the City, upon written demand of the Contractor and approval by the Corporation Counsel, shall return the amount so withheld without interest.

If any action on such claim is timely commenced and the liability of the City, or the Contractor, or both, shall have been established therein by final judgment of a court of competent jurisdiction, or if such claim shall be admitted by the Contractor to be valid, the City shall pay such judgment or admitted claim out of the monies retained by the City under the provisions of this Article, and return the balance, if any, without interest to the Contractor.

34. PAYMENTS WITHHELD

In addition to express provisions elsewhere contained in the Contract, the City may withhold from any payment otherwise due the Contractor, such amount as determined necessary to protect the City's interest, or, if it so elects, may withhold or nullify the whole of any progress payment, on account of:

a) Unsatisfactory progress of the work not caused by conditions beyond the Contractor's control

b) Defective work not corrected.

c) Contractor's failure to carry out instructions or order of the Engineer or the City Engineer.

d) Claims filed or reasonable evidence of probable filing of claims against the contractor.

e) Damage to another contractor.

f) A reasonable doubt that the Contract can be completed for the balance then unpaid.

g) Failure of the Contractor to make proper payments to subcontractors or for materials or labor.

SERVICE OF NOTICES

The following addresses are hereby designated as places where all notices, directions, or other communication may be delivered, or to which they must be mailed:

Contractor: The business address designated in his proposal, or his office maintained at the site of the work.

City: The address of the City Officer stated in the Special Notice to Bidders as acting on behalf of the City of Detroit in this Contract.

City Engineer: The address stated in the Advertisement.

Surety or Sureties on Contract Bonds: The home office, or to the agent or agents who executed the bonds on behalf of the Surety or Sureties.

Actual delivery of any such notice, direction, or communication to the aforesaid places, or depositing it in a postpaid wrapper addressed thereto in any post office box regularly maintained by the United States Post Office Department shall be conclusively deemed to be sufficient service thereof upon the above persons as of the date of such delivery or deposit.

The above address may be changed at any time by an instrument in writing executed and acknowledged by the party changing the address and delivered to the other party or parties.

Nothing herein contained shall, however, be deemed to preclude or tender inoperative the service of any notice, direction, or communication upon the above parties personally, or, if the Contractor be a corporation, upon any officer or director thereof.

36. FAIR EMPLOYMENT PRACTICES

The contractor agrees that he will not discriminate against any employee or applicant for employment, to be employed in the performance of this Contract with respect to his hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of his age, except when based on a bona fide occupation qualification or because of his race, color, religion, national origin or ancestry. (Act No. 251 P.A. 1955, as amended).

The Contractor further agrees that he will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to age, sex, race, creed, color or national origin. Affirmative action shall mean: 1) The issuance of a statement of policy regarding equal employment opportunity and its communication to all personnel involved in recruitment, hiring, training, assignment and promotion; 2) Notification of all employment sources of company policy and active efforts to review the qualifications of all applicants regardless of age, sex, race, creed, color or national origin; 3) Recruiting in the minority group community for employees; and 4) Establishing an internal system of reporting concerning equal employment, recruiting, hiring, upgrading and the like. (City of Detroit Ordinance No. 206-G)

The Contractor shall not discriminate against an employee or applicant for employment to be employed in the performance of this contract with respect to his hire; tenure, terms, conditions, or privileges of employment because of any physical limitation. This provision shall not apply if such physical limitation prevents the employee or applicant from performing the work involved, or would place the employer in violation of any law or regulation relating to the safety of employees or others or would require extraordinary action on the part of the employer. (City of Detroit Ordinance 206-G and 851-G)

Breach of these covenants may be regarded as a material breach of the contract.

The contractor further agrees that he will require a similar covenant on the part of any subcontractor employed in the performance of this contract.

37. DETROIT INCOME TAX

The Contractor and each subcontractor shall comply with the provisions of Detroit Income Tax Ordinance No. 694-F, as amended to date, by withholding from employees' earnings such amounts as required by the Ordinance.

As a condition precedent to final payment under the Contract, in addition to the requirements of Article 8B of the Agreement, the Contractor shall file with and on forms provided by the Engineer, an affidavit for himself and one for each subcontractor that the required amounts have been withheld from employees' earnings and that such amounts have or will be paid to the City of Detroit in accordance with the above Ordinance.

38. UNLAWFUL PROVISIONS DEEMED STRICKEN

If this Contract contains any unlawful provisions not an essential part of the Contract and which shall not appear to have been a controlling or material inducement to the making thereof, such unlawful provisions shall be of no effect. Upon the application of either party, the unlawful part shall be considered stricken from Contract without affecting remainder of Contract.

39. ALL LEGAL PROVISIONS INCLUDED

It is the intent and agreement of the parties to this Contract that all legal provisions of law required to be inserted herein, shall be and are inserted herein. However, if through mistake or otherwise, any such provision is not herein inserted, or is not inserted in proper form, then upon application of either party, the Contract shall be amended so as to strictly comply with the law and without prejudice to the rights of either party hereunder.

SECTION II

SPECIFICATIONS

The Improvements covered by these plans are based on the Michigan Department of Transportation Local Agency Program guidelines for Geometrics (3R) dated March 4, 2014. Except where otherwise indicated on these plans or in the Proposal and Supplemental Specifications contained therein, all materials and workmanship shall be in accordance with the Michigan Department of Transportation Standard Specifications for Construction, 2012 version and the Michigan Manual of Uniform Traffic Control Devices, 2009 edition.

SECTION III

Progress Clause
Progress of Work

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Special Provision for Maintaining Traffic 5
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Special Provision for Traffic Signal Mast Arm Pole and Mast Arm 4
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Special Provision for Handhole, Round 2
Special Provision for Casing Used with Strain Poles and Mast Arm Poles 1
Special Provision for Pushbutton and Sign 3
Special Provision for Wireless Vehicle Detection System 6
Special Provision for 24-48 Circuit Digital National Electrical Manufacturers' Association Type Traffic Controller and Cabinet 47
Special Provision for Wireless Interconnect for Closed Loop Traffic Signal System 5
Special Provision for Traffic Signal **Louvered** Backplates 2
Special Provision for Two-Way Illuminated Street Name Sign, Remove 1
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PROGRESS CLAUSE

PROGRESS CLAUSE: After receiving notice of award of contract, start work on the date designated as the starting date herein or the date agreed upon with the Engineer. In no case, shall any work be commenced prior to receipt of formal notice of award by the department.

The starting date for this project shall be as of the date of the Start Work notice issued after the contract has been approved and the entire project shall be completed ~~**within 550 calendar days**~~ **by November 20th, 2020 inclusive of any rain days (**except any landscaping maintenance guarantee work). No HMA pavement work will be allowed between November 15 and April 15.

The low bidder(s) for the work covered by this proposal will be required to meet with department representatives to work out a detailed progress schedule. The schedule for this meeting will be set within one week after the low bidder is determined.

The named subcontractor(s) for Specialty and/or Designated Items (if such items are designated in the proposal) which materially affect the work schedule, shall also be present at the scheduled meeting and they will be required to sign the Progress Schedule to indicate their approval of the scheduled dates of work set forth in the Progress Schedule.

The Department of Public Works - City Engineering Division will arrange the time and place for the meeting. A Start Work notice will not be granted without an agreed upon Progress Schedule.

The Progress Schedule shall include, as a minimum, the controlling work items for the completion of the project and the planned dates and timing (or work day for a work day project) that these work items will be controlling operations. When specified in the bidding proposal, the date the project is to be opened to traffic as well as the final project completion date shall also be included in the Progress Schedule. The intended sequencing of streets for milling and resurfacing shall be included in the Progress Schedule.

If the Bidding Proposal specifies other controlling dates, these shall also be included in the Progress Schedule.

Failure on the part of the Contractor to carry out the provisions of the Progress Schedule, as established, may be considered sufficient cause to prevent bidding future projects until a satisfactory rate of progress is again established.

Liquidated damages will be applied based on Section 108 of the 2012 Michigan Department of Transportation Standard Specifications for Construction.

Contractor’s attention is hereby called to see the Coordination Clause in the proposal.

PROGRESS OF WORK

The contractor is to schedule the work for this contract such that:

1. All work is to be completed ~~within 550 calendar days~~ **by November 20th, 2020**. All milestones shall be met per Sheet C003, liquidated damages will be incurred per milestone that is not met.
2. Field Office:
    a. Office space shall utilize an existing vacant building within the project area along Livernois Ave. between 8 Mile and Margareta Ave.
    b. Office must be in place and occupied for the full duration of the project.
    c. Available space shall be provided for city staff and project engineer use.
    d. Contractor shall also refer to MDOT Standard Field Office Specifications.
3. Maintain pedestrian access to all businesses throughout construction.
4. Maintain vehicular access to the public parking lot on the southeast corner of Livernois and Chesterfield throughout construction.
5. One lane of traffic must remain open (in both directions) during all phases of work per the provided staging plans.
6. Schedule – Contractor shall provide a detailed schedule at the Pre-Construction meeting showing work for specific segments of the street, milling, paving and concrete operations. This schedule shall be updated and sent 24 hours in advance by e-mail for each progress meeting (typically every two weeks).
7. **Contractor shall provide detailed anticipated hours of daily operations at the Pre-Construction meeting for review and discussion.**
8. **The proposed roadway should be paved and ready to be opened to traffic by September 1, 2019. If that date is not met, liquidated damages will be applied.**
9. **All hardscape elements (utilities, roadway, pavement markings, curbs, parking lanes, sidewalks, signage/signals, lighting, and bike lanes) must be completed from Margareta to Outer Drive by November 15, 2019 (or end of season if weather permits a longer season). If that date is not met, liquidated damages will be applied.**
10. **Street lighting (existing or new) must be maintained on at least one side of the street at all times throughout the duration of the project.**
11. **MOT must be coordinated with the PGA Event.**
12. **A foundation inspection will be done by the CE&I consultant prior to the start of construction for all building adjacent to project scope. The contractor will have access to review the inspection report. Contractor will be liable for any building foundation damage determined to be caused as a result of the construction activities. (Foundations include: Basements, floors or slabs, and building façade exterior and interior surfaces.)**
13. **The Contractor shall keep all construction related noise in the project area and surroundings below 80dBA during the hours of 9:00pm-7:00am or as directed by the Engineer for the duration of the project.**

CITY OF DETROIT

SPECIAL PROVISIONS

DET: PAL REVISED 01-26-18

Work Approvals: Acceptance by the City of Detroit of any or all utility work under this contract will be conditioned upon approval by the appropriate Department of the City of Detroit.

Utility Access: The Contractor shall contact the utility owners, including the Detroit Fire and Police Departments, regarding their facilities prior to starting the work. All utility outlets and control fixtures shall be maintained in an accessible condition at all times.

Adjacent Utilities: When proposed utilities cross or lay parallel to an existing or proposed utility, a vertical clearance of twelve (12) inches and a horizontal clearance of forty two (42) inches shall be provided between the outside limits of their construction and the outside limits of the Public Lighting Department (PLD) or Department of Water and Sewerage (DWSD) facility. PLD facilities include electrical conduits, communication conduits, and related structures. DWSD facilities include sewers, water mains, and related structures. If for any reason this clearance cannot be provided, the Contractor shall notify the project engineer and proceed under his direction in an approved manner.

Reclaiming Salvageable Material: All salvageable material within the limits of this project and belonging to either privately or municipally owned utilities, which are to be reclaimed by its owner, will be indicated on the plans or in the proposal. The removal of such material shall be done by the owner and at their own expense and at such time as will cause no delay to the Contractor. If after due notice the owner does not remove the material, the Engineer shall advise the Contractor to remove the material and this material shall become the property of the Contractor. The work of removing the material is included in the construction of the project and will not be paid for separately

Hydrants and Water: The Contractor shall pump out at the end of each day throughout the year, regardless of the season, any fire hydrant used to obtain water.

The Contractor shall secure the required permit from the Detroit Water and Sewerage Department, and shall bear all the expense for such permits and for the water used. If connections are made to hydrants, Fire Department's standard hydrant wrench shall be used for the operation of the hydrant.

The DWSD current fees include a permit fee of $650.00 per day and an unmetered commercial usage fee of $1,920.00. These fees are subject to change. For more information, contact DWSD at (313) 245-1057.

Removal of Miscellaneous Structures: The use of a crane and ball type pavement breaker for the removal of miscellaneous structures referred to in Section 204 of the 2012 MDOT Standard Specifications for Construction and the removal of other items called for in these Specifications and Plans will NOT be permitted at any time for work under this Contract, except when specifically authorized by the Engineer.

Pumping and Drainage: The Contractor will be required to furnish all equipment and supplies and perform all labor necessary to keep all excavated areas dewatered during the period of this Contract.

The work will include the disposal of all drainage water flowing into the excavation. The drainage of the entire project shall be disposed of in a manner that will not interfere with or delay the work of others. This work shall be performed as directed by the Engineer.

The City will permit, subject to its approval, drainage water from the excavations for the project to enter existing operating sewers without reimbursement. No claims for damages, however, will be allowed the Contractor because of the inadequacy of the City sewers to accommodate the water from the excavations.

All sewers and drainage structures shall be kept thoroughly cleaned of silt, debris and foreign matter, and shall be free from such accumulation at the time of final inspection.

The work of pumping and draining excavations, and cleaning the structures used for disposal of same will be considered included in the construction of the project and no additional payment will be made.

Property and Survey Monuments: Before any monuments or stakes marking the boundaries of property along or near the work are removed or disturbed, the Contractor shall notify the Engineer in sufficient time so that they can be properly located and reset.

All precautions shall be taken to avoid disturbance of permanent survey monuments of any City, County or State authority, and when any of these are disturbed or destroyed, the Contractor shall restore them to the satisfaction of such authority and shall pay all costs incurred by such authority in connection therewith.

City of Detroit vertical survey monuments shall be adjusted and preserved in accordance with the Special Provision\Specification titled Vertical Survey Monuments.

Notification: The Contractor shall provide notification to residents and businesses along the length of the project of pending surface milling, curb replacement, pavement repair and resurfacing activities, and sidewalk and ADA ramp construction a minimum of 48 hours in advance of such work. The notice, at a minimum, shall advise residents of the date work activity will start, the anticipated length of time the area will be worked on, notification of temporary loss of curbside or driveway access to property, and request that street be cleared of parked vehicles.

Should construction activities cease, either due to weather or scheduling, for an anticipated time of five (5) days or more, any and all posted signage shall be removed. Once work will begin again, the Contractor shall re-notify as previously set forth.

For sidewalk repair work, the Contractor shall provide notification to residents and businesses along the length of the pending sidewalk work a minimum of 72 hours (3 day) in advance of such work. This notification shall be placed in accordance with the Specification for Sidewalk Repair Notification.

Cleanliness of the Work: The Contractor shall at all times keep the street pavement and right-of-way and any public or private premises temporarily occupied by him for purposes of work under this contract free from accumulations of waste material or rubbish caused by the Contractors employees or the work. This requirement shall apply to any streets in vicinity of the work which are affected by the Contractor's construction or hauling operations, as well as to streets in which the work is located. If the Contractor shall fail to keep any street cleaned of

debris resulting from their operations, and therefore creating a public nuisance, they shall be notified in writing by the Engineer to clean the street and remove the nuisance immediately. If, within 24 hours after the receipt of such notice, the Contractor shall have failed to clean such street satisfactorily, the Engineer shall order the street cleaned by the Department of Public Works or such other agency as he shall designate and all costs of such cleaning shall be paid by the Contractor.

Materials and equipment not in current use shall not be stored on any city streets. Storage of materials on private property shall require a written agreement with the owner. The Contractor shall provide the Engineer a copy of the agreement.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
VALUE ENGINEERING CHANGE PROPOSAL (VECP)

a. Description. A Value Engineering Change Proposal (VECP) modifying plans, specifications, or other contract requirements may be submitted for this project if the proposed change results in reduced construction cost, a higher quality product, improved safety, or a shorter contract time. The estimated cost savings must be quantifiable in relation to the contract cost. No work can begin before written authorization. The proposed change must not alter the essential functions or characteristics of the project or significantly delay the completion of the project. A VECP or conceptual VECP will only be considered after project award. Essential functions and characteristics include, but are not limited to, service life, operating costs, ease of maintenance, desired appearance, impact on utilities and right of way, mobility and safety of the motorist, bicyclist and pedestrian; design standards, and safety standards. This specification does not restrict the Contractor from proposing improvements to the project that may not result in net cost savings. A conceptual VECP stating the basic concept and approximate cost savings may be submitted for preliminary consideration.

b. Submittal of Conceptual VECP. Submit a Conceptual Proposal for the preliminary evaluation. Upon review by the Engineer, one of the following actions will be taken:

- Conceptual approval and a request for the Contractor to submit a formal VECP.
- Request for additional information.
- Denial of the VECP.

Preliminary review of a conceptual proposal reduces the Contractor risk of subsequent denial but does not commit the Department to eventual approval of the full VECP. Submit five copies of the following information for each Conceptual VECP using the Value Engineering Change Proposal Form (Form # 1962) marked Conceptual VECP.

1. A description of the difference between the existing contract items and the proposed changes, and expected benefits.

2. A set of conceptual plans and a description of proposed changes to the contract items.

3. An estimate of the anticipated cost savings or increase.

4. A date by which the Department must make a decision to avoid delays to the existing contract and obtain the cost savings. Also include information on the amount of time necessary to develop the full proposal and impacts to the progress schedule.

5. If impacting maintenance of traffic provisions, identify proposed changes and impacts to the Special Provision for Maintaining Traffic.

After approval of conceptual VECP, the Contractor must follow section c for the Final VECP.

c. Submittal of Final VECP. Submit five copies of the following information for each VECP using Value Engineering Change Proposal Form (Form # 1962) marked Final VECP.

1. A description of the difference between the existing contract and the proposed change, and the advantages and disadvantages of each, including effects on service life, operating costs, ease of maintenance, desired appearance, impact on utilities and right of way**,** mobility and safety of the motorist, bicyclist and pedestrian; design standards, and safety standards.

2. A complete set of plans, if necessary, and specifications showing the revisions relative to the original contract. This portion of the submittal must include design notes and construction details. If the proposal has plans, these must be signed and sealed by the Contractor's Professional Engineer licensed in the State of Michigan.

3. All costs and proposed unit prices must be documented by the Contractor and must include a cost comparison summarizing all the items the VECP replaces, reduces, eliminates, adds, or otherwise changes from the original contract on a spreadsheet.

4. A date by which the Department must make a decision to avoid delays to the existing contract and to obtain the proposed cost savings.

5. If impacting maintenance of traffic provisions, identify proposed changes and impacts to the Special Provision for Maintaining Traffic. If the submitted revisions to the maintaining traffic provision are approved and require any corrections, the Contractor is responsible for all additional costs related to corrective measures.

6. A statement detailing the affect the proposal will have on the time for completing the contract and impacts to the critical path and progress schedule.

7. A description of any known uses or testing of the proposed changes and the conditions and the results.

8. If the VECP submittal includes pay items associated with a warranty, include the latest version of the warranty specification.

d. Evaluation. By submitting the VECP, the Contractor agrees not to hold the Department liable for its decision or for any delays to the work attributable to the VECP. Decisions on VECP are not subject to appeal. Work on the project will continue in accordance with the requirements of the contract until a work order is issued which incorporates the VECP changes. The Department has final authority of the acceptability of a VECP and of the estimated net savings attributable to the adoption of all or any part of the VECP. If, in the judgment of the Engineer, contract prices do not represent a fair measure of the value of work to be performed or to be deleted, the Engineer will use other means to determine the estimated net savings.

The Department may modify a VECP, with the concurrence of the Contractor, in order to make it acceptable. The Contractor's share of the savings will be based on the modified VECP.

If the VECP is accepted, in whole or in part, the written acceptance will be issued by a work order and followed with a contract modification. The work order and contract modification will include the necessary changes in the plans and specifications and any conditions upon which the approval is based. Acceptance of the VECP will not extend the time of contract completion unless specifically provided for in the work order and contract modification.

VECP will be evaluated in accordance with the following:

1. The Engineer will determine if a VECP qualifies for consideration and evaluation. The Engineer may deny any VECP that requires excessive time or costs for review, evaluation or investigation. The Engineer may deny any VECP that is not consistent with the Department's design policies and criteria for the project.

2. The Department will not accept a VECP that is similar to a change in the plans or specifications under consideration by the Department for the project at the time the proposal is submitted; nor will the Department accept a proposal based upon, or similar to, standard specifications, general use special provisions or standard drawings adopted by the Department after the advertisement for the contract. The Department reserves the right to make such changes without compensation to the Contractor under the provisions of subsection 103.02 of the Standard Specifications for Construction.

3. The Contractor will have no claim against the Department for additional costs or delays resulting from denial or untimely acceptance of a VECP. These costs include but are not limited to: development costs, loss of anticipated profits, increased material or labor costs, or untimely response.

4. A VECP will be denied if equivalent options are already provided in the contract.

5. A saving resulting solely from the elimination or reduction in quantity of a contract pay item will not be considered as a VECP. A saving resulting from the elimination or reduction in quantity of a contract item specified as part of a VECP may be considered.

6. In calculating the value of cost savings, the Department has the right to disregard the Contract bid prices, if such prices do not represent the value of the work to be performed or to be deleted, and has the right to calculate the savings based on reasonable cost for such work.

7 A VECP cannot be used to alter incentive and disincentive rates and maximum payments on A + B and/or lane rental projects.

8. A VECP will be denied if the design consultant for the contractor is also the design consultant for the Department or other apparent conflicts of interest exist.

e. Time Frame for VECP Evaluation. The Contractor will be notified of the Department's decision to approve or deny a conceptual or final VECP within 14 calendar days of receipt of the VECP. If a written acceptance has not been received within this time frame, and the date has not been extended by mutual agreement of both parties, the VECP is denied. The Department's decision is final and there is no appeal.

f. Future Use of VECP. The Department reserves the right to use all or any part of a VECP on other contracts without obligation or compensation to the Contractor. If the VECP is

accepted, the Department may use or disclose any information necessary to incorporate the VECP on future projects.

g. Payment for Work under the VECP. The Engineer may reject all or any portion of work performed under an approved VECP if results are unsatisfactory. The Engineer will direct the removal of rejected work and construction will proceed under the original contract requirements. There will be no payment for work performed under the proposal, or for its removal.

No work related to a VECP will be performed under force account. Agreed prices must be reached for any new or modified contract pay items related to the VECP before the VECP is approved.

The changes will be incorporated into the Contract by changes in quantities of unit bid items, new agreed unit price items, lump sum or any combination, as appropriate, under the Contract. Unless there is a differing site condition as described in subsection 103.02 of the Standard Specifications for Construction, the Contractor will not receive additional compensation for quantity overruns, design errors, supplemental surveys, geotechnical investigations, additional items or other increases in cost that were not foreseen in the accepted VECP, unless otherwise approved by the Engineer.

The work order and authorization will include the price for performing all affected items of work and the estimated net savings in the cost of performing the work directly attributable to the VECP. VECP payments only involve direct savings or costs. Indirect savings or costs (time, user delay, contract delay, etc) are not included in VECP payment calculations. The calculations of VECP payments are independent from the payments or penalties for contract time related issues. The Contractor will be paid 50 percent of this net savings based on as constructed or plan quantities whichever is in the best interests of the Department. The amount specified in the work order and authorization constitutes full compensation to the Contractor for the VECP and the performance of that work.

(Cost of Deleted Work) - (Cost of Added Work) = Net Savings

Payment = (Net Savings)/2

Note: Approved VECP’s will be paid using the pay item code “1200000”, item description of "Value Engineering" and the pay unit is "Dollar" for the contract modification.

The Contractor’s development costs for the proposed VECP, including all costs associated with design, are not reimbursable.

SPECIAL PROVISION
FOR
COMPLETION OF WORK INCENTIVE

1 of 1 02-08-19

a. Description. This specification describes the "Completion of Work Incentive" and pay item. The Contractor may earn incentive as follows:

1. Completion of all hardscape elements (utilities, roadway, pavement markings, curbs, parking lanes, sidewalks, signage/signals, lighting, and bike lanes) by November 15, 2019, or end of season if weather permits a longer season. In addition, completion of all remaining work shall be completed by May 15th, 2020. Contractor must meet both deadlines to be eligible for incentive payment. Incentive payment for meeting these dates is $300,000.

2. Completion of all hardscape elements (utilities, roadway, pavement markings, curbs, parking lanes, sidewalks, signage/signals, lighting, and bike lanes) between Margareta and Chippewa by November 15, 2019, or end of season if weather permits a longer season, will be eligible for an incentive payment of $200,000.

Failure to complete the specified work by the established completion date will result in assessment of liquidated damages in accordance with subsection 108.10.C of the Standard Specifications for Construction and the Progress Clause.

The Department will not extend the completion date for the specified work for any reason, regardless of fault, except as allowed in the Special Provision for Extension of Time and Extra Cost for Incentive/Disincentive Projects.

b. Measurement and Payment. Any incentive earned as described above, up to the allowable maximum, will be paid using the following pay item:

Pay Item	**Pay Unit**
Completion of Work Incentive, Modified	Dlr

CITY OF DETROIT

SPECIFICATIONS
FOR
LIMITATIONS OF OPERATIONS

DET: GJM Revised: 1-04-16

The work days used to develop the progress schedule shall be Monday through Saturday and shall not include Sundays or City Holidays. The Contractor may normally prosecute the work during the daylight hours of any work day provided that they so conduct their operations as not to create a public nuisance nor disturb the peace. Overtime shall be limited to the work days submitted on the progress schedule for the project. Overtime work on Sundays and City Holidays shall be limited to emergency work necessary to safeguard the health and safety of the public.

When the Contractor elects to conduct work operations in excess of eight hours per day, or on Saturdays, Sundays or a City Holiday, they shall bear overtime costs incurred by the City of Detroit for City personnel assigned to the project for those situations.

The following are the current City Holidays: New Year's Day, Martin Luther King Jr. Birthday, Good Friday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving, Christmas Eve, Christmas Day, New Year's Eve. The Contractor shall be responsible for confirming with the City Engineering Division any amendments to this list of calendar dates designated as holidays for City of Detroit employees.

The Engineer may require the Contractor to cease construction operations during times as may be determined to be in the interest of the public at no additional compensation or cost to the City.

Contractor shall suspend or limit their operations if work interferes with the City Sponsored Public events within project CIA (Construction Influence Area) at no additional compensation or cost to the City.

CITY OF DETROIT

SPECIAL PROVISION
FOR
WORKING AREA AND PROJECT CLEANUP

DET: GJM Revised: 12-07-15

All the work under this Contract shall be in City streets, alleys, easements, or right-of-ways, and the space allowed for the Contractor's operations shall be in City streets and alleys adjacent to the work. Construction equipment, storage of materials, and the construction operations shall normally be restricted to such areas. Should additional working or storage space be desired, the Contractor my be permitted to utilize adjacent private property provided the Contractor makes all arrangements with the Owners of the property, bears all expense in connection with its use, and in no way involves or obligates the City, County or State by such use.

Materials delivered on the street shall be neatly and compactly stored in such a manner as to cause the least inconvenience to adjacent property owners and the general public.

Working and storage areas shall be promptly restored to their original conditions as soon as the required construction work has been completed at the particular location, and shall not be used as a storage area for unneeded material or construction equipment.

The work, and all property used in connection with the work, shall be kept in a neat and orderly condition at all times. Waste material and refuse from the Contractor's operations may be temporarily stored behind the curb in a manner not to interfere with pedestrians. Waste materials, rubbish, and debris shall not be allowed to accumulate and shall be removed daily, or as directed by the Engineer. Construction equipment and excess materials shall be promptly removed from the site as they become no longer needed for the progress of the work.

All cost relating to maintaining a neat working area and providing the required cleanup will not be paid for separately, but shall be included in the total project cost.

CITY OF DETROIT

SPECIFICATION
FOR
MOBILIZATION

DET-GJM 01-04-2016

Description: This specification covers the preparatory work and operations, and movement of equipment, materials and personnel to the construction sites in the City of Detroit. The work covered shall be as specified in the Michigan Department of Transportation 2012 Standard Specifications for Construction, Section 150.0

The word “Department” in the body of the MDOT Specification shall mean “The City of Detroit”.

Measurement and Payment: In accordance with Section 150.04.

Pay Item	Pay Unit
Mobilizaton, Max ___	Lump Sum

CITY OF DETROIT

SPECIFICATIONS
FOR
DRAINAGE STRUCTURE CLEANING AND SEWER LEAD CLEANING

DET: GJM 10-02-15

Description: The work of drainage structure cleaning consists of cleaning existing catch basins and manholes in the area of the project where directed by the Engineer. The work of sewer cleanout consists of cleaning sewer lines between catch basins and between catch basins and manholes.

Construction: When necessary and as directed by the Engineer, the work shall be performed in accordance with Section 403.3.G of the 2012 MDOT Standard Specifications for Construction and as modified herein.

Cleaning shall be by high velocity hydro-cleaning (jetting). Mechanical cleaning shall only be used when authorized by the Engineer. Contractor shall take precautions to protect the sewer lines from damage.

No debris shall be accumulated on site except in totally enclosed containers approved by the Engineer. All material deposits shall be removed from site and disposed of at an approved location.

Some of the catch basins, manholes and sewers may be completely filled. The Engineer shall determine actual condition and necessity for cleaning prior to cleanout. Cleaning shall restore 90% of the pipe's carrying capacity.

Measurement and Payment: "Dr Structure Cleaning, Modified" will consist of cleaning catch basins and manholes, and shall be paid for at the contract unit price each, and will include all equipment and labor necessary to clean each catch basin or manhole, including installation of bulkheads as necessary and hauling away and disposing of any waste and debris generated.

"Dr Structure Lead, Cleaning, Modified" consists of cleaning sewers between catch basins or between catch basins and manholes, and shall be paid for at the contract unit price per foot which will include payment for furnishing all equipment and labor to clean sewers lines regardless of size, temporary bulkheads, and hauling away and disposing of any waste and debris generated.

Pay Item	Pay Unit
Dr Structure Cleaning, Modified	Each
Dr Structure Lead, Cleaning, Modified	Foot

CITY OF DETROIT

SPECIFICATIONS
FOR
DRAINAGE STRUCTURE COVERS

DET: GJM 01-19-2016

Description: The work shall consist of furnishing and placing metal frames and covers; removal of existing drainage structures.

Materials:

Gray Iron Castings shall be as specified in Section 908.05. Gray Iron Castings of the 2012 MDOT Standard Specifications for Construction, City of Detroit DPW/CED DWSD Manhole and Catch Basin Drawings No's. 101 thru 113, and as specified herein.

The manhole and catch basin frame and its cover or grate shall constitute one unit. Each unit shall conform to the detailed requirement of the respective DPW/CED DWSD drawing. Each unit shall have a weight, with a tolerance of plus or minus 3 percent, of that specified below:

Manhole Frame and Cover

East Jordan ERGO Assembly or Approved Equal
Product Number: 00104051L01 (Sewer) Weight 235 Lb

Catch Basin Rectangular Frame and Flat Grate

East Jordan Assembly or Approved Equal
Product Number: 00500063B01 Weight 219 Lb
Product Number 00500063B02 Weight 241 Lb

Construction
The metal frames, covers, and grates on existing manholes and catch basins that are to be reused shall be carefully removed to prevent damage. Any reusable casting damaged by the Contractor shall be replaced with a new casting without additional cost to the City. All salvaged castings that are not to be used on the work shall become the property of the Contractor and shall be promptly removed from the job site.

Measurement and Payment: Drainage Structure Cover unit prices shall include the furnishing and installation of the manhole, catch basin and inlet covers of the appropriate type.

Pavement removal and replacement, when required will be paid for separately.

Pay Item	Pay Unit
Dr Structure Cover, Modified	Each

CITY OF DETROIT

SPECIFICATIONS
FOR
STRUCTURE COVER ADJUSTMENT, RECONSTRUCTING STRUCTURE, AND WATER SHUTOFF ADJUSTMENT

DET: AHS 01-19-18

Description: The work consists of adjusting utility structure covers in accordance with the applicable provisions of Section 403 and Section 823 of the 2012 Michigan Department of Transportation (MDOT) Standard Specifications for Construction, except as modified herein.

Utility structure cover adjustments will include all Public Lighting Department (PLD) manholes, and all Detroit Water and Sewerage Department (DWSD) gate wells, sewer manholes and catch basins whose covers are required to be raised or lowered to meet the required new pavement elevations. Water shutoff adjustments will include DWSD water shutoff boxes or stop boxes, and PLD hand holes which are required to be raised or lowered to meet the required new pavement elevations.

Before starting this work, the Contractor and the Engineer, or his representative, shall jointly inspect each structure to evaluate its interior conditions. Access to the structure will be provided by the Contractor. The Engineer, or his representative, shall determine whether the structure is to be adjusted or reconstructed. The Engineer shall also determine if any structure cleaning is necessary to remove existing debris. The Contractor shall remove all debris from the structure resulting from the Contractor's operations.

Materials: Materials used in the adjustment and reconstruction of drainage structures shall be as specified in Section 403. Drainage Structures, of the 2012 MDOT Standard Specifications for Construction.

Construction: Where called for on the plans or authorized by the Engineer, existing structure covers shall be adjusted to the proper elevation in accordance with Section 403 of the 2012 MDOT Standard Specifications for Construction, except as modified herein.

For Case 1 structures, saw cut full depth and remove the adjacent concrete and/or HMA pavement, curb, curb and gutter, or sidewalk as necessary to adjust the structure and cover. Remove an area of pavement and curb at least five (5) feet by five (5) feet around the structure. The existing frame and cover shall be carefully removed and the upper portion of the existing utility structure repaired as necessary and raised or lowered as required. The frame and cover shall then be reset on the adjusted structure so constructed as to hold them firmly in place and reset on a full mortar bed so as to fit the required new pavement grade and cross section. Replace adjacent concrete and/or HMA pavement, curb, curb and gutter, or sidewalk to match existing grades or to the required new pavement grade and cross section.

Case 2 structures shall be those that are located outside of existing pavement, curb, and curb and gutter.

When the existing frames and covers are unacceptable for reuse as determined by the Engineer, new frames and covers shall be furnished and installed. Drainage structure frames and covers shall be as specified in the City of Detroit "Specifications for Manholes and Catch Basins", and as specified in the Plans for DWSD Watergate and PLD Manhole covers. Any reusable frame and cover damaged by the Contractor shall be replaced by the Contractor at no cost to the City. The frames and covers that are not to be used on the work shall become property of the Contractor and shall be promptly removed from the jobsite and properly disposed of.

Where the structure is in need of repair, as determined by the Engineer, in excess of the adjustment limits set forth herein, the existing structure shall be broken down and rebuilt with new materials as specified in the City of Detroit Specifications for Manholes and Catch Basins, to the required new pavement elevations.

A finished concrete collar shall be placed around any structure adjusted that is within five (5) feet of the Detroit Thermal (formerly Detroit Edison) steam lines, as directed by the Engineer. The cost of this shall be paid for separately as Pvmt Repr, Nonreinf Conc, 10 inch, Modified, and measured by the surface area of the concrete collar.

Non-ferrous handholes and covers used by PLD and other City Utilities are made of fiberglass, copolymer propylene or similar material. These structure and covers shall be adjusted by a qualified electrical contractor. The removal of concrete around the perimeter of a non-ferrous handholes shall be performed with light chipping hammers to insure that no damage is done to the handhole, cover or any conduit or other utility that may feed the structure. Any damage to structures, conduits, cable and wiring shall be repaired by the Contractor at no cost to the City or utility.

For HMA pavement sections, immediately before placing the HMA top course or overlay, make final adjustments to drainage structure covers. Equipment will not be permitted to operate over adjusted structures for a period of twenty four (24) hours after their completion, unless otherwise approved by the Engineer.

Measurement and Payment: The completed work as described for adjusting or reconstructing structure will be measured as units and will be paid for at the Contract Unit Price, which price will be payment in full for furnishing all materials, equipment and labor; removal and replacement of concrete or HMA pavement, curb, curb and gutter, sidewalk; excavation, backfilling, disposal of surplus material, removal of all debris and foreign material from the structure (including the sump); adjusting the structure and cover to the required new pavement grade and cross section, with the existing or new cover; and providing access to all structures for inspection, as directed by the Engineer.

Structure damage due to the Contractors operations shall be repaired at the Contractors expense.

"Dr Structure Cover, Adj. Case __, Modified" shall include the above described work necessary to raise or lower the existing catch basin, manhole or gate well rim elevation involving adjustment, repair or replacement of less than or equal to three (3) layers of bricks, including mortar, regardless of whether or not it is necessary to remove a cone section to accommodate the rim elevation adjustment.

“Reconstructing Dr Structure, Case __, Modified” shall include the above described work necessary to raise or lower the existing catch basin, manhole or gate well structure and cover involving adjustment, repair or replacement of more than three (3) layers of bricks, including mortar, and may include the removal of a cone section to accommodate the rim elevation adjustment.

“Water Shutoff, Adj, Case __, Modified” shall include the above described work necessary to raise or lower the existing structure and cover of water DWSD water shutoff boxes or stop boxes, and PLD hand holes.

Pay Item	Pay Unit
Dr Structure Cover, Adj, Case 1, Modified	Each
Dr Structure Cover, Adj, Case 2, Modified	Each
Reconstructing Dr Structure, Case 1, Modified	Each
Reconstructing Dr Structure, Case 2, Modified	Each
Water Shutoff, Adj, Case 1, Modified	Each
Water Shutoff, Adj, Case 2, Modified	Each

SPECIAL PROVISION
FOR
MAINTAINING TRAFFIC

PART 1 GENERAL

1.1 SUMMARY

Maintain traffic throughout the project in accordance with 2012 MDOT Standard Specifications for Construction, including any supplemental specifications, and as herein specified. All traffic control devices shall conform to the current edition of the 2011 Michigan Manual of Uniform Traffic Control Devices.

City of Detroit Street Maintenance Department and/or Contract Maintenance Agencies may perform maintenance work within or adjacent to the Construction Influence Area (CIA). The Maintenance Division of City of Detroit and or Contract Maintenance Agency will coordinate their operations with the Supervising Engineer to minimize the interference to the Contractor. No additional payment will be made to the Contractor for the joint use of the traffic control items.

The Contractor must submit a Work Zone Traffic Control Plan to the Engineer in accordance with Section 104 of the 2012 Standard Specifications for Construction. At a minimum, the plan shall include the proposed ingress/egress locations for construction equipment and vehicles, traffic control devices that will be utilized to warn the motoring public of ingess/egress locations, and measures that will be taken to ensure compliance with the plan. No work shall begin prior to the acceptance of the Work Zone Traffic Control Plan. Additional time required to obtain an accepted Work Zone Traffic Control Plan shall not be cause for delay or impact claims. All costs associated with obtaining an acceptable plan, providing and executing all parts of the accepted plan including required traffic control devices, or resolving an incomplete or unacceptable plan shall be borne by the Contractor.

Failure to comply with all stipulations of the following traffic specifications will be cause for complete shutdown of the project.

In the event of an emergency, the following specifications and restrictions are subject to change if traffic conditions indicate such a necessity.

Traffic specifications are to be with the work crews at all times.

PART 2 PRODUCTS

2.1 Provide traffic control devices that conform to the current edition of the 2011 Michigan Manual of Uniform Traffic Control Devices.

PART 3 EXECUTION

3.1 MAINTENANCE OF TRAFFIC

- Walks, driveways, alleys and entrances to buildings shall not be blocked.
- The required number of lanes shall be maintained by plating of pavement.
- The paved surface shall be free of stored equipment, excavated material, etc. during specified hours.
- Protection and temporary crossings shall be provided for pedestrians at all crossings.
- Protection and temporary driveway access to residents and businesses shall be provided and maintained as directed by the Engineer.
- The Contractor shall notify local businesses a minimum of 48 hours prior to the implementation of any lane closures, weekend closures and major traffic shifts.
- The Contractor shall notify the Engineer, the Michigan Department of Transportation and the Detroit Police and Fire Departments patrolling the area three (3) business days prior to making any lane closures or traffic switches.
- The Contractor must coordinate his operations with contractors performing work on other projects within or adjacent to the construction influence area.
- The Contractor shall be required to coordinate the work with the curb-side garbage pick-up within the construction influence area.
- Steel plates, 3/4 inch thick, of sufficient size, shall be furnished and installed by the Contractor to cover paving cuts and to provide crossings over trenches. No separate compensation will be made to furnish, install, maintain and remove these steel plates when no longer needed. The cost for this material and work shall be incidental to the project.
- Plates shall be bedded in Cold Patch so as to avoid rocking and the noise resulting there from, and shall be firmly anchored by spiking into the existing pavement.
- Approved HMA material, shall be used at the ends of the plates to eliminate bumps in traffic lanes. The cost of the HMA and placement of same shall be considered incidental to the work.
- The spikes shall have a minimum length of three (3) inches and shall be driven not closer than twelve (12) inches from the edge of a trench up to three (3) feet deep or two (2) feet from the edge of a trench greater than three (3) feet deep.
- For trenches wider than four (4) feet, the Contractor shall submit a method of bridging to the Engineer for approval. All bridging shall be of a design that will satisfactorily carry an HS-20 truck loading across the opening smoothly, safely, and without undue noise.

3.2 SIGNING AND TRAFFIC CONTROL:

The Contractor shall furnish and install all signing necessary for the maintenance of traffic. Traffic control devices shall conform to the current edition of the 2011 Michigan Manual of Uniform Traffic Control Devices, Part VI, Construction and Maintenance; the Michigan Department of Transportation Maintaining Traffic Safety Typical Standards: M0020a, M0030a, M0040a, M0050a, M0110a, M0140a, M0240a, WZD-100-A and WZD-125-E; and/or the City of Detroit, Department of Public Works Standards on Maintenance and Utility Signing as applicable.

Pedestrian traffic shall be maintained using Michigan Manual of Uniform Traffic Control Devices details as shown in Figures 6H-28 and 6H-29.

Distances between sign locations will vary depending on the lengths of the City blocks in advance of the job site. Other traffic signing and barricading requirements for this project are contained in the engineering drawings.

Temporary "No Parking" signs shall be placed in all parking areas when necessary to prohibit parking during construction activities. The "No Parking" signs shall be placed in all parking areas at least 24 hours and not more than 48 hours prior to construction activities.

The Contractor may relocate signs and other portable barricades only after coordinating with representatives of the Traffic Engineering Division of the Department of Public Works.

3.3 CONSTRUCTION INFLUENCE AREA (CIA)

Construction Influence Area (CIA): The CIA shall include the area within the right-of-way of the street or streets listed in the contract and/or the cross streets within the limits of the construction staging.

The Contractor shall coordinate his operations with Contractors performing work on other projects within or adjacent to the Construction Influence Area (CIA).

Time Restrictions: Maintaining traffic requirements and hourly restrictions are subject to change by the Engineer.

Maintain the full width of the following location(s) between 7:00 a.m. to 9:00 p.m. and 4:00 p.m. to 6:00 p.m. Monday through Friday, and one lane of thru traffic in each direction for all other hours:

STREET	FROM	TO
Cadieux	Mack	Chandler Park
Chicago, W	Schaefer	Meyers
E McNichols	E Davision	Dequindre
E Warren	McDougall	RXR Tracks, 35' E/o
Fenkell	Wyoming	Livernois
Joy Road	Greenfield	Schaefer
Lodge Fwy ESD	Milwaukee	Euclid
Lodge Fwy WSD	W Grand Blvd	Baltimore
Lonyo	Michigan Ave	Kirkwood
Mack	Alter	Wayburn
Ann Arbor Trail	W Warren	280’ W/o W Parkway

No work shall be performed or lane closures allowed during the Memorial Day, July 4th, or Labor Day holiday periods, as defined by the Engineer. The Contractor shall coordinate their work schedule around special events that take place in local communities in accordance with the Engineer. The Contractor shall be responsible to contact the Supervising Engineer to acquire specific dates and locations for these events.

Other special events that may affect lane closures, as defined by the Engineer, are as follows:

- PGA Rocket Mortgage Classic at Detroit Golf Club
- Downtown Hoe Down
- Freedom Festival
- Annual Detroit Electronic Music Festival
- Chrysler Jeep Detroit APBA Cup
- African World Festival
- Ford Detroit International Jazz Festival
- Ford Field Special Events and Home Games
- Comerica Park Special Events and Homes Games
- Little Ceasar's Arena Special Events and Home Games

Work shall be suspended by the Engineer at any time traffic is being unduly hampered or delayed. In general, traffic is expected to be unduly hampered from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. weekdays. These hours may be adjusted by the Engineer.

Truck Haul Routes: Truck haul routes selected by the Contractor must be submitted to the City of Detroit Department of Public Works for approval prior to the start of construction and are subject to regulations of the Department.

Barricades: Plastic Drums, High Intensity, and Barricade, Type III, High Intensity, Double Sided, Lighted necessary for traffic control and public safety shall be furnished and erected by the Contractor. All traffic control devices and their usage shall be in accordance with Part 6 of the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) and MDOT Maintaining Traffic Typicals M0020a, M0040a, M0110a and M0140a and any other applicable.

Warning Lights: Battery operated warning flashers shall be used on all barricades in accordance with the current edition of the 2011 Michigan Manual of Uniform Traffic Control Devices and any recent changes to special provision regarding battery operated warning lights.

Temporary Signs: The Federal Highway Administration (FHWA) requires that all signs be NCHRP 350 crashworthy. The Contractor shall submit the FHWA approved details for the temporary sign supports used on the project and have approval by the Engineer before the start of work.

Stage Construction: The traffic control required by this Special Provision for work on various streets in the contract and adjacent roadways is based on the current edition of the 2011 Michigan Manual of Uniform Traffic Control Devices. At the discretion of the Engineer, the Contractor may be requested to conduct construction activities in certain segments of the project at such times that coordinates with adjacent property owner uses and activities. The Contractor shall submit for review and approval by the Engineer a sequence of operation/staging plans to complete the work by the specified completion date. The adjustments or changes in the staging of construction to accommodate property owners shall not be paid for separately and shall be included in the overall project cost.

Cleaning Adjacent Streets and Sidewalks: Dirt, mud, construction materials or other debris deposited on public sidewalks or streets as the result of spilling, tracking by the wheels of trucks or construction equipment or by other actions of the Contractor, his employees or subcontractors shall be immediately removed by the Contractor. Failure to do so is a violation of City Ordinances punishable by fines and/or imprisonment.

Enforcement Stipulations: Failure to comply with any of these regulations and requirements is a violation of City Ordinances punishable by fines and or imprisonment.
Failure to comply with all of these regulations and requirements of the above traffic specifications will be cause for complete shutdown of the project.
In the event of an emergency, these restrictions are subject to change if traffic conditions indicate such a necessity.

Traffic specification documents are to be held with the work crews at all times.

PART 4 MEASUREMENT AND PAYMENT

Maintaining Traffic will be measured and paid for at the contract unit price for the contract pay items.

Payment for providing and maintaining driveway access and pedestrians crossing, temporary No Parking Signs, ¾ inch steel plates, plates bedding, spikes will not be paid separately, but shall be considered incidental and included in other pay items.

Any equipment required for nighttime operations shall be included in the cost of the work items being placed. All costs of additional signing or maintaining traffic devices required to expedite the construction will be borne by the Contractor.

Pay Item	Pay Unit
Barricade, Type III, High Intensity, Lighted, Furn	EA
Barricade, Type III, High Intensity, Lighted, Oper	EA
Pedestrian Type II Barricade, Temp	EA
Lighted Arrow, Type A, Furn	EA
Lighted Arrow, Type A, Oper	EA
Minor Traf Devices	LSUM
Plastic Drum, High Intensity, Furn	EA
Plastic Drum, High Intensity, Oper	EA
Sign, Type A, Temp, Prismatic, Furn	Sft
Sign, Type A, Temp, Prismatic, Oper	Sft
Sign, Type B, Temp, Prismatic, Furn	Sft
Sign, Type B, Temp, Prismatic, Oper	Sft

1. Barricade, Type III, High Intensity, Lighted, Furn includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Barricade, Type III, High Intensity, Lighted, Oper includes all labor, equipment, and materials to operate, inspect, maintain, relocate, and remove the item, as shown on the plans or as directed by the Civil Engineer.

3. Pedestrian Type II Barricade, Temp includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

4. Lighted Arrow, Type A, Furn includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

5. Lighted Arrow, Type A, Oper includes all labor, equipment, and materials to operate, inspect, maintain, relocate, and remove the item, as shown on the plans or as directed by the Civil Engineer.

6. Minor Traf Devices includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

7 Plastic Drum, High Intensity, Furn includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

8. Plastic Drum, High Intensity, Oper includes all labor, equipment, and materials to operate, inspect, maintain, relocate, and remove the item, as shown on the plans or as directed by the Civil Engineer.

9. Sign, Type A, Temp, Prismatic, Furn includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

10. Sign, Type A, Temp, Prismatic, Oper includes all labor, equipment, and materials to operate, inspect, maintain, relocate, and remove the item, as shown on the plans or as directed by the Civil Engineer.

11. Sign, Type B, Temp, Prismatic, Furn includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

12. Sign, Type B, Temp, Prismatic, Oper includes all labor, equipment, and materials to operate, inspect, maintain, relocate, and remove the item, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
TEMPORARY EROSION AND SEDIMENT CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED SECTIONS

A. Section 31 1100 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 2200 - Grading: Temporary and permanent grade changes for erosion control.

C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus.

B. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

C. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

F. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

G. ASTM D6461 – Standard Specification for Silt Fence Materials

H. ASTM D6462 - Standard Practice for Silt Fence Installation

I. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition; http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

J. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration.

1.4 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of the Wayne County Department of Environment.

B. Comply with the requirements of the approved Demolition and Soil Erosion and Sedimentation Control Plan and submit periodic inspection reports.

C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits. The cost of the permits will be the responsibility of the Contractor.

D. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

E. Timing: Put preventive measures in place prior to disturbance of surface cover.

F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Repair ruts due to equipment and vehicular traffic on a daily basis.

3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas and arrange to have off site areas cleaned and returned to pre-construction condition at no cost to Owner.

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction at no cost to Owner.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.5 SUBMITTALS

A. See applicable Specification Section for submittal procedures.

B. Erosion and Sedimentation Control Plan:

1. Acknowledge intent to implement the approved Demolition and Soil Erosion and Sedimentation Control Plan and provide the planned date not less than 7 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.

2. Include:
   a. The approved Demolition and Soil Erosion and Sedimentation Control Plan.
   b. Indicate any additional measures and associated costs that may be deemed necessary for Soil Erosion and Sedimentation Control. Additional measures must be approved by the Owner and Engineer, prior to implementation.
   c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
   d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
   e. Other information required by law.
   f. Format required by law is acceptable, provided any additional information specified is also included.
3. Do not begin work without the approval of the Demolition and Soil Erosion and Sedimentation Control Plan by the Wayne County Department of Environment.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Identify a responsible person employed by the Contractor who will oversee the implementation of the Demolition and Soil Erosion and Sedimentation Control Plan.

E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

F. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

G. Submit Copy of any Permits obtained under this section prior to commencing any type of earth work on this project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following where specifically indicated only:

1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.
4. Cutback asphalt.
5. Polyethylene film.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C Bales: Air dry, rectangular straw bales.

1. Cross Section: 14 by 18 inches, minimum.
2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; Comply with ASTM D6461 and the following:

1. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632.
2. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
3. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
4. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: subject to compliance with ASTM D6461, one of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Softwood, 4 by 4 inches in cross section.
3. Hardwood, 2 by 2 inches in cross section.

G. Gravel: See Section 32 1123 for aggregate.

H. Provide filter fabric for use at catch basin inlets: Catch-all by Hanes Geo Components or engineer approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. Do not discharge excavation ground water to the sanitary sewer, storm sewer, river, stream orsimilar natural or constructed feature.

B. Prevent construction runoff from entering the sanitary sewer, storm sewer, river, stream or similar natural or constructed feature by using silt fences or other suitable methods.

C. Protect surrounding soils from erosion.

D. Install sedimentation control devices prior to beginning Work. Maintain effective functioning soil erosion and sedimentation control devices at all times during the course of the Work.

E. If permanent erosion resistant measures have been installed, temporary preventive measures are not required.

F. Dust Control

1. Keep dust down at all times, including non-working periods.
2. Sprinkle soil at the site, haul roads, and other areas disturbed by operations or treat with dust suppressants.
3. Do no permit dry power brooming.

G. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers as shown on the Demolition and Soil Erosion and Sedimentation Control Plan.

H. Storm Drain Inlet Sediment Traps: As detailed on drawings.

3.4 INSTALLATION

A. General: Install soil erosion and sedimentation control devices as shown on the Drawings, in accordance with manufacturer’s recommendations, and in conformance with these specifications. Refer discrepancies to Engineer for resolution.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D4873.
2. Install in accordance with ASTM D6462.

3. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
4. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
5. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
6. Install with top of fabric at nominal height.
7. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
8. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
9. Fasten fabric to wood posts using one of the following:
   a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
   b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
10. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
11. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Mulching Over Large Areas:

1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Wood Waste: Apply 6 to 9 tons per acre.
3. Asphalt: Apply at 1200 gallons per acre.
4. Erosion Control Matting: Comply with manufacturer's instructions.

D. Mulching Over Small and Medium Areas:

1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Asphalt: Apply 1/4 gallon per square yard.
4. Erosion Control Matting: Comply with manufacturer's instructions.

3.5 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Erosion Control, Inlet Protection, Fabric Drop, Modified	EA

1. Erosion Control, Inlet Protection, Fabric Drop, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
REMOVING AND ABANDONING UTILITIES AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This work consists of removing, or abandoning, in whole or in part, sanitary and storm drainage structures, culverts, and sanitary and storm sewers as required. Salvaging, storing, and disposing of removed materials, and the backfilling and compacting of the excavated sites is also included.

B. This work also consists of removing fire hydrants, valves, gate wells, and removing or abandoning water mains, as required. Salvaging, storing, disposing of removed materials, and the backfilling and compacting of excavated sites are also included.

1.2 RELATED REQUIREMENTS

A. Section 31 23 16: Excavation

B. Section 31 23 23.23: Fill and Compaction

C. Other sections of the specifications apply to the extent required for proper performance of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete: Per 2012 MDOT Standard Specifications for Construction.

B. Backfill: Per 2012 MDOT Standard Specifications for Construction.

C. Caps: Mechanical Joint Caps conform to ANSI/AWWA/C110/A21.10 350 psi pressure rated.

D. Restraint: Series 1100 Megalug restraint as manufactured by EBBA Iron, Inc. or Engineer approved equal.

E. Flowable Fill: Per 2012 MDOT Standard Specifications for Construction.

PART 3 - EXECUTION

3.1 REMOVAL - SEWERS

A. When removing or abandoning a sanitary or a storm drainage structure, rebuild and properly reconnect any live sewers through the removal area. Maintain services during construction operations. If the drawings call for abandoning a sanitary or a storm drainage structure, remove covers and the structure broken down to five feet below the pavement subgrade or at least five feet below the final ground elevation outside the pavement area.

B. Remove all pipe culverts specified to be removed, including all end treatments.

C. Where existing culvert pipe is to be extended or the existing end treatment is to be replaced, remove such portions of the existing culvert pipe and provide a proper connection to the new work. Do not damage any portion of the remaining culvert pipe.

D. Bulkhead all pipe culverts to be abandoned per Item 3.01.H or other Engineer approved method. If the culvert is not in suitable condition for abandonment, in the judgment of the Engineer, alternate methods will be determined. Verify inverts of all culvert pipes designated to be abandoned and having a top elevation within six feet of the top of the pavement.

E. Dispose of all removed materials properly.

F. Backfilling: Where removed structures or culverts or sewers are partially or completely outside the limits of excavation of new work, backfill the excavated sites with Class IIA sand. Place and compact the backfill per contract requirements.

G. Remove all sewers (storm, sanitary, or combined) or parts thereof which are specified to be removed, or that interfere with the new construction. Remove only such part of the existing sewer where existing sewers are to be extended or otherwise incorporated into the new work to provide a proper connection to the new work. Cut, chip, and trim the connecting edges to the required lines and grades without weakening or damaging the parts of the sewer to be retained.

H. Bulkhead all sewers to be abandoned with concrete or with brick block masonry per contract requirements. Construct bulkhead to a minimum of 2 feet inside the pipe. If the sewer is not in suitable condition for abandonment, in the judgment of the Engineer, an alternate treatment will be determined. Fill the abandoned sewer with flowable fill between the bulkheads.

3.2 REMOVAL – WATER

A. When removing or abandoning a water main, rebuild and properly reconnect any live water connections throughout the removal area. Maintain services during construction operations.

If the drawings call for abandoning a well structure, remove covers and the structure broken down to five feet below the pavement subgrade or at least five feet below the final ground elevation outside the pavement area.

B. Dispose of all removed materials properly.

C. Backfilling: Backfill the trench with Class IIA sand. Place and compact the backfill per contract requirements.

3.3 REMOVAL – ALL

A. Any mineral mass of 1 cubic yard or larger, encountered in the removal or abandoning, in whole or in part, of sanitary and storm drainage structures, culverts, sanitary and storm sewers, or in removing fire hydrants, valves, gate wells, and removing or abandoning water mains, as required hereunder, will be incidental to the work defined herein. Contractor agrees that it is reasonable to expect structure bases, thrust blocks and other elements or appurtenances to be encountered in such removal, and further agrees they are NOT “Rock” as defined in the Contract Documents.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Hydrant , Rem, Modified	EA

1. Hydrant, Rem, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
ROADWAY TRAFFIC SIGNS AND SUPPORT

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Requirements for Roadway Traffic Signs and Supports

1.2 RELATED SECTIONS

A. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCE STANDARDS

A. Products to be in accordance with MDOT Standard Specification for Construction 2012:

1. Section 810: Permanent Traffic signs and Supports

B. Michigan Manual on Uniform Traffic Control Devices-MMUTCD (Latest Edition)

C. City of Detroit Traffic Engineering Division (TED) Standards

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with MDOT Standard Specification for Construction 2012; Section 810

B. Comply with City of Detroit TED Standards, as modified from MDOT Standards.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. General: Comply with MDOT Standard Specification for Construction 2012; Section 810

B. Comply with City of Detroit TED Standards, as modified from MDOT Standards.

END OF SECTION

SPECIAL PROVISIONS
FOR

SITE FURNISHINGS

PART 1 GENERAL

1.1 SUMMARY

A. Benches
B. Bike Racks
C. Litter Receptacle
D. Bus Shelter

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit material samples including full color and finish for each product used.

1.3 QUALITY ASSURANCE

A. Delivery: Deliver products to site in manufacturer’s original, unopened containers and packaging. Upon delivery, examine packages immediately to ensure all products are complete and undamaged.

B. Storage: Store products in a protected, dry area in manufacturer’s unopened containers and packaging.

C. Handling: Protect product’s finish from damage during handling and installation.

D. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers.

PART 2 PRODUCTS

2.1 MATERIALS

A. Benches:
1. Type: RB Collection
a. Style: RBF-28
b. Size: 6’-0” Length
c. Surface: Mount Tabs (Anchors not included)

2. Manufacturer:
Victor Stanley, Inc.
P.O. Drawer 330
Dunkirk, MD 20754 USA
Toll Free: (800) 368-2573 (USA & Canada)
Tel: (301) 855-8300 Fax: (410) 257-7579
E-mail: sales@victorstanley.com
Web site: http://www.victorstanley.com

Or Approved Equal

3. Material: Recycled Solid Steel Bar

4. Finish:
   a. Metal components:
      1) Shotblased
      2) Etched
      3) Phosphatized
      4) Preheated
      5) Electrically powder-coated with TGIC polyester powder coating

5. Color: Black

B. Bike Racks:
1. Type: “Loop” Bicycle Bike
   a. Mounting: Embeded

2. Manufacturer:
   Landscape Forms, Inc.
   431 Lawndale Avenue
   Kalamazoo, Michigan 49048.
   Toll Free (800) 521-2546.
   Phone (269) 381-0396.
   Website www.landscapeforms.com.

   Or Approved Equal

3. Material:
   a. Recycled content of 97%, and is 100% recyclable.
   b. Aluminum Casting

4. Finish:
   a. Primer: Rust inhibitor.
   b. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant
   c. Pangard II®, offered exclusively by Landscape Forms, a 19-step program of cleaning, priming, and powder coating that resists rusting, chipping, peeling and fading to produce the finest metal finish available for site furniture. In addition, Pangard II® contains no heavy metals and is free of Hazardous Air Pollutants.

5. Color: Titanium

C. Litter Receptacle:
1. Type: Model ES-342 from the Economy Collection
   a. Style:
      1) Opening: Side-door opening
      2) Lid: Tapered Formed Lid
      3) Lock: Standard lockable latch
      4) Liner: Standard plastic liner
      5) Feet: Standard rubber-tipped leveling feet
      6) Mounting: (3) anchor bolt holes
   b. Size: 36 gal capacity
   c. Mounting:
      1) Mounting: Standard surface with temper-resistant anchor bolts

a) Anchor bolts not included

2. Manufacturer:
Victor Stanley, Inc.
P.O. Drawer 330
Dunkirk, MD 20754 USA
Toll Free: (800) 368-2573 (USA & Canada)
Tel: (301) 855-8300 Fax: (410) 257-7579
E-mail: sales@victorstanley.com
Web site: http://www.victorstanley.com

Or Approved Equal

3. Material: Recycled solid steel bar

4. Finish:
a. Metal components:
1) Shotblased
2) Etched
3) Phosphatized
4) Preheated
5) Electrically powder-coated with TGIC polyester powder coating

5. Color: Black

D. Bus Shelter:
1. Type: Eclipse Transit Shelter
a. Size: 5'-0" Depth x 10'-0" Length

2. Manufacturer:
Brasco International Inc.
32400 Industrial Drive
Madison Heights, Michigan 48071.
Toll Free (800) 893-3665.
Website www.brasco.com.

Or Approved Equal

3. Material:
a. Powder Coated Aluminum Structure
b. 3/8" Clear Tempered Safety Glass.
c. Arched Roof With Bronze Polycarbonate Glazing
d. Solar Lighting Package for General Illumination
e. 6'-0" Eclipse Bench With Black HDPE Bench Slats
f. Anchor Boot Covers
g. Wind Screen (2 ADA Openings)
h. (2) USB Charger Ports in Rear

PART 3 EXECUTION

3.1 INSTALLATION

A. Take field measurements prior to fabrication, where possible.

B. Install site furnishings level, plumb, true, securely anchored and positioned at locations indicated on Drawings. All site furnishings shall be laid out in the field and approved prior to installation.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

D. Restore damaged finishes and protect work.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Bike Rack	EA
Litter Receptacle	EA
Street Bench	EA
Bus Shelter	EA

1. Bike Rack includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

2. Litter Receptacle includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

3. Street Benches includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

4. Bus Shelter includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISION
FOR
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

C. Removal of concrete and bituminous pavement.

1.2 RELATED SECTIONS

A. Section 01 5713 - Temporary Erosion and Sediment Control

B. Section 31 2200 - Grading

C. Section 31 2323 – Trenching and Backfilling.

D. Section 31 2319 – Dewatering: Dewatering requirements.

E. Section 31 2323.23 – Fill and Compaction

F. Section 32 1313 – Concrete Paving

G. Section 32 1216 – Asphalt Paving

H. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM C 270 – Specification for Mortar for Unit Masonry

B. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster

C. Michigan Department of Transportation (MDOT), Standard Specifications for Construction.

1.4 SUBMITTALS

A. See Applicable Specification Section for submittal procedures.

B. Site Plan: Showing:

1. Vegetation removal limits.
2. Areas for temporary construction and field offices.

C. Written permission to use disposal sites.

D. Written evidence that proper arrangements have been made with the owner of the utility line, structure or pole that must be disturbed in order to accomplish the contracted Work.

E. Copy of the Soil Erosion and Sedimentation Control permit.

1.5 QUALITY ASSURANCE

A. Prior to commencing earthwork, obtain a Soil Erosion and Sedimentation Control permit from the appropriate agency having jurisdiction.

B. Prior to commencing earthwork, CALL MISS DIG three days in advance of work and receive clearance.

C. Secure all permits and post all bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

1.6 PROJECT CONDITIONS

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. Comply with other requirements specified in Section 01 7000.

C. Protect trees, shrubs, and other vegetation that are outside the limits of the Work and those that are within the limits of the Work but not designated to be removed. Repair or replace trees, shrubs, and vegetation that are designated to be protected but are damaged by Contractor operations.

D. Protect existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement and other improvements that are outside the limits of the Work and those that are within the limits of the Work but are not designated to be removed. Repair or replace, to the satisfaction of the owner, structures and improvements that are designated to be protected but are damaged by Contractor operations. Replace damaged water mains and seepage bed tile in accordance with the requirements of the local County Department of Health.

E. Maintain existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage and other types of drainage within the limits of the Work free to discharge during excavating, backfilling and compacting operations. Immediately repair, replace, or clear drainage facilities that are not designated to be abandoned but are damaged or whose drainage function is impaired by Contractor operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill Material: As specified in Section 31 2200 – Grading

PART 3 - EXECUTION

3.1 PREPARATION

A. When required to permit the Work to be performed in a dry condition, provide dewatering in compliance with Section 31 2319.

3.2 EXISTING TOPSOIL AND SAND ON SITE

A. Existing topsoil may be pushed back and preserved for use in restoration following completion of the Project. Stockpile preserved topsoil separately from other stockpiles.

B. Sand encountered in the existing site may be used for construction purposes throughout the Project provided that it meets the requirements in Section 31 2200.

C. When construction takes place within private easements, sand shall not be removed from the private parcel or lot. If there is insufficient working area, the same may be removed, stockpiled, and replaced on the original parcel or lot.

3.3 EXISTING UTILITIES AND BUILT ELEMENTS

A. Locations of existing utilities shown on the Drawings are approximate; coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits. Contact Miss Dig three days in advance of proposed work and the public agency or utility having jurisdiction to request verification of utilities within the construction area.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction. Unless otherwise indicated, maintain flow in existing utilities by diversion, pumping, fluming, relocation,

or by other methods. At the conclusion of construction, return and reinstall diverted and relocated utilities to their original condition.

D. Protect existing structures and other elements that are not to be removed.

E. Remove existing signs, posts, fences, and utility structures as designated by construction documents, as noted. Store these items on the site, where designated by Owner, in reusable condition.

F. Expose utility lines prior to excavation to determine if conflicts with the proposed improvements exist. Be responsible for the cost of relocating items as required to resolve conflicts. Contact the owner of the utility for relocation.

G. Protect existing buildings and structures within the limits of the established right-of-way or easement. If it becomes necessary to move an existing building or structure in order to proceed with construction, perform the move without damaging the building or structure. Assume that existing structures that must be moved have a 6-inch thick base. Limit the distance of the move to the minimum that will allow for construction of the improvement.

3.4 LANDSCAPING

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds. Protect trees and vegetation that is scheduled to remain.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the limits provided in the Contract Documents except as otherwise shown on the Drawings.

D. Install substantial, highly visible fences per construction documents to prevent inadvertent damage to vegetation to remain:

1. At vegetation removal limits.
2. Around other vegetation to remain within vegetation removal limits.
3. See Section 01 5000 for fence construction requirements.

E. If in the opinion of the Engineer, the Contractor’s methods of protecting trees is not adequate, protect the trees by tunneling.

1. Place tunnels at a minimum depth of 30 inches, measured from the ground surface to the top of the tunnel.
2. Tunnel Length:
   a. For tree trunks eight inches in diameter or larger, construct one foot of tunnel for each inch of tree diameter whenever the trench or any portion thereof ap-

proaches the tree trunk within a distance (measured in feet) of one-half the tree diameter (measured in inches).

b. Measure tree trunk diameter at four feet above the ground surface.

c. Tunnel requirements for tree trunks less than eight inches in diameter are the same as for tree trunks that are eight inches in diameter.

d. Example: Provide a 12-foot long tunnel for a tree that has a twelve-inch diameter trunk whenever the trench or any portion thereof approaches within six feet of the tree.

F. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

G. In areas where cutting of minor trees is permitted by the Drawings, exercise care to avoid damage to adjacent trees to remain.

H. Vegetation Removed: Do not burn, bury, landfill, or leave on site, even temporarily, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

I. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

J. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner. Prune tree limbs, branches and roots that exhibit minor damage caused by Contractor operations to the satisfaction of the Engineer.

3.5 PAVEMENT

A. Where concrete and bituminous pavement is required by the Drawings to be removed, include removing and disposing of pavement only, including base courses and surface courses. Existing curb and gutter will remain except for those areas that are designated and approved for removal and replacement. Remove pavement to saw cut.

1. Perform saw cutting with a power-driven pavement saw approved by Engineer.

2. Provide minimum depth of saw cut of two inches.

B. Old pavement with a concrete or bituminous cap is considered as one pavement, whether or not there is a separation layer of earth, aggregate, or bituminous material between the old material and the cap.

C. Where work consists of removing curb and curb and gutter, where the adjoining pavement or sidewalk remains, perform the following in accordance with the 2012 MDOT Standard Specifications for Construction and as specified herein:

- When the curb is integral with the pavement, saw cutting of pavement two and one half (2.5) feet from the back of the curb is required.

- Backfill base material removed with concrete curb or integral curb and gutter as specified in Section 204.03.C to the level necessary for new curb or curb and gutter. The cost of all backfill material or any other approved material is included in the unit price of the pay items for new curb or new curb and gutter, and will not be paid separately. Backfill other area around curb with material excavated from site only if approved by the Engineer. Selected excavated material, suitable for backfill, will be free from rubbish or debris, organic matter, large stones, concrete fragments, or other road material, lumber, tree roots, or branches. In general, selected excavated material to be suitable for backfill will be restricted to sand or crumbly clay. Blue clay is not considered a suitable backfill material. If there is not sufficient selected excavated material on the project, the contractor shall provide the needed fill material and no additional payment will be made for providing this backfill.

- Protect lawn sprinkler systems, if encountered if not specified for removal. All costs associated with the lawn sprinkler protection, restoration and repair, if damaged, shall be borne by the Contractor and no separate payment shall be made.

D. Where integral curbs are to be removed flush with the existing pavement, perform removal by saw cutting or by cold milling, as approved by Engineer. Leave a neat and flush surface, without damage to the underlying pavement.

E. Remove integral curb and gutter by saw cutting. Do not remove less than 18 inches wide for sections with rolled or straight curb nor less than 24 inches wide at mountable curbs.

F. Remove and replace pavement that is damaged in areas beyond the designated removal limits.

G. Remove HMA pavement or surface by use of cold-milling equipment to prepare the foundation for HMA overlays per section 501.03 of the 2012 Michigan Department of Transportation (MDOT) Standard Specifications for Construction and as specified herein.

The Contractor shall schedule the cold-milling operation so that entire lane width of the roadway is cold milled between road terminus limit before switching over to other

lane/side. This is required to avoid having a vehicle travel over milled surface on one side and normal pavement surface other side.

At the end of the day, the Contractor shall place a wedge, a minimum of 6 feet wide, the full length of all transverse and longitudinal joints at intersections where milling is greater than 2 inches in depth, to provide a smooth transition onto and off of the milled surface.

It is the Contractor's responsibility to establish the finish (final) grade on all streets and to ensure proper (positive) drainage at all locations. This work shall included in the work of cold milling and be done at no additional cost to project.

3.6 FENCES

A. Remove fences where indicated on the Drawings. Fill in voids and holes resulting from fence removal in compliance with Section 31 2323.

B. Replace or restore existing fences whose removal was not called for on the Drawings; restore or replace to a condition comparable to that prior to construction.

C. After fence removal or relocation operations are complete, remove and properly dispose of surplus material, unless otherwise indicated.

3.7 ADJUST STRUCTURES

A. Adjust structures in which the elevation of the casting must be either raised twelve inches or less, or lowered six inches or less.

B. Carefully remove and store the existing frame and cover. Reinstall frame and cover on the same structure, unless a new frame and cover are required by the Drawings.

C. Remove or install clay brick or concrete block adjustment rings as necessary to adjust the structure's frame and cover to the proper elevation. Set clay brick and concrete block adjustment rings in ASTM C270 Type S or Type M mortar, unless otherwise shown on the Drawings or determined by the Engineer.

D. Provide a Portland cement plaster coat on the outside surface of the new clay brick or concrete block structures, a minimum of 1/2 inch (10 mm) thick, in accordance with ASTM C926. Clean the structure prior to backfilling.

E. Backfill the structure in compliance with Section 31 2323.

F. Maintain flow in the entire system while performing the Work.

G. Properly dispose of unsuitable material.

3.8 RECONSTRUCT STRUCTURES

A. Reconstruct structures in which the elevation of the casting must be raised in excess of twelve inches, lowered in excess of six inches, and where portions of the existing structure are deteriorated.

B. Carefully remove and store the existing frame and cover. Reinstall the frame and cover on the same structure unless a new frame and cover are required by the Drawings.

C. Remove the existing corbel entrance sections and precast concrete chimney type entrance, along with additional brick courses or precast concrete sections as necessary to achieve the amount of reconstruction required by the Drawings or as determined by the Engineer.

D. Install brickwork and precast concrete sections to meet the design grade. Set clay brick and concrete in ASTM C270 Type S or Type M mortar, unless otherwise shown on the Drawings or determined by the Engineer.

E. Furnish and install manhole steps so that the maximum spacing is 24-inches.

F. Provide a Portland cement plaster coat on the outside surface of the new clay brick or concrete block structures, a minimum of 1/2 inch (10 mm) thick, in accordance with ASTM C926. Clean the structure prior to backfilling.

G. Backfill the structure in compliance with Section 31 2323.

H. Maintain flow in the entire system while performing the Work.

I. Properly dispose of unsuitable material.

3.9 RESTORATION IN RIGHT-OF-WAY AND YARDS

A. Restore right-of-way, not paved or aggregate-surfaced, as follows, unless indicated otherwise on the Drawings.

1. The disturbed areas may be shaped by "Machine Grading" or another method approved by the Engineer to achieve the cross section, line and grade shown on the Drawings.
2. Restore areas with slopes of 1-on-4 or flatter with topsoil and seed.
3. Restore areas with slopes steeper than 1-on-4 with topsoil and sod.

B. Properly dispose of excess material from the restoration operation.

C. Furnish, place, and compact additional fill, in compliance with Section 31 2323, as needed to restore the disturbed areas to the cross sections called for on the Drawings or as determined by the Engineer.

3.10 RESTORATION OF PAVED SURFACES

A. Restoration includes furnishing backfill, compacting, forming, placing, rolling, floating, jointing, finishing, curing and providing protection against elements.

B. Restore roadways that are partially damaged to include a minimum replacement of one (1), full width lane of roadway. The length of replacement shall be at least equal to the width.

C. Concrete Restoration

1. Backfill trenches crossing concrete driveways, sidewalks, roads, streets or parking areas to the bottom of the proposed pavement, as specified in Section 31 2316.
2. Unless otherwise specified on the Drawings or determined by the Engineer, replace removed concrete with 4,000 psi compressive strength concrete of the thickness removed. Include reinforcing equal to existing. Comply with Section 32 1313.
3. Include construction of sidewalk ramps at the intersection of the curb with restoration of sidewalks. Provide sidewalk ramps that conform to the current rules and regulations of Act 8, Michigan PA 1973, as amended.

D. Bituminous Restoration

1. Backfill trenches crossing parking areas to the bottom of the base course, as specified in Section 31 2316.
2. Replace bituminous pavement in accordance with Section 32 1216.
3. Resurface bituminous-surfaced areas beyond the limits of the work when those surfaces are disturbed by the subject work including but not limited to the passage of equipment. Resurface with an approved bituminous mixture as shown on the Drawings, but in no case less than two (2) inches in thickness. Extend the replacement material to smooth-cut edges, uniform in direction and at an elevation that provides a uniform surface between the undisturbed abutting surfaces.

3.11 DEBRIS AND CLEAN-UP

A. Remove debris, junk, and trash from site.

B. Fill holes due to removal of earth in accordance with Section 31 2200 and Section 31 2323.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Tree Rem, 6 inch to 18 inch, Modified	EA
Curb and Gutter, Rem, Modified	Ft
Pavt, Rem, Modified	Syd
Cold Milling HMA Surface, Modified	Syd
Ex Striping, Rem, Modified	Ft
Median, Rem, Modified	Sft
Sidewalk, Rem, Modified	Syd
Non Haz Contaminated Material Handling & Disposal, LM, Modified	Cyd
Utl. Structure, Adj, Modified	EA
Post, Steel, 3 lb, Rem, Modified	Ft
Sign, Type I, Erect, Salv, Modified	Ft

1. Tree Rem, 6 inch to 18 inch, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

2. Curb and Gutter, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

3. Pavt, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

4. Cold Milling HMA Surface, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

5. Ex Striping, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

6. Median, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer. Median removal includes complete removal and disposal of all curb, landscaping, trees, irrigation structures/ sprinklers/ piping, topsoil, unsuitable soil, and utility poles, and existing rail track. Street art located in the median shall be removed by the contractor and returned to the Owner. Pedestrian cross-walk signals shall be removed by the contractor and returned to the Owner. Signs shall be removed by the contractor and salvaged for re-use/re-installation.

7. Sidewalk, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

8. Non Haz Contaminated Material Handling & Disposal, LM, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

9. Utl. Structure, Adj, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer.

10. Post, Steel, 3 lb, Rem, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer in accordance with MDOT specifications Section 810.

11. Sign, Type I, Erect, Salv, Modified includes all labor, equipment, and materials to procure and execute the removal, as shown on the plans or as directed by the Civil Engineer in accordance with MDOT specifications Section 810.

END OF SECTION

SPECIAL PROVISION
FOR
GRADING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Removal and salvage of topsoil.

B. Rough grading the site for site structures and pavements.

C. Finish grading.

1.2 RELATED SECTIONS

A. Section 01 5713 – Soil and Sedimentation Control

B. Section 31 1100 – Clearing and Grubbing.

C. Section 31 2323 - Fill: Filling and compaction.

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with these specifications. Maintain one copy of the specifications on site.

1.4 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, designated to remain, from grading equipment and vehicular traffic.

D. Provide temporary erosion and sediment control in compliance with Section 01 5713.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: See Section 31 2323.

B. Other Fill Materials: See Section 31 2323.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain, from damage.

D. Call Miss Dig three days in advance of work and notify utility company to remove and/or re-locate utilities.

E. Remove and dispose of vegetation, brush, stones, rocks and other objectionable litter and foreign material before the ground is broken for topsoil removal.

3.3 ROUGH GRADING

A. Remove existing pavements from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

1. Do not strip pavements if weather conditions are unsuitable.
2. If approved by Engineer, salvage topsoil for reuse.
3. Dispose of salvaged topsoil in excess of that required for the project.

B. Remove and dispose of material detrimental to site improvement in accordance with Section 31 1100.

C. Do not remove topsoil when wet.

D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded. Remove subsoil parallel to proposed finished grades and to elevations that allow for thickness of pavement section. Do not over-excavate.

E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

F. When excavating through roots, perform work by hand and cut roots with sharp axe.

G. See Section 31 2323 for filling procedures.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

G. Grade the site as necessary to comply with the Drawings or as determined by the Engineer.

3.4 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site. Locate stockpiles as near the original location as possible.

B. Stockpile subsoil to be re-used on site in an approved area remove remainder from site. Segregate contaminated fill suitable for reuse as backfill from native uncontaminated soil and from imported engineered fill.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 10 feet; protect from erosion; avoid diversion of storm water runoff, creating standing water, and interference of controlled irrigation.

1. Do not stockpile around trunks and roots of trees to be preserved.
2. Maintain stockpiled topsoil separate from stockpiled subsoil.
3. Locate and retain soil materials at least 100 feet away from edge of excavations and at least 50 feet from the top of the slope of a shoreline.

3.5 FINISH GRADING

A. Before Finish Grading:

1. Verify structure and trench backfilling have been inspected.
2. Verify subgrade has been contoured to grades and elevations shown on the Drawings and has been compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Perform finished grading when the ground is frost-free and weather is favorable.

D. Where topsoil is to be placed, scarify surface to depth of 3 inches.

E. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

F. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

G. Grade areas adjacent to building/structure lines to drain away from structures and to prevent ponding. Finish surfaces free from irregularities.

H. Lightly compact placed topsoil.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.7 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.8 CLEANING AND PROTECTION

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SPECIAL PROVISION
FOR
SUBGRADE PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal and salvage of topsoil.

B. Proof-rolling subgrade

C. Undercutting and backfilling areas that are unstable

1.2 RELATED SECTIONS

A. Section 01 5713 – Temporary Erosion and Sediment Control

B. Section 31 1100 – Clearing and Grubbing.

C. Section 31 2323 - Fill: Filling and compaction.

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with these specifications. Maintain one copy of the specifications on site.

1.4 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, designated to remain, from grading equipment and vehicular traffic.

D. Provide temporary erosion and sediment control in compliance with Section 01 5713.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: See Section 31 2323.

B. Fill Materials: See Section 31 2323

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain, from damage.

D. Call Miss Dig three days in advance of work and notify utility company to remove and/or re-locate utilities.

E. Remove and dispose of vegetation, brush, stones, rocks and other objectionable litter and foreign material before the ground is broken for topsoil removal.

3.3 ROUGH GRADING

A. Remove existing pavements from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

1. Do not strip pavements if weather conditions are unsuitable.
2. If approved by Engineer, salvage topsoil for reuse.
3. Dispose of salvaged topsoil in excess of that required for the project.

B. Remove and dispose of material detrimental to site improvement in accordance with Section 31 1100.

C. Do not remove topsoil when wet.

D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded. Remove sub soil parallel to proposed finished grades and to elevations that allow for thickness of pavement section. Do not over-excavate.

E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

F. When excavating through roots, perform work by hand and cut roots with sharp axe.

G. Proof-roll subgrade to receive fill material with a fully loaded tandum dump truck to detect unstable areas.

H. Stability: Replace damaged, displaced and/or unstable subsoil to same requirements as for specified fill.

I. See Section 31 2323 for filling procedures.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.8 CLEANING AND PROTECTION

A. Remove unused/excess stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Subgrade Undercutting, Modified	Cyd

1. Subgrade Undercutting includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
EXCAVATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating for above/below grade structures, paving, and installation of underground utilities

Trenching for utilities outside the building/structures to utility main connections.

1.2 RELATED SECTIONS

A. Section 01 7000 - Execution and Closeout Requirements: General requirements for de-watering of excavations and water control.

B. Section 31 2200 - Grading: Soil removal from surface of site.

C. Section 31 2200 - Grading: Grading.

D. Section 31 2319 – Dewatering: Dewatering of excavations and water control.

E. Section 31 2323 - Fill: Fill materials, filling, and compacting.

F. Section 31 2333 - Trenching: Excavating for utility trenches outside the building/structures to utility main connections.

G. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 SUBMITTALS

A. Submit sheeting, shoring, and bracing plans for information only.

B. Excavation Plan: Prior to the start of excavation work, submit written plan that demonstrates compliance with the Contract Documents and OSHA Standard 29 CFR Part 1926.650. As a minimum, include:

1. Name of competent person responsible for excavation operations.
2. Excavation method(s) and protective system(s) to be used.
3. Manufacturer’s data if proprietary protective system(s) are designed on the basis of such data.
4. Submit disposal plan and copies of written permission for the use of disposal sites.

C. Stockpiling Plan: Prior to the start of excavation work, submit temporary soil stockpiling plan. Include provisions for maintaining stockpiles during the Work and removal of stockpiles upon completion of the Work.

D. If in need of additional area outside the right of way, obtain written permission from the property owner and submit copy.

E. If a structure is to be removed from a system that is to remain in service, submit a proposed bypass system prior to performing the work.

1.4 QUALITY ASSURANCE

A. Obtain necessary permits for work in roads, rights-of-way, railroads, etc. Also obtain permits as required by local, state and federal agencies for discharging water from excavations.

B. Perform Work in compliance with applicable requirements of governing authorities having jurisdiction, including the City of Detroit, the County of Wayne and the State of Michigan.

C. Comply with OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section 650 (Subpart P - Excavations).

1.5 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Perform excavations as indicated on the Drawings.

E. Existing Structures

1. Surface structures and underground structures shown on the Drawings are based on existing records and limited investigation. This information is provided for the convenience of the Contractor and is not guaranteed to be complete or correct.
2. Explore ahead of the required excavation to determine exact locations of structures.
3. Support and protect existing structures from damage. Immediately restore damaged and broken structures at no cost to Owner, if damage or breakage was the result of Contractor operations.

F. Existing Utilities

1. Cooperate and coordinate construction activities with the owners of utilities as stated in Section 104.08 of the 2012 Michigan Department of Transportation (MDOT)

Standard Specifications for Construction. In addition, for the protection of underground utilities, follow the requirements in Section 107.12 of the 2012 MDOT Standard Specifications for Construction. Contractor delay claims, resulting from a utility, will be determined based upon Section 108.08 of the 2012 MDOT Standard Specifications for Construction.

2. Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection.
3. If uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult piping or utility owner and Engineer immediately for direction. Cooperate with Owner and utility owner in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
4. In general, service lines to individual residences and businesses are not shown; however, assume that service exists for each utility to each residence and business.
5. Do not interrupt utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
6. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
7. The existing utilities listed below and shown on the plans represent the best information available. This information does not relieve the Contractor of the responsibility to satisfy themselves as to its accuracy, or of their responsibility in case utilities have been constructed or removed since the most recent surveys.

NAME AND ADDRESS OF OWNER	KIND OF UTILITY
Miss Dig Call three (3) working days before you dig 1-800-482-7171	All Underground Utilities
City of Detroit Public Lighting Authority 65 Cadillac Square Suite 3100 Detroit, MI 48226 (313) 324-8290, ext. 216 Mohamed Abbas abbasm@detroitmi.gov	Street Lighting and Traffic Signals
City of Detroit Detroit Water & Sewerage Department Contract Services Facility 6425 Huber Detroit, MI 48211 General: (313) 267-4863 Fax: (313) 842-6480	Water Mains & Sewers

NAME AND ADDRESS OF OWNER	KIND OF UTILITY
City of Detroit Traffic Engineering, D.P.W. 2633 Michigan Avenue Detroit, MI 48207 General: (313) 224-1610 Fax: (313)224-1304 Prasad Nannapaneni (313) 628-5603 prasadn@detroitmi.gov Sunny Jacobs (313) 628-5604 sunjac@detroitmi.gov Jubi Chackunkal (313) 224-1315 JubCha@detroitmi.gov	Pavement Markings, Signs &Traffic Signals
Sign Shop 2425 Fenkell Detroit, MI 48238 Willie Riley (313) 628-2923 Fax (313) 628-4966	Sign Removals & Installations
City of Detroit Detroit Fire Department 1301 3rd Street Detroit, MI 48226 General: (313) 596-2900 Fax: (313) 224-4128 communityrelations@detroitmi.gov	KNOX Boxes and Fire Hydrants
City of Detroit Detroit Police Department 1301 3rd Street Detroit, MI 48226 General: (313) 596-2200 Fax: (313)596-1450 publicinfo@detroitmi.gov	Police Call Boxes
DTE One Energy Plaza Detroit, MI 48226 Gas Leak 1-800-947-5000 Electrical 1-800-477-4747	Electric and Gas

Contact DTE ten working days prior to the construction start date to coordinate adjustments for DTE electric and gas manhole frames and covers.

NAME AND ADDRESS OF OWNER	KIND OF UTILITY
AT&T 17651 Michigan Ave, Dearborn, MI 48126 Joe Raczak Legal Mandate Engineer (313) 240-5314 JR1983@att.com or Mark Braham OSP Engineer - Metro South (313) 240-5390 MB6352@att.com AT&T will require five to seven business days advance notice prior to adjusting frames and covers.	Telephone For adjusting Frames and Covers
Detroit Thermal LLC 3575 E Palmer St Detroit, MI 48201 Ed LaRosa (313) 921-1922 Fax (313) 921-1972	Steam Lines

G. Protection of Persons and Property

1. Barricade open excavations occurring as part of the Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

H. Dust Control: Conduct operations and maintain areas of activity to minimize creation and dispersion of dust, including sweeping and sprinkling of roadways. Calcium chloride may be used to control serious or prolonged dust problems, only when explicitly approved in advance by Engineer.

I. Temporary Fencing: Furnish and install a temporary fence surrounding excavations.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Clear landscaping including: trees, brush, roots, stumps, logs, vegetation, sod, topsoil, organic matter, wood and other materials and debris from areas to be occupied by permanent construction or embankments or excavations.

1. Promptly remove waste materials from the site.
2. Properly dispose of water materials. Burning and/or burying is not permitted.

D. Test pits

1. Where shown on Drawings or where requested by Engineer, excavate and backfill, in advance of construction, test pits to determine conditions or locate existing facilities. Include excavating, stockpiling, maintaining, sheeting, shoring, backfilling, and replacing pavements at test pits.
2. Compensation for test pits ordered by the Engineer will be based on the unit price included on the Bid Form.
3. No compensation will be made for test pits made by the Contractor for his own use.

3.2 SHEETING, SHORING AND BRACING

A. Furnish, place and maintain sheeting, shoring, and bracing of the excavation to ensure safety of people in and around the excavation. Protect the new Work, existing construction, and pedestrian and vehicular traffic.

B. Be responsible for the design of sheeting, shoring, and bracing. Design to provide strength, quality, dimension and spacing of sheeting, shoring and bracing of existing soil conditions so as to prevent caving, loss of ground, and squeezing within the lines of the excavation and effectively restrain movement of the adjacent soil.

1. Design in conformance with current federal, state, and local regulations for safety.
2. Do not permit sheeting, shoring, and bracing to come into contact with pipes. Install sheeting, shoring and bracing to prevent concentrated loads and horizontal thrusts from being transmitted to the pipe.

C. Where indicated on the Drawings and where necessary in the Work, leave sheeting, shoring, and bracing in place.

D. Provide supports for pipes, conduits and similar construction that crosses the excavation. If required, leave such supports in place.

E. Do not remove sheeting, shoring, and bracing until pipes in trenches have been properly bedded and the trench has been backfilled to sufficiently support the external loads.

F. Do not remove earth material below the bottom of a shield beyond the limits established by ordinances, codes, laws and regulations.

G. When removing or moving a shield ahead, take care to prevent movement of pipe or structures and avoid disturbing the bedding for pipes and structures. Remove and reinstall pipes and structures that are disturbed.

3.3 EXCAVATING

A. Excavate to accommodate construction operations. Excavation is unclassified, and includes contaminated and uncontaminated earth, sand, clay, gravel, hardpan, boulders not requiring drilling and blasting for removal, concrete debris, decomposed rock, pavements, rubbish and other materials within the excavation limits

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Unless otherwise indicated, provide open excavations for structures and pipelines. Utilize protection systems as follows:

1. Excavation Less Than Three Feet Deep: Excavations in soils where there is not potential for a cave-in may be made with vertical sides. For other soils, provide excavations that are sloped and benched, shielded, or shored and braced.
2. Excavation More Than Three Feet Deep: Provide excavations that are sloped and benched, shielded, or shored and braced.
3. Install and maintain protection system(s) in compliance with the approved Excavation Plan.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Perform pavement cutting by saw or other methods satisfactory to the authorities having jurisdiction. Do not perform pavement breaking by drop weight or other impact type equipment.

G. Hand trim excavations. Rounded and undercut edges will not be permitted for footing excavations. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

I. When the structure or pipeline is to be observed within water bearing strata below the ground water table, use well points, cofferdams or other acceptable methods to permit observation of said structure or pipeline under dry conditions. Maintain dry conditions until backfilling is complete and accepted. Comply with Section 31 2319.

J. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; See Section 31 2323.

K. Provide subgrade for roadways, structures and trench bottoms that is firm, dense, and thoroughly compacted and consolidated; free from mud, muck, and other soft or unsuitable materials; and firm and intact.

1. Reinforce subgrade that is otherwise solid, but becomes soft or mucky on top due to construction operations, with crushed stone or gravel.
2. Do not permit the finished elevation of stabilized subgrade to be above subgrade elevations shown.

L. Grade top perimeter of excavation to prevent surface water from draining into excavation.

M. Remove excavated material that is unsuitable for re-use from site.

N. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

O. Remove excess excavated material from site.

P. Dispose of materials removed for the site in compliance with ordinances, codes, laws and regulations of authorities having jurisdiction.

3.4 EXCESS EXCAVATION

A. Excess excavation is defined as surplus earth material, free of brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material, that is realized from the construction.

B. When requested by the Owner, transport excess excavation to a site(s) designated by the Owner. Grade the excess excavation to provide positive surface drainage of the site so that adjacent properties are not damaged or affected. Include removal of surface irregularities to provide a smooth surface (± 0.25 foot).

C. When transportation of excess excavation has not been requested by the Owner, remove and properly dispose of the material.

D. Brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction is the property of the Contractor. Properly dispose of this material in accordance with applicable laws, rules and regulations.

3.5 DRAINAGE AND DEWATERING

A. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.

B. Remove water from excavation as fast as it collects.

C. Maintain the ground water level below the bottom of the excavation to provide a stable surface for construction operations, a stable subgrade for permanent work, and to prevent damage to the Work.

D. Perform dewatering in conformance with Section 31 2319 to convey water away from excavations.

3.6 FIELD QUALITY CONTROL

A. See Specification Section Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of storm basins and pipe.

3.7 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Excavation, Earth, Modified	LSUM

1. Excavation, Earth, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Provide all equipment, tools, materials and labor required for dewatering operations of the temporary groundwater control systems as required to lower and control groundwater levels during construction, and to dispose of the pumped water.
2. The Contractor is responsible for the design of all dewatering systems. All dewatering systems to be used on the site shall have minimum effect on the groundwater level at adjacent property limits.
3. As a part of the Contract, the Contractor may be required to dewater construction excavation. Treatment or off-site disposal of water removed from the excavation may be required. The cost of water treatment and/or off-site disposal shall be included in the Base Bid at no additional cost to the Owner.
4. The CONTRACTOR shall obtain all required permits for dewatering.

1.2 RELATED SECTIONS

A. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

B. Summary of Work
C. Submittals

1.3 QUALITY ASSURANCE

A. Provide a superintendent with a minimum ten years' experience in groundwater control who has successfully completed at least three dewatering projects in similar subsurface conditions.

1.4 SITE CONDITIONS

A. Geotechnical and environmental soil borings, test pits, and observation wells were made during the design of this project at locations identified on the Drawings. The logs of the borings, and soil data can be provided upon request. Interpretation of all data and reports for construction purposes is the responsibility of the Contractor.

B. Protection of Existing Structures:

1. Determine and verify the location of existing underground utilities and existing structures before starting excavation, or temporary dewatering installation operations. If utilities are to remain in place, provide protection from damage during excavation operations.
2. Existing abandoned and inactive utility lines shall be removed.
3. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer, and then only after acceptable temporary utility services have been provided.

1.5 SUBMITTALS

A. Submit, for the Engineer's record, a copy of all discharge permits. No pumping or discharge into a utility line or body of water shall be allowed, unless the proper permits are issued and a copy of the permits has been submitted to the Engineer.

B. Submit detailed plans of the proposed dewatering system including the following:

1. A detailed description of equipment and materials to be used and the procedure followed in installation, operation, and maintenance.
2. Locations and depths of all dewatering components including sumps, wells and/or wellpoints.
3. The standby equipment and power supply.
4. Types and sizes of sedimentation basins and filters, when required.
5. Soil and structures monitoring plan to show that soil movements and movements of existing structures will not compromise the construction activities or existing structures.
6. Groundwater disposal plan to show the method of discharging, and/or disposing of groundwater from the construction excavations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials and equipment suitable for the dewatering of construction excavations.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide auxiliary dewatering equipment to assure continuous dewatering capacity.

B. Coordinate construction operations to minimize duration and extent of dewatering required.

C. Comply with federal, state and local codes, ordinances and regulations for the collection and disposal of discharged water.

D. Perform groundwater control operations in a manner that will protect existing roads, structures, and utilities. The Contractor shall be solely responsible for preventing damage to roads, buildings or structures, sewers and other utility installations, pavements, sidewalks, and other property that may result from Contractor's groundwater control operations.

E. The Contractor shall immediately repair any structure damaged as a result of the dewatering operations at no additional costs to the Owner.

F. Control of sediments in the discharge water shall be performed in accordance with all federal, state and local code rules and regulations.

G. Collection and analysis of water samples shall be performed to verify compliance with applicable permits and regulations. Any sample collection, shipping costs, and testing shall be paid for by the Contractor and are incidental to the Contract. The sampling and testing requirements for hazardous contaminated material disposal shall be the Contractor’s responsibility.

H. If there are indications of a hydraulic gradient causing uncontrolled flow, seepage, or ground instability, the Contractor shall increase the capacity of the groundwater control system, undertake a grouting program to control or limit seepage, or take other supplementary measures to reduce water pressure immediately adjacent to the excavation.

3.2 MONITORING AND CONTROL

A. During dewatering operations, monitor groundwater level with piezometers to ensure the specified groundwater elevation is maintained.

B. Modify dewatering operation if there is an indication movement of structures, sheeting or embankments.

C. The dewatering operations shall not undermine the integrity of existing structures at any time. Existing structures must be protected at all times.

3.3 REMOVAL

A. Remove sumps and/or wells upon completion of work and tremie backfill hole with grout for full depth.

END OF SECTION

SPECIAL PROVISION
FOR
FILL AND COMPACTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for paving.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2 RELATED SECTIONS

A. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

B. Section 31 2200 - Grading: Site grading.

C. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

D. Section 31 2333 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 32 1216 –Asphalt Paving: Temporary pavement over trenching.

F. Section 33 4600 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

G. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)).

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

E. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).F. Michigan Department of Transportation (MDOT), Standard Specifications for Construction.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.5 SUBMITTALS

A. See applicable Specification, for submittal procedures.

B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including gradation in accordance with ASTM D422.

C. Compaction Density Test Reports.

D. Product data for equipment proposed to be used for compaction.

1.6 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

1. Graded.
2. Free of lumps larger than 6- inches, rocks larger than 6- inches, and debris; free of concentrations of silt, clay, rubble, wood and other organic matter.

3. Free of material conforming to ASTM D2487 Group Symbol CL, CH, ML, or combination.

B. Granular Fill - Gravel complying with MDOT 902.08, Class II, natural bank run sand.

C. Drainage Fill: Open-graded aggregates conforming to MDOT 902.07 34R.

D. Dense Graded Aggregate for Subbase: Comply with MDOT 902.06 Class 21AA, crushed natural aggregate only. Use of 1”x3” crushed stone (in lieu of or in combination with 21AA) is acceptable for subgrade undercut backfill or as directed by the Engineer.

E. Dense Graded Aggregate for Base: Comply with MDOT 902.06 Class 21A or 22A, crushed natural aggregate only.

F. Sand: Comply with MDOT 2NS or MDOT Class III, or as specified on the Drawings or as directed by the Engineer.

G. Topsoil: See Site Restoration.

2.2 ACCESSORIES

A. Geotextile Fabric:

1. Comply with MDOT 910.03A; for subdrainage. See Subdrainage SP.
2. Comply with MDOT 910.03 C; typical unless otherwise shown on the Drawings.
3. Comply with MDOT 910.03 D; at soft soils where shown on the Drawings.

2.3 SOURCE QUALITY CONTROL

A. See Section for Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Verify structural ability of unsupported walls to support imposed loads by the fill.

D. Verify that subgrade surface is dry and firm and approved by the Engineer.

3.2 PREPARATION

A. Proof roll entire subgrade with a fully loaded tandem dump truck or other approved rubber tired equipment of equivalent weight to identify unstable areas in need of repair.

B. Remove areas of subgrade that do not perform well under proof rolling and replace with properly compacted fill. The use of geotextile fabric may be required at the base of the excavation, subject to the judgment of the Engineer.

C. Scarify and bench, or otherwise treat original ground to provide adequate bond and to prevent slippage of fill.

D. Remove areas of subgrade with existing density of less than 95% of the maximum density.

E. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

F. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

G. Notify Engineer in advance of filling operations to permit Engineer to examine areas and conditions.

H. Do not proceed with filling operations until unsatisfactory conditions have been corrected.

3.3 FILLING - GENERAL

A. Do not place fill material when free water is on the surface of the area to be filled or when the area to be filled is not compacted to a density equal to or greater than requirements for subsequent fill material.

B. Fill to contours and elevations indicated using unfrozen materials that conform to the requirements of these specifications. Fill material shall be within an acceptable range of the optimum moisture content to permit specified compaction, as indicated by the moisture-density cure for the specific fill material. Do not place fill when temperatures are below freezing. Do not place and compact fill material that has not been tested in accordance with ASTM D 1557 to determine the maximum dry density, optimum moisture content and range of moisture content that will result in specified compacted density.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill in horizontal lifts. Do not fill over unstable, porous, wet, frozen or spongy subgrade surfaces.

E. Remove fill containing organic materials or other unacceptable material and replace with approved fill material.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

H. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

I. General Fill: Place and compact material in equal continuous layers not exceeding 12 inch thick loose lifts. Place, mix, and spread to assure uniform thickness.

J. Slope grade away from building minimum 1/8 foot, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

K. Compaction Density Unless Otherwise Specified or Indicated:

1. Under structures, paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
2. Elsewhere: 90 percent of maximum dry density.
3. During placement, control the water content of fill material within the range necessary to obtain the specified compaction density.
4. If field and laboratory tests indicate unsatisfactory compaction, adjust moisture content if required and perform additional compaction at no additional cost to Owner until specified compaction is achieved.

L. Compact each layer of fill before placing the next lift.

M. Correct areas that are over-excavated. Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

N. Use compaction equipment that is suitable for the type of material placed and that is capable of providing the densities required.

O. Perform compaction by conducting at least two coverages of all portions of the surface of each lift. One coverage is defined as the condition obtained when all portions of the fill material surface have been subjected to the direct contact of the compactor.

1. Test the effectiveness of the compaction equipment at the beginning of construction on a section of fill within the area where fill is to be placed.

2. If tests show that the specified compaction is not obtained, increase the number of coverages, decrease the lift thickness, or use a different type of compactor.
3. The effort required to achieve the specified compaction and the equipment used to achieve that compaction is the sole responsibility of the Contractor.

P. Reshape and re-compact fills subjected to and damaged by vehicular traffic.

3.4 BACKFILLING TRENCHES

A. Do not place backfill on bedded pipes until the pipe bedding and backfill materials have been approved by the Engineer.

B. Follow pipe laying with trench backfilling as closely as possible. Do not permit pipe laying to precede backfilling by more than 100 feet, unless otherwise approved in advance by the Engineer.

C. Backfill utility trenches under paved areas as follows:

1. Provide bedding of four-inches of MDOT Class II sand compacted to 95 percent of the maximum density. Place pipe directly on the bedding so that it is supported continuously for the full length. Provide bell holes at the ends of the pipe.
2. Envelop ductile iron pipe in sand. Extend the sand to full depth of trench. Compact in layers not exceeding twelve inches (loose) to 95 percent maximum density.
3. Do not backfill over pipe encased in concrete until the concrete has attained sufficient strength.

D. Backfill pipe trenches below structures, other pipes, and paved areas in horizontal layers not exceeding 8 inches of compacted depth. Thoroughly compact each layer before placing the next layer.

E. Backfill pipe trenches that are not below structures, other pipes, or paved areas in horizontal layers not exceeding 8 inches in depth up to the pipe centerline. Place sand backfill above the pipe centerline in layers not exceeding 12 inches in depth to 12- inches above the pipe. Complete backfill to top of trench with general fill compacted to 90 percent maximum density.

F. When pipes are to be placed in areas of fill, first place the fill as required by this Section until a minimum height of two feet above the pipe is reached, unless otherwise indicated. Then, excavate the trench, install the bedding and pipe, and backfill. Then, place the remainder of the fill.

3.5 BACKFILLING EXCAVATIONS

A. Do not backfill excavations until all of the following are complete:

1. Engineer’s acceptance of construction below finish grade, including dampproofing,

waterproofing, and perimeter insulation.

2. Inspection, testing, approval, and recording of locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing.
5. Removal of trash and debris.
6. Installation of permanent or temporary horizontal bracing on walls.

B. Keep excavations dry during backfilling operations.

C. Place backfill uniformly around structures and on both sides of piping.

D. Do not permit backfill levels on opposite sides of walls to differ by more than two feet unless the wall has been designed to resist the unequal lateral pressure.

E. Within ten feet of foundations and underground structures, use light compaction equipment whose gross weight does not exceed 7,000 pounds but is capable of achieving the required compaction with the restricted areas next to structures and around piping.

F. Provide minimum density for backfill under structures and pavements of 95 percent of the maximum density obtained in the laboratory in accordance with ASTM D 1557, Method C including Note 2 (Modified Proctor). This density is required for a minimum depth of five feet below the foundation or below the pavement.

3.6 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. See Specification for Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D 6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Prior to paving, proof roll compacted fill at surfaces that will be under paving and repair unstable areas.

F. Test subgrade and fill layers as follows:

1. Footing subgrade: At least one test per lift of backfill for each strata of soil on which footings will be placed.
2. Paved areas and building slab subgrade: At least one field density test per lift of backfill for every 2,000 square feet of paved area or building slab.
3. Foundation wall backfill: One test per 2,000 square feet.
4. Utility trench backfill: One test per 500 feet.

3.8 CLEAN-UP AND FINISHING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

D. Perform grading so as to restore the ground surface to its established elevation. Set grade stakes at maximum intervals of 100 feet for ditch restoration.

E. Maintain the surface over the trench in good and safe condition during the course of the Work. Promptly fill depressions caused by settlement of backfilling.

END OF SECTION

SPECIAL PROVISION
FOR
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Open cut trench excavation, including material excavation, support and protection of structures and utilities encountered above and below the ground surface, and removal of water from the construction site.

B. Backfilling and compacting for utilities outside the building/structures to utility main connections.

1.2 RELATED SECTIONS

A. Section 31 2200 - Grading: Site grading.

B. Section 31 2316 - Excavation: Sheeting, shoring and bracing.

C. Section 31 2319 – Dewatering: Dewatering requirements.

D. Section 31 2323 - Fill: Backfilling at trenches, building and foundations.

E. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

C. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)).

D. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

E. ASTM D 6938 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

H. Michigan Department of Transportation (MDOT), Standard Specifications for Construction.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.5 SUBMITTALS

A. See applicable Specification for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

F. Mix design for lean concrete and flowable fill to be used on the Project. Include technical information on admixtures in the mix. Include certified test reports for 7-day and 28-day compressive strength.

G. Submit qualifications of the testing laboratory proposed to be used for field quality control.

1.6 QUALITY ASSURANCE

A. Engineer will perform testing on backfilled materials and will provide copies of the test reports within one week.

B. Extra sampling and testing required due to detected deficiencies will be performed at the Contractor’s expense.

1.7 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. General: Provide backfill materials that are free of cinders, ashes, refuse, boulders, topsoil, grass, roots, stumps, trees, timbers, brush, organic material, debris and other materials that are unsuitable, in the opinion of the Engineer.

B. General Fill: Comply with Section 31 2323.

C. Concrete for Fill: Lean concrete, 500 to 600 psi maximum compressive strength.

D. Dense Graded Granular Fill: Comply with Section 31 2323.

E. Granular Fill: Comply with MDOT 902.08, Class II.

F. Granular Fill for Underdrains: Comply with MDOT 34-R.

G. Sand: Comply with Section 31 2323.

2.2 ACCESSORIES

A. Geotextile Fabric:

1. Comply with MDOT 910.03 A; for subdrainage. See Section 33 4600
2. Comply with MDOT 910.03 C, typical unless otherwise shown on Drawings.
3. Comply with MDOT 910.03 D at soft soils where shown on Drawings.

2.3 SOURCE QUALITY CONTROL

A. See Specification Section for Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance and submit documentation before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify utility company to remove and relocate utilities.

D. See Section 31 2200 for additional requirements.

E. Perform dewatering, in compliance with Section 31 2319, prior to trenching where required to permit trench excavating operation, backfilling, and compacting to proceed in a dry condition.

3.2 TRENCHING

A. Begin trenching operation at the downstream or outlet end of the Work and proceed upstream, unless otherwise indicated. Do not open more than 100 feet of trench in advance of pipe laying.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less (flatter) unless they are properly braced and/or shored. Brace and/or shore excavations, including those for shafts and structures, in accordance with Section 31 2316 to prevent caving or squeezing of the soil.

D. Do not excavate or otherwise compromise the integrity of the soil within the 45 degree bearing splay of foundations.

E. Cut trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Remove large stones and other hard matter over 6-inches in diameter which could damage piping or impede consistent backfilling or compaction.

H. Remove lumped subsoil, boulders, and rock over 6-inches in diameter or equivalent measured volume.

I. Remove excavated material that is unsuitable for re-use from site.

J. Temporarily store excavated material along the trench in a manner that will not cause damage to trees, shrubs, fences, improvement, utilities, private property, public property or traffic. Stockpiled material shall not be placed closer to the trench than the trench is deep. Do not place excavated materials so as to endanger the trench banks.

K. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

L. Remove excess excavated material from site.

M. Grade bottom of trench to provide uniform bedding for utilities.

N. When excavating trenches for utility observation, do not use power excavators within 6-inches of the utility. The final stage of the observation trench shall be excavated using hand tools.

O. Do not over-excavate. Backfill unauthorized excavations at no charge to Owner.

P. Form trench of sufficient width to provide adequate working space for installation of shoring and bracing or shielding, dewatering, pipe installation, observation of existing pipes and compaction of the bedding material around the pipes.

Q. Trench Width Limitations:

1. From the bottom of the pipe bedding and up to twelve inches above the top of the pipe, do not exceed the following trench widths:

PIPE DIAMETER	MAXIMUM TRENCH WIDTH
6-inch through 12-inch	30 inches
15-inch through 36-inch	Outside diameter of pipe plus 16 inches
42-inch through 60-inch	Outside diameter of pipe plus 20 inches
Greater than 60-inch	Outside diameter of pipe plus 24 inches

2. If the maximum trench width specified in Paragraph 3.02 Q.1 is exceeded and rigid pipe is placed in the trench, provide concrete encasement that completely surrounds the pipe and has minimum cover thickness above the pipe of one-fourth (1/4) the outside pipe diameter or four inches, whichever is greater.

3. If the maximum trench width specified in Paragraph 3.02 Q.1 is exceeded and flexible or semi-rigid pipe is placed in the trench, provide dense graded granular fill bedding for the full width between trench walls on both sides of the pipe.

R. Replace existing drain tiles, pavements, and walks that are disturbed by the work of this section at no cost to Owner, except for items designated for removal.

3.3 BACKFILLING

A. Do not place backfill until pipe bedding and backfill materials have been approved by the Engineer. Backfill requirements apply to the materials placed above the pipe bedding (bedding is normally up to twelve inches above the top of the pipe).

B. Follow pipe laying with trench backfilling as closely as possible. Do not permit pipe laying to precede backfilling by more than 100 feet, unless otherwise approved in advance by the Engineer.

C. Backfill to contours and elevations indicated using approved unfrozen materials. Do not backfill in freezing weather except with the approval of the Engineer.

D. Fill up to subgrade elevations unless otherwise indicated.

E. Employ a placement method that does not disturb or damage other work.

F. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

G. Maintain optimum moisture content of fill materials to attain required compaction density.

H. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6-inches compacted depth.

I. Soil Fill: Place and compact material in equal continuous layers not exceeding 8-inches compacted depth.

J. Do not place rocks or stone having a dimension larger than six inches within three feet of the top of the pipe. Larger stone may be placed in the remainder of the trench backfill only if well separated and arranged so that interference with backfill compaction results.

K. When backfill or bedding is indicated on the Drawings to be flowable fill, take care to avoid displacing pipes and structures due to fluid pressure. Secure pipes against the buoyancy effect.

L. Slope grade away from building minimum 1/8 inch per foot, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

M. Correct areas that are over-excavated.

1. Thrust bearing surfaces: Fill with concrete.
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

N. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density, determined in accordance with ASTM D1557.
2. Maintain backfill moisture content between 98% and 102% of the optimum moisture content determined in accordance with ASTM D1557.
3. Do not place additional backfill until the previous lift has been tested and found to be in compliance.

O. Reshape and re-compact fills subjected to and adversely affected by vehicular traffic.

3.5 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, and Duct Bank:

1. Bedding: Use granular fill.
2. Cover with general fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

C. At Pipe Culverts:

1. Bedding: Use granular fill.
2. Place filter (geotextile) fabric over compacted bedding.
3. Cover with general fill.
4. Fill up to subgrade elevation.
5. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

D. Over Underdrain Piping:

1. Drainage fill and geotextile fabric: Section 33 4600.

2. Backfill entire underdrain trench with MDOT 34-R open graded aggregate.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

E. Under road surfaces, pavement, curb, driveway, sidewalk and whenever the trench edge is within three feet of the pavement, and when the pipe is installed under an existing or proposed utility:

1. Use granular fill.
2. Compact to 95 percent of maximum dry density.

3.6 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. See Specification Section for Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D6938, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.8 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SPECIAL PROVISION
FOR
AGGREGATE BASE AND SURFACE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

1.2 RELATED SECTIONS

A. Section 31 2200 - Grading: Preparation of site for base course.

B. Section 31 2323 - Fill: Compacted fill under base course and topsoil fill at areas adjacent to aggregate base course.

C. Section 31 2333 - Trenching: Compacted fill over utility trenches under base course.

D. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.

E. Section 32 1313 - Concrete Paving: Finish concrete surface course.

F. Section 32 1613 – Curbs and Gutters

1.3 REFERENCES

A. ASTM D 98 - Standard Specification for Calcium Chloride.

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D 6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

D. Standard Specifications for Construction; Michigan Department of Transportation (MDOT).

E. Other sections of the specifications apply to the extent required for proper performance of this work.

1.4 SUBMITTALS

A. See applicable Specification for submittal procedures.

B. Materials Sources: Submit name(s) of imported materials source(s).

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Product data and samples of proposed geotextile fabrics and geogrid verifying product supplied meets the standard manufacturer’s requirements.

1.5 PROJECT CONDITIONS

A. Provide sufficient quantities of aggregate to meet project schedule and requirements. When necessary, store materials on site in approved areas in advance of need.

B. When aggregate materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.
4. Stockpile so as to permit removal of materials with uniform gradation.
5. Do not permit stockpiles to exceed four feet in depth on the complete subbase or aggregate surface.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

1.6 ENVIRONMENTAL CONDITIONS

A. Do not place aggregate materials when there are indications that they may become frozen before the maximum unit weight is obtained.

B. Do not place aggregate on a frozen subgrade or base course, unless otherwise directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fine Aggregate for Subbase: MDOT 902.08 Class II.

B. Dense Graded Aggregate for Base: MDOT 902.06 Class 21AA, crushed natural aggregate only.

C. Geotextile Fabric: MDOT 910.03 C; typical unless otherwise shown on the Drawings.

D. Geotextile Fabric: MDOT 910.03 D; at soft soils where shown on the Drawings.

E. Water: Clean and free from substances injurious to the finished product. Water from sources approved by the Michigan state Department of Public health as potable may be used.

F. Calcium Chloride Admixtures are only permitted when approved in advance by the Engineer; Conform to ASTM D98 and MDOT 903.02.

2.2 SOURCE QUALITY CONTROL

A. See Specification Section for quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, grades and elevations are correct, and substrate is dry.

B. Verify locations of existing improvements, including structures, against which the new work will be placed. Obtain Engineer's approval of adjustments in the line and grade if necessary to align the new work with the existing improvements.

C. Existing Base: Prior to placing aggregate material for surfacing, examine the existing base for grade and condition; verify that it is adequately compacted to receive the aggregate surfacing. Correct defects and deficiencies before proceeding with the Work.

3.2 PREPARATION

A. Correct irregularities in substrate grades and elevation by scarifying, reshaping, and recompacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

C. If the subgrade or subbase remains wet after surface water has been removed, the Engineer may require installation of an edge drain based upon site and soil conditions.

D. Do not proceed with placement of aggregate material until the subgrade, subbase, or existing aggregate surface has been approved by the Engineer.

E. Place the geotextile fabric if required, on the subgrade in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Comply with MDOT 302.03.

B. Under Portland Cement Concrete and Bituminous Concrete Paving:

1. Place aggregate base to a total compacted thickness as shown on the Drawings.
2. Compact aggregate base to 95 percent of maximum dry density.

C. Place aggregate in maximum 6 inch lifts and roller compact to specified density.

D. Level and contour surfaces to elevations and gradients indicated.

E. Add water to assist compaction.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of 1/2 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D 6938 at a rate of one measurement per each 600 square yards.

C. Moisture content testing will be performed on compacted aggregate base course in accordance with ASTM D 6938 at a rate of one measurement per each 600 square yards.

D. Locations of test measurements will be determined at the discretion of the Engineer.

E. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("Modified Proctor").

F. If tests indicate work does not meet specified requirements, adjust moisture content, recompact and retest. In the event that specified density still cannot be achieved verify that the proper moisture density information is being used for the material and reevaluate test results if warranted. Otherwise remove, replace and re-compact the material

G. Proof roll compacted aggregate at surfaces that will be under paving and repair if necessary at Contractor’s expense.

3.6 CLEAN-UP

A. Remove unused stockpiled materials and leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave the site in a clean and neat condition. Grade to prevent standing surface water.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Aggregate Base, 4 inch, Modified	SYD

1. Aggregate Base, 4 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
TACK COATS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Tack Coats (Bond Coats)

1.2 RELATED SECTIONS

A. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.

B. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. Standard Specifications for Construction; Michigan Department of Transportation (MDOT), Section 501 and 904.

1.4 SUBMITTALS

A. See applicable Specification for submittal procedures.

B. Materials Sources: Submit name and grades of Tack Coat (Bond Coat) along with source and MDOT acceptance.

C. Product data on proposed Tack Coat including MDOT approved grades for seasonal use.

1.5 PROJECT CONDITIONS

A. Provide sufficient quantities of Tack Coat to meet project schedule and requirements.

1.6 ENVIRONMENTAL CONDITIONS

A. Use appropriate grade of tack coat for the season/time of year per MDOT requirements. MC-70 grade for time period June 1 thru September 1 and MC-30 grade for other times of the year, unless otherwise directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tack Coat: MDOT specified asphalt emulsion for Bond (tack) coat in HMA paving; SS-1h or CSS-1h. See Section 501 Plant Produced Hot Mix Asphalt and Section 904 Asphaltic materials.

2.2 SOURCE QUALITY CONTROL

A. Submit documentation that Tack Coat (Bond Coat) is approved for use by MDOT.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that base course has been inspected, grades and elevations are correct, and approved for placement of top course of asphalt

3.2 PREPARATION

A. Do not place Tack Coat (Bond Coat) on heavily soiled and/or muddy base course.

B. Clean base course to an acceptable condition approved by the Engineer prior to placement of Tack Coat (Bond Coat).

3.3 INSTALLATION

A. Comply with MDOT Bond Coat (Tack Coat), SS-1h, CSS-1h.

3.4 TOLERANCES

A. Comply with MDOT Section 904

3.5 FIELD QUALITY CONTROL

A. See Specification Section for Quality Requirements, for general requirements for field inspection and testing.

3.6 CLEAN-UP

A. Leave area in a clean and neat condition.

END OF SECTION

SPECIAL PROVISION
FOR
ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Superpave Hot Mix Asphalt Paving

1.2 RELATED SECTIONS

A. Section 31 2200 - Grading: Preparation of site for paving and base.

B. Section 31 2323 - Fill: Compacted subgrade for paving and backfill.

C. Section 32 1123 – Aggregate Base Courses: Aggregate base courses.

D. Section 32 1613 – Curbs and Gutters

E. Section 32 1723 13 – Painted pavement markings.

F. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM C 131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

B. ASTM D 244 - Standard Test Methods and Practices for Emulsified Asphalts.

C. ASTM D 692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

D. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

E. ASTM D 1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.

F. ASTM D 2026 - Standard Specification for Cutback Asphalt (Slow-Curing Type).

G. ASTM D 2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type.

H. ASTM D 2028 - Standard Specification for Cutback Asphalt (Rapid-Curing Type).

I. ASTM D 4125 - Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method.

J. ASTM D 6925 – Standard Test method For Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyratory Compactor

K. Michigan Department of Transportation (MDOT) Standard Specifications for Construction-2012.

L. MTM 118 – Michigan Test Method for Measuring Fine Aggregate Angularity.

1.4 SUBMITTALS

A. Provide certification that the materials used conform to the standards specified in this Section.

B. Prior to beginning the Work, submit a two certified copies of proposed mix design for each type of bituminous mixture used on this Project.

C. Submit certified batch plant delivery ticket prior to placing each load of materials.

1.5 QUALITY ASSURANCE

A. Comply with MDOT, unless specified otherwise herein.

B. Obtain materials from same source throughout.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Comply with MDOT 502.03 J for weather and seasonal limitations on placement.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Superpave:

- Top/Wearing Course: 5E3
- Leveling Course: 4E3

B. Aggregate for Base Courses

C. Blended Aggregate for Hot-Mixed Asphalt (HMA)

1. Coarse aggregate complying with ASTM D 692 and MDOT 902.09
2. Fine aggregate complying with ASTM D 1073 and MDOT 902.09.
3. Provide aggregate blend that conforms to the applicable requirements of MDOT 902, specifically Tables 902-5 and 902-6, and other applicable requirements of MDOT 902 for Composition of HMA Mixtures and MDOT 501 for HMA Superpave Mix Design Criteria.
4. Provide aggregate blend that has Aggregate Wear Index (AWI) of at least 260.

D. Fine Aggregate for HMA Surface Treatments: MDOT 902.10.

E. Asphaltic Binder: MDOT 904.

F. Mineral Filler: MDOT 902.11.

G. Anti-Foaming Agents: MDOT 904.03A.

H. Cut-Back Asphalt: MDOT 904.03B and ASTM D 2026 or ASTM D 2027 or ASTM D2028.

I. Emulsified Asphalt: MDOT 904.03C and ASTM D244.

J. Prime Coat and Bond Coat: Homogeneous, medium curing, liquid asphalt Per MDOT.

K. Use of Reclaimed Asphalt Pavement (RAP) is not permitted.

L. Verify compliance with MDOT material requirements

2.2 EQUIPMENT

A. Comply with MDOT 502.03A.

2.3 ASPHALT PAVING MIXES AND MIX DESIGN

A. General: Comply with MDOT 501, unless otherwise approved by Engineer.

B. Combine aggregates, mineral filler (if required), and asphalt binder to produce a hot-mixed asphalt (HMA) that complies with MDOT 501, 902 and 904 for descriptions of courses and thicknesses.

C. Provide a mixture that meets MDOT requirements when tested at optimum asphalt content in accordance with ASTM D 4125.

D. If a proposed mixture fails to meet the MDOT requirements, submit additional samples of bituminous mixtures until a combination of materials is found that will produce a mixture that meets MDOT requirements.

E. If the source of any of the aggregate changes, submit and test new mixtures for compliance.

F. Base mixture proportions on the composite samples of aggregate and the particular bituminous material per MDOT

2.4 SOURCE QUALITY CONTROL

A. Test mix design and samples to verify conformance with MDOT requirements.

B. Maintain uniform gradation of aggregate placed in the cold feed bins so that the combination of aggregates produced by blending the aggregate from two or more cold feed bins will be uniformly fed into the HMA.

1. Use adjustable feeders on the belt that supplies the asphalt plant.
2. Equip feeders with cutoffs that will automatically stop the operations to the asphalt plant whenever the flow of any aggregate fraction is changed so as to affect the uniformity of the finished product.
3. Hot bins may be used for proportioning of the aggregates to meet the specified tolerances.

C. After the job-mix formula (JMF) is accepted by the Engineer, maintain the bituminous mixture within the uniformity tolerance limits established by MDOT.

1. If the deviation from specified asphalt binder content, air voids, maximum specific gravity, or VMA is within the range provided by MDOT, the unit price will be adjusted accordingly.
2. If the deviation from specified asphalt binder content, air voids, maximum specific gravity, or VMA is exceeds the range provided by MDOT, the work will be rejected. Suspend operations and before resuming production, make alterations to the materials or plant so that the job-mix formula can be maintained within the deviations permitted by MDOT.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that compacted subgrade is dry, not frozen and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Obtain Engineer’s acceptance of the density, grade and cross-section of the aggregate base prior to placing bituminous base course mixtures directly on the aggregate base.

D. Perform cold-milling to prepare the foundation for HMA overlays per section 501.03 of the 2012 Michigan Department of Transportation (MDOT) Standard Specifications for Construction and as specified herein.

E. The cost of exploration for the existing street car rails when encountered during cold milling shall be included in the work of cold milling HMA surface. Extra payment for cost of actual removal and disposal of any street car rail will be made per Contract Documents.

F. Schedule the cold-milling operation so that entire lane width of the roadway is cold milled between road terminus limit before switching over to other lane/side. This is required to avoid having a vehicle travel over milled surface on one side and normal pavement surface other side.

G. At the end of the day place a wedge, a minimum of 6 feet wide, the full length of all transverse and longitudinal joints at intersections where milling is greater than 2 inches in depth, to provide a smooth transition onto and off of the milled surface.

H. It is the Contractor's responsibility to establish the finish (final) grade on all streets and to ensure proper (positive) drainage at all locations. Include this work in the cold milling work and be done at no additional cost to project.

I. Perform conditioning of the existing pavement in accordance with Subsection 501.03.C of the 2012 Michigan Department of Transportation Standard Specifications for Construction including Removing HMA Patches, Joint and Crack Clean Out, Hand Patching, and Repairing Pavement Joints and Cracks, Engineering Details, and, shall include the application of bond coat as required.

3.2 BASE COURSE

A. Preparation of Aggregate Base Course: Section 32 1123 - Aggregate Base Courses.

3.3 INSTALLATION - GENERAL

A. Provide curb drops for sidewalk ramps at street intersections, and for driveway approaches and sidewalks at locations shown on the drawings or where determined by Engineer. Provide curb drops that comply with Act 8 of Michigan PA 1973, as amended.

B. Protect existing improvements, including structures, to prevent their surfaces from becoming discolored during application of bituminous materials.

3.4 PREPARATION – PRIME COAT

A. Ensure that the aggregate base or subbase to be primed is free from moisture when the treatment is applied.

B. Apply prime coat on aggregate base by means of a pressure distributor. Hand spraying apparatus may be used to distribute the prime coat only in areas that are inaccessible to the pressure distributor operation.

C. Apply prime coat at a rate between .05 and 0.10 gallons per square yard (225 to 450 ml/m^2), or as recommended by the Engineer.

D. Do not permit pools of bituminous material to remain on the surface.

E. Permit the prime coat to properly cure before placing HMA. Do not use aggregate to blot excess primer in lieu of proper curing.

3.5 PREPARATION - BOND COAT

A. Treat each layer of bituminous mixture with bituminous material before placing the succeeding layer.

B. Apply bond coat on paving by means of a pressure distributor. Hand spraying apparatus may be used to distribute the prime coat only in areas that are inaccessible to the pressure distributor operation.

C. Apply bond coat at a rate between .025 and 0.05 gallons per square yard (112 to 225 ml/m^2), or as recommended by the Engineer.

D. Do not permit pools of bituminous material to remain on the surface.

E. Apply prime coat ahead of the paving operation for a distance of at least 140 feet (43 m), subject to space limitations and as recommended by Engineer.

F. Permit the bond coat to properly cure before placing HMA. Do not use aggregate to blot excess primer in lieu of proper curing.

G. Coat surfaces of manhole frames with oil prior to bond coat placement in the vicinity of the manhole frames to prevent bond with asphalt pavement. Do not bond coat these surfaces.

3.6 TRANSPORTING AND PLACING ASPHALT PAVEMENT

A. Transport mixtures in accordance with MDOT 502.03 E.

B. Place HMA in accordance with MDOT 502.03 F.

C. Roll and compact HMA in accordance with MDOT 502.03 G.

D. Heating Bituminous Materials

1. Ensure uniform temperature throughout the entire mass of bituminous material that require heating before application, as directed by the Engineer, by using efficient and positive control at all times
2. Heat bituminous materials to a temperature that is consistent with the type of material used and only to such temperature as required to achieve the necessary fluidity. Avoid excessively high temperatures.
3. Provide a thermometer to enable the Engineer to observe the temperature at any time. Bituminous material that has been overheated will be rejected.
4. Circulate asphalt emulsion continuously when heated above atmospheric temperature so as to prevent it from separating.
5. Heat asphalt emulsion to the required temperature for application in the distributor unless a circulating heater is used in the storage tank to maintain uniform temperature.
6. Asphalt emulsion that has been damaged by continuous heating for too long a time or by alternate heating and cooling will be rejected.

3.7 TOLERANCES

A. Flatness, as measured with a 10 foot straight edge.

1. Lower Courses of Multiple Bituminous Base Courses: Maximum variation of 3/8 inch.
2. Top Course of Multiple Bituminous Base Courses: Maximum variation of 1/4 inch.
3. Surface Course of Multiple Bituminous Courses: Maximum variation of 1/8 inch.
4. Surface Course of Single Bituminous Course: Maximum variation of 1/4 inch.

B. Compacted Thickness: Within 1/4 inch of specified or indicated total pavement thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.8 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. General: Comply with MDOT for testing procedures.

C. Owner will retain a testing laboratory to perform quality control testing of mix designs, aggregate gradation and physical properties, bitumen content, compaction or density, and thickness of material.

1. Aggregate gradation tests will be performed on aggregate extracted from samples of bituminous mixture taken from the trucks as directed by the Engineer.
2. Samples will be taken at the start of production and at other times when tests indicate that the aggregate gradation is fluctuating. At these times, truck samples will be taken at a frequency of one sample per 250 tons (225 metric tons) of mixture, but not more than four samples per day.

3. During periods when tests indicate the aggregate gradation is stable, truck samples will be taken at a frequency of one sample per 500 tons (450 metric tons) of mixture, but no more than two samples per day.

D. Mixtures that exceed the permitted deviations provided by MDOT will be rejected and the Contractor shall be required to remove and replace bituminous pavement that were determined by the Engineer to be constructed with mixtures that exceeded the permitted deviations.

E. Roll HMA until the required compaction is attained. Base the required amount of rolling on test results of a nuclear gage or on using a specified minimum number of rollers. When the total tonnage for the Project is in excess of 1,000 tons (900 metric tons), use the nuclear gage method to govern compaction requirements.

F. Determine the control density for the bituminous mixture to be placed by ASTM D 6925 – Standard Test method For Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyratory Compactor.

G. Comply with the attached MDOT Special Provision for “Acceptance of Hot Mix Asphalt Mixture on Local Agency Projects”.

3.9 PROTECTION AND CLEAN-UP

A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.

B. Backfill the area adjacent to the new Work with sound earth of topsoil quality. Comply with Section 31 2323.

C. Leave backfill compacted, leveled to achieve positive drainage and in a neat, workmanlike condition.

D. At a seasonally correct time, rake the disturbed area, place topsoil thereon, and restore the area.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
HMA 4E3, Modified	Ton
HMA 5E3, Modified	Ton

1. HMA 4E3, Modified includes all labor, equipment, and materials to procure the install a 3 inch Leveling Course for the bike lane, as shown on the plans or as directed by the Landscape Architect and a 2 inch Leveling Course for Livernois Ave from approximate Sta. 60+53 to Sta. 64+50, as shown on the plans or as directed by the Civil Engineer.

2. HMA 5E3, Modified includes all labor, equipment, and materials to procure the install a 1.5 inch Wearing Course for the bike lane, as shown on the plans or as directed by the Landscape Architect and a 1.5 inch Wearing Course for Livernois Ave from approximate Sta. 60+53 to Sta. 64+50, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ACCEPTANCE OF HOT MIX ASPHALT MIXTURE ON LOCAL AGENCY PROJECTS

CFS:KPK 1 of 7 APPR:CJB:JWB:07-05-16
FHWA:APPR:07-05-16

a. Description. This special provision provides sampling and testing requirements for local agency projects using the roller method and the nuclear density gauge testing. Provide the hot mix asphalt (HMA) mixture in accordance with the requirements of the standard specifications, except where modified herein.

b. Materials. Provide aggregates, mineral filler (if required), and asphalt binder to produce a mixture proportioned within the master gradation limits shown in the contract, and meeting the uniformity tolerance limits in Table 1.

Table 1: Uniformity Tolerance Limits for HMA Mixtures

Parameter			Top and Leveling Course		Base Course	
Number	Description		Range 1 (a)	Range 2	Range 1 (a)	Range 2
1	% Binder Content		-0.30 to +0.40	±0.50	-0.30 to +0.40	±0.50
2	% Passing	# 8 and Larger Sieves	±5.0	±8.0	±7.0	±9.0
		# 30 Sieve	±4.0	±6.0	±6.0	±9.0
		# 200 Sieve	±1.0	±2.0	±2.0	±3.0
3	Crushed Particle Content (b)		Below 10%	Below 15%	Below 10%	Below 15%

a. This range allows for normal mixture and testing variations. The mixture must be proportioned to test as closely as possible to the Job-Mix-Formula (JMF).
b. Deviation from JMF.

Parameter number 2 as shown in Table 1 is aggregate gradation. Each sieve will be evaluated on one of the three gradation tolerance categories. If more than one sieve is exceeding Range 1 or Range 2 tolerances, only the one with the largest exceedance will be counted as the gradation parameter.

The master gradation should be maintained throughout production; however, price adjustments will be based on Table 1. Aggregates which are to be used in plant-mixed HMA mixtures must not contain topsoil, clay, or loam.

c. Construction. Submit a Mix Design and a JMF to the Engineer. Do not begin production and placement of the HMA until receipt of the Engineer's approval of the JMF. Maintain the binder content, aggregate gradation, and the crushed particle content of the HMA mixture within the Range 1 uniformity tolerance limits in Table 1. For mixtures meeting the definition of top or leveling course, field regress air void content to 3.5 percent with liquid asphalt cement unless

specified otherwise on HMA application estimate. For mixtures meeting the definition of base course, field regress air void content to 3.0 percent with liquid asphalt cement unless specified otherwise on HMA application estimate.

Ensure all persons performing Quality Control (QC) and Quality Assurance (QA) HMA field sampling are "Local Agency HMA Sampling Qualified" samplers. At the Pre-Production or Pre-Construction meeting, the Engineer will determine the method of sampling to be used. Ensure all sampling is done in accordance with *MTM 313 (Sampling HMA Paving Mixtures)* or *MTM 324 (Sampling HMA Paving Mixtures Behind the Paver)*. Samples are to be taken from separate hauling loads.

For production/mainline type paving, obtain a minimum of two samples, each being 20,000 grams, each day of production, for each mix type. The Engineer will sample and maintain possession of the sample. Sampling from the paver hopper is prohibited. Each sample will be divided into two 10,000 gram parts with one part being for initial testing and the other part being held for possible dispute resolution testing. Obtain a minimum of three samples for each mix type regardless of the number of days of production.

Obtain samples that are representative of the day's paving. Sample collection is to be spaced throughout the planned tonnage. One sample will be obtained in the first half of the tonnage and the second sample will be obtained in the second half of the tonnage. If planned paving is reduced or suspended, when paving resumes, the remaining sampling must be representative of the original intended sampling timing.

Ensure all persons performing testing are Bit Level One certified or Bit QA/QC Technician certified.

Ensure daily test samples are obtained, except, if the first test results show that the HMA mixture is in specification, the Engineer has the option of not testing additional samples from that day.

At the Pre-Production or Pre-Construction meeting, the Engineer and Contractor will collectively determine the test method for measuring asphalt content (AC) using *MTM 319 (Determination of Asphalt Content from Asphalt Paving Mixtures by the Ignition Method)* or *MTM 325 (Quantitative Extraction of Bitumen from HMA Paving Mixtures)*. Back calculation will not be allowed for determining asphalt content.

Ensure all labs performing local agency acceptance testing are qualified labs per the *HMA Production Manual* and participate in the MDOT round robin process, or they must be *AASHTO Materials Reference Laboratory* (AMRL) accredited for *AASHTO T 30* or *T 27*, and *AASHTO T 164* or *T 308*. Ensure on non-National Highway System (NHS) routes, Contractor labs are made available, and may be used, but they must be qualified labs as previously stated. Contractor labs may not be used on NHS routes. Material acceptance testing will be completed by the Engineer within 14 calendar days, except holidays and Sundays, for projects with less than 5,000 tons (plan quantity) of HMA and within 7 calendars days, except holidays and Sundays, for projects with 5,000 tons (plan quantity) or more of HMA, after the Engineer has obtained the samples. QA test results will be provided to the Contractor after the Engineer receives the QC test results. Failure on the part of the Engineer or the laboratory to provide Quality Assurance test results within the specified time frame does not relieve the Contractor of their responsibility to provide an asphalt mix within specifications.

The correlation procedure for ignition oven will be established as follows. Asphalt binder content based on ignition method from MTM 319. Gradation (*ASTM D 5444*) and Crushed particle content *(MTM 117)* based on aggregate from *MTM 319*. The incineration temperature will be established at the Pre-Production Meeting. The Contractor will provide a laboratory mixture sample to the acceptance laboratory to establish the correction factor for each mix. Ensure this sample is provided to the Engineer a minimum of 14 calendar days prior to production.

For production/mainline type paving, the mixture may be accepted by visual inspection up to a quantity of 500 tons per mixture type, per project (not per day). For non-production type paving defined as driveways, approaches, and patching, visual inspection may be allowed regardless of the tonnage.

The mixture will be considered out-of-specification, as determined by the acceptance tests, if for any one mixture, two consecutive tests per parameter, (for Parameter 2, two consecutive aggregate gradations on one sieve) are outside Range 1 or Range 2 tolerance limits. If a parameter is outside of Range 1 tolerance limits and the second consecutive test shows that the parameter is outside of Range 2, then it will be considered to be a Range 1 out-of-specification. Consecutive refers to the production order and not necessarily the testing order. Out-of-specification mixtures are subject to a price adjustment per the Measurement and Payment section of this special provision.

Contractor operations will be suspended when the mixture is determined to be out-of-specification, but contract time will continue to run. The Engineer may issue a Notice of Non-Compliance with Contract Requirements (Form 1165), if the Contractor has not suspended operations and taken corrective action. Submit a revised JMF or proposed alterations to the plant and/or materials to achieve the JMF to the Engineer. Effects on the Aggregate Wear Index (AWI) and mix design properties will be taken into consideration. Production and placement cannot resume until receipt of the Engineer's approval to proceed.

Pavement in-place density will be measured using one of two approved methods. The method used for measuring in-place density will be agreed upon at a pre-production or pre-construction meeting.

Pavement in-place density tests will be completed by the Engineer during paving operations and prior to traffic staging changes. Pavement in-place density acceptance testing will be completed by the Engineer prior to paving of subsequent lifts and being open to traffic.

Option 1 – Direct Density Method

Use of a nuclear density gauge requires measuring the pavement density using the Gmm from the JMF for the density control target. The required in-place density of the HMA mixture must be 92.0 to 98.0 percent of the density control target. Nuclear density testing and frequency will be in accordance with the *MDOT Density Testing and Inspection Manual*.

Option 2 – Roller Method

The Engineer may use the Roller Method with a nuclear or non-nuclear density gauge to document achieving optimal density as discussed below.

Use of the density gauge requires establishing a rolling pattern that will achieve the required in-place density. The Engineer will measure pavement density with a density gauge using the Gmm from the JMF for the density control target.

Use of the Roller Method requires developing and establishing density frequency curves, and meeting the requirements of Table 2. A density frequency curve is defined as the measurement and documentation of each pass of the finished roller until the in-place density results indicate a decrease in value. The previous recording will be deemed the optimal density. The Contractor is responsible for establishing and documenting an initial or QC rolling pattern that achieves the optimal in-place density. When the density frequency curve is used, the Engineer will run and document the density frequency curve for each half day of production to determine the number of passes to achieve the maximum density. Table 5, located at the end of this special provision, can be used as an aid in developing the density frequency curve. The Engineer will perform density tests using an approved nuclear or non-nuclear gauge per the manufacturer's recommended procedures.

Table 2: Minimum Number of Rollers Recommended Based on Placement Rate

Average Laydown Rate, Square Yards per Hour	Number of Rollers Required (a)	
	Compaction	Finish
Less than 600	1	1 (b)
601 - 1200	1	1
1201 - 2400	2	1
2401 - 3600	3	1
3601 and More	4	1

a. Number of rollers may increase based on density frequency curve.
b. The compaction roller may be used as the finish roller also.

After placement, roll the HMA mixture as soon after placement as the roller is able to bear without undue displacement or cracking. Start rolling longitudinally at the sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drum. Ensure each required roller is 8 tons minimum in weight unless otherwise approved by the Engineer.

Ensure the initial breakdown roller is capable of vibratory compaction and is a maximum of 500 feet behind the paving operations. The maximum allowable speed of each roller is 3 miles per hour (mph) or 4.5 feet per second. Ensure all compaction rollers complete a minimum of two complete rolling cycles prior to the mat temperature cooling to 180 degrees Fahrenheit (F). Continue finish rolling until all roller marks are eliminated and no further compaction is possible. The Engineer will verify and document that the roller pattern has been adhered to. The Engineer can stop production when the roller pattern is not adhered to.

d. Measurement and Payment. The completed work, as described, will be measured and paid for using applicable pay items as described in subsection 501.04 of the Standard Specifications for Construction, or the contract, except as modified below.

Base Price. Price established by the Department to be used in calculating incentives and adjustments to pay items and shown in the contract.

If acceptance tests, as described in section c. of this special provision, show that a Table 1 mixture parameter exceeds the Range 1, but not the Range 2, tolerance limits, that mixture parameter will be subject to a 10 percent penalty. The 10 percent penalty will be assessed based on the acceptance tests only unless the Contractor requests that the 10,000 gram sample part retained for possible dispute resolution testing be tested. The Contractor has 4 calendar days from receipt of the acceptance test results to notify the Engineer, in writing, that dispute resolution testing is requested. The Contractors QC test results for the corresponding QA test results must result in an overall payment greater than QA test results otherwise the QA tests will not be allowed to be disputed. The Engineer has 4 calendar days to send the dispute resolution sample to the lab once dispute resolution testing is requested. The dispute resolution sample will be sent to an independent lab selected by the Local Agency, and the resultant dispute test results will be used to determine the penalty per parameter, if any. Ensure the independent lab is a MDOT QA/QC qualified lab or an AMRL HMA qualified lab. The independent lab must not have conflicts of interest with the Contractor or Local Agency. If the dispute testing results show that the mixture parameter is out-of-specification, the Contractor will pay for the cost of the dispute resolution testing and the contract base price for the material will be adjusted, based on all test result parameters from the dispute tests, as shown in Table 3 and Table 4. If the dispute test results do not confirm the mixture parameter is out-of-specification, then the Local Agency will pay for the cost of the dispute resolution testing and no price adjustment is required.

If acceptance tests, as described in section c. of this special provision, show that a Table 1 mixture parameter exceeds the Range 2 tolerance limits, the 10,000 gram sample part retained for possible dispute resolution testing will be sent, within 4 calendar days, to the MDOT Central Laboratory for further testing. The MDOT Central Laboratory's test results will be used to determine the penalty per mixture parameter, if any. If the MDOT Central Laboratory's results do not confirm the mixture parameter is out-of-specification, then no price adjustment is required. If the MDOT Central Laboratory's results show that the mixture is out-of-specification and the Engineer approves leaving the out-of-specification mixture in place, the contract base price for the material will be adjusted, based on all parameters, as shown in Table 3 and Table 4.

In the case that the Contractor disputes the results of the test of the second sample obtained for a particular day of production, the test turn-around time frames given would apply to the second test and there would be no time frame on the first test.

The laboratory (MDOT Central Laboratory or independent lab) will complete all Dispute Resolution testing and return test results to the Engineer, who will provide them to the Contractor, within 13 calendar days upon receiving the Dispute Resolution samples.

In all cases, when penalties are assessed, the penalty applies to each parameter, up to two parameters, that is out of specification.

Table 3: Penalty Per Parameter

Mixture Parameter out-of-Specification per Acceptance Tests	Mixture Parameter out-of-Specification per Dispute Resolution Test Lab	Price Adjustment per Parameter
NO	N/A	None
YES	NO	None
	YES	Outside Range 1 but not Range 2: decrease by 10%
		Outside Range 2: decrease by 25%

The quantity of material receiving a price adjustment is defined as the material produced from the time the first out-of-specification sample was taken until the time the sample leading to the first in-specification test was taken.

Each parameter of Table 1 is evaluated with the total price adjustment applied to the contract base price based on a sum of the two parameter penalties resulting in the highest total price adjustment as per Table 4. For example, if three parameters are out-of-specification, with two parameters outside Range 1 of Table 1 tolerance limits, but within Range 2 of Table 1 limits and one parameter outside of Range 2 of Table 1 tolerance limits and the Engineer approves leaving the mixture in place, the total price adjustment for that quantity of material is 35 percent.

Table 4: Calculating Total Price Adjustment

Cost Adjustment as a Sum of the Two Highest Parameter Penalties		
Number of Parameters Out-of-Specification	Range(s) Outside of Tolerance Limits of Table 1 per Parameter	Total Price Adjustment
One	Range 1	10%
	Range 2	25%
Two	Range 1 & Range 1	20%
	Range 1 & Range 2	35%
	Range 2 & Range 2	50%
Three	Range 1, Range 1 & Range 1	20%
	Range 1, Range 1 & Range 2	35%
	Range 1, Range 2 & Range 2	50%
	Range 2, Range 2 & Range 2	50%

Table 5: Density Frequency Curve Development

Tested by: _____ Date/Time: _____

Route/Location:		Air Temp:
Control Section/Job Number:		Weather:
Mix Type:	Tonnage:	Gauge:
Producer:	Depth:	Gmm:

Roller #1 Type:

Pass No.	Density	Temperature	Comments
1			
2			
3			
4			
5			
6			
7			
8			
Optimum			

Roller #2 Type:

Pass No.	Density	Temperature	Comments
1			
2			
3			
4			
5			
6			
7			
8			
Optimum			

Roller #3 Type:

Pass No.	Density	Temperature	Comments
1			
2			
3			
4			
5			
6			
7			
8			
Optimum			

Summary: _____

_____

_____

_____

_____

SPECIAL PROVISION
FOR
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement for sidewalks, integral curbs, gutters, parking areas, and roads.
2. Furnish all materials, including dowels, tie bars and joint materials; and furnish all equipment, tools, labor and work incidental to placing, curing, and protection of the concrete; and construct the pavement complete.

B. Pay Items

1. Concrete pay items, both critical and non-critical as defined by MDOT, are subject to Quality Control testing by the Owner, unless otherwise noted.
2. No concrete pay items are eligible for or subject to positive pay adjustments. All concrete pay items are subject to negative pay adjustments, in accordance with Table 1 and Table 2.

Table 1: Concrete Thickness

Amount Less Than Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
more than 1/4", but not exceeding 1/2" (56 mm to 10 mm)	20
more than 1/2", but not exceeding 1" (03 mm to 25 mm)	50
more than 1" (greater than 25 mm)	Remove and replace

Table 2: Concrete Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
more than 500 psi (greater than 3.5 MPa)	Remove and replace

3. Reductions in the unit price are additive, that is, if an area of concrete is deficient by 3/8 inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% for a total reduction of 40%.
4. The deficient area of concrete identified by a core shall be confirmed by drilling and testing two additional cores, one on each side of the deficient core and 20 feet (6 m) from it, when possible. This extra core drilling and testing shall be at the Contractor's expense.

1.2 RELATED SECTIONS

A. Section for Joint Sealers

B. Section 31 2200 – Site Grading

C. Section 31 2323 – Fill and Backfill

D. Section 32 1123 – Aggregate Base Course

E. Section 32 1723.13 – Painted Pavement Markings

F. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM International:

1. C 31 Practice for Making and Curing Concrete Test Specimens in the Field
2. C 33 Specification for Concrete Aggregates
3. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. C 94 Specification for Ready-Mixed Concrete
5. C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
6. C 114 Chemical Analysis of Hydraulic Cement
7. C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
8. C 143 Test Method for Slump of Hydraulic-Cement Concrete
9. C 150 Specification for Portland Cement
10. C 172 Method of Sampling Freshly Mixed Concrete
11. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
12. C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13. C 260 Specification for Air-Entraining Admixtures for Concrete

14. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. C 311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
16. C 457 Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
17. C 494 Specification for Chemical Admixtures for Concrete
18. C 595 Specification for Blended Hydraulic Cements
19. C 618 Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete
20. C 685 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
21. C 823 Practice for Examination and Sampling of Hardened Concrete in Construction
22. C 856 Practice for Petrographic Examination of Hardened Concrete
23. C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
24. C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
25. C 1157 Performance Specification for Hydraulic Cement
26. C 1222 Practice for Evaluation of Laboratories Testing Hydraulic Cement
27. C 1240 Specification for Silica Fume Used in Cementitious Mixtures
28. C 1260 Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
29. C 1293 Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
30. C 1567 Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Test)
31. D 98 Specification for Calcium Chloride
32. D 994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
33. D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
34. D 5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
35. D 6690 Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements

B. Michigan Department of Transportation (MDOT): Standard Specifications for Construction

C. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International
2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International

4. ACI 305R – Hot Weather Concreting
5. ACI 306R-88 – Cold Weather Concreting

D. Metric Conversions:

Inch-pound unit	Factor	SI unit
in.	x 25.4	= mm
lb/yd^3	x 0.5933	= Kg/m^3
Psi	x 0.006895	= MPa
temperature, °F	(°F - 32)/1.8	= °C

1.4 SUBMITTALS

A. Provide the following information in initial submittals: Whenever material sources or relevant properties of the materials change, provide a re-submittal of the relevant information, demonstrating compliance with the applicable provisions.

1. List of sources for materials.
2. Material certifications for each material.
3. Product data for curing compound, including installation instructions, joint filler, and admixtures.
4. Proposed concrete mix design in accordance with ACI 301.
5. Contractor's quality control plan.

B. Submit the concrete mix design to the Engineer one week prior to placing concrete. Develop proportions for normal weight concrete mixtures in accordance with ACI 211 to meet the requirements of ACI 201. Include the following information for each concrete mix design:

1. Grading of fine and coarse aggregates
2. Proportions of all ingredients including admixtures added either at the time of batching or at the job site.
3. Water/cement ratio
4. Slump
5. Air content of freshly mixed concrete by the pressure method
6. Unit weight of concrete
7. Strength at 7 and 28 days
8. Chloride content
9. Total alkali content of the cementitious materials
10. Test results, not more than 1 year old that verify the selected materials and relative proportions are adequate to mitigate the risk of alkali-silica reactivity, as required by Article 2.2 G.

C. Laboratory Qualifications: For each laboratory that supplies test reports or data required by this specification, provide evidence that the laboratory is properly equipped and qualified, in accordance with ASTM C 1077 and C 1222, to perform the tests method(s) on which they are reporting.

D. Samples: Submit representative samples of the following products and materials:

1. Fine aggregate
2. Coarse aggregate
3. Expansion joint filler
4. Contraction joint filler
5. Hot-poured joint sealant
6. Backer rod

E. If work will be performed during cold weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

F. If work will be performed during hot weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Provide Owner’s quality control testing agency with access to stockpiles, quarries, bulk storage bins, ready-mix facility, etc. for the purpose of obtaining samples of materials used in the concrete mix.

1. Furnish labor to assist testing agency in obtaining and handling samples at the job site.
2. Advise testing agency in advance (minimum of 48 hours) of operations to allow for the assignment of testing personnel and testing.
3. Provide and maintain adequate facilities for the use of the testing agency for proper curing of concrete test specimens on the project site in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C31.

C. Materials and operations will be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.

D. The following testing services will be performed by a testing agency, designated and compensated by the Owner:

1. For each mix design, make one strength test for each 150 cubic yards or fraction thereof of concrete placed in any one day.
2. Secure composite samples in accordance with "Standard Method of Sampling Freshly Mixed Concrete", ASTM C 172.
3. For each required strength test, mold and cure six specimens in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field", ASTM C 31.
4. Test specimens in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C 39. Two specimens will be tested at 28 days for acceptance, one tested at 3 and 7 days for information and two retained as spares.
5. For each strength test, determine slump of concrete sample in accordance with "Standard Test Method for Slump of Portland Cement Concrete", ASTM C 143.
6. For each strength test, determine total air content of concrete sample in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM D 231.
7. For each strength test, determine temperature, unit weight, yield and air content (gravimetric) of concrete sample in compliance with ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete".

E. If test results indicate deficient compressive strength, a negative pay adjustment in the unit price of concrete pavement shall be made in accordance with Article 1.1 B.

F. Delivered concrete may be rejected at the job site prior to placement due to any of the following:

1. Concrete fails to conform to submitted and approved concrete mix design.
2. Failure of concrete samples obtained from the first or middle portion of the delivered concrete load to meet required concrete qualities outlined in Article 2.2.
3. Placement of the delivered concrete load did not begin within 45 minutes from ready-mix concrete plant batch time.
4. More than 90 minutes have elapsed between ready-mix concrete plant batch time and concrete placement.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Cold Weather Concreting: Comply with ACI 306R and the following:
   a. Do not use admixtures or accelerators unless approved in advance by the Engineer.

b. Protect the subgrade from freezing by a layer of 12 inches to 24 inches of hay, straw, or insulating blankets covered with waterproof canvas or sheeting.

c. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

d. Concrete Temperature As-Mixed: Provide as-mixed concrete temperature that is not less than the following, depending upon the ambient temperature:
   i 60 degrees F when the ambient temperature is above 30 degrees F;
   ii 65 degrees F when the ambient temperature is between 0 and 30 degrees F;
   iii 70 degrees F when the ambient temperature is below 0 degrees F.

e. Placement: Do not place concrete that is less than 60 degrees F nor more than 90 degrees F.

f. Protection: Unless otherwise specified, maintain the minimum temperature of concrete at 60 degrees F. Temperatures specified to be maintained during the protection period are those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of +/- 2 degrees F. Measure the temperature of concrete in each placement at regular time intervals.

g. Protection against freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the minimum specified surface temperature of the concrete during that period.

h. The protection period may be reduced to 2 days if one or more of the following is used to alter the concrete mixture and is approved by the Engineer:
   i. Type III Portland cement, meeting the requirements of ASTM C 150, is substituted for the Type I Portland cement.
   ii. A strength accelerating admixture, meeting the requirements of ASTM C 494, is added.

i. After Termination of Protection: Do not permit the surface temperature of the concrete to decrease in temperature more than 50 degrees F in a 24 hours period.

j. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

k. Protection Deficiency: If the temperature requirements during the specified protection period are not met, but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below 60 degrees F.

l. Curing of Concrete: Prevent concrete from drying during the required curing period.

2. Hot Weather Concreting: Comply with ACI 305R and the following:
   a. Provide temperature of concrete, (as placed), that is not so high as to cause difficulty from loss of slump, flash set, or cold joints, and does not exceed 90 degrees F. When the temperature of concrete exceeds 90 degrees F, undertake precautionary measures approved by the Engineer. When the temperature of steel forms is greater than 120 degrees F, spray the forms with water just prior to placing concrete.
   b. Cool concrete ingredients before mixing. Flake ice, or well-crushed ice of size that will melt completely during mixing, may be substituted for all or part of the mixing water if low slump, flash set or cold joints are encountered due to high temperature.

B. Protection against Rain

1. Protect new concrete from the effects of rain until the concrete has sufficiently hardened.
2. Use burlap or 6-mil polyethylene to cover and protect one day's work.
3. After rain has stopped, remove the covering and burlap-drag the surface. Apply curing compound where the previously-applied compound has been disturbed or washed away.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregates: Conform to the requirements of ASTM C 33, MDOT 902.09, and this specification.

1. Fine Aggregates:
   a. Clean, hard, durable, uncoated particles of natural sand, free from lumps of clay, soft or flaky material and, at the time of use, free from crusts of hard or frozen material.
   b. Natural Sand 2NS consisting of fine granular material resulting from the natural disintegration of rock; free from organic impurities (when measured by subjecting to the sodium hydroxide colorimetric test, produced color shall not be darker than light brown).
   c. The following gradation represents the extreme limits of suitability for use from all sources of supply (MDOT "2NS", Table 902-4):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
Loss by Washing (No. 200)*	0-3

* Michigan Test Method, MTM 108

d. Provide fine aggregate with reasonably uniform gradation from any one source and not exhibiting the extreme percentage of gradation specified above. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 more than or less than the fineness modulus of the representative sample will be rejected.

2. Coarse Aggregate:
   a. Hard, strong, durable, pebbles, crushed natural stone, free from adherent coatings, clay lumps, coal and lignite and other foreign matters. Chert (excluding sound gravels) or other nondurable particles shall not exceed 3% by weight.
   b. Coarse aggregate derived from crushed concrete is not permitted.
   c. Uniformly graded within the following limits (MDOT "17A", Table 902-1):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
1 in	100
3/4 in	90-100
1/2 in	50-75
No. 4	0-8
Loss by Washing (No. 200)*	1.0 Max**

* Michigan Test Method, MTM 108

** Loss by washing of 2.0 percent for material produced entirely by crushing rock, boulders, cobbles or concrete.

B. Cementitious Materials

1. Portland cement, ASTM C150, Type I , Type II, or Type III
2. Slag cement, MDOT 901.06 and ASTM C 989 Grade 100 or Grade 120
3. Fly ash, MDOT 901.07 and ASTM C 618, Class F
4. Blended hydraulic cement, ASTM C 595 or ASTM C 1157
5. Silica fume, MDOT 901.08 and ASTM C1240

C. Water: MDOT 911; Clean, potable, low-alkali content (maximum 80 parts per million), and free amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or metal in the concrete.

D. Admixtures: Conform to the following:

1. Air Entrainment: MDOT 903.01 and ASTM C 260
2. Water Reducing: MDOT 903.02 and ASTM C 494, Type A.
3. Accelerators: MDOT 903.04 and ASTM C 494, Type C
4. Calcium Chloride: Not permitted

E. Curing Materials:

1. White pigmented, impervious membrane curing compound: MDOT 903.06A and ASTM C 309, Type 2, Class B Vehicle, with the following additions:
   a. Base tests for moisture retention, reflectance, and drying time on curing compound application rate of 200 square feet per gallon (5 square meters per liter).
   b. Allow three weeks from the time of sampling before reporting results.
   c. Store the compound in clean containers.
2. Insulating Blankets: MDOT 903.07C and Federal Specifications HH-1-521e, minimum 2 inches thick, minimum R-Value of 7.0 ($^{\circ}F*hr*ft^2/Btu$) per inch, and enveloping membranes.

F. Joint Materials:

1. Expansion joints: Premolded, non-extruding bituminous fiber conforming to MDOT 914.03 and ASTM D 1751 (AASHTO M 59).
2. Contraction or Weakened Plane Joints: Premolded filler conforming to ASTM D 994 (AASHTO M 33).
3. Hot-Poured Joint Sealant: ASTM D 6690 with exceptions specified in MDOT Section 914.04.A.
4. Backer Rod for Use With Hot-Poured Joint Sealant: Solid, round, heat resistant, closed-cell, cross-linked polyethylene foam rod conforming to MDOT 914.04B and ASTM D 5249, Type I.

G. Reinforcement: Provide Concrete Reinforcement as stipulated in the Engineering Drawings.

H. Smooth Dowel Bars for Transverse Expansion and Contraction Joints: MDOT 914.07.

I. Devices for Transverse End-of-Pour Joints: MDOT 914.08.

2.2 CONCRETE MIX:

A. Mix concrete in accordance with ASTM C 94.

B. Proportion concrete by weighing and in conformance to the following table, unless otherwise directed by the Engineer:

1.	Compressive Strength:	4,000 psi at 28 days
2.	Maximum water/cementitious ratio:	0.45
3.	Air content:	6.5% plus or minus 1.5%
4.	Slump:	3 inches plus or minus 1 inch
5.	Minimum Cement Content:	564 lb/cy
6.	Maximum size of aggregate:	3/4 inch

7. Maximum water-soluble chloride ion content in hardened concrete of 0.15 percent by weight of concrete.

C. Add air entrainment agent to produce a total air content of 6.5% +/- 1.5% at the point of placement and an air void system with the following characteristics when evaluated in accordance with ASTM C 457:

1. Spacing factor less than 0.008 inch
2. Specific surface: at least 600 square inch per cubic inch of air void volume.
3. Voids per linear inch at least 1-1/2 to 2 times greater than the air content percentage.

D. Provide slump not more than 4 inches or less than 2 inches, when tested in accordance with ASTM C 143, unless otherwise directed by the Engineer, and except for hand placement. Slump not more than 4 inches for concrete that is hand-placed.

E. Add mixing water at the batch plant only. Do not add water at the job site unless authorized by the Engineer. When authorized to add water at the job site, do not add water more than one time. Adding water and the result on concrete is the responsibility of the Contractor.

F. Slag cement, fly ash, silica fume, and/or blended cement may be used as a partial replacement for Portland cement provided that testing confirms that the as-designed mixture, using the specific materials and sources contemplated for the project, complies with the requirements of this Article 2.2, including the requirement for adequate mitigation of risk of alkali-silica reactivity.

1. The maximum permitted replacement of Portland cement with slag cement is 40% by weight of the total cementitious material (Portland cement plus slag cement). Slag must not be from open hearth furnace.
2. The maximum permitted replacement of Portland cement with fly ash is 25% by weight of the total cementitious material (Portland cement plus fly ash)
3. The maximum permitted replacement of Portland cement with supplementary cementitious materials is 40% by weight of the total cementitious material.
4. The total alkali content of the cementitious materials shall not exceed 3.5 pounds per cubic yard, when evaluated in accordance with ASTM C 114 and ASTM C 311.

G. Perform preconstruction testing to verify that the proposed combination of aggregates and cementitious materials will be adequate to mitigate the risk of alkali-silica reactivity (ASR).

1. Evaluate fine and coarse aggregate by a minimum of two tests each in accordance with ASTM C 1260.
   a. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion less than 0.10% at 16 days will be considered acceptable and no further testing for ASR mitigation will be required.
   b. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion equal to or greater than 0.10% at 16 days will be considered potentially reactive and unacceptable.
2. If the aggregate is reactive, evaluate the effectiveness of the proposed pozzolans and ground granulated blast-furnace slag to control deleterious ASR by conducting a minimum of two tests in accordance with ASTM C 1567.
   a. If the ASTM C 1567 mean mortar bar expansion is less than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered acceptable and no further testing for ASR mitigation will be required.
   b. If the ASTM C 1567 mean mortar bar expansion is equal to or greater than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered indicative of potentially deleterious expansion and unacceptable.
   c. Acceptable test results in accordance with ASTM C 1567 will be accepted in lieu of testing in accordance with ASTM C 1260.

2.3 EQUIPMENT

A. Finishing Machine: Power driven and of an approved type that will strike-off and compact the concrete with a screening and troweling action.

B. Forms: Metal, of an approved section that will ensure their rigidity under the impact, thrust, and weight of the heaviest machine carried on them.

1. Minimum length of 10 feet and a depth not less than the edge thickness of the work prescribed; width of the base in direct bearing on the soil not less than 8 inches; at least three stake pockets for each 10 foot section of form.
2. Straight, free from distortion and showing no vertical variation greater than 1/8-inch in 10-foot lengths from the true plan surface on the top of the form when tested with a 10-foot straight edge.
3. Connect form sections with a locked joint that is free from vertical movement in excess of 1/8-inch and free from horizontal movement in excess of one-quarter of an inch under the impact, thrust and weight of the heaviest machine carried on forms.
4. Provide sufficient forms so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

C. Water Supply: Provide pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, curing, sprinkling, subgrade and all other requirements of the work. Water may be supplied in approved tank wagons.

PART 3 - EXECUTION

3.1 PREPARATION

A. Smooth, trim and compact the subgrade to the required line, grade and cross-section. Thoroughly compact the subgrade, between lines at least 12 inches outside of each edge of the proposed pavement, by rolling with a roller of an approved type weighing not less than 5 tons.

B. Ensure that the subgrade is moist at the time of placing concrete. If the subgrade becomes dry before the concrete is placed, sprinkle the subgrade with water using a method of sprinkling that does not permit pools of water to form on the subgrade. Do not place the concrete on muddy, soft or frozen subgrade.

C. Restore and thoroughly compact rutting and other displacement caused by material hauling equipment or by the paver, for a distance of at least 100 feet ahead of the subgrade planer. Maintain the remainder of the prepared subgrade in its compacted state and true to the required grade and cross-section.

D. Place the concrete forms in advance of placing concrete. Substantially bring the foundation on which the forms are to be placed to the proper grade. Do not place forms on dikes or mounds. Where feasible, bring the subgrade to the approximate required cross-section by means of a subgrade machine.

E. Check forms for line and grade in advance of placing concrete. Adequately stake and brace forms to resist the pressure of the concrete and the thrust of any equipment traveling on them. Provide uniform bearing on the subgrade throughout the forms' entire length and

width. Finish the entire width of the subgrade and thoroughly compact it for a sufficient distance outside the area required for the pavement in order to adequately support the forms. Place forms in direct contact with the subgrade. After the forms have been set to grade, thoroughly compacted, both inside and outside, by use of an approved mechanical form tamper. Joint all forms neatly and tightly, securely stake by at least three stakes per form, and thoroughly clean and oil forms before concrete is placed against them.

F. After the forms are set in place, check their top surface for grade and trueness with a straight edge not less than 10 feet long. Reset or move any forms showing a variance greater than 1/8 inch in 10 feet.

G. Coat the surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.2 CONSTRUCTION

A. Except as modified herein, comply with MDOT Sections 601.03 and 602.03 and ACI 304R.

B. Mixing

1. On the project site, mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
2. Transit mixers: Comply with ASTM C 94

C. Placing Concrete:

1. Do not proceed with concrete placement until the conditions of the subgrade/subbase are approved by the Engineer.
2. Distributed or spread the concrete as soon as placed. Deposit concrete on the subgrade so as to require as little handling as possible and to avoid segregation and separation of the materials. Distribute concrete to such depth and sufficiently above grade so that when consolidated and finished, the surface conforms to the required finished grade. Consolidate the concrete along the faces of the forms and adjacent to joints. Consolidate concrete with an approved vibrator to fill all voids and finish to ensure a dense smooth surface.
3. Deposit and spread concrete continuously, as far as possible between transverse joints. In the case of a temporary shutdown, cover the concrete at the unfinished end of the slab with wet burlap. In the event of an unavoidable interruption of the work continuing more than 30 minutes, place a construction joint, provided the section is 10 feet or more in length between joints. Remove sections less than 10 feet in length at no expense to Owner.

D. Tie Bars, Dowels and J-Bolts: Place tie bars and dowels at the required depth parallel to the finished surface, perpendicular to the joints and at the uniform spacing shown on the Drawings. Use approved chairs or dowel baskets to support the tie bars or dowels in place, or use approved mechanical devices; do not place tie bars or dowels by hand methods.

E. Joints:

1. Construct all joints with faces perpendicular to the surface of the pavement. Construct transverse joints at right angles to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit transverse joints to vary more than 1/4 inch from a true line. Construct longitudinal joints along or parallel to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit longitudinal joints to vary more than one-quarter (1/4") inch from their true designated positions.
2. Finish the pavement surface adjacent to all joints to a true surface. Where indicated on the Drawings, edge the surface adjacent to joints to the radius shown. Test the surface across the joints with a 10-foot straight edge as the joints are finished, and correct irregularities before the concrete has hardened.
3. Longitudinal Joints: Bulkhead construction joints or contraction joints, as shown on the Drawings.
    a. Provide a keyway in the bulkhead construction joints.
    b. Accurately form keyways with templates of metal, wood, or other approved material.
    c. Provide the gauge or thickness of the template material to form the full keyway as specified.
4. Transverse Joints: Contraction joints, expansion joints or construction joints.
5. Contraction Joints: Transverse contraction joints are without tie bars. Locate transverse contraction joints at 24 to 30 times the pavement thickness, except do not exceed a maximum spacing of 15 feet. Provide tie bars in longitudinal contraction joints. Form contraction joints by saw cutting to a depth of 1/3 of the pavement thickness. Perform additional saw cutting to form 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the contraction joint. Where pavement under construction is adjacent to an existing pavement, construct contraction joints in line with similar joints in the abutting pavement.
    a. Provide tie bars in longitudinal contraction joints, of length and size shown on the Drawings.
    b. Embed tie bars on each side of the longitudinal contraction joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness.
    c. Space tie bars in longitudinal contraction joints as shown on the Drawings.
6. Expansion Joints: One-half (1/2") thick and placed every 600 feet, unless shown otherwise in the Drawings. Where the pavement under construction is adjacent to an existing pavement, construct expansion joints in line with the expansion joints in the abutting pavement.
    a. Provide expansion joints at right angles to the centerline, perpendicular to the surface of the finished pavement and extended entirely through the concrete.
    b. Provide smooth dowels, of length and size shown on the Drawings, with expansion cap on one end. Embed dowels a minimum on each side of the expansion joint as shown on the Drawings, and locate at the centerline of the

concrete pavement thickness. Space dowels in expansion joints as shown on the Drawings.

c. During installation, maintain the joint filler in place by an approved installing device that is securely staked. Maintain the top of the joint filler at not less than l/2 inch or more than 3/4 inch below the finished surface. Cover the top of the joint filler with an approved metal cap before the concrete is placed. Shape the metal cap to the finished crown of the pavement. Provide a metal cap that will not warp or twist out of shape. Keep the cap in place during finishing machine operations.

d. Place concrete simultaneously against the dowels and joint filler to a depth approximately equal to the depth of the finished pavement. Thoroughly consolidate concrete with vibration tools. Carefully remove the installing device so that the joint filler and caps are not disturbed.

7. Construction Joints: Form construction joints with dowels whenever an unavoidable interruption of the work constituting a shutdown of more than 30 minutes has occurred, or when directed by the Engineer. Strike the concrete and finish to the bulkhead.

a. Saw cut to form minimum 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the construction joint, or as shown on the Drawings.

b. Provide dowels, of length and size shown on the Drawings, in construction joints. Embed dowels on each side of the joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in construction joints as shown on the Drawings.

8. Clean the sealant reservoirs of all extraneous matter. Ensure that the contact faces of the joints are dry at the time of filling and sealing. Compressed air jets, wire brushes and such additional equipment as may be necessary to clean the openings and dry the contact faces of the joints will be required.

9. Fill the top of contraction joints, construction joints, and expansion joints and seal with hot, poured sealant before any traffic is permitted on the pavement. Install joint sealant by hand pouring pots, mechanical methods, or any other method that will give satisfactory results. Place sufficient sealant into the joints so that, upon completion of the work, the surface of the sealant will be flush with the surface of the pavement. Do not spill the sealant on exposed surfaces of the concrete. Immediately remove excess sealant on the surface of the concrete pavements. If the sealant subsides to a level below the surface of the slab, place a second application of sealant. When more than one application is required to fill the joint, perform succeeding applications immediately after shrinkage of the previous sealant application has taken place.

a. Do not place sealant when the air temperature in the shade is less than 50 degrees F, except with the approval of the Engineer.

b. Do not permit traffic over the sealed joints until the sealant has hardened sufficiently to resist pickup.

F. Finishing:

1. After the placement of the concrete, test surface with straight edge and finish with burlap drag, and perform final finishing on slabs at catch basins with broom.

G. Surface Requirements: On the day following placement of the concrete, the pavement will be straight edged by the Engineer. A 10-foot straight edge will be placed parallel to the centerline so as to bridge any depressions and touch high spots. High spots indicated by a variation exceeding 1/8 inch from the straight edge will be plainly marked. Remove high spots or reduce by rubbing with a carborundum brick and water. If these methods are inadequate to remove the high spots, use an approved surface-grinding machine.

H. Removal of Forms:

1. Do not remove forms from freshly placed concrete until it has set for at least 12 hours. Carefully remove forms so that no damage is done to the edge of the pavement.
2. After the forms have been removed, clean the ends of joints and point honeycombed areas.
3. Cover the sides of the pavement with curing material except where honeycombed areas are to be pointed. Cover areas to be pointed with wet burlap until the pointing is complete, and then cure as specified in Article 3.2 I.

I. Curing:

1. Immediately after finishing operations have been completed and free water has left the surface, completely coat and seal the surface of the slab and curb with a uniform layer of curing compound. Apply the compound in one or two applications, as required by manufacturer instructions. When the compound is applied in two increments, follow the first application with the second application within 30 minutes.
2. Thoroughly agitate the compound to a uniform consistency, with the pigment uniformly suspended, before transferring the compound between containers and before use.
3. Apply the compound in a continuous uniform film by means of mechanical pressure sprayer equipment at the rate stipulated by the compound manufacturer but not less than one gallon per 200 square feet of surface. Use equipment that provides adequate stirring of the compound during application. Hand spray equipment will be permitted for application of the curing compound over the sides of the slab.
4. Provide uniformly painted, solid white surface after application of curing compound. If appearance is blotchy and non-uniform, apply another layer of curing compound.
5. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, apply a new coat of material to the affected areas equal to that originally applied.
6. Protect the treated surface from injury for a minimum period of seven days. All traffic will be considered injurious to the film of applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided that any damage to the film is immediately repaired by the application of another coat of the compound.
7. Provide sufficient burlap, cotton, or polyethylene sheet coverings to protect the pavement in case of rain or breakdown of the spray equipment. If any hair checking

develops before the curing compound can be applied, perform preliminary curing with wetted burlap or cotton coverings before the curing compound is applied.

8. Cold Weather Curing: Comply with Article 1.5 A.

J. Cleanup

1. After the concrete has gained sufficient strength, but no sooner than twelve hours, remove fixed forms and immediately backfill the spaces on both sides with sound earth of topsoil quality.
2. Compact and level backfill, providing a neat, workmanlike condition.

3.3 FIELD QUALITY CONTROL

A. Delivery Tickets: With each load of concrete delivered to the jobsite, provide ready-mix concrete producer's delivery tickets in triplicate, one for Contractor, one for Engineer, and one for Owner. Provide the following information on delivery tickets:

1. Date and serial number of ticket
2. Name of ready-mixed concrete plant, operator and job location
3. Types of cementitious materials, brand names, and proportions
4. Types of admixtures, brand names, and dosages
5. Aggregate sizes, proportions, and sources
6. Specified cement content in bags per cubic yards of concrete, or mix number
7. Truck number and time dispatched
8. Amount of concrete in load, and in cubic yards delivered
9. Slump of concrete ordered
10. Amount of water added before the truck left the plant
11. Water added at the jobsite, if any and if authorized by Engineer, and corresponding slump of concrete. Adding water at the jobsite without authorization by the Engineer is grounds for rejection.

B. Quality assurance testing, defined in Articles 1.5 C and 1.5 D, will be performed by a testing agency retained by the Owner. This testing is in addition to the quality control program required to be performed by the Contractor.

C. Comply with the attached MDOT Special Provision for Quality Control and Acceptance of Portland Cement Concrete (For Local Agency Projects Only).

3.4 PROTECTION

A. Protect newly laid pavement that is threatened with damage by rain with a covering of burlap or cotton fabric or by other suitable means.

B. Comply with the hot and cold weather construction requirements in Part 1 of this specification.

C. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather. Remove and replace concrete injured by frost action at no expense to the Owner.

D. Opening to traffic:

1. Do not open pavement to traffic until the strength of placed concrete attains 90% the specified design strength and not before 14 days after time of placement, without the written permission of the Engineer.
2. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85 percent of the design strength.
3. Opening pavement to traffic will not constitute a final acceptance of the concrete paving.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Conc Pavt, Nonreinf, 10 inch, Modified	Syd

1. Conc Pavt, Nonreinf, 10 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY)

a. Description. The Contractor must administer quality control (QC) and the Agency will administer quality assurance (QA) procedures that will be used for acceptance of and payment for all Portland cement concrete (PCC) for the project. Except as explicitly modified by this special provision, all materials, test methods, and PCC mixture requirements of the standard specifications and the contract apply.

Do not place concrete until the Engineer's daily startup testing verifies that the fresh concrete properties have been met, in accordance with subsection d.2 of this special provision.

Provide the Engineer a minimum 24 hours notification prior to each concrete placement.

1. Terminology.

Air Content of Fresh Concrete. The recorded total air content of fresh concrete sampled and tested according to this special provision.

Air Content Test Results. The recorded air content of fresh concrete corresponding to the strength test specimens that were molded for acceptance.

Alkali-Silica Reactivity (ASR). A chemical reaction which occurs over time within concrete between high alkaline cement paste and reactive forms of silica found in some aggregates. In the presence of moisture, an expansive ASR gel is formed which can exert pressure within the concrete, causing random cracking and premature deterioration of the concrete. See subsection c.5.A of this special provision.

Base Price. Price established by the Department to be used in calculating incentives or adjustments to pay items and shown in the contract.

Concrete Mix Design. The process, by which the concrete mixture performance characteristics are defined, based on selected materials, performance requirements, environmental exposure considerations, placement methods, and other factors that control the plastic and hardened properties of the concrete in efforts to produce an economical and durable product.

Job Mix Formula (JMF). The actual batch quantities (mixture proportions) of each constituent included in the concrete mixture, based on adjustments to the target weights attained from the mix design process, necessary to optimize the concrete mixture properties.

Pay Factor (PF). The factor that is determined according to subsections d.3 of this special provision, used to calculate the price adjustment for a discrete quantity of concrete relative

to its respective level of quality. Pay factor will not exceed 1.00. Therefore, there will never be a positive pay adjustment.

Production Lot. A discrete cubic yard quantity of concrete containing the same JMF and used for the same application, as described in subsection d.2 of this special provision.

Quality Assurance (QA). Activities administered by the Engineer dealing with acceptance of the product, including, but not limited to, materials selection, sampling, testing, construction inspection, and review of Contractor QC documentation. All concrete QA sampling and testing will be administered by the Agency. Agency administered QA is described in section d of this special provision.

Quality Control (QC). All activities administered by the Contractor to monitor, assess, and adjust production and placement processes to ensure the final product will meet the specified levels of quality, including, but not limited to, training, materials selection, sampling, testing, project oversight and documentation. Contractor administered QC is described in section c of this special provision.

QC Action Limits. A range of values established by the Contractor in the QC plan that, if exceeded, requires that corrective action be taken by the Contractor to restore the continuity and uniformity of the mixture and methods in conformance with specification requirements. The QC action limits must not exceed the QC suspension limits.

QC Plan. The project-specific plan developed by the Contractor describing, in detail, all aspects of production and construction for the project to ensure consistent control of quality to meet specification requirements.

QC Plan Administrator. An employee of, or consultant engaged by the Contractor, responsible for developing and overseeing all aspects of QC for the project. This includes, but is not limited to preparing the QC plan, managing the Contractor QC personnel, communicating routinely with the production personnel to ensure quality, initiating corrective action and suspending operations when the process is found to be producing non-conforming materials, and preparing and submitting all necessary QC documentation to the Engineer within the specified time period.

QC Suspension Limits. A range of values defined in Table 1 that, if exceeded on a single QC test, requires that the Contractor suspend operations and determine, correct, and document the deficiencies before resuming production. The QC suspension limit must not exceed specification requirement thresholds.

Sample. A representative quantity of concrete taken during production which is used to measure the quality characteristics for the concrete.

Sampling Rate. The number of times the fresh concrete is sampled, as described in subsection d.2 of this special provision.

Small Incidental Quantity. A single day's placement of less than 20 cubic yards of concrete used for non-structural or non-pavement related applications, including, but not limited to: curb and gutter, sidewalks and sidewalk ramps (excluding driveways and driveway ramps), installing sign or fence posts, guard rail or cable rail foundations (excluding end anchorage foundations), or other contract items where the small quantity of concrete is not paid for

separately, as approved by the Engineer. Requirements for small incidental quantity consideration are described in subsections c.5.G, d.2.B and d.3 of this special provision. The corresponding weekly QA test results must meet specification limits defined in Table 3.

Specification Limits. The threshold values placed on a quality characteristic used to evaluate the quality of the material.

Strength Sample Test Result. The average of the two companion 28-day compressive strength test specimens taken from the same sample of concrete is considered a strength sample test result.

Strength Test Specimen. A strength test specimen is an individual 6-inch by 12-inch strength test cylinder or 4-inch by 8-inch strength test cylinder molded and cured according to *AASHTO T 23/ASTM C 31* and tested according to *AASHTO T 22/ASTM C 39*. All respective QC or QA strength test specimens must be the same nominal size. Strength test specimen cylinder size of 4-inch by 8-inch is permitted only if the nominal maximum coarse aggregate particle size, as specified for the coarse aggregate in the concrete mixture, is 1-inch, or less.

Sublot. A portion of a production lot, represented by a complete set of QA tests, as described in subsection d.2.A of this special provision. The Engineer and the Contractor may agree to reduce the typical sublot size based on project staging or other project conditions.

Supplementary Cementitious Materials (SCM). A mineral admixture (slag cement, fly ash) used to replace a portion of the Portland cement, either individually or as a blended cement, in the concrete mixture. SCM requirements are described in subsection c.5 of this special provision.

b. Materials. Mixture requirements must be in accordance with the contract.

c. Contractor Administered Quality Control (QC).

1. Contractor Quality Control Plan (QC Plan). Prepare, implement, and maintain a QC plan specific to the project for concrete that will provide quality oversight for production, testing, and control of construction processes. The QC plan must be in conformance with the contract and must identify all procedures used to control production and placement including when to initiate corrective action necessary to maintain the quality and uniformity of the work.

Develop concrete mix designs and JMFs, as specified, and conduct QC sampling, testing, and inspection during all phases of the concrete work at the minimum frequency, or at an increased frequency sufficient to ensure that the work conforms to specification requirements.

Project-specific items required in the QC plan include (where applicable), but are not limited to the following:

A. Organization chart.

B. QC Plan Administrator and contact information.

C. The name(s) and credentials of the QC staff.

D. Methods for interaction between production and QC personnel to engage timely corrective action, including suspension of work.

E. Coordination of activities.

F. Documentation, procedures, and submittals.

G. Project and plant specifics.

H. Concrete production facilities inspections and certifications.

I. Current testing equipment calibration documentation including calibration factor.

J. Testing and initial field curing facilities for QC and QA strength test specimens (AASHTO T 23/ASTM C 31).

K. Stockpile management plan.

L. Corrective action plan.

M. Mixing time and transportation, including time from batching to completion of delivery and batch placement rate (batches per hour), along with the manufacturer's documentation relative to the batching equipment's capabilities in terms of maximum mixing capacity and minimum mixing time (*ASTM C 94*).

N. Placement and consolidation methods including monitoring of vibration, depth checks, and verification of pavement dowel bar alignment.

O. Process for monitoring stability of air content of fresh concrete during concrete production and placement.

P. Hot and cold weather protection considerations and methods.

Q. Control charts with action and suspension limits.

R. Verification for non-deleterious alkali-silica reactivity (see subsection c.5.A of this special provision).

S. Mix design and JMFs.

T. Proposed location for use of each JMF on the project.

U. The frequency of sampling and testing.

V. Handling, protection, initial curing, and transporting of strength test specimens (*AASHTO T 23/ASTM C 31*).

W. Methods to monitor construction equipment loading and open-to-traffic strengths.

X. Finishing and curing procedure.

Y. Ride quality control.

Z. List of QC records to be submitted to the Engineer in accordance with subsection c.2 of this special provision.

Submit the QC plan, for the appropriate items of work, to the Engineer for review a minimum of 10 working days before the start of related work. The Engineer will notify the Contractor of any objections relative to the content of the QC plan within 5 working days of receipt of the QC plan. Do not begin concrete placement before acceptance of the QC plan by the Engineer. If the approved QC plan fails to provide acceptable work, or acceptable control of the work, the Engineer may require the Contractor to revise the QC Plan. Revisions to the QC plan must be approved by the Engineer prior to resuming work.

2. QC Records. Maintain complete records of all QC tests and inspections. Document what action was taken to correct deficiencies. Include sufficient information to allow the test results to be correlated with the items of work represented.

Furnish one copy of all QC records, including test reports for the fresh concrete placement, to the Engineer within 24 hours after the date covered by the record in a format acceptable to the Engineer. The Engineer will withhold acceptance of the concrete for failure to provide properly documented and timely QC records and reports.

If the Engineer is performing QA sampling and testing at the same time the Contractor is performing QC sampling and testing, all associated QC records must include the appropriate production lot identification number that correlates with the Agency's QA production lot identification number.

3. Personnel Requirements. The QC Plan Administrator must have full authority and responsibility to take all actions necessary for the successful implementation of the QC plan, including but not limited to, the following:

A. Monitoring and utilizing QC tests, control charts, and other QC practices to ensure that delivered materials and proportioning meets specification requirements.

B. Monitoring materials shipped to the project, prior to their use, to ensure their continued compatibility toward producing consistent quality.

C. Periodically inspecting all equipment utilized in transporting, proportioning, mixing, placing, consolidating, finishing, and curing to ensure proper operation.

D. Monitoring materials stockpile management, concrete batching, mixing, transporting, placement, consolidation, finishing, and curing to ensure conformance with specification requirements.

E. Maintaining and submitting all QC records and reports.

F. Directing the necessary corrective action to ensure continual conformance within the QC action limits.

G. Suspending production for the project when suspension limits are exceeded.

H. Conducting or monitoring adjustments to the JMF.

Individuals performing QC tests must demonstrate that they are proficient and capable of sampling and testing concrete or aggregate, where applicable, in accordance with the associated test procedures and Agency requirements prior to commencement of related work. Any adjustments to the JMF must be made by a certified concrete technician (Michigan Concrete Association (MCA) Michigan Level II).

4. QC Laboratory Requirements. Laboratories, including field laboratories and all associated testing equipment that prepare concrete mixes or perform QC testing, must demonstrate to the Engineer that they are equipped, staffed, calibrated, and managed so as to be capable of batching, and testing PCC in accordance with the applicable test methods and procedures. Mix designs and their accompanying JMFs must include a statement, signed by a certified concrete technician (MCA Michigan Level II), that all applicable standard test methods have been followed in verifying the mix design and JMF.

5. Mix Design and Documentation. Design concrete mixtures meeting the requirements specified in Table 1. Provide the grade of concrete for the section number reference application specified in Table 1, or as specified in the contract. Request variance in writing when proposing a mix design that exhibits temperature, slump or air content other than those specified. Include the proposed mix design, JMF, and associated trial batch verification test data. Do not use a grade of concrete with a lower specification limit (LSL) 28-day compressive strength greater than what is designated for the application.

Blended cement meeting the requirements of *ASTM C 595 Type IL* is permitted.

Ensure supplemental cementitious materials are from an MDOT Approved Manufacturer. Slag cement must meet the requirements of subsection 901.06 of the Standard Specifications for Construction. Fly ash must meet the requirements of subsection 901.07 of the Standard Specifications for Construction.

Secure prior approval from the Engineer to use concrete intended for early opening to traffic to facilitate driveway gaps or other features necessary for required local access.

Unless otherwise specified in the contract, set accelerating admixtures are prohibited.

Unless otherwise specified in the contract, provide either concrete Grade P1 or Grade D for bridge approach slab applications.

Unless otherwise specified in the contract, do not exceed 40 percent replacement of the Portland cement in the concrete mixture with a supplementary cementitious material. Do not exceed 40 percent total replacement of the Portland cement if more than one supplementary cementitious material is used in the concrete mixture.

Use the combined weight of all cementitious materials to determine compliance with the maximum water-cementitious ratio and cementitious material content requirements specified in Table 1.

For night casting, where applicable, a water-reducing admixture may be used in lieu of a

water-reducing and retarding admixture, provided the concrete can be placed and finished in the sequence specified on the plans prior to initial set, is not subjected to residual vibration, or is not within the areas influenced by dead load deflections as a result of adjacent concrete placement operations. When the maximum air temperature is not forecast to exceed 60 degrees F for the day, the Contractor may use a water-reducing admixture or a water-reducing retarding admixture.

Table 1: Minimum Mix Design Requirements for Concrete

Mix Design Parameter	Grade of Concrete						
	P1M (a,b,e)	P1 (a,b)	D,DM (a,b,e)	T	S1 (a)	S2,S2M (a,b,e)	S3/P2 (a)
Lower Specification Limit (LSL) (28-day compressive, psi)	3500	3500	4500	3500	4000	3500	3000
Rejection Limit for an Individual Strength Sample Test Result	3000	3000	4000	3000	3500	3000	2500
Maximum Water/Cementitious Ratio (lb/lb) (c)	0.45						
Cementitious Material Content (lb/yd3) (d)	470-564	517-611	517-658	517-611	517-611	517-611	489-517
Air Content (percent) (f)	5.5-8.0						
Slump (inch) (max.)	(g)						
Section Number Reference (h)	602, 603	602, 603, 801, 802, 803, 810	706, 711, 712	706, 718	705	401, 706, 712, 713, 718, 801, 802, 803, 810, 819	402, 403, 602, 803, 804, 806, 808, 810, 813, 814

a. If the local average minimum temperature in the next 10 consecutive days is forecast to be below 40 degrees F, submit a revised QC plan, for the Engineer's approval, addressing, in detail, changes in materials, concrete batching and mixing processes, construction methods, curing, and protection of the in situ concrete to ensure that the necessary quality characteristics of the hardened concrete product will not be compromised as a result of the cold weather. The revised QC plan must be approved by the Engineer prior to cold weather concrete placement.

b. Use aggregates from only geologically natural sources for pavement, shoulder, miscellaneous pavement (including ramps), concrete pavement overlay, bridge approach slab, structural concrete, drilled shaft, bridge railing, and bridge sidewalk applications.

c. Use admixtures as listed in the Qualified Products Lists to reduce mixing water. Ensure concrete in concrete diaphragms contains a water-reducing admixture, or a water-reducing retarding admixture.

d. Type III cement is not permitted.

e. For grades of concrete requiring optimized gradation, aggregates must meet the physical requirements specified in subsection 902.03.C of the Standard Specifications for Construction.

f. For action, suspension, and specification limits, see Tables 2 and 3, where applicable. Air content of fresh concrete less than 5.5 percent for concrete that lies in the finished work at least 3 feet below the surface of the ground or entirely under water will not be cause for rejection or air content of fresh concrete pay factor PFac reduction.

g. The maximum slump for Grades P1, P1M, and P2 concrete is 3 inches or as documented on the approved JMF. All other grades of concrete will be according to Table 701-1 of the Standard Specifications for Construction.

h. Section Number Reference:

401 Culverts
402 Storm Sewers
403 Drainage Structures
602 Concrete Pavement
603 Concrete Pavement Restoration
705 Foundation Piling
706 Structural Concrete Construction
711 Bridge Railings
712 Bridge Rehabilitation-Concrete
713 Bridge Rehabilitation-Steel
718 Drilled Shafts
801 Concrete Driveways
802 Concrete Curb, Gutter and Dividers
803 Concrete Sidewalk, Sidewalk Ramps, and Steps
804 Concrete Barriers and Glare Screens
806 Shared Use Paths
808 Fencing
810 Permanent Traffic Signs and Supports
813 Slope Protection
814 Paved Ditches
819 Electrical and Lighting

A. Alkali-Silica Reactivity. Provide documentation to the Engineer that the concrete

mixture does not present the potential for excessive expansion caused by alkali-silica reactivity (ASR). Provide current ASR test results (valid for 2 years from completion of testing), for the fine aggregate that is proposed to be used in the concrete, from an independent testing laboratory proficient in ASR testing. The independent testing laboratory must certify in writing, including a signed statement that all testing was conducted in accordance with the designated standard test procedures, described herein. Test results must conform to the specified criterion for one of the following standard test methods. ASR requirements specified in subsection c.5.A of this special provision are not required for concrete pavement repairs and temporary concrete pavements. Use the Rounding Method described in *ASTM E 29* when determining significant digits for reporting expansion test results.

(1) Method 1. *ASTM C 1260*. Mortar Bar Test. If the expansion of the mortar bars is less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

(2) Method 2. *ASTM C 1293*. Concrete Prism Test.

(a) If the expansion of concrete prisms is not greater than 0.040 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

(b) If the expansion of concrete prisms is greater than 0.040 percent, but not exceeding 0.120 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered moderately deleterious to ASR and mitigation is required, as follows. A low-alkali cement with Na2O equivalent alkalies (Na2O + 0.658 × percent K2O) not exceeding 0.60 percent must be used in the concrete mixture to mitigate the potential for ASR. A supplementary cementitious material may be used in conjunction with the low-alkali cement. The total alkali content for the cementitious materials combination must not exceed 3.0 pounds per cubic yard of Na2O equivalent.

(3) Method 3. *ASTM C 1567*. Mortar Bar Test. If no previous test data are available for the fine aggregate that shows it is resistant to ASR using either Method 1 or 2, above, replace 25 to 40 percent of the Portland cement in the concrete mixture with a supplementary cementitious material. A blended cement meeting the requirements of *ASTM C 595* containing Portland cement and a supplementary cementitious material may also be used.

Demonstrate the ability of the supplementary cementitious material to control the deleterious expansion caused by ASR by molding and testing mortar bars according to the standard test method described in *ASTM C 1567* using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the average of three mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the JMF associated with that combination will be considered non-deleterious to ASR. If the average expansion is 0.10 percent (rounded to the nearest 0.01 percent) or greater,

the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

The Engineer will not approve the use of the JMF if the expansion exceeds the respective threshold limits for the respective ASTM test method used.

B. Contractor Provided Mixes. Provide mix design and accompanying JMFs using the methods of verification included in this special provision. Include sufficient information on constituent materials and admixtures along with trial batch verified physical properties of the fresh concrete, mix proportions per cubic yard for all constituents and compressive strength test results necessary to allow the Engineer to fully evaluate the expected performance of the concrete mixture.

(1) Mix Documentation. Prepare mix designs for each grade of concrete required on the project. Submit JMF for each mix design, including all required documentation, to the Engineer for review 10 working days before the anticipated date of placement. The Engineer will notify the Contractor of any objections within 5 working days of receipt of the mix documentation. Number or otherwise identify each JMF and reference all accompanying documentation to this identification. Reference each JMF to the appropriate method of verification. Mix design and JMF submittals that do not include all required documentation will be considered incomplete and the Engineer will return them without review.

Mix documentation is valid for 2 years.

All mix designs and accompanying JMFs must be traceable to a laboratory meeting the requirements of this special provision.

Submit mix design and JMF on the MDOT Job Mix Formula (JMF) Concrete Field Communication form (MDOT Form Number 1976); include accompanying documentation. List the source of materials, bulk density (unit weight) of coarse aggregate (rodding procedure or shoveling procedure), absorption of aggregates, relative density (specific gravity) of aggregates, aggregate correction factors, batch weights, and project specific or historical laboratory test data. Include the recorded air content of fresh concrete using the same admixture and cementitious material sources to be used in the production of the concrete for the project. A JMF will be approved only if all of the minimum mix design requirements specified in the contract have been met.

(2) Job Mix Formula (JMF). Select proportions for concrete mixtures according to *ACI Standard 211.1*. The volume (oven-dry-rodded) of coarse aggregate per unit volume of concrete must be 65 percent, minimum.

Four methods of verification of proposed JMF are acceptable.

(a) Method 1. Trial Batches. Verification of JMF is based on trial batches with the same materials and proportions proposed for use on the project. Prepare at least one trial batch for each mix design in sufficient time before starting concrete placement to allow for review according to subsection c.5.B.(1) of this special provision. Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of

concrete at the time of strength testing, for a minimum of three independent samples. All samples may be taken from a single trial batch for a mix design provided the trial batch is at least four cubic yards in volume. For JMF trial batch verification purposes only, 7-day compressive strength test results which report at least 70 percent of the specified 28-day lower specification limit (LSL) will be sufficient documentation in lieu of 28-day compressive strengths. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Provide the necessary ASR documentation as described in subsection c.5.A of this special provision.

(b) Method 2. Same Mix. Verification of JMF is based on experience with the same mix design, JMF, and the same materials. Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of three independent samples. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Do not substitute material types or sources, including admixtures or cementitious materials, nor change mix proportions in the JMF. Provide the necessary ASR documentation as described in subsection c.5.A of this special provision.

(c) Method 3. Similar Mix. Verification of JMF is based on requirements described in method 2, above. Substitution of coarse aggregate source is permitted if the new source is of the same geologic type as the original aggregate, and conforms to the specification requirements for the application. Substitution of fine aggregate is permitted only if the new source has been tested for ASR. Provide the necessary ASR documentation as described in subsection c.5.A of this special provision.

Provide the supporting laboratory trial batch documentation and accompanying calculations showing how the mix proportions in the JMF were adjusted, based on the documented differences in relative density (specific gravity), bulk density (unit weight) and absorption of the substituted aggregate sources, to produce a theoretical yield of 100 percent and the required fresh concrete properties.

(d) Method 4. Annual Verification. At the Engineer's option, verification may be accepted annually for a concrete plant rather than on a project basis provided the sources and proportions of the constituent materials, including cementitious materials and source and types admixtures, do not change. If the project is the continuation of work in progress during the previous construction season and written certification is submitted to the Engineer that materials from the same source and with the same mixture properties are to be used, the Engineer may waive the requirement for annual renewal verification of the JMF for the project. Provide the necessary ASR documentation as described in subsection c.5.A of this special provision.

C. Agency Provided Mixes. Unless otherwise specified in the contract or approved by the Engineer, the Engineer will provide the concrete JMF for the following types of concrete regardless of the total quantity for the project.

(1) Structural concrete patching mixtures, mortar and grout.

(2) Bridge deck overlay concrete mixtures.

(3) Project-specific concrete mixtures and grades not defined in Table 1.

Provide all other mix designs and accompanying JMF's according to subsection c.5.B of this special provision.

The ASR documentation for the fine aggregate described in subsection c.5.A of this special provision must accompany the Contractor's request for the concrete JMF.

D. Changes in Materials and Proportions. Any changing from one approved JMF to another for the same grade of concrete must have prior approval by the Engineer.

Prior to batching, verify that the proposed JMF changes will not affect the properties of the fresh concrete (slump, temperature, air content, density (unit weight), workability), nor result in excessive mortar bar expansion as a result of deleterious reactivity between the aggregates and cementitious materials as described in subsection c.5.A of this special provision.

Record all changes to JMF in the QC records along with the rationale for the change.

E. QC Sampling and Testing. Conduct startup sampling and testing for temperature, slump, density (unit weight), and air content on the first load. Do not place concrete until testing verifies that the fresh concrete properties have not exceeded the QC action and suspension limit thresholds specified in Table 2 and the testing correlation requirements of subsection d.1.B of this special provision have been met. Continue testing subsequent loads as described in the QC plan, for each grade of concrete delivered to the work site each day. The QC sampling and testing must be random and independent from the Agencies QA sampling and testing.

Provide the curing facilities in accordance with subsection d.2.C of this special provision prior to start of concrete production.

Perform QC sampling and testing for air content of fresh concrete that is either slipformed or pumped, as follows:

(1) At least once during each week of production.

(2) Whenever the concrete pump is relocated, where applicable.

(3) Whenever there is a significant change in the boom angle of the concrete pump during concrete placement, where applicable.

Sample and test a representative haul unit of concrete immediately after its discharge but before the slipform paver or pump hopper, where applicable. Sample and test the concrete representing the same haul unit, again, after the slipform paver or after discharge from the pump (after vibration), where applicable. If the difference in measured air content between the two test locations for the same concrete is greater than 1.5 percent air by volume of concrete, suspend operations and administer corrective action. Resume concrete placement only after taking the necessary corrective action to

reduce the loss in air content of fresh concrete between the two test locations, as approved by the Engineer. Document the corrective action to be taken in the QC records and make the necessary changes to the QC plan, where applicable.

Concrete exceeding the maximum specification limits for slump or temperature must be rejected regardless of the total mixing time at the time of arrival to the project.

The Engineer may require the Contractor to administer additional QC sampling and testing if the Engineer determines the Contractor's current QC sampling and testing methodology is shown to be insufficient to ensure continual control of the quality of the concrete.

Take the appropriate corrective action, as described in the QC plan, when QC testing shows the QC action limits for any quality characteristic are exceeded. Suspend production if any of the QC suspension limits are exceeded or if the corrective action is not sufficient to restore the quality to acceptable levels.

Resume production only after making all necessary adjustments to bring the mixture into conformance with all applicable specifications and receiving approval to resume work from the Engineer. Document these adjustments in the QC records.

Table 2: QC Action and Suspension Limits

Quality Characteristic	Action Limits	Suspension Limits
Air Content (percent)	See Note Below	< 5.0 or > 8.5
Air Content Loss (percent)	As Defined in the Contractor QC Plan	Greater than 1.5
Conc. Temp. (Deg. F)		< 45 or > 90 at time of placement
Slump (max.) (inch)		See Table 1, footnote (g)
Density (unit weight)		N/A
Note: Action limits must be defined in the Contractor QC Plan and cannot be < 5.5 or > 8.0		

F. Work Progress Test Specimens. Determine the strength of concrete for opening to construction traffic or regular traffic, for removing shoring and forms, or for similar purposes in accordance with subsections 104.11, 601.03.H and 701.03.D of the Standard Specifications for Construction, and as approved by the Engineer. Cure work progress test specimens in the same manner as the in-situ concrete. Allow the Engineer to witness testing of work progress test specimens.

The maturity method may be used to determine the in-place, opening-to-traffic flexural strength, provided the necessary preliminary flexural strength versus time-temperature factor correlation, using the same materials and JMF, is established according to Agency procedures and approved by the Engineer before placing the concrete.

G. Reduced QC for Small Incidental Quantities. If approved by the Engineer, reduced levels of on-site QC testing for concrete may be considered for small incidental quantities defined in subsection a.1 of this special provision.

Unless approved by the Engineer, multiple small incidental quantities, including ones that are consecutively placed throughout the project on the same day, are not eligible for reduced QC consideration if the total plan quantity of concrete for the item exceeds 100 cubic yards in volume. Include details for reduced QC testing and oversight in the approved QC plan, and in accordance with following:

(1) The small incidental quantity of concrete will be limited to a single day's concrete placement of a maximum 20 cubic yards in volume.

(2) The small incidental quantity of concrete is not an integral part of a structural load bearing element.

(3) The Engineer received written certification from the Contractor that the concrete supplier has a current QC plan in place and available for review upon request by the Engineer.

(4) The concrete supplier employs a certified concrete technician (MCA Michigan Level II) available at the plant or on call during concrete placement to validate and authorize modifications to the concrete JMF, as necessary.

(5) Prior to the first concreting operation, concrete representing the JMF for the small incidental quantity has been sampled and tested by a certified concrete technician (MCA Michigan Level I or II) to verify that, historically, the JMF produced a concrete mixture meeting the minimum requirements for density (unit weight), slump, air content, and strength. Annual verification may be acceptable provided there are no changes to the material types or sources, including the cementitious materials and admixtures.

(6) The Engineer verified that the temperature, slump, and air content conform to specification requirements at the start of the day's concreting operation associated with the small incidental quantity.

(7) The Engineer is notified and provided sufficient opportunity to witness concrete placement.

d. Agency Administered Quality Assurance (Acceptance).

1. Agency Quality Assurance Plan (QA plan). The Engineer will be responsible for administering the quality-based acceptance and will institute any actions necessary toward its successful implementation.

Acceptance of concrete pavement repair mixtures and concrete mixtures not included in Table 1 will be in accordance with the contract.

The Engineer will develop and follow a QA plan. The Engineer will provide the QA plan to the QC Plan Administrator a minimum of 5 working days prior to the pre-production meeting. The QA plan will be reviewed at the pre-production meeting and any proposed changes will be documented.

The nominal QA strength test specimen size, defined in subsection a.1 of this special provision will be noted in the QA plan.

A. Personnel Requirements. The personnel responsible for field inspection and for obtaining QA samples will possess the required qualifications to collect QA samples. Sampling will be performed by a certified concrete technician (MCA Michigan Level I or II) or (MCAT) certified aggregate technician, where applicable.

B. Testing Correlation. The testing equipment and associated testing personnel for both the Engineer's QA testing and Contractor's QC testing must be used to conduct side by side correlation testing of the same concrete from the first load to verify correlation of both the Agency's and the Contractor's test results for temperature and air content of fresh concrete. Side by side testing correlation must be conducted whenever there is a change in QC or QA equipment and/or personnel for the project, or as directed by the Engineer. The temperature measuring devices used for QC and QA must correlate relative to each other within 2 degrees F. If the air content results of two tests conducted between the Engineer's and the Contractor's testers differ by more than 0.8 percent air by volume of concrete, an air content test of fresh concrete must be conducted by a third party, designated by the Engineer but independent of the project, prior to commencement of concrete placement in efforts to resolve issues relative to non-correlation.

C. Laboratory Facilities. The testing laboratory with responsibility for acceptance testing on this project is the Agency testing laboratory, or a qualified facility under the authority of the Engineer.

2. QA Sampling and Testing. The Engineer will verify the Contractor's daily startup sampling and testing of temperature, slump, and air content of fresh concrete on the first load; conduct QA sampling and testing; monitor Contractor adherence to the QC plan; and inspect field placed materials in such a manner as to ensure that all concrete for the project is represented. The testing correlation requirements of subsection d.1.B of this special provision must be met prior to concrete placement.

The following *ASTM* test methods will apply. The Agency's established procedures for sampling and testing are acceptable alternatives.

C 31 Practice for Making and Curing Concrete Test Specimens in the Field

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens

C 78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

C 138 Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete

C 143 Test Method for Slump of Hydraulic-Cement Concrete

C 172 Practice for Sampling Freshly Mixed Concrete

C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C 293 Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)

A. Lot Size and Make Up. A production lot will not include more than one grade of concrete, concrete of the same grade having different specified slump or air content, or concrete of the same grade having different mix designs, or JMFs. Lot size and makeup

will be determined by the Engineer, based on site conditions. A production lot may consist of a single day's production, individual concrete structural elements (eg. footing, column, pier cap, deck, bridge approach slab), or any combination thereof, provided they are of the same JMF. Each production lot will be divided into sublots of approximately equal size, as determined by the Engineer. The minimum number of sublots will be one per production lot, with the maximum number of sublots based on the anticipated total quantity of concrete to be placed and site conditions. A minimum of one sublot will be required for each day of production.

B. Sampling. QA sampling and testing will be conducted by the Engineer during concrete placement. Where practical, the random number method (as described in the "Random Sampling for Quality Control/Quality Assurance Projects" section of the Materials Quality Assurance Procedures Manual) will be used to determine the sampling locations. The sampling rate will be determined by the Engineer, based on the anticipated total quantity of concrete to be placed and site conditions, with a minimum of one sampling for each day of production.

At the option of the Engineer, small incidental quantities as defined in subsection a.1 of this special provision may be accepted (visually inspected and noted on the Inspector's Daily Report) without daily 28-day compressive strength QA test specimens provided there is a current acceptable strength test history of the JMF for the project prior to placement of the small incidental quantity. One set of compressive strength QA test specimens will then be molded for each small incidental quantity JMF at least once per week during production, thereafter, as determined by the Engineer (note the test results or identification number for the corresponding weekly QA compressive strength test result on the Inspector's Daily Report for each small incidental quantity). Quality control testing and daily QA testing for temperature, slump, and air content of fresh concrete are still required. Reduced QC for small incidental quantities, as described in subsection c.5.G of this special provision, may be considered.

The QA sampling rate and sample location will be based on cubic yard quantities.

Samples will be taken from the concrete at the location as close to its final placement into the forms or on the grade as practical. If sampling from the discharge of the haul unit, the sample will be taken from approximately the middle one-third of the load.

Samples for acceptance will not be taken at the concrete production facility (batch plant), nor prior to discharge from a concrete pump (excluding tremie seal placement applications). Mix adjustments to the concrete contained within the haul unit selected for QA sampling and testing (beyond normal QC) will not be permitted prior to QA sampling and testing. QA sampling will be random and without prior notification.

C. Testing. The location(s) within the project limits for QA testing of the fresh concrete and placement of curing facilities for initial curing of the 28-day compressive strength QA test cylinders will be determined by the Engineer in conformance with the following criteria:

(1) The elapsed time between obtaining the first and the final portion of the composite sample must not exceed 15 minutes.

(2) Testing for slump, temperature, and air content of fresh concrete must begin within 5 minutes after obtaining the final portion of the composite sample.

(3) Molding of the 28-day compressive strength QA test cylinders must begin within 15 minutes after obtaining the final portion of the composite sample.

(4) The concrete sample must be protected from the sun, wind, and other sources of rapid evaporation, and from contamination.

Two QA concrete strength test specimens per sample will be molded for 28-day compressive strength QA testing.

The Contractor will provide curing facilities equipped to ensure the proper environment for the Agencies QA concrete strength test specimens during initial cure. Each initial cure facility must provide ventilation or insulation, where applicable, to ensure the ambient temperature surrounding the specimens is maintained according to *AASHTO T 23/ASTM C 31*. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for rejection of samples or claims against the Agency. Each initial curing facility must be capable of being locked, using an Agency provided padlock. The Contractor will ensure that all initial curing facilities are accounted for at all time, and protected against theft and damage. The Contractor will place and secure each initial cure facility throughout the project limits in such a manner so as to minimize excessive transport of the test specimens prior to initial cure, as follows:

(5) Immediately after finishing molded specimens, the Engineer will move the QA concrete strength test specimens to the closest initial cure facility provided by the Contractor.

(6) Immediately after all QA concrete strength test specimens are placed into the cure facility and the proper initial curing conditions have been established, the Engineer will secure the facility using the Agency provided padlock. Access to the QA concrete strength test specimens, thereafter, must be coordinated with the Engineer and will only be permitted in the presence of the Engineer.

(7) The Engineer will transport the QA concrete strength test specimens within 48 hours after molding, but not prior to 8 hours after final set of the concrete, from the initial curing facility to the Agency's designated testing laboratory for final curing and strength testing. The specimens will be protected with a suitable cushioning material to prevent damage from jarring during transport. The total transportation time must not exceed 4 hours prior to commencement of final curing.

D. QA Stop Production Criteria. The Engineer will issue a Notice of Non-Compliance with Contract Requirements (Form 1165) and concrete production must stop when one or more of the following are observed.

(1) The QA testing shows that one or more of the suspension limits for quality characteristics defined in Table 2 are in non-compliance.

(2) The QC plan is not being followed.

(3) Segregation, excessive slumping of unsupported slipformed edges, or other notable changes in the fresh concrete properties is observed that may prevent proper placement, consolidation and finishing, or compromise the performance or long-term

durability of the finished product.

(4) The required curing system is not being applied in a timely manner, as specified by the contract.

(5) If the measured air content loss between the two testing locations for the same concrete is greater than 1.5 percent air by volume of concrete as described in subsection c.5.E of this special provision.

The Engineer will issue a Notice to Resume Work (Form 1165) only after all necessary adjustments are made to restore conformance with all applicable specifications, and the appropriate documentation is made in the QC records.

E. QA Records. The Engineer will maintain a complete record of all QA tests and inspections. The records will contain, as a minimum, signed originals of all QA test results and raw data, random numbers used (where applicable) and resulting calculations. The QA test results will not be provided to the Contractor until the corresponding QC test results are received by the Engineer.

3. Quality Index Analysis. The Engineer's QA test results will be used to determine the pay factor (PF) and price adjustment (ADJ). The Contractor's QC test results will not be used for pay factor and price adjustment analysis. The Engineer will complete pay factor and price adjustment analysis within 7 working days after completion of all 28-day compressive strength testing for the representative production lot or quantity of concrete. The quality index parameter specification limits are defined in Table 3. Unless otherwise specified in the contract, concrete not conforming to the requirements specified in Table 3 is rejectable and subject to further evaluation. All values of PF and OLPF in these formulae are decimal, not percent. All values of PF and OLPF are rounded to two decimal places.

Price adjustment will not be applied to small incidental quantities provided the concrete is of acceptable quality and all other provisions are met for the contract item. Price adjustment for 28-day compressive strength deficiencies will be based on test results for the corresponding weekly QA test specimens and the pay factor (PFs) calculated according to the formula defined in subsection d.3.A. The price adjustment (ADJ) = (PFs – 1)(Price).

Table 3: Quality Index Parameter Specification Limits

Quality Characteristic	Specification Limits
Air Content of Fresh Concrete (percent)	5.5 – 8.0
Rejection Limit (percent)	<5.0 or >8.5
Conc. Temp. (deg. F)	45 - 90 at time of placement
Slump (max.) (inch)	See Table 1, footnote (g)
28-day Compressive Strength (psi)	For LSL see Table 1
Rejection Limit - 28-day Compressive Strength	See Table 1

A. Pay Factor for 28-Day Compressive Strength (PFs).

$$PFs = \frac{\text{Tested Strength}}{\text{LSL}}$$

Where:

PFs = Pay Factor for 28-day compressive strength (not to exceed 1.00)

Tested Strength = QA 28-day compressive strength sample test result

LSL = Lower specification limit (see Table 1)

If the tested strength does not meet the rejection limit specified in Table 1, the Engineer will require additional evaluation as described in subsection d.4 of this special provision.

B. Pay Factor for Air Content of Fresh Concrete (PFac). The pay factor for air content of fresh concrete (PFac) will be according to Table 4.

Table 4: Air Content of Fresh Concrete Pay Factor (PFac)

Air Content of Fresh Concrete (percent)	Pay Factor (PFac)
5.5 – 8.0	1.00
5.0 – 5.4	0.50
Below 5.0	Rejection
8.1 – 8.5	0.75
Above 8.5	Rejection

If the air content of fresh concrete is below 5.0 or above 8.5 percent, the Engineer will elect to do one of the following.

(1) Require removal and replacement of the entire quantity of concrete represented by the test with new testing conducted on the replacement concrete and repeat the evaluation procedure.

(2) Allow submittal of a corrective action plan for the Engineer's approval. If the Engineer does not approve the plan for corrective action, subsection d.3.B.(1) of this special provision will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

C. Overall Lot Pay Factor (OLPF). The following formulae are used to calculate the OLPF and ADJ. The OLPF will not exceed 1.00.

$$OLPF = (0.60 \times PFs) + (0.40 \times PFac)$$

$$ADJ = (OLPF - 1)(Price)$$

ADJ = Price adjustment per pay unit to be applied to the quantity represented by the QA test

Price = Base price established for the pay item

4. Evaluation of Rejectable Concrete. The Engineer will require additional evaluation to decide what further action may be warranted, as described below. Acceptance for air content of fresh concrete will be based on QA test results reported at the time of concrete placement.

If the Engineer determines that non-destructive testing (NDT) is appropriate, this work will be done by the Contractor in the presence of the Engineer within 45 calendar days from concrete placement. All costs associated with this work will be borne by the Contractor. A complete set of non-destructive tests must be conducted (in accordance with the respective standard test method) at a minimum three randomly selected locations. If NDT is used to estimate the in-situ strength, a calibrated relationship between the project JMF under evaluation and the NDT apparatus must have been established prior to NDT testing according to its respective standard test method.

If the 28-day compressive strength QA test results show that the rejection limit (as specified in Table 1) has not been achieved, the quantity of concrete under evaluation will be rejected and the Engineer will require additional evaluation to decide what further action may be warranted.

Propose an evaluation plan and submit it to the Engineer for approval before proceeding. The results from NDT will be used only to decide what further action is required. This determination will be made by the Engineer, as follows:

A. For non-structural concrete. If no test result from non-destructive testing falls below the lower specification (LSL) 28-day compressive strength, the represented quantity of concrete under evaluation will remain in place and a pay factor for 28-day compressive strength (PFs) of 1.00 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations according to subsection d.3 of this special provision.

B. For structural concrete (including overhead sign foundations). If no test result from non-destructive testing falls below the lower specification limit 28-day compressive strength, the represented quantity of concrete under evaluation will remain in place and a pay factor for 28-day compressive strength (PFs) of 0.85 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations according to subsection d.3 of this special provision.

C. If one or more of the non-destructive test results fall below the lower specification limit (LSL) 28-day compressive strength, the Engineer may elect to do one of the following:

(1) Require removal and replacement of the entire rejected quantity of concrete, including new initial tests for pay factor (PF) determination and price adjustment conducted according to subsection d.3 of this special provision.

(2) Allow the Contractor to submit a plan for corrective action, for the Engineer's approval, to address the disposition of the rejected concrete. If the Engineer does not approve the plan for corrective action, subsection d.4.C.(1) of this special provision will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

(3) Allow the in-situ quantity of concrete under evaluation to remain in place and a pay factor (PFs) of 0.50 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations according to subsection d.3 of this special provision.

e. Measurement and Payment. If a price adjustment is made for reasons included in this special provision, that adjustment will be made using the base price established for the specific item. If a contract unit price requires adjustment for other reasons not described in this special provision, the adjustments will be made using the unit price and the adjustments will be cumulative.

Separate payment will not be made for providing, implementing, and maintaining an effective QC program. All costs associated with this work will be included in the applicable unit prices for the concrete items. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for claim against the Agency.

All costs associated with providing, locating, relocating, maintaining, and securing the adequate number of portable initial curing facilities for both the QC and QA strength test specimens will be included in the applicable unit prices for the concrete items. No additional payment will be permitted. The Contractor is responsible for damage, theft, subsequent replacement, and removal after completion of the work for each curing facility used on the project.

SPECIAL PROVISION
FOR
CURBS AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement for integral curbs and gutters
2. Furnish all materials, including dowels, tie bars and joint materials; and furnish all equipment, tools, labor and work incidental to placing, curing, and protection of the concrete; and construct curbs and gutters complete.

B. Pay Items

1. Concrete pay items, both critical and non-critical as defined by MDOT, are subject to Quality Control testing by the Owner, unless otherwise noted.
2. No concrete pay items are eligible for or subject to positive pay adjustments. All concrete pay items are subject to negative pay adjustments, in accordance with Table 1 and Table 2.

Table 1: Concrete Thickness

Amount Less Than Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
more than 1/4", but not exceeding 1/2" (56 mm to 10 mm)	20
more than 1/2", but not exceeding 1" (03 mm to 25 mm)	50
more than 1" (greater than 25 mm)	Remove and replace

Table 2: Concrete Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
more than 500 psi (greater than 3.5 MPa)	Remove and replace

3. Reductions in the unit price are additive, that is, if an area of concrete is deficient by 3/8 inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% for a total reduction of 40%.
4. The deficient area of concrete identified by a core shall be confirmed by drilling and testing two additional cores, one on each side of the deficient core and 20 feet (6 m) from it, when possible. This extra core drilling and testing shall be at the Contractor's expense.

1.2 RELATED SECTIONS

A. Specification for Joint Sealers

B. Section 31 2200 – Site Grading

C. Section 31 2323 – Fill and Backfill

D. Section 32 1123 – Aggregate Base Course

E. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM International:

1. C 31 Practice for Making and Curing Concrete Test Specimens in the Field
2. C 33 Specification for Concrete Aggregates
3. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. C 94 Specification for Ready-Mixed Concrete
5. C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
6. C 114 Chemical Analysis of Hydraulic Cement

7. C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
8. C 143 Test Method for Slump of Hydraulic-Cement Concrete
9. C 150 Specification for Portland Cement
10. C 172 Method of Sampling Freshly Mixed Concrete
11. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
12. C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13. C 260 Specification for Air-Entraining Admixtures for Concrete
14. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. C 311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
16. C 457 Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
17. C 494 Specification for Chemical Admixtures for Concrete
18. C 595 Specification for Blended Hydraulic Cements
19. C 618 Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete
20. C 685 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
21. C 823 Practice for Examination and Sampling of Hardened Concrete in Construction
22. C 856 Practice for Petrographic Examination of Hardened Concrete
23. C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
24. C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
25. C 1157 Performance Specification for Hydraulic Cement
26. C 1222 Practice for Evaluation of Laboratories Testing Hydraulic Cement
27. C 1240 Specification for Silica Fume Used in Cementitious Mixtures
28. C 1260 Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
29. C 1293 Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
30. C 1567 Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Test)
31. D 98 Specification for Calcium Chloride
32. D 994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
33. D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
34. D 5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
35. D 6690 Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements

B. Michigan Department of Transportation (MDOT): Standard Specifications for Construction

C. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International
2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International
4. ACI 305R – Hot Weather Concreting
5. ACI 306R-88 – Cold Weather Concreting

D. Metric Conversions:

Inch-pound unit	Factor	SI unit
in.	x 25.4	= mm
lb/yd^3	x 0.5933	= Kg/m^3
psi	x 0.006895	= MPa
temperature, °F	(°F - 32)/1.8	= °C

1.4 SUBMITTALS

A. Provide the following information in initial submittals: Whenever material sources or relevant properties of the materials change, provide a re-submittal of the relevant information, demonstrating compliance with the applicable provisions.

1. List of sources for materials.
2. Material certifications for each material.
3. Product data for curing compound, including installation instructions, joint filler, and admixtures.
4. Proposed concrete mix design in accordance with ACI 301.
5. Contractor’s quality control plan.

B. Submit the concrete mix design to the Engineer one week prior to placing concrete. Develop proportions for normal weight concrete mixtures in accordance with ACI 211 to meet the requirements of ACI 201. Include the following information for each concrete mix design:

1. Grading of fine and coarse aggregates
2. Proportions of all ingredients including admixtures added either at the time of batching or at the job site.
3. Water/cement ratio
4. Slump
5. Air content of freshly mixed concrete by the pressure method

6. Unit weight of concrete
7. Strength at 7 and 28 days
8. Chloride content
9. Total alkali content of the cementitious materials
10. Test results, not more than 1 year old that verify the selected materials and relative proportions are adequate to mitigate the risk of alkali-silica reactivity, as required by Article 2.2 G.

C. Laboratory Qualifications: For each laboratory that supplies test reports or data required by this specification, provide evidence that the laboratory is properly equipped and qualified, in accordance with ASTM C 1077 and C 1222, to perform the tests method(s) on which they are reporting.

D. Samples: Submit representative samples of the following products and materials:

1. Fine aggregate
2. Coarse aggregate
3. Expansion joint filler
4. Contraction joint filler
5. Hot-poured joint sealant
6. Backer rod

E. If work will be performed during cold weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

F. If work will be performed during hot weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Provide Owner’s quality control testing agency with access to stockpiles, quarries, bulk storage bins, ready-mix facility, etc. for the purpose of obtaining samples of materials used in the concrete mix.

1. Furnish labor to assist testing agency in obtaining and handling samples at the job site.
2. Advise testing agency in advance (minimum of 48 hours) of operations to allow for the assignment of testing personnel and testing.
3. Provide and maintain adequate facilities for the use of the testing agency for proper

curing of concrete test specimens on the project site in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C31.

C. Materials and operations will be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.

D. The following testing services will be performed by a testing agency, designated and compensated by the Owner:

1. For each mix design, make one strength test for each 150 cubic yards or fraction thereof of concrete placed in any one day.
2. Secure composite samples in accordance with "Standard Method of Sampling Freshly Mixed Concrete", ASTM C 172.
3. For each required strength test, mold and cure six specimens in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field", ASTM C 31.
4. Test specimens in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C 39. Two specimens will be tested at 28 days for acceptance, one tested at 3 and 7 days for information and two retained as spares.
5. For each strength test, determine slump of concrete sample in accordance with "Standard Test Method for Slump of Portland Cement Concrete", ASTM C 143.
6. For each strength test, determine total air content of concrete sample in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM D 231.
7. For each strength test, determine temperature, unit weight, yield and air content (gravimetric) of concrete sample in compliance with ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete".

E. If test results indicate deficient compressive strength, a negative pay adjustment in the unit price of concrete pavement shall be made in accordance with Article 1.1 B.

F. Delivered concrete may be rejected at the job site prior to placement due to any of the following:

1. Concrete fails to conform to submitted and approved concrete mix design.
2. Failure of concrete samples obtained from the first or middle portion of the delivered concrete load to meet required concrete qualities outlined in Article 2.2.
3. Placement of the delivered concrete load did not begin within 45 minutes from ready-mix concrete plant batch time.
4. More than 90 minutes have elapsed between ready-mix concrete plant batch time and concrete placement.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Cold Weather Concreting: Comply with ACI 306R and the following:
   a. Do not use admixtures or accelerators unless approved in advance by the Engineer.
   b. Protect the subgrade from freezing by a layer of 12 inches to 24 inches of hay, straw, or insulating blankets covered with waterproof canvas or sheeting.
   c. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
   d. Concrete Temperature As-Mixed: Provide as-mixed concrete temperature that is not less than the following, depending upon the ambient temperature:
      i 60 degrees F when the ambient temperature is above 30 degrees F;
      ii 65 degrees F when the ambient temperature is between 0 and 30 degrees F;
      iii 70 degrees F when the ambient temperature is below 0 degrees F.
   e. Placement: Do not place concrete that is less than 60 degrees F nor more than 90 degrees F.
   f. Protection: Unless otherwise specified, maintain the minimum temperature of concrete at 60 degrees F. Temperatures specified to be maintained during the protection period are those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of +/- 2 degrees F. Measure the temperature of concrete in each placement at regular time intervals.
   g. Protection against freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the minimum specified surface temperature of the concrete during that period.
   h. The protection period may be reduced to 2 days if one or more of the following is used to alter the concrete mixture and is approved by the Engineer:
      i. Type III portland cement, meeting the requirements of ASTM C 150, is substituted for the Type I portland cement.
      ii. A strength accelerating admixture, meeting the requirements of ASTM C 494, is added.
   i. After Termination of Protection: Do not permit the surface temperature of the concrete to decrease in temperature more than 50 degrees F in a 24 hours period.
   j. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

k. Protection Deficiency: If the temperature requirements during the specified protection period are not met, but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below 60 degrees F.

l. Curing of Concrete: Prevent concrete from drying during the required curing period.

2. Hot Weather Concreting: Comply with ACI 305R and the following:

a. Provide temperature of concrete, (as placed), that is not so high as to cause difficulty from loss of slump, flash set, or cold joints, and does not exceed 90 degrees F. When the temperature of concrete exceeds 90 degrees F, undertake precautionary measures approved by the Engineer. When the temperature of steel forms is greater than 120 degrees F, spray the forms with water just prior to placing concrete.

b. Cool concrete ingredients before mixing. Flake ice, or well-crushed ice of size that will melt completely during mixing, may be substituted for all or part of the mixing water if low slump, flash set or cold joints are encountered due to high temperature.

B. Protection against Rain

1. Protect new concrete from the effects of rain until the concrete has sufficiently hardened.
2. Use burlap or 6-mil polyethylene to cover and protect one day's work.
3. After rain has stopped, remove the covering and burlap-drag the surface. Apply curing compound where the previously-applied compound has been disturbed or washed away.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregates: Conform to the requirements of ASTM C 33, MDOT 902.09, and this specification.

1. Fine Aggregates:

a. Clean, hard, durable, uncoated particles of natural sand, free from lumps of clay, soft or flaky material and, at the time of use, free from crusts of hard or frozen material.

b. Natural Sand 2NS consisting of fine granular material resulting from the natural disintegration of rock; free from organic impurities (when measured by subjecting to the sodium hydroxide colorimetric test, produced color shall not be darker than light brown).

c. The following gradation represents the extreme limits of suitability for use from all sources of supply (MDOT "2NS", Table 902-4):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
Loss by Washing (No. 200)*	0-3

* Michigan Test Method, MTM 108

d. Provide fine aggregate with reasonably uniform gradation from any one source and not exhibiting the extreme percentage of gradation specified above. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 more than or less than the fineness modulus of the representative sample will be rejected.

2. Coarse Aggregate:

a. Hard, strong, durable, pebbles, crushed natural stone, free from adherent coatings, clay lumps, coal and lignite and other foreign matters. Chert (excluding sound gravels) or other nondurable particles shall not exceed 3% by weight.

b. Coarse aggregate derived from crushed concrete is not permitted.

c. Uniformly graded within the following limits (MDOT "17A", Table 902-1):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
1 in	100
3/4 in	90-100
1/2 in	50-75
No. 4	0-8
Loss by Washing (No. 200)*	1.0 Max**

* Michigan Test Method, MTM 108

** Loss by washing of 2.0 percent for material produced entirely by crushing rock, boulders, cobbles or concrete.

B. Cementitious Materials

1. Portland cement, ASTM C150, Type I , Type II, or Type III
2. Slag cement, MDOT 901.06 and ASTM C 989 Grade 100 or Grade 120
3. Fly ash, MDOT 901.07 and ASTM C 618, Class F
4. Blended hydraulic cement, ASTM C 595 or ASTM C 1157
5. Silica fume, MDOT 901.08 and ASTM C1240

C. Water: MDOT 911; Clean, potable, low-alkali content (maximum 80 parts per million), and free amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or metal in the concrete.

D. Admixtures: Conform to the following:

1. Air Entrainment: MDOT 903.01 and ASTM C 260
2. Water Reducing: MDOT 903.02 and ASTM C 494, Type A.
3. Accelerators: MDOT 903.04 and ASTM C 494, Type C
4. Calcium Chloride: Not permitted

E. Curing Materials:

1. White pigmented, impervious membrane curing compound: MDOT 903.06A and ASTM C 309, Type 2, Class B Vehicle, with the following additions:
   a. Base tests for moisture retention, reflectance, and drying time on curing compound application rate of 200 square feet per gallon (5 square meters per liter).
   b. Allow three weeks from the time of sampling before reporting results.
   c. Store the compound in clean containers.
2. Insulating Blankets: MDOT 903.07C and Federal Specifications HH-1-521e, minimum 2 inches thick, minimum R-Value of 7.0 ($^{\circ}F*hr*ft^2/Btu$) per inch, and enveloping membranes.

F. Joint Materials:
1. Expansion joints: Premolded, non-extruding bituminous fiber conforming to MDOT 914.03 and ASTM D 1751 (AASHTO M 59).
2. Contraction or Weakened Plane Joints: Premolded filler conforming to ASTM D 994 (AASHTO M 33).
3. Hot-Poured Joint Sealant: ASTM D 6690 with exceptions specified in MDOT Section 914.04.A.
4. Backer Rod for Use With Hot-Poured Joint Sealant: Solid, round, heat resistant, closed-cell, cross-linked polyethylene foam rod conforming to MDOT 914.04B and ASTM D 5249, Type I.

G. Reinforcement: Reinforcement as stipulated in the Engineering Drawings.

H. Smooth Dowel Bars for Transverse Expansion and Contraction Joints: MDOT 914.07.

I. Devices for Transverse End-of-Pour Joints: MDOT 914.08.

2.2 CONCRETE MIX:

A. Mix concrete in accordance with ASTM C 94.

B. Proportion concrete by weighing and in conformance to the following table, unless otherwise directed by the Engineer:

1. Compressive Strength: 4,000 psi at 28 days
2. Maximum water/cementitious ratio: 0.45
3. Air content: 6.5% plus or minus 1.5%
4. Slump: 3 inches plus or minus 1 inch, unless slip form construction is used in which case slump can be 1 inch plus or minus 2 inches
5. Minimum Cement Content: 564 lb/cy
6. Maximum size of aggregate: 3/4 inch
7. Maximum water-soluble chloride ion content in hardened concrete of 0.15 percent by weight of concrete.

C. Add air entrainment agent to produce a total air content of 6.5% +/- 1.5% at the point of placement and an air void system with the following characteristics when evaluated in accordance with ASTM C 457:

1. Spacing factor less than 0.008 inch
2. Specific surface: at least 600 square inch per cubic inch of air void volume.
3. Voids per linear inch at least 1-1/2 to 2 times greater than the air content percentage.

D. Provide slump not more than 4 inches or less than 2 inches, when tested in accordance with ASTM C 143, unless otherwise directed by the Engineer, and except for hand placement. Slump not more than 4 inches for concrete that is hand-placed.

E. Add mixing water at the batch plant only. Do not add water at the job site unless authorized by the Engineer. When authorized to add water at the job site, do not add water more than one time. Adding water and the result on concrete is the responsibility of the Contractor.

F. Slag cement, fly ash, silica fume, and/or blended cement may be used as a partial replacement for Portland cement provided that testing confirms that the as-designed mixture, using the specific materials and sources contemplated for the project, complies with the requirements of this Article 2.2, including the requirement for adequate mitigation of risk of alkali-silica reactivity.
1. The maximum permitted replacement of Portland cement with slag cement is 40% by weight of the total cementitious material (portland cement plus slag cement). Slag must not be from open hearth furnace.
2. The maximum permitted replacement of Portland cement with fly ash is 25% by weight of the total cementitious material (portland cement plus fly ash)

3. The maximum permitted replacement of Portland cement with supplementary cementitious materials is 40% by weight of the total cementitious material.
4. The total alkali content of the cementitious materials shall not exceed 3.5 pounds per cubic yard, when evaluated in accordance with ASTM C 114 and ASTM C 311.

G. Perform preconstruction testing to verify that the proposed combination of aggregates and cementitious materials will be adequate to mitigate the risk of alkali-silica reactivity (ASR).

1. Evaluate fine and coarse aggregate by a minimum of two tests each in accordance with ASTM C 1260.
   a. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion less than 0.10% at 16 days will be considered acceptable and no further testing for ASR mitigation will be required.
   b. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion equal to or greater than 0.10% at 16 days will be considered potentially reactive and unacceptable.
2. If the aggregate is reactive, evaluate the effectiveness of the proposed pozzolans and ground granulated blast-furnace slag to control deleterious ASR by conducting a minimum of two tests in accordance with ASTM C 1567.
   a. If the ASTM C 1567 mean mortar bar expansion is less than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered acceptable and no further testing for ASR mitigation will be required.
   b. If the ASTM C 1567 mean mortar bar expansion is equal to or greater than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered indicative of potentially deleterious expansion and unacceptable.
   c. Acceptable test results in accordance with ASTM C 1567 will be accepted in lieu of testing in accordance with ASTM C 1260.

2.3 EQUIPMENT

A. Finishing Machine: Power driven extruder an approved type that will strike-off and compact the concrete with a screening and troweling action.

B. Forms: Metal, of an approved section that will ensure their rigidity under the impact, thrust, and weight of the heaviest machine carried on them.

1. Minimum length of 10 feet and a depth not less than the edge thickness of the work prescribed; width of the base in direct bearing on the soil not less than 8 inches; at least three stake pockets for each 10 foot section of form.
2. Straight, free from distortion and showing no vertical variation greater than 1/8-inch in 10-foot lengths from the true plan surface on the top of the form when tested with a 10-foot straight edge.
3. Connect form sections with a locked joint that is free from vertical movement in excess of 1/8-inch and free from horizontal movement in excess of one-quarter of an inch under the impact, thrust and weight of the heaviest machine carried on forms.

4. Provide sufficient forms so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

C. Water Supply: Provide pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, curing, sprinkling, subgrade and all other requirements of the work. Water may be supplied in approved tank wagons.

PART 3 - EXECUTION

3.1 PREPARATION

A. Smooth, trim and compact the subgrade to the required line, grade and cross-section. Thoroughly compact the subgrade, between lines at least 12 inches outside of each edge of the proposed curb and gutter, by rolling with approved compaction equipment.

B. Ensure that the subgrade is moist at the time of placing concrete. If the subgrade becomes dry before the concrete is placed, sprinkle the subgrade with water using a method of sprinkling that does not permit pools of water to form on the subgrade. Do not place the concrete on muddy, soft or frozen subgrade.

C. Restore and thoroughly compact rutting and other displacement caused by material hauling equipment or by the concrete placement equipment, for a distance of at least 100 feet ahead of the placement equipment. Maintain the remainder of the prepared subgrade in its compacted state and true to the required grade and cross-section.

D. Place the concrete forms in advance of placing concrete. Substantially bring the foundation on which the forms are to be placed to the proper grade. Do not place forms on dikes or mounds. Where feasible, bring the subgrade to the approximate required cross-section by means of a subgrade machine.

E. Check forms for line and grade in advance of placing concrete. Adequately stake and brace forms to resist the pressure of the concrete and the thrust of any equipment traveling on them. Provide uniform bearing on the subgrade throughout the forms' entire length and width. Finish the entire width of the subgrade and thoroughly compact it for a sufficient distance outside the area required for the curb and gutterin order to adequately support the forms. Place forms in direct contact with the subgrade. After the forms have been set to grade, thoroughly compacted, both inside and outside, by use of an approved mechanical form tamper. Joint all forms neatly and tightly, securely stake by at least three stakes per form, and thoroughly clean and oil forms before concrete is placed against them.

F. After the forms are set in place, check their top surface for grade and trueness with a straight edge not less than 10 feet long. Reset or move any forms showing a variance greater than 1/8 inch in 10 feet.

G. Coat the surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.2 CONSTRUCTION

A. Except as modified herein, comply with MDOT (2012)

Sections 601.03 and 602.03 and ACI 304R.

B. Mixing

1. On the project site, mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
2. Transit mixers: Comply with ASTM C 94

C. Placing Concrete:

1. Do not proceed with concrete placement until the conditions of the subgrade/subbase are approved by the Engineer.
2. Distribute or spread the concrete as soon as placed. Deposit concrete on the sub-grade so as to require as little handling as possible and to avoid segregation and separation of the materials. Distribute concrete to such depth and sufficiently above grade so that when consolidated and finished, the surface conforms to the required finished grade. Consolidate the concrete along the faces of the forms and adjacent to joints. Consolidate concrete with an approved vibrator to fill all voids and finish to ensure a dense smooth surface.
3. Deposit and spread concrete continuously, as far as possible between transverse joints. In the case of a temporary shutdown, cover the concrete at the unfinished end of the slab with wet burlap. In the event of an unavoidable interruption of the work continuing more than 30 minutes, place a construction joint, provided the section is 10 feet or more in length between joints. Remove sections less than 10 feet in length at no expense to Owner.

D. Tie Bars, Dowels and J-Bolts: Place tie bars and dowels at the required depth parallel to the finished surface, perpendicular to the joints and at the uniform spacing shown on the Drawings. Use approved chairs or dowel baskets to support the tie bars or dowels in place, or use approved mechanical devices; do not place tie bars or dowels by hand methods.

E. Joints:

1. Construct all joints with faces perpendicular to the surface of the pavement. Construct transverse joints at right angles to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit transverse joints to vary more than 1/4 inch from a true line. Construct longitudinal joints along or parallel to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit longitudinal joints to vary more than one-quarter (1/4") inch from their true designated positions.
2. Finish the pavement surface adjacent to all joints to a true surface. Where indicated on the Drawings, edge the surface adjacent to joints to the radius shown. Test the surface across the joints with a 10-foot straight edge as the joints are finished, and correct irregularities before the concrete has hardened.
3. Transverse Joints: Contraction joints, expansion joints or construction joints.
4. Contraction Joints: Transverse contraction joints are without tie bars. Locate transverse contraction joints at 24 to 30 times the pavement thickness, except do not exceed a maximum spacing of 15 feet. Provide tie bars in longitudinal contraction joints. Form contraction joints by saw cutting to a depth of 1/3 of the concrete thickness. Perform additional saw cutting to form 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the contraction joint. Where curb and gutter under construction is adjacent to an existing pavement, construct contraction joints in line with similar joints in the abutting pavement.
5. Expansion Joints: One-half (1/2") thick and placed every 60 feet on center, unless shown otherwise in the Drawings. Where the curb and gutter under construction is adjacent to an existing pavement, construct expansion joints in line with the expansion joints in the abutting pavement.
    a. Provide expansion joints at right angles to the centerline, perpendicular to the surface of the finished pavement and extended entirely through the concrete.
    b. Provide smooth dowels, of length and size shown on the Drawings, with expansion cap on one end. Embed dowels a minimum on each side of the expansion joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in expansion joints as shown on the Drawings.
    c. During installation, maintain the joint filler in place by an approved installing device that is securely staked. Maintain the top of the joint filler at not less than l/2 inch or more than 3/4 inch below the finished surface. Cover the top of the joint filler with an approved metal cap before the concrete is placed. Shape the metal cap to the finished elevation of the curb and gutter. Provide a metal cap that will not warp or twist out of shape. Keep the cap in place during finishing machine operations.
    d. Place concrete simultaneously against the dowels and joint filler to a depth approximately equal to the depth of the finished pavement. Thoroughly consolidate concrete with vibration tools. Carefully remove the installing device so that the joint filler and caps are not disturbed.
6. Construction Joints: Form construction joints with dowels whenever an unavoidable interruption of the work constituting a shutdown of more than 30 minutes has oc-

curred, or when directed by the Engineer. Strike the concrete and finish to the bulkhead.

a. Saw cut to form minimum 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the construction joint, or as shown on the Drawings.
b. Provide dowels, of length and size shown on the Drawings, in construction joints. Embed dowels on each side of the joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in construction joints as shown on the Drawings.

7. Clean the sealant reservoirs of all extraneous matter. Ensure that the contact faces of the joints are dry at the time of filling and sealing. Compressed air jets, wire brushes and such additional equipment as may be necessary to clean the openings and dry the contact faces of the joints will be required.
8. Fill the top of contraction joints, construction joints, and expansion joints and seal with hot, poured sealant before any traffic is permitted on the curb and gutter. Install joint sealant by hand pouring pots, mechanical methods, or any other method that will give satisfactory results. Place sufficient sealant into the joints so that, upon completion of the work, the surface of the sealant will be flush with the surface of the pavement. Do not spill the sealant on exposed surfaces of the concrete. Immediately remove excess sealant on the surface of the concrete pavements. If the sealant subsides to a level below the surface of the slab, place a second application of sealant. When more than one application is required to fill the joint, perform succeeding applications immediately after shrinkage of the previous sealant application has taken place.
   a. Do not place sealant when the air temperature in the shade is less than 50 degrees F, except with the approval of the Engineer.
   b. Do not permit traffic over the sealed joints until the sealant has hardened sufficiently to resist pickup.

F. Finishing:

1. After the placement of the concrete, test surface with straight edge and finish with burlap drag, and perform final finishing on slabs at catch basins with broom.

G. Surface Requirements: On the day following placement of the concrete, the pavement will be straight edged by the Engineer. A 10-foot straight edge will be placed parallel to the centerline so as to bridge any depressions and touch high spots. High spots indicated by a variation exceeding 1/8 inch from the straight edge will be plainly marked. Remove high spots or reduce by rubbing with a carborundum brick and water. If these methods are inadequate to remove the high spots, use an approved surface-grinding machine.

H. Removal of Forms:

1. Do not remove forms from freshly placed concrete until it has set for at least 12 hours. Carefully remove forms so that no damage is done to the edge of the pavement.
2. After the forms have been removed, clean the ends of joints and point honeycombed areas.

3. Cover the sides of the pavement with curing material except where honeycombed areas are to be pointed. Cover areas to be pointed with wet burlap until the pointing is complete, and then cure as specified in Article 3.2 I.

I. Curing:

1. Immediately after finishing operations have been completed and free water has left the surface, completely coat and seal the surface of the curb and gutter with a uniform layer of curing compound. Apply the compound in one or two applications, as required by manufacturer instructions. When the compound is applied in two increments, follow the first application with the second application within 30 minutes.
2. Thoroughly agitate the compound to a uniform consistency, with the pigment uniformly suspended, before transferring the compound between containers and before use.
3. Apply the compound in a continuous uniform film by means of mechanical pressure sprayer equipment at the rate stipulated by the compound manufacturer but not less than one gallon per 200 square feet of surface. Use equipment that provides adequate stirring of the compound during application. Hand spray equipment will be permitted for application of the curing compound over the sides of the slab.
4. Provide uniformly painted, solid white surface after application of curing compound. If appearance is blotchy and non-uniform, apply another layer of curing compound.
5. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, apply a new coat of material to the affected areas equal to that originally applied.
6. Protect the treated surface from injury for a minimum period of seven days. All traffic will be considered injurious to the film of applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided that any damage to the film is immediately repaired by the application of another coat of the compound.
7. Provide sufficient burlap, cotton, or polyethylene sheet coverings to protect the pavement in case of rain or breakdown of the spray equipment. If any hair checking develops before the curing compound can be applied, perform preliminary curing with wetted burlap or cotton coverings before the curing compound is applied.
8. Cold Weather Curing: Comply with Article 1.5 A.

J. Cleanup

1. After the concrete has gained sufficient strength, but no sooner than twelve hours, remove fixed forms and immediately backfill the spaces on both sides with sound earth of topsoil quality.
2. Compact and level backfill, providing a neat, workmanlike condition.

3.3 FIELD QUALITY CONTROL

A. Delivery Tickets: With each load of concrete delivered to the jobsite, provide ready-mix concrete producer's delivery tickets in triplicate, one for Contractor, one for Engineer, and one for Owner. Provide the following information on delivery tickets:

1. Date and serial number of ticket
2. Name of ready-mixed concrete plant, operator and job location
3. Types of cementitious materials, brand names, and proportions
4. Types of admixtures, brand names, and dosages
5. Aggregate sizes, proportions, and sources
6. Specified cement content in bags per cubic yards of concrete, or mix number
7. Truck number and time dispatched
8. Amount of concrete in load, and in cubic yards delivered
9. Slump of concrete ordered
10. Amount of water added before the truck left the plant
11. Water added at the jobsite, if any and if authorized by Engineer, and corresponding slump of concrete. Adding water at the jobsite without authorization by the Engineer is grounds for rejection.

B. Quality assurance testing, defined in Articles 1.5 C and 1.5 D, will be performed by a testing agency retained by the Owner. This testing is in addition to the quality control program required to be performed by the Contractor.

C. Comply with the attached MDOT Special Provision for Quality Control and Acceptance of Portland Cement Concrete (For Local Agency Projects Only).

3.4 PROTECTION

A. Protect newly laid curb and gutter that is threatened with damage by rain with a covering of burlap or cotton fabric or by other suitable means.

B. Comply with the hot and cold weather construction requirements in Part 1 of this specification.

C. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather. Remove and replace concrete injured by frost action at no expense to the Owner.

D. Opening of Pavement:

1. Do not expose the curb and gutter to traffic until the strength of placed concrete attains 90% the specified design strength and not before 14 days after time of placement, without the written permission of the Engineer.
2. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85 percent of the design strength.
3. Opening pavement to traffic will not constitute a final acceptance of the concrete curb.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Curb, Conc, Type II, Modified	LF
Curb Cut, Modified	EA

1. Curb, Conc., Type II, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Curb Cut, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement for sidewalks
2. Furnish all materials, including dowels, tie bars and joint materials; and furnish all equipment, tools, labor and work incidental to placing, curing, and protection of the concrete; and construct sidewalks complete.

B. Pay Items

1. Concrete pay items, both critical and non-critical as defined by MDOT, are subject to Quality Control testing by the Owner, unless otherwise noted.
2. No concrete pay items are eligible for or subject to positive pay adjustments. All concrete pay items are subject to negative pay adjustments, in accordance with Table 1 and Table 2.

Table 1: Concrete Thickness

Amount Less Than Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
more than 1/4", but not exceeding 1/2" (56 mm to 10 mm)	20
more than 1/2", but not exceeding 1" (03 mm to 25 mm)	50
more than 1" (greater than 25 mm)	Remove and replace

Table 2: Concrete Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
more than 500 psi (greater than 3.5 MPa)	Remove and replace

3. Reductions in the unit price are additive,that is, if an area of concrete is deficient by 3/8 inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% for a total reduction of 40%.
4. The deficient area of concrete identified by a core shall be confirmed by drilling and testing two additional cores, one on each side of the deficient core and 20 feet (6 m) from it, when possible. This extra core drilling and testing shall be at the Contractor's expense.

1.2 RELATED SECTIONS

A. Section for Joint Sealers

B. Section 31 2200 – Site Grading

C. Section 31 2323 – Fill and Backfill

D. Section 32 1123 – Aggregate Base Course

E. Section 32 1700 – Detectable Warning Surface

F. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM International:

1. C 31 Practice for Making and Curing Concrete Test Specimens in the Field
2. C 33 Specification for Concrete Aggregates
3. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. C 94 Specification for Ready-Mixed Concrete
5. C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
6. C 114 Chemical Analysis of Hydraulic Cement
7. C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
8. C 143 Test Method for Slump of Hydraulic-Cement Concrete
9. C 150 Specification for Portland Cement
10. C 172 Method of Sampling Freshly Mixed Concrete
11. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
12. C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13. C 260 Specification for Air-Entraining Admixtures for Concrete
14. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. C 311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete

16. C 457 Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
17. C 494 Specification for Chemical Admixtures for Concrete
18. C 595 Specification for Blended Hydraulic Cements
19. C 618 Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete
20. C 685 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
21. C 823 Practice for Examination and Sampling of Hardened Concrete in Construction
22. C 856 Practice for Petrographic Examination of Hardened Concrete
23. C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
24. C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
25. C 1157 Performance Specification for Hydraulic Cement
26. C 1222 Practice for Evaluation of Laboratories Testing Hydraulic Cement
27. C 1240 Specification for Silica Fume Used in Cementitious Mixtures
28. C 1260 Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
29. C 1293 Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
30. C 1567 Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Test)
31. D 98 Specification for Calcium Chloride
32. D 994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
33. D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
34. D 5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
35. D 6690 Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements

B. Michigan Department of Transportation (MDOT): Standard Specifications for Construction-2012 Edition (Section 803) and Current MDOT Standard Plan R-28-1, as Modified

C. American With disability Act (ADA) Provisions, as Applicable

D. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International
2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International
4. ACI 305R – Hot Weather Concreting
5. ACI 306R-88 – Cold Weather Concreting

E. Metric Conversions:

Inch-pound unit	Factor	SI unit
in.	x 25.4	= mm
lb/yd^3	x 0.5933	= Kg/m^3
Psi	x 0.006895	= MPa
temperature, °F	(°F - 32)/1.8	= °C

1.4 SUBMITTALS

A. Provide the following information in initial submittals: Whenever material sources or relevant properties of the materials change, provide a re-submittal of the relevant information, demonstrating compliance with the applicable provisions.

1. List of sources for materials.
2. Material certifications for each material.
3. Product data for curing compound, including installation instructions, joint filler, and admixtures.
4. Proposed concrete mix design in accordance with ACI 301.
5. Contractor's quality control plan.

B. Submit the concrete mix design to the Engineer one week prior to placing concrete. Develop proportions for normal weight concrete mixtures in accordance with ACI 211 to meet the requirements of ACI 201. Include the following information for each concrete mix design:

1. Grading of fine and coarse aggregates
2. Proportions of all ingredients including admixtures added either at the time of batching or at the job site.
3. Water/cement ratio
4. Slump
5. Air content of freshly mixed concrete by the pressure method
6. Unit weight of concrete
7. Strength at 7 and 28 days
8. Chloride content
9. Total alkali content of the cementitious materials
10. Test results, not more than 1 year old that verify the selected materials and relative proportions are adequate to mitigate the risk of alkali-silica reactivity, as required by Article 2.2 G.

C. Laboratory Qualifications: For each laboratory that supplies test reports or data required by this specification, provide evidence that the laboratory is properly equipped and qualified, in accordance with ASTM C 1077 and C 1222, to perform the tests method(s) on which they are reporting.

D. Samples: Submit representative samples of the following products and materials:

1. Fine aggregate
2. Coarse aggregate
3. Expansion joint filler
4. Contraction joint filler
5. Hot-poured joint sealant
6. Backer rod

E. If work will be performed during cold weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

F. If work will be performed during hot weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Provide Owner's quality control testing agency with access to stockpiles, quarries, bulk storage bins, ready-mix facility, etc. for the purpose of obtaining samples of materials used in the concrete mix.

1. Furnish labor to assist testing agency in obtaining and handling samples at the job site.
2. Advise testing agency in advance (minimum of 48 hours) of operations to allow for the assignment of testing personnel and testing.
3. Provide and maintain adequate facilities for the use of the testing agency for proper curing of concrete test specimens on the project site in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C31.

C. Materials and operations will be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.

D. The following testing services will be performed by a testing agency, designated and compensated by the Owner:

1. For each mix design, make one strength test for each 150 cubic yards or fraction thereof of concrete placed in any one day.
2. Secure composite samples in accordance with "Standard Method of Sampling Freshly Mixed Concrete", ASTM C 172.
3. For each required strength test, mold and cure six specimens in accordance with

"Standard Method of Making and Curing Concrete Test Specimens in the Field", ASTM C 31.

4. Test specimens in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C 39. Two specimens will be tested at 28 days for acceptance, one tested at 3 and 7 days for information and two retained as spares.
5. For each strength test, determine slump of concrete sample in accordance with "Standard Test Method for Slump of Portland Cement Concrete", ASTM C 143.
6. For each strength test, determine total air content of concrete sample in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM D 231.
7. For each strength test, determine temperature, unit weight, yield and air content (gravimetric) of concrete sample in compliance with ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete".

E. If test results indicate deficient compressive strength, a negative pay adjustment in the unit price of concrete pavement shall be made in accordance with Article 1.1 B.

F. Delivered concrete may be rejected at the job site prior to placement due to any of the following:

1. Concrete fails to conform to submitted and approved concrete mix design.
2. Failure of concrete samples obtained from the first or middle portion of the delivered concrete load to meet required concrete qualities outlined in Article 2.2.
3. Placement of the delivered concrete load did not begin within 45 minutes from ready-mix concrete plant batch time.
4. More than 90 minutes have elapsed between ready-mix concrete plant batch time and concrete placement.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Cold Weather Concreting: Comply with ACI 306R and the following:
   a. Do not use admixtures or accelerators unless approved in advance by the Engineer.
   b. Protect the subgrade from freezing by a layer of 12 inches to 24 inches of hay, straw, or insulating blankets covered with waterproof canvas or sheeting.
   c. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
   d. Concrete Temperature As-Mixed: Provide as-mixed concrete temperature that is not less than the following, depending upon the ambient temperature:
      i 60 degrees F when the ambient temperature is above 30 degrees F;
      ii 65 degrees F when the ambient temperature is between 0 and 30 degrees F;

iii 70 degrees F when the ambient temperature is below 0 degrees F.

e. Placement: Do not place concrete that is less than 60 degrees F nor more than 90 degrees F.

f. Protection: Unless otherwise specified, maintain the minimum temperature of concrete at 60 degrees F. Temperatures specified to be maintained during the protection period are those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of +/- 2 degrees F. Measure the temperature of concrete in each placement at regular time intervals.

g. Protection against freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the minimum specified surface temperature of the concrete during that period.

h. The protection period may be reduced to 2 days if one or more of the following is used to alter the concrete mixture and is approved by the Engineer:

i. Type III portland cement, meeting the requirements of ASTM C 150, is substituted for the Type I portland cement.

ii. A strength accelerating admixture, meeting the requirements of ASTM C 494, is added.

i. After Termination of Protection: Do not permit the surface temperature of the concrete to decrease in temperature more than 50 degrees F in a 24 hours period.

j. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

k. Protection Deficiency: If the temperature requirements during the specified protection period are not met, but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below 60 degrees F.

l. Curing of Concrete: Prevent concrete from drying during the required curing period.

2. Hot Weather Concreting: Comply with ACI 305R and the following:

a. Provide temperature of concrete, (as placed), that is not so high as to cause difficulty from loss of slump, flash set, or cold joints, and does not exceed 90 degrees F. When the temperature of concrete exceeds 90 degrees F, undertake precautionary measures approved by the Engineer. When the temperature of steel forms is greater than 120 degrees F, spray the forms with water just prior to placing concrete.

b. Cool concrete ingredients before mixing. Flake ice, or well-crushed ice of size that will melt completely during mixing, may be substituted for all or part of the mixing water if low slump, flash set or cold joints are encountered due to high temperature.

B. Protection against Rain

1. Protect new concrete from the effects of rain until the concrete has sufficiently hardened.
2. Use burlap or 6-mil polyethylene to cover and protect one day's work.
3. After rain has stopped, remove the covering and burlap-drag the surface. Apply curing compound where the previously-applied compound has been disturbed or washed away.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregates: Conform to the requirements of ASTM C 33, MDOT 902.09, and this specification.

1. Fine Aggregates:
   a. Clean, hard, durable, uncoated particles of natural sand, free from lumps of clay, soft or flaky material and, at the time of use, free from crusts of hard or frozen material.
   b. Natural Sand 2NS consisting of fine granular material resulting from the natural disintegration of rock; free from organic impurities (when measured by subjecting to the sodium hydroxide colorimetric test, produced color shall not be darker than light brown).
   c. The following gradation represents the extreme limits of suitability for use from all sources of supply (MDOT "2NS", Table 902-4):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
Loss by Washing (No. 200)*	0-3

* Michigan Test Method, MTM 108

   d. Provide fine aggregate with reasonably uniform gradation from any one source and not exhibiting the extreme percentage of gradation specified above. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 more than or less than the fineness modulus of the representative sample will be rejected.
2. Coarse Aggregate:

a. Hard, strong, durable, pebbles, crushed natural stone, free from adherent coatings, clay lumps, coal and lignite and other foreign matters. Chert (excluding sound gravels) or other nondurable particles shall not exceed 3% by weight.
b. Coarse aggregate derived from crushed concrete is not permitted.
c. Uniformly graded within the following limits (MDOT "17A", Table 902-1):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
1 in	100
3/4 in	90-100
1/2 in	50-75
No. 4	0-8
Loss by Washing (No. 200)*	1.0 Max**

* Michigan Test Method, MTM 108
** Loss by washing of 2.0 percent for material produced entirely by crushing rock, boulders, cobbles or concrete.

B. Cementitious Materials

1. Portland cement, ASTM C150, Type I , Type II, or Type III
2. Slag cement, MDOT 901.06 and ASTM C 989 Grade 100 or Grade 120
3. Fly ash, MDOT 901.07 and ASTM C 618, Class F
4. Blended hydraulic cement, ASTM C 595 or ASTM C 1157
5. Silica fume, MDOT 901.08 and ASTM C1240

C. Water: MDOT 911; Clean, potable, low-alkali content (maximum 80 parts per million), and free amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or metal in the concrete.

D. Admixtures: Conform to the following:

1. Air Entrainment: MDOT 903.01 and ASTM C 260
2. Water Reducing: MDOT 903.02 and ASTM C 494, Type A.
3. Accelerators: MDOT 903.04 and ASTM C 494, Type C
4. Calcium Chloride: Not permitted

E. Curing Materials:

1. White pigmented, impervious membrane curing compound: MDOT 903.06A and ASTM C 309, Type 2, Class B Vehicle, with the following additions:
   a. Base tests for moisture retention, reflectance, and drying time on curing compound application rate of 200 square feet per gallon (5 square meters per liter).
   b. Allow three weeks from the time of sampling before reporting results.
   c. Store the compound in clean containers.

2. Insulating Blankets: MDOT 903.07C and Federal Specifications HH-1-521e, minimum 2 inches thick, minimum R-Value of 7.0 ($^{\circ}F*hr*ft^2/Btu$) per inch, and enveloping membranes.

F. Joint Materials:

1. Expansion joints: Premolded, non-extruding bituminous fiber conforming to MDOT 914.03 and ASTM D 1751 (AASHTO M 59).
2. Contraction or Weakened Plane Joints: Premolded filler conforming to ASTM D 994 (AASHTO M 33).
3. Hot-Poured Joint Sealant: ASTM D 6690 with exceptions specified in MDOT Section 914.04.A.
4. Backer Rod for Use With Hot-Poured Joint Sealant: Solid, round, heat resistant, closed-cell, cross-linked polyethylene foam rod conforming to MDOT 914.04B and ASTM D 5249, Type I.

G. Smooth Dowel Bars for Transverse Expansion and Contraction Joints: MDOT 914.07.

H. Devices for Transverse End-of-Pour Joints: MDOT 914.08.

2.2 CONCRETE MIX:

A. Mix concrete in accordance with ASTM C 94.

B. Proportion concrete by weighing and in conformance to the following table, unless otherwise directed by the Engineer:

1. Compressive Strength: 4,000 psi at 28 days
2. Maximum water/cementitious ratio: 0.45
3. Air content: 6.5% plus or minus 1.5%
4. Slump: 3 inches plus or minus 1 inch
5. Minimum Cement Content: 564 lb/cy
6. Maximum size of aggregate: 3/4 inch
7. Maximum water-soluble chloride ion content in hardened concrete of 0.15 percent by weight of concrete.

C. Add air entrainment agent to produce a total air content of 6.5% +/- 1.5% at the point of placement and an air void system with the following characteristics when evaluated in accordance with ASTM C 457:

1. Spacing factor less than 0.008 inch
2. Specific surface: at least 600 square inch per cubic inch of air void volume.
3. Voids per linear inch at least 1-1/2 to 2 times greater than the air content percentage.

D. Provide slump not more than 4 inches or less than 2 inches, when tested in accordance with ASTM C 143, unless otherwise directed by the Engineer, and except for hand placement. Slump not more than 4 inches for concrete that is hand-placed.

E. Add mixing water at the batch plant only. Do not add water at the job site unless authorized by the Engineer. When authorized to add water at the job site, do not add water more than one time. Adding water and the result on concrete is the responsibility of the Contractor.

F. Slag cement, fly ash, silica fume, and/or blended cement may be used as a partial replacement for Portland cement provided that testing confirms that the as-designed mixture, using the specific materials and sources contemplated for the project, complies with the requirements of this Article 2.2, including the requirement for adequate mitigation of risk of alkali-silica reactivity.

1. The maximum permitted replacement of Portland cement with slag cement is 40% by weight of the total cementitious material (portland cement plus slag cement). Slag must not be from open hearth furnace.
2. The maximum permitted replacement of Portland cement with fly ash is 25% by weight of the total cementitious material (portland cement plus fly ash)
3. The maximum permitted replacement of Portland cement with supplementary cementitious materials is 40% by weight of the total cementitious material.
4. The total alkali content of the cementitious materials shall not exceed 3.5 pounds per cubic yard, when evaluated in accordance with ASTM C 114 and ASTM C 311.

G. Perform preconstruction testing to verify that the proposed combination of aggregates and cementitious materials will be adequate to mitigate the risk of alkali-silica reactivity (ASR).

1. Evaluate fine and coarse aggregate by a minimum of two tests each in accordance with ASTM C 1260.
   a. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion less than 0.10% at 16 days will be considered acceptable and no further testing for ASR mitigation will be required.
   b. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion equal to or greater than 0.10% at 16 days will be considered potentially reactive and unacceptable.
2. If the aggregate is reactive, evaluate the effectiveness of the proposed pozzolans and ground granulated blast-furnace slag to control deleterious ASR by conducting a minimum of two tests in accordance with ASTM C 1567.
   a. If the ASTM C 1567 mean mortar bar expansion is less than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered acceptable and no further testing for ASR mitigation will be required.
   b. If the ASTM C 1567 mean mortar bar expansion is equal to or greater than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered indicative of potentially deleterious expansion and unacceptable.
   c. Acceptable test results in accordance with ASTM C 1567 will be accepted in lieu of testing in accordance with ASTM C 1260.

2.3 EQUIPMENT

A. Finishing Machine: Power driven and of an approved type that will strike-off and compact the concrete with a screening and troweling action.

B. Forms: Metal, of an approved section that will ensure their rigidity under the impact, thrust, and weight of the heaviest machine carried on them.

1. Minimum length of 10 feet and a depth not less than the edge thickness of the work prescribed; width of the base in direct bearing on the soil not less than 8 inches; at least three stake pockets for each 10 foot section of form.
2. Straight, free from distortion and showing no vertical variation greater than 1/8-inch in 10-foot lengths from the true plan surface on the top of the form when tested with a 10-foot straight edge.
3. Connect form sections with a locked joint that is free from vertical movement in excess of 1/8-inch and free from horizontal movement in excess of one-quarter of an inch under the impact, thrust and weight of the heaviest machine carried on forms.
4. Provide sufficient forms so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

C. Water Supply: Provide pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, curing, sprinkling, subgrade and all other requirements of the work. Water may be supplied in approved tank wagons.

PART 3 - EXECUTION

3.1 PREPARATION

A. Smooth, trim and compact the subgrade to the required line, grade and cross-section. Thoroughly compact the subgrade, between lines at least 12 inches outside of each edge of the proposed sidewalk, by rolling with a roller of an approved type weighing not less than 5 tons.

B. Ensure that the subgrade is moist at the time of placing concrete. If the subgrade becomes dry before the concrete is placed, sprinkle the subgrade with water using a method of sprinkling that does not permit pools of water to form on the subgrade. Do not place the concrete on muddy, soft or frozen subgrade.

C. Restore and thoroughly compact rutting and other displacement caused by material hauling equipment or by the concrete placement equipment, for a distance of at least 100 feet ahead of the placement equipment.. Maintain the remainder of the prepared subgrade in its compacted state and true to the required grade and cross-section.

D. Place the concrete forms in advance of placing concrete. Substantially bring the foundation on which the forms are to be placed to the proper grade. Do not place forms on dikes or

mounds. Where feasible, bring the subgrade to the approximate required cross-section by means of a subgrade machine.

E. Check forms for line and grade in advance of placing concrete. Adequately stake and brace forms to resist the pressure of the concrete and the thrust of any equipment traveling on them. Provide uniform bearing on the subgrade throughout the forms' entire length and width. Finish the entire width of the subgrade and thoroughly compact it for a sufficient distance outside the area required for the sidewalk in order to adequately support the forms. Place forms in direct contact with the subgrade. After the forms have been set to grade, thoroughly compacted, both inside and outside, by use of an approved mechanical form tamper. Joint all forms neatly and tightly, securely stake by at least three stakes per form, and thoroughly clean and oil forms before concrete is placed against them.

F. After the forms are set in place, check their top surface for grade and trueness with a straight edge not less than 10 feet long. Reset or move any forms showing a variance greater than 1/8 inch in 10 feet.

G. Coat the surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.2 CONSTRUCTION

A. Except as modified herein, comply with MDOT (2012) Sections 601.03 and 602.03 and ACI 304R.

B. Mixing

1. On the project site, mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
2. Transit mixers: Comply with ASTM C 94

C. Placing Concrete:

1. Do not proceed with concrete placement until the conditions of the subgrade/subbase are approved by the Engineer.
2. Distribute or spread the concrete as soon as placed. Deposit concrete on the subgrade so as to require as little handling as possible and to avoid segregation and separation of the materials. Distribute concrete to such depth and sufficiently above grade so that when consolidated and finished, the surface conforms to the required finished grade. Consolidate the concrete along the faces of the forms and adjacent to joints. Consolidate concrete with an approved vibrator to fill all voids and finish to ensure a dense smooth surface.
3. Deposit and spread concrete continuously, as far as possible between transverse joints. In the case of a temporary shutdown, cover the concrete at the unfinished end of the slab with wet burlap. In the event of an unavoidable interruption of the work continuing more than 30 minutes, place a construction joint, provided the section is 10 feet or more in length between joints. Remove sections less than 10 feet in length at no expense to Owner.

D. Tie Bars, Dowels and J-Bolts: Place tie bars and dowels at the required depth parallel to the finished surface, perpendicular to the joints and at the uniform spacing shown on the Drawings. Use approved chairs or dowel baskets to support the tie bars or dowels in place, or use approved mechanical devices; do not place tie bars or dowels by hand methods.

E. Joints:

1. Construct all joints with faces perpendicular to the surface of the pavement. Construct transverse joints at right angles to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit transverse joints to vary more than 1/4 inch from a true line. Construct longitudinal joints along or parallel to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit longitudinal joints to vary more than one-quarter (1/4") inch from their true designated positions.
2. Finish the pavement surface adjacent to all joints to a true surface. Where indicated on the Drawings, edge the surface adjacent to joints to the radius shown. Test the surface across the joints with a 10-foot straight edge as the joints are finished, and correct irregularities before the concrete has hardened.
3. Longitudinal Joints: Bulkhead construction joints or contraction joints, as shown on the Drawings.
   a. Provide a keyway in the bulkhead construction joints.
   b. Accurately form keyways with templates of metal, wood, or other approved material.
   c. Provide the gauge or thickness of the template material to form the full keyway as specified.
4. Transverse Joints: Contraction joints, expansion joints or construction joints.
5. Contraction Joints: Transverse contraction joints are without tie bars. Locate transverse contraction joints at 24 to 30 times the pavement thickness, except do not exceed a maximum spacing of 15 feet. Provide tie bars in longitudinal contraction joints. Form contraction joints by saw cutting to a depth of 1/3 of the concrete thickness. Perform additional saw cutting to form 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the contraction joint. Where sidewalks under construction are adjacent to an existing pavement, construct contraction joints in line with similar joints in the abutting pavement.
   a. Provide tie bars in longitudinal contraction joints, of length and size shown on the Drawings.
   b. Embed tie bars on each side of the longitudinal contraction joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness.
   c. Space tie bars in longitudinal contraction joints as shown on the Drawings.
6. Expansion Joints: One (1") thick and placed every 60 feet on center, unless shown otherwise in the Drawings. Where the sidewalk under construction is adjacent to an existing pavement, construct expansion joints in line with the expansion joints in the abutting pavement.
   a. Provide expansion joints at right angles to the centerline, perpendicular to the surface of the finished pavement and extended entirely through the concrete.

b. Provide smooth dowels, of length and size shown on the Drawings, with expansion cap on one end. Embed dowels a minimum on each side of the expansion joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in expansion joints as shown on the Drawings.

c. During installation, maintain the joint filler in place by an approved installing device that is securely staked. Maintain the top of the joint filler at not less than l/2 inch or more than 3/4 inch below the finished surface. Cover the top of the joint filler with an approved metal cap before the concrete is placed. Shape the metal cap to the finished elevation of the sidewalk.. Provide a metal cap that will not warp or twist out of shape. Keep the cap in place during finishing machine operations.

d. Place concrete simultaneously against the dowels and joint filler to a depth approximately equal to the depth of the finished pavement. Thoroughly consolidate concrete with vibration tools. Carefully remove the installing device so that the joint filler and caps are not disturbed.

7. Construction Joints: Form construction joints with dowels whenever an unavoidable interruption of the work constituting a shutdown of more than 30 minutes has occurred, or when directed by the Engineer. Strike the concrete and finish to the bulkhead.

a. Saw cut to form minimum 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the construction joint, or as shown on the Drawings.

b. Provide dowels, of length and size shown on the Drawings, in construction joints. Embed dowels on each side of the joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in construction joints as shown on the Drawings.

8. Clean the sealant reservoirs of all extraneous matter. Ensure that the contact faces of the joints are dry at the time of filling and sealing. Compressed air jets, wire brushes and such additional equipment as may be necessary to clean the openings and dry the contact faces of the joints will be required.

9. Fill the top of contraction joints, construction joints, and expansion joints and seal with hot, poured sealant before any traffic is permitted on the sidewalk. Install joint sealant by hand pouring pots, mechanical methods, or any other method that will give satisfactory results. Place sufficient sealant into the joints so that, upon completion of the work, the surface of the sealant will be flush with the surface of the pavement. Do not spill the sealant on exposed surfaces of the concrete. Immediately remove excess sealant on the surface of the concrete pavements. If the sealant subsides to a level below the surface of the slab, place a second application of sealant. When more than one application is required to fill the joint, perform succeeding applications immediately after shrinkage of the previous sealant application has taken place.

a. Do not place sealant when the air temperature in the shade is less than 50 degrees F, except with the approval of the Engineer.

b. Do not permit traffic over the sealed joints until the sealant has hardened sufficiently to resist pickup.

F. Finishing:

1. After the placement of the concrete, test surface with straight edge and finish with a broom finish.

G. Surface Requirements: On the day following placement of the concrete, the pavement will be straight edged by the Engineer. A 10-foot straight edge will be placed parallel to the centerline so as to bridge any depressions and touch high spots. High spots indicated by a variation exceeding 1/8 inch from the straight edge will be plainly marked. Remove high spots or reduce by rubbing with a carborundum brick and water. If these methods are inadequate to remove the high spots, use an approved surface-grinding machine.

H. Removal of Forms:

1. Do not remove forms from freshly placed concrete until it has set for at least 12 hours. Carefully remove forms so that no damage is done to the edge of the pavement.
2. After the forms have been removed, clean the ends of joints and point honeycombed areas.
3. Cover the sides of the pavement with curing material except where honeycombed areas are to be pointed. Cover areas to be pointed with wet burlap until the pointing is complete, and then cure as specified in Article 3.2 I.

I. Curing:

1. Immediately after finishing operations have been completed and free water has left the surface, completely coat and seal the surface of the sidewalk with a uniform layer of curing compound. Apply the compound in one or two applications, as required by manufacturer instructions. When the compound is applied in two increments, follow the first application with the second application within 30 minutes.
2. Thoroughly agitate the compound to a uniform consistency, with the pigment uniformly suspended, before transferring the compound between containers and before use.
3. Apply the compound in a continuous uniform film by means of mechanical pressure sprayer equipment at the rate stipulated by the compound manufacturer but not less than one gallon per 200 square feet of surface. Use equipment that provides adequate stirring of the compound during application. Hand spray equipment will be permitted for application of the curing compound over the sides of the slab.
4. Provide uniformly painted, solid white surface after application of curing compound. If appearance is blotchy and non-uniform, apply another layer of curing compound.
5. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, apply a new coat of material to the affected areas equal to that originally applied.
6. Protect the treated surface from injury for a minimum period of seven days. All traffic will be considered injurious to the film of applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided that any damage to the film is immediately repaired by the application of another coat of the compound.
7. Provide sufficient burlap, cotton, or polyethylene sheet coverings to protect the pavement in case of rain or breakdown of the spray equipment. If any hair checking

develops before the curing compound can be applied, perform preliminary curing with wetted burlap or cotton coverings before the curing compound is applied.

8. Cold Weather Curing: Comply with Article 1.5 A.

J. Sidewalk Ramps

1. Construct sidewalk ramp(s), landings flares and detectable warning surface according to MDOT Standard Plan R-28-I. The concrete sidewalk and ramp thickness shall be as determined by the City of Detroit and as shown on the MDOT Sidewalk Ramp and Detectable Warning Details, R-28-I, COD Modification, included in these Specifications. The Detectable Warning Surface installation shall also comply with the manufacturer's instructions.
2. The curb and gutter section at the bottom of the ramp (curb ramp opening) shall be a full depth curb with a minimum depth of 12 inches, and shall be 18 inches from the back of curb to abutting pavement.
3. It is also the Contractor's responsibility to incorporate any changes made to the ADA accessibility requirements that may take effect prior to the start date of actual construction. If the Contractor determines that any changes significantly alter the original bid cost, the Contractor may submit a written request to the Engineer or his representative for approval and compensation. Include a cost comparison between the original bid cost and the cost of the ADA required changes in the request.
4. The contractor shall stamp all concrete with a legible stamp bearing the name of the company and the year of construction. No sidewalk or ramp construction shall commence without a Contractor's stamp on site.
5. Restore berm areas disturbed beyond sidewalk ramp repair limits to its original conditions. No separate payment will be made for such restoration, but is considered part of the work item.
6. Any constructed ramps that do not meet the current MDOT/COD Sidewalk Ramp Standard Plans and the latest ADA accessibility requirements will be removed and replaced by the Contractor, as directed by the Engineer or his representative, at the Contractor's expense.

K. Cleanup

1. After the concrete has gained sufficient strength, but no sooner than twelve hours, remove fixed forms and immediately backfill the spaces on both sides with sound earth of topsoil quality.
2. Compact and level backfill, providing a neat, workmanlike condition.

3.3 FIELD QUALITY CONTROL

A. Delivery Tickets: With each load of concrete delivered to the jobsite, provide ready-mix concrete producer's delivery tickets in triplicate, one for Contractor, one for Engineer, and one for Owner. Provide the following information on delivery tickets:

1. Date and serial number of ticket
2. Name of ready-mixed concrete plant, operator and job location

3. Types of cementitious materials, brand names, and proportions
4. Types of admixtures, brand names, and dosages
5. Aggregate sizes, proportions, and sources
6. Specified cement content in bags per cubic yards of concrete, or mix number
7. Truck number and time dispatched
8. Amount of concrete in load, and in cubic yards delivered
9. Slump of concrete ordered
10. Amount of water added before the truck left the plant
11. Water added at the jobsite, if any and if authorized by Engineer, and corresponding slump of concrete. Adding water at the jobsite without authorization by the Engineer is grounds for rejection.

B. Quality assurance testing, defined in Articles 1.5 C and 1.5 D, will be performed by a testing agency retained by the Owner. This testing is in addition to the quality control program required to be performed by the Contractor.

C. Comply with the attached MDOT Special Provision for Quality Control and Acceptance of Portland Cement Concrete (For Local Agency Projects Only).

3.4 PROTECTION

A. Protect newly laid sidewalk that is threatened with damage by rain with a covering of burlap or cotton fabric or by other suitable means.

B. Comply with the hot and cold weather construction requirements in Part 1 of this specification.

C. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather. Remove and replace concrete injured by frost action at no expense to the Owner.

D. Opening of Pavement:

1. Do not expose the sidewalk to traffic until the strength of placed concrete attains 90% the specified design strength and not before 14 days after time of placement, without the written permission of the Engineer.
2. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85 percent of the design strength.
3. Opening pavement to traffic will not constitute a final acceptance of the concrete sidewalk.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Sidewalk Ramp, Conc, 6 inch, Modified	Sft
Sidewalk, Conc, 4 inch, Modified	Sft
Sidewalk, Conc, 6 inch, Modified	Sft

1. Sidewalk Ramp, Conc, 6 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Sidewalk, Conc, 4 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

3. Sidewalk, Conc, 6 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
COLORED CONCRETE SIDEWALK

DET:CAW APPR:LML:JFS:07-20-16

a. Description. This work consists of constructing colored concrete sidewalk as shown on the plans and as directed by the Engineer. Complete this work in accordance to the applicable sections of the standard specifications and this special provision. Follow industry standards and conform to the details as shown on the plans.

Provide documentation of experience placing and finishing colored concrete as specified herein. Ensure that the placement and finishing of decorative concrete is performed by experienced personnel. Provide a list of completed projects and the contact person for the project owner(s) to the Engineer at the pre-construction meeting. The project list must demonstrate satisfactory completion of a minimum of 10,000 square feet of colored concrete.

b. Materials. Provide materials in accordance with section 803 of the Standard Specifications for Construction. Furnish tools and equipment as recommended by the manufacturer and as approved by the Engineer. Use equipment and materials from a single manufacturer throughout the entire project.

Select coloring agents, colored admixture, pigmented release agent, joint sealant, clear surface sealant and all material required to construct colored concrete surfaces from the following supplier list or propose an alternate source to the Engineer for approval. Secure the approval for the final color selection for all coloring agents from the Engineer prior to beginning production.

1. Coloring Agent. Produce the colored concrete using an iron oxide type pigmented admixture conforming to *ASTM C 979* added at the concrete batch plant. The required color BLACK.

2. Clear Surface Sealant. Apply a low-luster, matte finish, clear coating recommended by the manufacturer to protect the concrete surface.

3. Joint Sealant. Seal all expansion joints with a premium-quality, three component, gun-grade, color-matched, low-modulus sealant for dynamically moving joints for exterior applications as recommended by the manufacturer.

Acceptable products:

Company	Phone
Increte Systems, Inc.	(586) 563-2000
L.M. Scofield Company	(586) 749-9575
Altamar	(800) 443-2627

c. Construction. Arrange with the manufacturer to have a representative on site for the first

workday of decorative concrete placement.

The Engineer will determine whether the representative is required on-site for additional days to ensure satisfactory results.

Construct a test section, consisting of at least 25 square feet, for approval by the Engineer for color, texture, and workmanship.Seal the surface of the test section and include one saw-cut joint and one sealed joint.

Keep the approved test section at the worksite as a standard for judging the completed work. Any portion of the completed work that does not match the workmanship of the approved test section must be removed and replaced. All costs associated with this removal and replacement will be borne by the Contractor.

Construct concrete sidewalk in accordance with section 803 of the Standard Specifications for Construction and as recommended by the manufacturer.

Do not place concrete sidewalk until the ambient air temperature away from artificial heat is at least 40 degrees Fahrenheit (F) and rising and no freezing temperatures are expected for 48 hours. Do not use frost blankets or other cold weather protection that can impact the finished surface.

Apply pigmented release agent to tools and forms in accordance with the system manufacturer's specifications. Place concrete and screed to the specified grade. Float and finish the surface as shown on the plans.

Do not clean the surface until adequate curing has been obtained, as recommended by the manufacturer.

Mechanically saw cut all joints 1/4 inch wide and one-fifth depth of concrete, following the joint patterns illustrated on the plans and details, or as directed by the Engineer. Seal all expansion joints with color-matched joint sealant, as recommended by the manufacturer. Apply two coats of low-luster, matte finish clear surface sealer to the finished decorative concrete as recommended by the manufacturer.

Take steps to avoid the contamination of adjacent surfaces while placing and finishing colored concrete; clean all surfaces that do get contaminated. Areas that were not properly protected and/or cannot be cleaned to the satisfaction of the Engineer must be removed and replaced. All costs associated with this removal and replacement will be borne by the Contractor.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Sidewalk, Conc, 4 inch, Colored, Modified	Square Foot

The initial test section will be included in the quantity for Sidewalk, Conc, 4 inch, Colored. All costs associated with constructing additional test sections will be borne by the Contractor.

SPECIAL PROVISION
FOR

DECORATIVE SIDEWALK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stamped concrete.

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Verification Sample: Submit finish product specified, minimum size 12 inches square representing actual product and patterns.

C. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

D. Applicator's Project References: Submit applicator's list of successfully completed stamped concrete projects, including project name and location, name of architect, and type and quantity of materials applied.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.
   1. Regularly engaged, for preceding 5 years, in application of stamped concrete of similar type to that specified.
   2. Employ persons trained for application of stamped concrete.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Construct Mock-ups of Stamped Concrete:
      a. Use same materials and methods for use in the Work.
      b. Location: Determined by Landscape Architect.
      c. Minimum Size: 20 feet by 20 feet (4 patterns).
   2. Receive approval of mock-ups by Landscape Architect for patterns, textures, finishing, curing, cleaning, sealing, special effects, and workmanship before application of stamped concrete.
   3. Approved Mock-ups:
      a. Standard for patterns, textures, finishing, curing, sealing, special effects, and workmanship of stamped concrete.
      b. Retain through completion of Work for use as quality standard.

1.4 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.
   1. Require attendance of parties directly affecting work of this section, including:
      a. Contractor.

b. Landscape Architect.
c. Applicator.
d. Manufacturer's representative.
e. Owner.

2. Review:
a. Mock-ups.
b. Materials.
c. Preparation.
d. Application.
e. Finishing.
f. Curing.
g. Cleaning.
h. Sealing.
i. Protection.
j. Coordination with other work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until application.
3. Store materials in clean, dry area indoors.
4. Store materials out of direct sunlight.
5. Keep materials from freezing.
6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Apply materials when air and surface temperatures are between 55 degrees F and rising; to 80 degrees F and falling.

C. Do not apply materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

1.7 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Solomon Colors, which is located at: 4050 Color Plant Rd.; Springfield, IL 62702-1060; Toll Free Tel: 800-624-0261; Tel: 217-522-3112; Fax: 800-624-3147; Email:request info (sgs@solomoncolors.com); Web:www.solomoncolors.com

B. Or Approved Equal

2.2 MATERIALS

A. Stamping Mats:

1. Pattern: See drawings for all custom pattern layouts.
2. Texture: None

B. Curing Compound:
1. Clear, non-yellowing, non-staining, breathable, UV stable.
2. Compliance: ASTM C 309.

C. Concrete Cleaner:
1. Biodegradable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive stamped concrete.

B. Notify Landscape Architect of conditions that would adversely affect application or subsequent use.

C. Do not begin preparation or application until unacceptable conditions are corrected.

3.2 PREPARATION

A. Protection of In-Place Conditions: Protect adjacent surfaces, areas, adjoining walls, and landscaping from contact with stamped concrete materials.

B. Preparation of Subgrade:
1. Ensure subgrade is uniformly graded, compacted, and moistened.
2. Ensure subgrade is free of standing water.
3. Do not place concrete over soft, frozen, or muddy subgrade.

C. Concrete:
1. Specified in Section 32 16 23 - Sidewalks, unless otherwise specified in this section.
2. Slump: Maximum 4 inches.
3. Calcium Chloride: Do not use calcium chloride or admixtures containing calcium chloride.
4. Fine and Course Aggregates:
   a. Non-reactive.
   b. Free of deleterious material.

3.3 APPLICATION

A. Apply stamped concrete materials in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Stamping Mats:
1. Press stamping mats in accordance with manufacturer's instructions into concrete that has reached plastic stage desirable for imprinting.
2. Use stamping mats to create patterns in concrete as indicated on the Drawings.

C. Approved Mock-ups: Match approved mock-ups for patterns, textures, finishing, curing, cleaning, sealing, special effects, and workmanship.

3.4 CURING

A. Cure concrete in accordance with manufacturer's instructions.

B. Apply curing compound in accordance with manufacturer's instructions.

C. Do not cure concrete using materials or methods harmful to concrete surface, including:
1. Low-pressure or high-pressure steam.
2. Burlap.
3. Plastic sheeting.
4. Membrane paper.
5. Water misting.
6. Sodium-silicone-type hardeners.

3.5 CLEANING

A. Clean concrete in accordance with manufacturer's instructions.

B. Apply concrete cleaner in accordance with manufacturer's instructions to remove:
1. Excess colored bond breaker/antiquing release agent.
2. Efflorescence.
3. Cement scale.

3.6 PROTECTION

A. Interior Surfaces: Protect applied stamped concrete from damage during construction.

B. Exterior Surfaces: Protect applied stamped concrete to ensure that, except for normal weathering, concrete will be without damage or deterioration at time of Substantial Completion.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Decorative Sidewalk	SF

1. Decorative Sidewalks includes all labor, equipment, and materials to procure and apply decorative concrete surface application (stamp) to the varying concrete thickness, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISIONS
FOR

DETECTABLE WARNING PLATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Detectable Warning Plates.

1.2 REFERENCES

A. ADA-ABA Accessibility Guidelines for Buildings and Facilities (ADAAG):
   1. ADAAG 4.29.2 - Detectable Warnings on Walking Surfaces.

B. Americans with Disabilities Act (ADA):
   1. ADA 705.1.1 - Detectable Warnings; Dome Size.
   2. ADA 705.1.2 - Detectable Warnings; Dome Spacing.
   3. ADA 705.1.3 - Detectable Warnings; Contrast.
   4. ADA 705.2 - Detectable Warnings; Platform Edges.

C. ASTM International (ASTM):
   1. ASTM A48 - Standard Specification for Gray Iron Castings.

D. International code council (ICC):
   1. ICC A117.1 - Accessible and usable Buildings and Facilities.

E. American Concrete Institute (ACI):
   1. ACI 530.1 - Specification for Masonry Structures.

F. American Society of Civil Engineers (ASCE):
   1. ASCE 6 - Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

G. The Masonry Society (TMS):
   1. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Source Limitations: Single source detectable warning plates and integrated anchoring materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
1. Standards Compliance: ACI 530.1, ASCE 6, and TMS 602.

1.7 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 WARRANTY

A. Warranty: Manufacturer's standard limited warranty.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Neenah Foundry Co., which is located at: 2121 Brooks Ave. P. O. Box 729; Neenah, WI 54957; Toll Free Tel: 800-558-5075; Tel: 920-725-7000; Fax: 920-729-3661; Email:request info (construction.sales@neenahenterprises.com); Web:www.nfco.com

B. Or Approved Equal.

2.2 CAST IRON DETECTABLE WARNING PLATES

A. Quick connect plates as manufactured by Neenah Foundry Co.
1. Catalog No: 4984-24Q. (D x W): 24 x 24 in.

B. Radius plates as manufactured by Neenah Foundry Co.
1. Catalog No: 4984-See Drawings. (D x Rad): 24 in x See Drawings.

C. Standards Compliance:
1. U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities.
2. ICC A117.1 - Accessible and Usable Buildings and Facilities.

D. Material: Cast iron conforming to ASTM A48, Class 30B, minimum.

E. Finish: Manufactured true to pattern; component parts fit together in satisfactory manner. Uniform quality free of blowholes, porosity, hard spots, shrinkage distortion or other defects. Cleaned by blasting.
1. Visual warning surface to remain unpainted.

F. Visual Contrast:
1. Standards Compliance: ADAAG 2.29.2 and ADA 705.1.3.
2. Visual surfaces to contrast visually with adjacent walking surfaces; either light-on-dark or dark-on-light.

G. Coefficient of Friction: Comply with all ADA and ABA guidelines. The measured coefficient of friction is 0.9.

H. Dome Size: Truncated domes in detectable waning surface.
1. Standards Compliance: ADAAG 2.29.2 and ADA 705.1.1.
2. Base diameter: From 0.9 to 1.4 inch.
3. Top Diameter: From 0.45 to 0.91 inch .
4. Height: 0.2 inch.

I. Dome Spacing: Truncated domes in a detectable waning surface.
1. Standards Compliance: ADAAG 2.29.2 and ADA 705.1.2.
2. Center-to-center spacing: From 1.6 to 2.4 inches.
3. Base-to-base spacing: 0.65 in minimum. Measured between the most adjacent domes on a square grid.

J. Platform Edges:
1. Standards Compliance: ADAAG 2.29.2 and ADA 705.2.
2. Detectable warning surfaces at platform boarding edges to have a depth of 24 in and extend full length of the public use areas of the platform.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not begin installation until substrates have been properly prepared and necessary building services are installed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean and prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install warning plates in accordance with manufacture's written instructions and approved submittals.
1. Comply with installation requirements in Section 32 13 13 – Sidewalks.
2. Completely seat warning plates in wet concrete by tamping or vibrating. Ensure full contact with concrete.
3. Surface of warning plate to be flush with surrounding concrete. Variation from flush not to exceed plus or minus 1/8 inch (3 mm).
4. Clean tiles using methods recommended in writing by manufacturer.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Detectable Warning Surface, Modified	Sft

1. Detectable Warning Surface includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISION
FOR
DRIVEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement for entrance drives, driveways and parking areas, unless called out as asphalt pavement on the plans.
2. Furnish all materials, including dowels, tie bars and joint materials; and furnish all equipment, tools, labor and work incidental to placing, curing, and protection of the concrete; and construct the entrance drives, driveways and parking areas complete.

B. Pay Items

1. Concrete pay items, both critical and non-critical as defined by MDOT, are subject to Quality Control testing by the Owner, unless otherwise noted.
2. No concrete pay items are eligible for or subject to positive pay adjustments. All concrete pay items are subject to negative pay adjustments, in accordance with Table 1 and Table 2.

Table 1: Concrete Thickness

Amount Less Than Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
more than 1/4", but not exceeding 1/2" (56 mm to 10 mm)	20
more than 1/2", but not exceeding 1" (03 mm to 25 mm)	50
more than 1" (greater than 25 mm)	Remove and replace

Table 2: Concrete Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
more than 500 psi (greater than 3.5 MPa)	Remove and replace

3. Reductions in the unit price are additive, that is, if an area of concrete is deficient by 3/8 inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% for a total reduction of 40%.

4. The deficient area of concrete identified by a core shall be confirmed by drilling and testing two additional cores, one on each side of the deficient core and 20 feet (6 m) from it, when possible. This extra core drilling and testing shall be at the Contractor's expense.

1.2 RELATED SECTIONS

A. Section for Joint Sealers

B. Section 31 2200 – Site Grading

C. Section 31 2323 – Fill and Backfill

D. Section 32 1123 – Aggregate Base Course

E. Section 32 1723.13 Pavement Markings

F. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM International:

1. C 31 Practice for Making and Curing Concrete Test Specimens in the Field
2. C 33 Specification for Concrete Aggregates
3. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. C 94 Specification for Ready-Mixed Concrete
5. C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
6. C 114 Chemical Analysis of Hydraulic Cement
7. C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
8. C 143 Test Method for Slump of Hydraulic-Cement Concrete
9. C 150 Specification for Portland Cement
10. C 172 Method of Sampling Freshly Mixed Concrete
11. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
12. C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13. C 260 Specification for Air-Entraining Admixtures for Concrete

14. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. C 311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
16. C 457 Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
17. C 494 Specification for Chemical Admixtures for Concrete
18. C 595 Specification for Blended Hydraulic Cements
19. C 618 Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete
20. C 685 Specification for Concrete Made by Volumetric Batching and Continuous Mixing
21. C 823 Practice for Examination and Sampling of Hardened Concrete in Construction
22. C 856 Practice for Petrographic Examination of Hardened Concrete
23. C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
24. C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
25. C 1157 Performance Specification for Hydraulic Cement
26. C 1222 Practice for Evaluation of Laboratories Testing Hydraulic Cement
27. C 1240 Specification for Silica Fume Used in Cementitious Mixtures
28. C 1260 Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
29. C 1293 Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
30. C 1567 Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Test)
31. D 98 Specification for Calcium Chloride
32. D 994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
33. D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
34. D 5249 Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
35. D 6690 Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements

B. Michigan Department of Transportation (MDOT): Standard Specifications for Construction

C. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International
2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete;

American Concrete Institute International

4. ACI 305R – Hot Weather Concreting
5. ACI 306R-88 – Cold Weather Concreting

D. Metric Conversions:

Inch-pound unit	Factor	SI unit
in.	x 25.4	= mm
lb/yd^3	x 0.5933	= Kg/m^3
psi	x 0.006895	= MPa
temperature, °F	(°F - 32)/1.8	= °C

1.4 SUBMITTALS

A. Provide the following information in initial submittals: Whenever material sources or relevant properties of the materials change, provide a re-submittal of the relevant information, demonstrating compliance with the applicable provisions.

1. List of sources for materials.
2. Material certifications for each material.
3. Product data for curing compound, including installation instructions, joint filler, and admixtures.
4. Proposed concrete mix design in accordance with ACI 301.
5. Contractor's quality control plan.

B. Submit the concrete mix design to the Engineer one week prior to placing concrete. Develop proportions for normal weight concrete mixtures in accordance with ACI 211 to meet the requirements of ACI 201. Include the following information for each concrete mix design:

1. Grading of fine and coarse aggregates
2. Proportions of all ingredients including admixtures added either at the time of batching or at the job site.
3. Water/cement ratio
4. Slump
5. Air content of freshly mixed concrete by the pressure method
6. Unit weight of concrete
7. Strength at 7 and 28 days
8. Chloride content
9. Total alkali content of the cementitious materials
10. Test results, not more than 1 year old that verify the selected materials and relative proportions are adequate to mitigate the risk of alkali-silica reactivity, as required by Article 2.2 G.

C. Laboratory Qualifications: For each laboratory that supplies test reports or data required by this specification, provide evidence that the laboratory is properly equipped and qualified, in accordance with ASTM C 1077 and C 1222, to perform the tests method(s) on which they are reporting.

D. Samples: Submit representative samples of the following products and materials:

1. Fine aggregate
2. Coarse aggregate
3. Expansion joint filler
4. Contraction joint filler
5. Hot-poured joint sealant
6. Backer rod

E. If work will be performed during cold weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

F. If work will be performed during hot weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Provide Owner’s quality control testing agency with access to stockpiles, quarries, bulk storage bins, ready-mix facility, etc. for the purpose of obtaining samples of materials used in the concrete mix.

1. Furnish labor to assist testing agency in obtaining and handling samples at the job site.
2. Advise testing agency in advance (minimum of 48 hours) of operations to allow for the assignment of testing personnel and testing.
3. Provide and maintain adequate facilities for the use of the testing agency for proper curing of concrete test specimens on the project site in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C31.

C. Materials and operations will be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.

D. The following testing services will be performed by a testing agency, designated and compensated by the Owner:

1. For each mix design, make one strength test for each 150 cubic yards or fraction thereof of concrete placed in any one day.
2. Secure composite samples in accordance with "Standard Method of Sampling Freshly Mixed Concrete", ASTM C 172.
3. For each required strength test, mold and cure six specimens in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field", ASTM C 31.
4. Test specimens in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C 39. Two specimens will be tested at 28 days for acceptance, one tested at 3 and 7 days for information and two retained as spares.
5. For each strength test, determine slump of concrete sample in accordance with "Standard Test Method for Slump of Portland Cement Concrete", ASTM C 143.
6. For each strength test, determine total air content of concrete sample in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM D 231.
7. For each strength test, determine temperature, unit weight, yield and air content (gravimetric) of concrete sample in compliance with ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete".

E. If test results indicate deficient compressive strength, a negative pay adjustment in the unit price of concrete pavement shall be made in accordance with Article 1.1 B.

F. Delivered concrete may be rejected at the job site prior to placement due to any of the following:

1. Concrete fails to conform to submitted and approved concrete mix design.
2. Failure of concrete samples obtained from the first or middle portion of the delivered concrete load to meet required concrete qualities outlined in Article 2.2.
3. Placement of the delivered concrete load did not begin within 45 minutes from ready-mix concrete plant batch time.
4. More than 90 minutes have elapsed between ready-mix concrete plant batch time and concrete placement.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Cold Weather Concreting: Comply with ACI 306R and the following:
   a. Do not use admixtures or accelerators unless approved in advance by the Engineer.

b. Protect the subgrade from freezing by a layer of 12 inches to 24 inches of hay, straw, or insulating blankets covered with waterproof canvas or sheeting.

c. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

d. Concrete Temperature As-Mixed: Provide as-mixed concrete temperature that is not less than the following, depending upon the ambient temperature:
   i 60 degrees F when the ambient temperature is above 30 degrees F;
   ii 65 degrees F when the ambient temperature is between 0 and 30 degrees F;
   iii 70 degrees F when the ambient temperature is below 0 degrees F.

e. Placement: Do not place concrete that is less than 60 degrees F nor more than 90 degrees F.

f. Protection: Unless otherwise specified, maintain the minimum temperature of concrete at 60 degrees F. Temperatures specified to be maintained during the protection period are those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of +/- 2 degrees F. Measure the temperature of concrete in each placement at regular time intervals.

g. Protection against freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the minimum specified surface temperature of the concrete during that period.

h. The protection period may be reduced to 2 days if one or more of the following is used to alter the concrete mixture and is approved by the Engineer:
   i. Type III portland cement, meeting the requirements of ASTM C 150, is substituted for the Type I portland cement.
   ii. A strength accelerating admixture, meeting the requirements of ASTM C 494, is added.

i. After Termination of Protection: Do not permit the surface temperature of the concrete to decrease in temperature more than 50 degrees F in a 24 hours period.

j. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

k. Protection Deficiency: If the temperature requirements during the specified protection period are not met, but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below 60 degrees F.

l. Curing of Concrete: Prevent concrete from drying during the required curing period.

2. Hot Weather Concreting: Comply with ACI 305R and the following:
   a. Provide temperature of concrete, (as placed), that is not so high as to cause difficulty from loss of slump, flash set, or cold joints, and does not exceed 90 degrees F. When the temperature of concrete exceeds 90 degrees F, undertake precautionary measures approved by the Engineer. When the temperature of steel forms is greater than 120 degrees F, spray the forms with water just prior to placing concrete.
   b. Cool concrete ingredients before mixing. Flake ice, or well-crushed ice of size that will melt completely during mixing, may be substituted for all or part of the mixing water if low slump, flash set or cold joints are encountered due to high temperature.

B. Protection against Rain

1. Protect new concrete from the effects of rain until the concrete has sufficiently hardened.
2. Use burlap or 6-mil polyethylene to cover and protect one day's work.
3. After rain has stopped, remove the covering and burlap-drag the surface. Apply curing compound where the previously-applied compound has been disturbed or washed away.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregates: Conform to the requirements of ASTM C 33, MDOT 902.09, and this specification.

1. Fine Aggregates:
   a. Clean, hard, durable, uncoated particles of natural sand, free from lumps of clay, soft or flaky material and, at the time of use, free from crusts of hard or frozen material.
   b. Natural Sand 2NS consisting of fine granular material resulting from the natural disintegration of rock; free from organic impurities (when measured by subjecting to the sodium hydroxide colorimetric test, produced color shall not be darker than light brown).
   c. The following gradation represents the extreme limits of suitability for use from all sources of supply (MDOT "2NS", Table 902-4):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
Loss by Washing (No. 200)*	0-3

* Michigan Test Method, MTM 108

d. Provide fine aggregate with reasonably uniform gradation from any one source and not exhibiting the extreme percentage of gradation specified above. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 more than or less than the fineness modulus of the representative sample will be rejected.

2. Coarse Aggregate:

a. Hard, strong, durable, pebbles, crushed natural stone, free from adherent coatings, clay lumps, coal and lignite and other foreign matters. Chert (excluding sound gravels) or other nondurable particles shall not exceed 3% by weight.

b. Coarse aggregate derived from crushed concrete is not permitted.

c. Uniformly graded within the following limits (MDOT "17A", Table 902-1):

SIEVE ANALYSIS (MTM 109)	TOTAL % PASSING BY WEIGHT
1 in	100
3/4 in	90-100
1/2 in	50-75
No. 4	0-8
Loss by Washing (No. 200)*	1.0 Max**

* Michigan Test Method, MTM 108

** Loss by washing of 2.0 percent for material produced entirely by crushing rock, boulders, cobbles or concrete.

B. Cementitious Materials

1. Portland cement, ASTM C150, Type I , Type II, or Type III
2. Slag cement, MDOT 901.06 and ASTM C 989 Grade 100 or Grade 120
3. Fly ash, MDOT 901.07 and ASTM C 618, Class F
4. Blended hydraulic cement, ASTM C 595 or ASTM C 1157

5. Silica fume, MDOT 901.08 and ASTM C1240

C. Water: MDOT 911; Clean, potable, low-alkali content (maximum 80 parts per million), and free amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or metal in the concrete.

D. Admixtures: Conform to the following:

1. Air Entrainment: MDOT 903.01 and ASTM C 260
2. Water Reducing: MDOT 903.02 and ASTM C 494, Type A.
3. Accelerators: MDOT 903.04 and ASTM C 494, Type C
4. Calcium Chloride: Not permitted

E. Curing Materials:

1. White pigmented, impervious membrane curing compound: MDOT 903.06A and ASTM C 309, Type 2, Class B Vehicle, with the following additions:
   a. Base tests for moisture retention, reflectance, and drying time on curing compound application rate of 200 square feet per gallon (5 square meters per liter).
   b. Allow three weeks from the time of sampling before reporting results.
   c. Store the compound in clean containers.
2. Insulating Blankets: MDOT 903.07C and Federal Specifications HH-1-521e, minimum 2 inches thick, minimum R-Value of 7.0 ($°F*hr*ft^2$/Btu) per inch, and enveloping membranes.

F. Joint Materials:

1. Expansion joints: Premolded, non-extruding bituminous fiber conforming to MDOT 914.03 and ASTM D 1751 (AASHTO M 59).
2. Contraction or Weakened Plane Joints: Premolded filler conforming to ASTM D 994 (AASHTO M 33).
3. Hot-Poured Joint Sealant: ASTM D 6690 with exceptions specified in MDOT Section 914.04.A.
4. Backer Rod for Use With Hot-Poured Joint Sealant: Solid, round, heat resistant, closed-cell, cross-linked polyethylene foam rod conforming to MDOT 914.04B and ASTM D 5249, Type I.

G. Reinforcement: Reinforcement as stipulated in the Engineering Drawings.

H. Smooth Dowel Bars for Transverse Expansion and Contraction Joints: MDOT 914.07.

I. Devices for Transverse End-of-Pour Joints: MDOT 914.08.

2.2 CONCRETE MIX:

A. Mix concrete in accordance with ASTM C 94.

B. Proportion concrete by weighing and in conformance to the following table, unless otherwise directed by the Engineer:

1. Compressive Strength: 4,000 psi at 28 days
2. Maximum water/cementitious ratio: 0.45
3. Air content: 6.5% plus or minus 1.5%
4. Slump: 3 inches plus or minus 1 inch
5. Minimum Cement Content: 564 lb/cy
6. Maximum size of aggregate: 3/4 inch
7. Maximum water-soluble chloride ion content in hardened concrete of 0.15 percent by weight of concrete.

C. Add air entrainment agent to produce a total air content of 6.5% +/- 1.5% at the point of placement and an air void system with the following characteristics when evaluated in accordance with ASTM C 457:

1. Spacing factor less than 0.008 inch
2. Specific surface: at least 600 square inch per cubic inch of air void volume.
3. Voids per linear inch at least 1-1/2 to 2 times greater than the air content percentage.

D. Provide slump not more than 4 inches or less than 2 inches, when tested in accordance with ASTM C 143, unless otherwise directed by the Engineer, and except for hand placement. Slump not more than 4 inches for concrete that is hand-placed.

E. Add mixing water at the batch plant only. Do not add water at the job site unless authorized by the Engineer. When authorized to add water at the job site, do not add water more than one time. Adding water and the result on concrete is the responsibility of the Contractor.

F. Slag cement, fly ash, silica fume, and/or blended cement may be used as a partial replacement for Portland cement provided that testing confirms that the as-designed mixture, using the specific materials and sources contemplated for the project, complies with the requirements of this Article 2.2, including the requirement for adequate mitigation of risk of alkali-silica reactivity.
1. The maximum permitted replacement of Portland cement with slag cement is 40% by weight of the total cementitious material (Portland cement plus slag cement). Slag must not be from open hearth furnace.
2. The maximum permitted replacement of Portland cement with fly ash is 25% by weight of the total cementitious material (Portland cement plus fly ash)
3. The maximum permitted replacement of Portland cement with supplementary cementitious materials is 40% by weight of the total cementitious material.

4. The total alkali content of the cementitious materials shall not exceed 3.5 pounds per cubic yard, when evaluated in accordance with ASTM C 114 and ASTM C 311.

G. Perform preconstruction testing to verify that the proposed combination of aggregates and cementitious materials will be adequate to mitigate the risk of alkali-silica reactivity (ASR).

1. Evaluate fine and coarse aggregate by a minimum of two tests each in accordance with ASTM C 1260.
   a. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion less than 0.10% at 16 days will be considered acceptable and no further testing for ASR mitigation will be required.
   b. Aggregate sources that exhibit ASTM C 1260 mean mortar bar expansion equal to or greater than 0.10% at 16 days will be considered potentially reactive and unacceptable.
2. If the aggregate is reactive, evaluate the effectiveness of the proposed pozzolans and ground granulated blast-furnace slag to control deleterious ASR by conducting a minimum of two tests in accordance with ASTM C 1567.
   a. If the ASTM C 1567 mean mortar bar expansion is less than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered acceptable and no further testing for ASR mitigation will be required.
   b. If the ASTM C 1567 mean mortar bar expansion is equal to or greater than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered indicative of potentially deleterious expansion and unacceptable.
   c. Acceptable test results in accordance with ASTM C 1567 will be accepted in lieu of testing in accordance with ASTM C 1260.

2.3 EQUIPMENT

A. Finishing Machine: Power driven and of an approved type that will strike-off and compact the concrete with a screening and troweling action.

B. Forms: Metal, of an approved section that will ensure their rigidity under the impact, thrust, and weight of the heaviest machine carried on them.

1. Minimum length of 10 feet and a depth not less than the edge thickness of the work prescribed; width of the base in direct bearing on the soil not less than 8 inches; at least three stake pockets for each 10 foot section of form.
2. Straight, free from distortion and showing no vertical variation greater than 1/8-inch in 10-foot lengths from the true plan surface on the top of the form when tested with a 10-foot straight edge.
3. Connect form sections with a locked joint that is free from vertical movement in excess of 1/8-inch and free from horizontal movement in excess of one-quarter of an inch under the impact, thrust and weight of the heaviest machine carried on forms.

4. Provide sufficient forms so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

C. Water Supply: Provide pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, curing, sprinkling, subgrade and all other requirements of the work. Water may be supplied in approved tank wagons.

PART 3 - EXECUTION

3.1 PREPARATION

A. Smooth, trim and compact the subgrade to the required line, grade and cross-section. Thoroughly compact the subgrade, between lines at least 12 inches outside of each edge of the proposed pavement, by rolling with a roller of an approved type weighing not less than 5 tons.

B. Ensure that the subgrade is moist at the time of placing concrete. If the subgrade becomes dry before the concrete is placed, sprinkle the subgrade with water using a method of sprinkling that does not permit pools of water to form on the subgrade. Do not place the concrete on muddy, soft or frozen subgrade.

C. Restore and thoroughly compact rutting and other displacement caused by material hauling equipment or by the concrete placement equipment, for a distance of at least 100 feet ahead of the placement equipment.. Maintain the remainder of the prepared subgrade in its compacted state and true to the required grade and cross-section.

D. Place the concrete forms in advance of placing concrete. Substantially bring the foundation on which the forms are to be placed to the proper grade. Do not place forms on dikes or mounds. Where feasible, bring the subgrade to the approximate required cross-section by means of a subgrade machine.

E. Check forms for line and grade in advance of placing concrete. Adequately stake and brace forms to resist the pressure of the concrete and the thrust of any equipment traveling on them. Provide uniform bearing on the subgrade throughout the forms' entire length and width. Finish the entire width of the subgrade and thoroughly compact it for a sufficient distance outside the area required for the pavement in order to adequately support the forms. Place forms in direct contact with the subgrade. After the forms have been set to grade, thoroughly compacted, both inside and outside, by use of an approved mechanical form tamper. Joint all forms neatly and tightly, securely stake by at least three stakes per form, and thoroughly clean and oil forms before concrete is placed against them.

F. After the forms are set in place, check their top surface for grade and trueness with a straight edge not less than 10 feet long. Reset or move any forms showing a variance greater than 1/8 inch in 10 feet.

G. Coat the surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.2 CONSTRUCTION

A. Except as modified herein, comply with MDOT (2012) Sections 601.03 and 602.03 and ACI 304R.

B. Mixing

1. On the project site, mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
2. Transit mixers: Comply with ASTM C 94

C. Placing Concrete:

1. Do not proceed with concrete placement until the conditions of the subgrade/subbase are approved by the Engineer.
2. Distribute or spread the concrete as soon as placed. Deposit concrete on the subgrade so as to require as little handling as possible and to avoid segregation and separation of the materials. Distribute concrete to such depth and sufficiently above grade so that when consolidated and finished, the surface conforms to the required finished grade. Consolidate the concrete along the faces of the forms and adjacent to joints. Consolidate concrete with an approved vibrator to fill all voids and finish to ensure a dense smooth surface.
3. Deposit and spread concrete continuously, as far as possible between transverse joints. In the case of a temporary shutdown, cover the concrete at the unfinished end of the slab with wet burlap. In the event of an unavoidable interruption of the work continuing more than 30 minutes, place a construction joint, provided the section is 10 feet or more in length between joints. Remove sections less than 10 feet in length at no expense to Owner.

D. Tie Bars, Dowels and J-Bolts: Place tie bars and dowels at the required depth parallel to the finished surface, perpendicular to the joints and at the uniform spacing shown on the Drawings. Use approved chairs or dowel baskets to support the tie bars or dowels in place, or use approved mechanical devices; do not place tie bars or dowels by hand methods.

E. Joints:

1. Construct all joints with faces perpendicular to the surface of the pavement. Construct transverse joints at right angles to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit transverse joints to vary more

than 1/4 inch from a true line. Construct longitudinal joints along or parallel to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit longitudinal joints to vary more than one-quarter (1/4") inch from their true designated positions.

2. Finish the pavement surface adjacent to all joints to a true surface. Where indicated on the Drawings, edge the surface adjacent to joints to the radius shown. Test the surface across the joints with a 10-foot straight edge as the joints are finished, and correct irregularities before the concrete has hardened.
3. Longitudinal Joints: Bulkhead construction joints or contraction joints, as shown on the Drawings.
    a. Provide a keyway in the bulkhead construction joints.
    b. Accurately form keyways with templates of metal, wood, or other approved material.
    c. Provide the gauge or thickness of the template material to form the full keyway as specified.
4. Transverse Joints: Contraction joints, expansion joints or construction joints.
5. Contraction Joints: Transverse contraction joints are without tie bars. Locate transverse contraction joints at 24 to 30 times the pavement thickness, except do not exceed a maximum spacing of 15 feet. Provide tie bars in longitudinal contraction joints. Form contraction joints by saw cutting to a depth of 1/3 of the concrete thickness. Perform additional saw cutting to form 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the contraction joint. Where sidewalks under construction are adjacent to an existing pavement, construct contraction joints in line with similar joints in the abutting pavement.
    a. Provide tie bars in longitudinal contraction joints, of length and size shown on the Drawings.
    b. Embed tie bars on each side of the longitudinal contraction joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness.
    c. Space tie bars in longitudinal contraction joints as shown on the Drawings.
6. Expansion Joints: One (1") thick and placed every 60 feet on center, unless shown otherwise in the Drawings. Where the pavement under construction is adjacent to an existing curb and gutter and/or sidewalk, construct expansion joints in line with the expansion joints in the abutting curb and gutter and/or sidewalk.
    a. Provide expansion joints at right angles to the centerline, perpendicular to the surface of the finished pavement and extended entirely through the concrete.
    b. Provide smooth dowels, of length and size shown on the Drawings, with expansion cap on one end. Embed dowels a minimum on each side of the expansion joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in expansion joints as shown on the Drawings.
    c. During installation, maintain the joint filler in place by an approved installing device that is securely staked. Maintain the top of the joint filler at not less than l/2 inch or more than 3/4 inch below the finished surface. Cover the top of the joint filler with an approved metal cap before the concrete is placed.

Shape the metal cap to the finished elevation of the pavement. Provide a metal cap that will not warp or twist out of shape. Keep the cap in place during finishing machine operations.

d. Place concrete simultaneously against the dowels and joint filler to a depth approximately equal to the depth of the finished pavement. Thoroughly consolidate concrete with vibration tools. Carefully remove the installing device so that the joint filler and caps are not disturbed.

7. Construction Joints: Form construction joints with dowels whenever an unavoidable interruption of the work constituting a shutdown of more than 30 minutes has occurred, or when directed by the Engineer. Strike the concrete and finish to the bulkhead.
   a. Saw cut to form minimum 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the construction joint, or as shown on the Drawings.
   b. Provide dowels, of length and size shown on the Drawings, in construction joints. Embed dowels on each side of the joint as shown on the Drawings, and locate at the centerline of the concrete pavement thickness. Space dowels in construction joints as shown on the Drawings.
8. Clean the sealant reservoirs of all extraneous matter. Ensure that the contact faces of the joints are dry at the time of filling and sealing. Compressed air jets, wire brushes and such additional equipment as may be necessary to clean the openings and dry the contact faces of the joints will be required.

9. Fill the top of contraction joints, construction joints, and expansion joints and seal with hot, poured sealant before any traffic is permitted on the pavement. Install joint sealant by hand pouring pots, mechanical methods, or any other method that will give satisfactory results. Place sufficient sealant into the joints so that, upon completion of the work, the surface of the sealant will be flush with the surface of the pavement. Do not spill the sealant on exposed surfaces of the concrete. Immediately remove excess sealant on the surface of the concrete pavements. If the sealant subsides to a level below the surface of the slab, place a second application of sealant. When more than one application is required to fill the joint, perform succeeding applications immediately after shrinkage of the previous sealant application has taken place.
   a. Do not place sealant when the air temperature in the shade is less than 50 degrees F, except with the approval of the Engineer.
   b. Do not permit traffic over the sealed joints until the sealant has hardened sufficiently to resist pickup.

F. Finishing:

1. After the placement of the concrete, test surface with straight edge and finish with a burlap drag and perform final finishing on slabs at catch basins with a broom.

G. Surface Requirements: On the day following placement of the concrete, the pavement will be straight edged by the Engineer. A 10-foot straight edge will be placed parallel to the centerline so as to bridge any depressions and touch high spots. High spots indicated by a

variation exceeding 1/8 inch from the straight edge will be plainly marked. Remove high spots or reduce by rubbing with a carborundum brick and water. If these methods are inadequate to remove the high spots, use an approved surface-grinding machine.

H. Removal of Forms:

1. Do not remove forms from freshly placed concrete until it has set for at least 12 hours. Carefully remove forms so that no damage is done to the edge of the pavement.
2. After the forms have been removed, clean the ends of joints and point honeycombed areas.
3. Cover the sides of the pavement with curing material except where honeycombed areas are to be pointed. Cover areas to be pointed with wet burlap until the pointing is complete, and then cure as specified in Article 3.2 I.

I. Curing:

1. Immediately after finishing operations have been completed and free water has left the surface, completely coat and seal the surface of the pavement with a uniform layer of curing compound. Apply the compound in one or two applications, as required by manufacturer instructions. When the compound is applied in two increments, follow the first application with the second application within 30 minutes.
2. Thoroughly agitate the compound to a uniform consistency, with the pigment uniformly suspended, before transferring the compound between containers and before use.
3. Apply the compound in a continuous uniform film by means of mechanical pressure sprayer equipment at the rate stipulated by the compound manufacturer but not less than one gallon per 200 square feet of surface. Use equipment that provides adequate stirring of the compound during application. Hand spray equipment will be permitted for application of the curing compound over the sides of the slab.
4. Provide uniformly painted, solid white surface after application of curing compound. If appearance is blotchy and non-uniform, apply another layer of curing compound.
5. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, apply a new coat of material to the affected areas equal to that originally applied.
6. Protect the treated surface from injury for a minimum period of seven days. All traffic will be considered injurious to the film of applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided that any damage to the film is immediately repaired by the application of another coat of the compound.
7. Provide sufficient burlap, cotton, or polyethylene sheet coverings to protect the pavement in case of rain or breakdown of the spray equipment. If any hair checking develops before the curing compound can be applied, perform preliminary curing with wetted burlap or cotton coverings before the curing compound is applied.
8. Cold Weather Curing: Comply with Article 1.5 A.

J. Cleanup

1. After the concrete has gained sufficient strength, but no sooner than twelve hours, remove fixed forms and immediately backfill the spaces on both sides with sound earth of topsoil quality.
2. Compact and level backfill, providing a neat, workmanlike condition.

3.3 FIELD QUALITY CONTROL

A. Delivery Tickets: With each load of concrete delivered to the jobsite, provide ready-mix concrete producer's delivery tickets in triplicate, one for Contractor, one for Engineer, and one for Owner. Provide the following information on delivery tickets:

1. Date and serial number of ticket
2. Name of ready-mixed concrete plant, operator and job location
3. Types of cementitious materials, brand names, and proportions
4. Types of admixtures, brand names, and dosages
5. Aggregate sizes, proportions, and sources
6. Specified cement content in bags per cubic yards of concrete, or mix number
7. Truck number and time dispatched
8. Amount of concrete in load, and in cubic yards delivered
9. Slump of concrete ordered
10. Amount of water added before the truck left the plant
11. Water added at the jobsite, if any and if authorized by Engineer, and corresponding slump of concrete. Adding water at the jobsite without authorization by the Engineer is grounds for rejection.

B. Quality assurance testing, defined in Articles 1.5 C and 1.5 D, will be performed by a testing agency retained by the Owner. This testing is in addition to the quality control program required to be performed by the Contractor.

C. Comply with the attached MDOT Special Provision for Quality Control and Acceptance of Portland Cement Concrete (For Local Agency Projects Only).

3.4 PROTECTION

A. Protect newly laid pavement that is threatened with damage by rain with a covering of burlap or cotton fabric or by other suitable means.

B. Comply with the hot and cold weather construction requirements in Part 1 of this specification.

C. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather. Remove and replace concrete injured by frost action at no expense to the Owner.

D. Opening of pavement:

1. Do not open entrance drives, driveways and parking areas to traffic until the strength of placed concrete attains 90% the specified design strength and not before 14 days after time of placement, without the written permission of the Engineer.
2. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85 percent of the design strength.
3. Opening pavement to traffic will not constitute a final acceptance of the concrete driveways.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT
Driveway, Reinf Conc 8 inch, Modified	Syd
Driveway, Nonreinf Conc 8 inch, Modified	Syd

1. Driveway, Reinf Conc 8 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Driveway, Nonreinf Conc 8 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

MICHIGAN
LOCAL AGENCY
SPECIAL PROVISION
FOR
WARRANTY WORK REQUIREMENTS FOR JOINTED PLAIN CONCRETE PAVEMENT

a. Description. This special provision is for use with MICHIGAN LOCAL ROAD AGENCY SPECIAL PROVISION FOR HOT MIX ASPHALT and CONCRETE PAVEMENT WARRANTY for construction/reconstruction projects using jointed concrete pavement on an unbound or stabilized aggregate base that will be warranted against defects in workmanship and materials.

When a local agency concrete project is to be warranted, its Initial Acceptance shall follow Section.602 of the current MDOT Standard Specifications for Construction.

b. Terms of the Warranty

Limits of the Warranted Work - Warranted work includes all jointed plain concrete pavement placed in driving lanes within the project limits, unless described otherwise on the plans.

Warranty Term - A timeframe which begins at the Acceptance Date of Warranted Work of a completed Concrete Pavement project. Multi-phased projects may have multiple "Acceptance Dates of Warranted Work." The Warranty Term will last five (5) years, unless otherwise specified in the contract.

Warranty Bond - The Contractor shall furnish a single term bond worth 5% of the total contract or $1,000,000 whichever is less, secured in the name of the road owner and/or the agency in charge of the project. The effective starting date of the warranty bond will be the Acceptance Date of Warranted Work. The warranty bond will be released at the end of the warranty period or upon satisfactory completion of all warranty work; whichever is later.

Warranty Requirements - Table 1 lists maximum allowable defect thresholds for each condition per $1/10^{th}$-mile lane segments and the maximum allowable number of segments for each condition parameter. If the Contractor has not met any warranty requirement, even in non-contiguous segments, the Engineer will request warranty fixes.

Each driving lane will be assessed separately. Any warranty work required of the Contractor to correct deficiencies for any condition, will be full-width across the driving lane.

c. Quality Control / Quality Assurance (QA/QC). The Contractor is responsible for project quality and must provide QC testing procedures and results.

The Engineer will perform Quality Assurance (QA) testing as a spot-check to determine Initial Acceptance or assess penalties if specifications are not met. QA testing does not relieve the Contractor of QC responsibilities. A Contractor may not use QA tests as evidence in a warranty dispute.

d. Initial Ride Quality Acceptance. Initial Ride Quality requirements are outlined in the bid documents.

e. Corrective Action. Table 2 lists the recommended corrective actions/treatments for the various defects. The Contractor may use an alternative action subject to Engineer's approval.

Table 1: Warranty Requirements

Condition Parameter or Defect	Threshold Limits Per Segment (Length = 528 feet)	Max. Defective Segments Per Driving Lane-Mile (b)
Transverse Crack	2 (a)	1
Longitudinal Crack	5% of segment length	1
Map Cracking	10% of segment area	1
Spalling	10% each slab (c) < 2 slabs	1
Surface Scaling	15% of the slab area < 1 slab	1
Corner Cracking	1	1
Joint Sealant Failure	10% joint length (c,d) < 2 slabs	1
Shattered Slab	0	0

a. For segments less than 1/10 mile in length, divide the segment length in feet by 528. The multiply the threshold limit shown in the table by this fractional number. Round the result to the nearest whole number for the new threshold limit. In no case can the threshold limit be less than 1.

b. The maximum allowable number of defective segments per condition for a specific driving lane is determined by multiplying the length of the specific driving lane in miles by the maximum allowable defective segments per mile as shown in the table for that condition. . In no case can the max Defective segments per driving lane limit be less than 1.

c. Can be non-contiguous. 10% value applies to total perimeter (four sides) of the slab.

d. Applies to all transverse and longitudinal joints on the perimeter of the slab. Non-contiguous lengths will be summed on a per-slab basis.

Table 2: Recommended Corrective Action

Condition Parameter or Defect	Recommended Action (a)
Longitudinal Cracking (b)	Retrofit load transfer
Transverse Cracking (b)	Retrofit load transfer
Corner Cracking	Full-depth, tied, concrete patch
Map Cracking	Remove and replace
Spalling	Repair with epoxy or cement mortar (c)
Surface Scaling	Diamond grind surface (d)
Joint Sealant Failure	Remove and replace seal material (e)
Shattered Slab	Full depth slab replacement (f)

a. If multiple defects are present, the Engineer may revise the recommended actions, up to and including removal and replacement.
b. The Engineer's requested corrective treatment will depend on the crack's location and depth. Full-depth T-cracks require retrofit load transfer (> 90% load transfer efficiency) as a minimum. Full depth/full length L-cracks require slab removal and replacement, if outside influence of lane ties.
c. The Engineer's requested repair depends on the area and depth of spall, relying on most current specifications in the MDOT Material's Technology Section, Construction and Technology Division.
d. Diamond grinding applies to entire slab surface area where scaling exists.
e. Replace with existing material type. Neoprene seals are removed and replaced full-width.
f. All shattered slabs must be removed and replaced.

SPECIAL PROVISION
FOR
PAINTED PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pavement markings, including lane markings, crosswalks, arrows, stop lines, handicapped symbols, and curb markings as shown on the drawings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

D. Installing thermoplastic pavement markings as shown on the drawings for bus and bike lanes.

E. Recessing pavement markings.

F. Installing polymer cement surface system (PCSS) pavement markings as shown on the drawings for bus and bike lanes.

1.2 RELATED SECTIONS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving

C. Section 321213 – Tack Coats

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; 2004.

E. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; current edition at http://mutcd.fhwa.dot.gov.

F. MMUTCD – Michigan Manual on Uniform Traffic Control Devices, Michigan Department of Transportation.

G. ASTM E 28 - Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus.

H. ASTM G 152 - Standard Practice for Operating Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

I. ASTM G 153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

J. MDOT 2012 Standard Specifications for Construction Sections 811 and 920 - Permanent Pavement Markings.

1.4 SUBMITTALS

A. See applicable Specification Section titled Submittal Procedures, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

D. Provide safety data sheet to Engineer for required materials and supplies

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

E. Store, mix and prepare paints only in areas designated for that purpose.

F. Provide clean cans and buckets for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At the close of each work day, remove used rags and other waste materials associated with painting from the site.

G. Take precautions to prevent fire in and around painting materials. Provide and maintain appropriate fire extinguishers near paint, paint storage, and mixing areas.

H. Deliver the PCSS material to site in weather proof containers and stored in a covered and ventilated location.

G. Obtain manufacturer or approved installer approval for PCSS equipment to be used.

1.6 PROJECT CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Place PCSS only when all of the following conditions are met:

- The pavement surface is dry.
- Ambient and substrate temperatures are 50° F (10° C) and rising and expected to remain above 50° F (10° C) for 6 hours
- There is no forecast of temperatures below 35° F (2° C) within 24 hours from the time of placement.
- The weather is not foggy or rainy. When rain appears imminent, all placement operations shall cease and the work shall not be resumed until the threat of rain has passed.
- When the ambient temperature is below 50° F (10° C), but will remain above 40° F (5° C) during paving and the substrate temperatures are 50° F (10° C) and rising, the PCSS can be placed only when manufacturer approved accelerators are added to the mix and approval of the Engineer is obtained.
- Care should be taken when placing the PCSS when the substrate temperature exceeds 130° F (50° C). Application temperatures of the substrate above 130° F (50° C) should be closely monitored for performance during the course of application. Any observable defects occurring as a result of extreme temperature should be cause for immediate halting of placement operations.
- Where the ambient paving air temperature is going to exceed 90° F (32° C) then the use of cold water and ice should be considered for the blending operation. Where the provision of cold water or replacing the part of the water requirement with ice is not possible, then the use of a retarder should be used with the mix.

1.7 EXTRA MATERIALS

A. See Specification Section titled Product Requirements, for additional provisions.

B. Supply 2 containers of each color for Owner's use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.

1. Roadway Markings: As required by authorities having jurisdiction.
2. Parking Lots: Yellow.
3. Handicapped Symbols: Blue.

B. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for Portland cement pavements.

C. Reflective Glass Beads: MDOT 2012 Standard Specifications for Construction Section 920 - Permanent Pavement Markings.

D. PCSS Material: Endurablend™ system as manufactured by Pavement Surface Coating, LLC or engineer-approved equivalent.

E. Obtain approval form the manufacturer for use of any chemical admixtures and/or color pigments dosage rates and the conditions for use in the PCSS.

F. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

G. Thermoplastic material: Provide material per MDOT 2012 Standard Specifications for Construction; Section 920 - Permanent Pavement Markings.

H. Thermoplastic equipment: Provide equipment per MDOT 2012 Standard Specifications for Construction Section 811 - Permanent Pavement Markings.

I. Thermoplastic pavement marking material: Clearly mark each container to indicate color, weight, type of material, and lot or batch number (consider lot or batch as each individual mix or blend that produces finished product ready for use). Package material in either suitable corrugated containers or thermal degradable plastic bags to avoid sticking during shipment or storage.

J. Thermoplastic markings shall not be slippery when wet, nor exhibit tacky, exposed surface. Cold ductility of material shall permit normal road surface expansion and contraction without chipping or cracking. Markings shall retain their original color, dimensions, and placement under normal traffic conditions at road surface temperatures of 158 F and below.

K. Glass Traffic Beads: In general meet the following requirements:
Manufactured from glass;
Spherical in shape;
Free of sharp angular particles;
Free of particles showing milkiness, surface scoring, or surface scratching;
Water white in color;
Containing less than 1/4 of 1% moisture by weight;
Free of trash, dirt, etc;
Showing no evidence of objectionable static electricity when flowing through regular traffic-bead dispenser.

L. Glass Bead Gradation: per MDOT 2012 Standard Specifications for Construction Section 920 - Permanent Pavement Markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Obliteration of existing markings: Per manufacturer’s recommendations

D. Clean surfaces thoroughly prior to installation.

1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
2. Completely remove rubber deposits, existing paint markings, and other coatings

adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.

3. Sandblasting: Use equipment of size and capacity necessary, providing not less than 150 cfm of air at pressure not less than 90 psi at each nozzle used.
4. Comply with Manufacturer's recommendations.

E. Where pavement markings are to be recessed, groove the pavement in a single pass dry cut using stacked diamond cutting heads or engineer approved carbide or similar cutting tools, and the equipment used shall be self-vacuuming and leave the cut groove ready for material installation. The equipment and method used for grooving shall be approved by the manufacturer of the recessed material. The bottom of the groove shall have a fine corduroy finish. If a coarse tooth pattern is present, the number of blades is to be increased and the spaces on the cutting head are to be decreased. The pavement marking material shall be placed in the grooves the same day as the cut is made. Grooves shall be clean and dry prior to placing any pavement marking material.

On new surfaces where no permanent markings are present, paint temporary lines (with no beads) exactly where the permanent markings will be placed. Use these lines as a template for the grooving operation.

Groove Width:	Material width +1 inch, + / - 1/8 inch
Groove Depth:	As recommended by the manufacturer, + / - 5 mils or as shown on the plans
Groove Position:	On the lane, 4 inches in from the joint line, + / - 1/8 inch

F. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

G. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

H. Temporary Pavement Markings: When required or directed by Engineer, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.

1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

I. Do not intermix materials of different character or different manufacturer.

J. Do not thin material except as recommended by paint manufacturer.

K. Clean the substrate that is to receive the PCSS system of sand, dirt, dust, rock, or any other debris that could prevent proper adhesion. Perform cleaning by power broom, scraping, blowing, washing, or other approved methods necessary to assure bonding between the PCSS surface course and the substrate. Do not start PCSS operations until the surface is in a condition as recommended by the manufacturer.

L. Verify all substrate receiving PCSS is free of potholes, spalling, or other areas of structural deterioration. If identified in the plans, or directed by the Engineer, excavate all such areas to a depth where the substrate is structurally sound and repaired with an approved pothole repair method. Report to the Engineer all structurally deficient areas not identified for repair in the plans.

M. Perform measuring and mixing that is capable of producing a consistent homogeneous mix sufficient to maintain the production levels required for the work. The water and dry blend shall be charged into the mixer and blended to the desired consistency while maintaining effective temperatures to prevent flashing of the mix. Hand mixing in pails is not permissible**.**

3.3 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried. Do not paint wet or damp surfaces.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) and MMUTCD for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted. Where applying to recessed area, make sure the entire permanent marking is within the recessed area.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.

1. Apply paint in one coat only.
2. Wet Film Thickness: 0.015 inch, minimum.
3. Length Tolerance: Plus or minus 2 inches.
4. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.

1. Conduct operations in such a manner that necessary traffic can move without hindrance.
2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.

1. Mark the International Handicapped Symbol at indicated parking spaces.
2. Hand application by pneumatic spray is acceptable.
3. Parking space striping dimensions indicated on the Drawings are nominal dimensions. Comply with the following tolerances:
   a. Parking space length: plus or minus 2 inches
   b. Parking space width or base line dimension: plus or minus 2 inches
   c. Group of parking spaces: plus or minus 2 inches per run
   d. Stripe width: 4 inches plus or minus1/8 inch
   e. Extend stripes to within 3 inches of walls or other vertical surfaces

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

J. Deposit PCSS material uniformly on the substrate by roto-stator spray equipment. Verify the spray apparatus device is approved by the manufacturer and have the capability of mixing the materials at a rate to insure continuous spray operations. With the stencil design, the base coat may be applied with a squeegee. Stenciled Pavement requires a base coat of the material to be applied by squeegee or spray on top of asphalt or concrete pavement. Concrete pavement may require shot blasting to roughen the surface to ensure proper bonding. The base coat provides a grout line color plus seals the surface. Once the

base coat has cured, apply the specified stencil pattern and spray the top coat. Remove stencil when the top coat has reached the proper consistency and allow coating to cure. Cure to traffic time is approximately 2 hours at 70 degrees. The total cured thickness should be between 1/8" and 3/16". The stencils should be a plastic or paper pattern consistent with the design of the crosswalks.

For Non-Patterned Application, use a colored or base color coating without a decorative pattern. Apply the material to the asphalt or concrete pavement using roto-stator spray apparatus. Concrete pavement may require shot blasting to roughen the surface to ensure proper bonding. A smooth or textured surface can be created. A textured surface is achieved by adding aggregate to the mix or distributing a fine aggregate to the surface after application as specified in the plans. Cure to traffic time is approximately 2 hours at 70 degrees. The total cured thickness should be between 1/8" and 3/16".

K. For thermoplastic In general comply with MDOT 2012 Standard Specifications for Construction Section 811 - Permanent Pavement Markings and the following:
- Spray apply pavement marking or extrude hot to pavement surface unless application method is specified on Drawings.
- Provide continuous mixing and agitation of material. Provide clean, square, marking ends. Do not use pans, aprons, or similar appliances which dye overruns.
- Provide thermometer capable of measuring temperature of pavement marking material.
- Use automatic bead dispenser attached to pavement marking equipment in manner that beads are dispensed uniformly and almost instantly upon marking as marking is being applied to road surface. Rate of application shall be sufficient to achieve retro-directive reflective characteristics specified. Provide automatic cut-off control for bead dispenser, synchronized with cut-off of pavement marking equipment.
- Place markings in accordance with approved traffic control plan so that minimal interruption to traffic flow is achieved. Protect newly-installed pavement markings from damage by traffic.
- Apply pavement markings onto clean, dry pavement having road surface temperature above 60 F for Portland cement concrete surface and above 50 F for asphaltic surface. When pavement marking application is by spray and operations cease for five or more minutes, flush spray head by spraying pavement marking material into pan or similar container until material is proper temperature for application.
- Use markings that are completely reflectorized internally and externally.
- Use crew experienced in work of installing pavement markings and supply all equipment and materials necessary for placement of pavement markings.
- Apply material within temperature limits recommended by manufacturer.
- Prior to placement of thermoplastic material, properly prepare pavement with primer.

3.4 LAYOUT

A. Place pavement markings in proper alignment with guidelines established on roadway. Do not deviate from alignment established greater than two inches. Do not deviate in alignment

of marking being placed greater than one inch per 200 feet of marking and do not deviate abruption.

B. Place additional markings required to achieve alignment specified throughout both straight and horizontally curved sections of roadway. Additional markings placed on roadway for alignment purposes shall be temporary in nature and shall not establish permanent marking on roadway. Materials used for alignment markings and equipment used to place markings shall be approved by Engineer.

3.5 SURFACE PREPARATION (Thermoplastic)

A. Clean pavement by sandblasting and prepare in accordance with recommendations of thermoplastic material manufacturer and to satisfaction of Engineer, prior to placement of markings. Surface scarification can be used with prior approval of Engineer.

B. Use cleaning methods approved by Engineer that completely remove contaminants, loose materials, and conditions deleterious to proper adhesion. Do not clean Portland cement concrete surfaces by grinding.

C. Prepare Portland cement concrete surfaces further after cleaning by completely sealing with epoxy or methyl methacrylate sealer, as recommended by thermoplastic material manufacturer. Placed sealer sufficiently in advance of thermoplastic to allow release of all solvents.

D. Prime asphaltic surfaces with sealer, as recommended by thermoplastic material manufacturer based on surface conditions. Include adhesive or adhesion promoter when asphaltic surfaces exhibit polished aggregate.

3.6 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

G. Clean paint spots and repair damage to other finishes.

H. Protect the PCSS surface course from traffic until the area is sufficiently cured. Curing time will vary depending on ambient and surface temperatures. Do not open the PCSS to traffic until it has reached sufficient compressive strength that the surface will not be damaged by vehicular traffic and the area has been approved for opening by a representative of the manufacturer, the installer, or the Engineer.

3.7 TESTING

A. Maintain uniform cross section, density, quality, and thickness for markings. Markings shall be uniform throughout their thickness. Use applied markings that are 95% free of holes and voids, and free of blisters for minimum of 60 days after application.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Pavt Mrkg, Polymer Cement Surface System (PCSS), Green, Modified	Sft
Pavt Mrkg, Polymer Cement Surface System (PCSS), White, Modified	Sft
Pavt Mrkg, Polymer Cement Surface System (PCSS), Red, Modified	Sft

1. Pavt Mrkg, Polymer Cement Surface System (PCSS), Green, Modifed includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Pavt Mrkg, Polymer Cement Surface System (PCSS), White, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

3. Pavt Mrkg, Polymer Cement Surface System (PCSS), Red, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISIONS
FOR

PLANT RAIL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plant Rail.

1.2 REFERENCES

A. ASTM A 653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 787 - Standard Specification for Electric-Resistance-Welded Metallic- Coated Carbon Steel Mechanical Tubing.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches, representing actual product, color, and patterns.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of 5 years documented experience with ornamental fencing of the type and scale specified.

B. Installer Qualifications: Installer with a minimum of 5 years documented experience with ornamental fencing of the type and scale specified.

C. Mock-Up: Provide a mock-up for evaluation and application workmanship.
   1. Finish areas designated by Landscape Architect.
   2. Do not proceed with remaining work until workmanship and color are approved by Landscape Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Identify each package with manufacturer's name.

C. Store fence material and accessories in secure and dry place.

1.6 WARRANTY

A. Provide manufacturers 20 Year Limited Warranty for Ornamental Fencing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Exclusive Iron Works New York, 51 West 88th Street; New York, NY 10024;; Tel: 646 319 4144; Website:www.exironworks.com

B. Or Approved Equal

2.2 WROUGHT IRON PLANT RAIL

A. Style: “Tree Fence 8”

B. Height: Custom, Refer to Drawings.

C. Width: Custom, Refer to Drawings.

D. Color: Black.

E. Anchor: 2 ft deep stakes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until boundaries and grading has been properly prepared.

B. Verify that property lines and legal boundaries of work are clearly established.

C. If preparation is the responsibility of another installer, notify Landscape Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean and or prepare surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set post uniformly as indicated on the Drawings.

C. Set posts plumb in concrete having a diameter 4 times the diameter of the post, and 6 inches deeper than the bottom of the post. Forms are not necessary or recommended.

D. Check each post for vertical and top alignment.

E. Attach panels to brackets using one way security bolts.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 3 inch.

C. Minimum distance from property line: 6 inches.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Plant Rail	LF

A. Plant Rail includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISIONS
FOR

PLANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Plants
2. Planting Soil
3. Mulch
4. Tree Stabilization
5. Metal Restraint
6. Tree Watering Bag

1.03 SUBMITTALS

A. Product Data: For each type of product indicated
1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
3. Soils: Include source of materials and photographs of each constituent material.
4. Plant Anchoring Systems.
5. Metal Restraint.
6. Tree Watering Bags

B. Samples: Provide for each element of construction listed:
1. Soil: Submit a one gallon sample of the soil after mixing to architect for approval.
2. Tree Stakes.
3. Arbor Ties.
4. Plant Anchoring System, all components.
5. Metal Restraint

C. Plant Species and Source List: The Contractor shall submit for approval plant species and source list indicating the plant botanical and common name, size, quantity, form, rootball, identification of fall dig hazards, limb height (if applicable), nursery source, including contact information, and Landscape Architect’s seal number
1. Plant list shall clearly indicate deviations from the specified plant list and any proposed substitutions.
2. As the project progresses and plants are located and sealed, revise and re-submit the plant list submittal.

D. Photographs of Plants taken at the Nursery Source: Provide representative images of plants prior to scheduling tagging trips and as the basis for the Landscape Architect to select plants.

1. Contractor shall label each photograph with the plant species botanical name, nursery name, and date of photograph.
2. Photographs shall include images showing the full range of characteristics of each plant including detailed photographs of the bark, the base of the tree (rootball crown), leaves if present, branching structure, form, and habit.
3. Images shall include a scale figure or measuring device to indicate true size.
4. Photographs may be transmitted electronically but the title of electronic files must bear the plant name, nursery, and date.
5. For container plants, also provide close up photographs of the rootball with the container removed.

E. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

F. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

G. Warranty: Written warranty and maintenance procedures.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator, if applicable: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed. LSU Ag Center Soil Testing Lab shall be the preferred testing facility.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three (3) representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for plant growth.

a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

G. Preinstallation Conference: Conduct conference at Project site or other location approved by Architect. Contractor to notify Architect of meeting time/location at least seven (7) days in advance.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, rhizomes, corms, and tubers in a dry place at 60 to 65 deg F until planting.

F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
   1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
   2. Do not remove container-grown stock from containers before time of planting.
   3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
   1. Notify Architect no fewer than seven days in advance of proposed interruption of each service or utility.
   2. Do not proceed with interruption of services or utilities without Architect's written permission.

C. Planting Restrictions: Plant during the following period unless temporary irrigation is installed, calibrated, operated and maintained by the contractor for a period of 6 months from planting date. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
   1. Planting Season: ~~September 15th – May 1~~ **March 1st – May 15th & October 1st – November 15th.**

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.07 PRECONSTRUCTION MEETING

A. Prior to the start of the installation of Plants meet at the site with the landscape architect, general contractor and installer to review installation layout, procedures, means and methods

1.08 WARRANTY

A. Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of tree stabilization.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion of Project.
   a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.
   b. Ground Covers, Biennials, Perennials, and Other Plants: 24 months.
3. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.09 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
   1. Maintenance Period: 24 months from date of Substantial Completion of Project.

B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
   1. Maintenance Period: 24 months from date of Substantial Completion of Project.

C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; with lichen, moss or other living

substances growing on the bark; with cuts in the bark, whether healed or fresh; or with stem girdling roots will be rejected.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.02 PLANTING SOILS

A. Existing Site Soil: Existing site soil cannot be used. All soil to be brought to site pre-mixed at an approved facility

B. Soil Components:

1. Manufactured Topsoil: ASTM D 5268 topsoil, Fertile, friable, loamy soil, containing 1.5 to 5 percent by dry weight organic matter; free from subsoil, refuse, roots, heavy or stiff clay, stones larger than 1/2 inch, noxious seeds, sticks, brush, litter, and other deleterious substances; suitable for the germination of seeds and the support of vegetative growth. The pH value shall be between 5.5 and 7.0. Manufactured topsoil from off-site sources. Soil shall be harvested at a single source from the O and or A horizons of the soil profile. Test soil for pH levels after mixing. Soil source location and extent of area suitable for harvest shall be approved by the Landscape Architect.

2. Black Bark Mulch: Shredded pine bark, no more than 1/2 inch x 1inch in size. Dark and rich in color, free of stones larger than ½ inch, noxious seeds, and litter. Source location shall be approved by the Landscape Architect.

3. Coarse Sand: ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2

a. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles. Sand PH shall be lower than 7.0.

b. Provide the following particle size distribution:

Sieve	Percent Passing
3/8" (9.5mm)	100
No 4 (4.75mm)	95-100
No 8 (2.36mm)	80-100
No 16(1.18mm	50-85
No30 (.60mm)	25-60
No50 (.30mm)	10-30
No100 (.15mm)	2-10

4. Provide a one gallon sample of each soil component (Manufactured Topsoil, Black Bark Mulch, Coarse Sand) with manufacturer's literature and material certification that the product meets the requirements.

C. Mix the following quantities of materials to produce Planting Soil (for Trees and Shrubs):

Material	% by volume
Manufactured Topsoil	33.3%
Black Bark Mulch	33.3%
Coarse Sand	33.3%

Adjust the ratio of the components to achieve water permeability between 0.75 and 1.75 inches per hour when compacted to 80-85% of maximum dry density. The permeability of the allowable topsoil materials will vary the overall permeability of the final mix. Submit multiple mix ratios for permeability testing to establish the correct mix ratio for the available topsoil.

1. Planting mix shall be thoroughly mixed.

2. Final mix shall have a pH of between 5.5 and 7.0.

3. Provide a one gallon sample of each mix ratio with the required soil test results.

D. Mix the following quantities of materials to produce Raingarden Soil:

Material	% by volume
Manufactured Topsoil	40%
Black Bark Mulch	20%
Coarse Sand	40%
Weight of 8-8-8 Slow-Release Fertilizer Per 1,000 SF: 8 Lbs.	

1. Planting mix shall be thoroughly mixed.

2. Final mix shall have a pH of between 5.5 and 7.0.

3. Provide a one gallon sample of mix ratio with the required soil test results.

2.03 MULCH

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:
   1. Type: Brown Hardwood Mulch
   2. Depth: Three (3) inches.
   3. Cypress Mulch will not be accepted.

B. Mulch must not be placed within three (3) inches of a tree trunk.

C. The Contractor shall be responsible for the replacement of mulch during the 24 month warranty and maintenance period.

D. Provide a one gallon sample of material with manufacturer's literature and material certification that the product meets the requirements.

2.04 TREE STABILIZATION SYSTEM

A. Wood Stakes: 2” Ø unpeeled stakes, 8’-0” min. length, Eastern Redcedar (Juniperus virginiana) or approved equivalent. Provide three (3) stakes per tree or as otherwise indicated in the Drawings.

B. Guying straps: ¾" wide "ArborTie" flat polypropylene strap with break strength of 900lbs (min). Color: dark green or black. As manufactured by:

1. DeepRoot Green Infrastructure, LLC
   101 Montgomery Street, Suite 2850
   San Francisco, CA 94104
   info@deeproot.com
   Tel: 415.781.9700 / Toll Free: 800 458 7668

   a. Or Approved Equal.

2.05 METAL RESTRAINT

A. To be used separating Asphalt Pavement and planting areas. Refer to drawing for location.

B. Size/Finish: 4 inches by 3 inches; Black Duraflex

C. Manufacture: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   Permaloc Corporation; 13505 Barry St. ; Holland, MI 49424; Tel: 800 356 9660; Website: www.permaloc.com

D. Or Approved Equal

2.06 TREE WATERING BAGS

A. Treegator (Original), Slow Release Watering Bag.

B. Manufacturer: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Treegator; 153 Mosswood Blvd; Youngsville NC, 27596; Tel: (866) 873-3428, Website: www.treegator.com

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 12 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Spread planting soil to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.04 PLANT LAYOUT

A. Horizontal Layout: The plant locations shown on the Drawings are approximate. The Contractor shall layout the final location of individual plants by stake or flag and obtain the Landscape Architect’s approval of locations before starting installation. After staking is accepted, set plants in place for final review and acceptance by the Landscape Architect. The Contractor shall make revisions and adjustments as directed by the Landscape Architect.
   1. Contractor shall not stake plant locations until proper subgrade, drainage, and subsoil layers are installed.
   2. Contractor shall verify the locations of all unground utilities before staking plant locations.
   3. Indicate the species and size of plant on the stake or flag
   4. Contractor shall make adjustments as determined by the Landscape Architect without additional cost to the Owner.

B. Indicate the species and size of plant on the stake or flag Vertical Layout: Set the elevation of trees through the use of string lines or by instrumentation. Demonstrate to the Landscape Architect through the use of stakes and string that trees have been set at the correct elevation prior to completing planting and installing the upper soil horizon, if requested.

3.05 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away

from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Subsoil and topsoil removed from excavations may not be used as planting soil.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.06 TREE, SHRUB, AND VINE PLANTING

A. Rootball Pedestals: Provide a rootball pedestal composed of subgrade fill immediately beneath the ball or root mass. Pedestal shall provide the relationship to finish grade described below and prevent settlement of the plant. Compact pedestal to 95% Standard Proctor.

B. Identifying and Exposing the Root Flare: Prior to setting the height of the rootball pedestal, the Contractor shall remove burlap and twine from the top of the rootball and inspect each plant to determine if the trunk flare is buried within the rootball. If buried, the Contractor shall expose the trunk flare (according to ANSI Z60.1) by removing excess fill on top of rootball, taking care not to damage the bark or roots while removing the soil overburden. Adventitious roots and girdling roots shall be removed with sharp pruners. Adjust the rootball pedestal to position the trunk flare 2"-3" higher than the proposed finished grade.

C. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

D. Wire Baskets: Once set, completely remove top one-third of wire basket. Cleanly cut each tier of all horizontal wires making one cut centered between each set of vertical wires. Completely remove top 1/3 of burlap.

E. Drum lacing and Burlap: Once set, remove top one-third of lacing and burlap.

F. Containerized plants: Completely remove container. Cut out container with a sharp blade if container does not readily separate from the rootball.

G. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above finish grades.
   1. Use planting soil for backfill.

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.07 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Do not apply pruning paint to wounds.

3.08 GROUNDCOVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in drawings with triangular spacing.

B. Before planting, landscape architect shall review and approve plant layout. Contractor shall notify landcape architect five days prior to layout and planting installation.

C. The Contractor shall scarify the rootballs of container plants. Using a sharp knife, make vertical cuts the full height of the rootball at a depth of 2” and every 3” o.c.

D. Use planting soil for backfill.

E. Dig holes large enough to allow spreading of roots.

F. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

G. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

H. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

I. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.09 PLANTING AREA MULCHING

A. Mulch surfaces of planting areas and other areas indicated with Pine Straw Mulch only to a depth of 3”.

B. Trees without the specified depth of mulch at the end of the Warranty and Maintenance period shall be rejected.

3.010 MAINTENANCE

A. Trees and Shrubs: Contractor shall irrigate as required to maintain vigorous and healthy plant growth. Overwatering or flooding shall not be allowed. The Contractor shall furnish any water to ensure adequate irrigation.

B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

C. Stake Removal: At the end of the Warranty and Maintenance period, the Contractor shall be responsible for removing any above ground stakes from all trees planted under this contract.

D. Documentation
1. Provide a monthly check-list in writing of maintenance tasks performed by landscape area.
2. Provide monthly photos of maintenance performance.

3.011 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion of Project remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.012 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

PART 4 - MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Watering and Cultivating, First Season, Modified	LSUM
Watering and Cultivating, Second Season, Modified	LSUM
Acer x freemanii Celebration, 6 inch	EA
Acer x freemanii Celebration, 3 inch	EA
Tilia cordata, 6 inch	EA
Tilia cordata, 3 inch	EA
Ulmus Frontier, 6 inch	EA
Ulmus Frontier, 3 inch	EA
Gymnocladus dioica, 6 inch	EA
Gymnocladus dioica, 3 inch	EA
Cercis canadensis, 2 inch clump, 3 Stem	EA
Plant Bed Planting Mixture	Sft
Rain Garden Planting Mixture	Sft
Planting Soil	Cyd
Rain Garden Soil	Cyd
Mulch, Modified	Syd

1. Watering and Cultivating, First Season includes all labor, equipment, and materials to maintain all landscape areas for the first year after installation.

2. Watering and Cultivating, Second Season includes all labor, equipment, and materials to maintain all landscape areas for the second year after installation.

3. Acer x freemanii Celebration, 6 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

4. Acer x freemanii Celebration, 3 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

5. Tilia cordata, 6 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

6. Tilia cordata, 3 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

7. Ulmus Frontier, 6 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

8. Ulmus Frontier, 3 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

9. Gymnocladus dioica, 6 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

10. Gymnocladus dioica, 3 inch includes all labor, equipment, and materials (watering bag and stabilizers) to procure and install, as shown on the plans or as directed by the Landscape Architect.

11. Cercis canadensis, 2 inch clump, 3 Stem includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

12. Plant Bed Planting Mixture includes all labor, equipment, and materials to procure and install, as

shown on the plans or as directed by the Landscape Architect.

13. Rain Garden Planting Mixture includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

14. Planting Soil includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

15. Rain Garden Soil includes all labor, equipment, and materials to procure and install, as shown on the plans or as directed by the Landscape Architect.

16. Mulch, Modified includes all labor, equipment, and materials to procure and install mulch 3 inch thick, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISION

FOR

LANDSCAPE UNDERDRAIN

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Examine all Drawings and other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SUMMARY

A. The work of this section includes, but is not limited to, the following:

1. Perforated HDPE Underdrain Pipe
2. Aggregate Drainage System
3. Geotextile Filter Fabric

1.3 SUBMITTALS

A. Submit certificates from manufacturers of the following items certifying that the following materials comply with the requirements specified in this Section:

1. Perforated HDPE Underdrain Pipe
2. Aggregate Drainage System
3. Geotextile Filter Fabric

B. Submit, for testing, to a certified testing laboratory, one quart representative sample of each porous granular material proposed as backfill around the subdrains

1. Submit the sample in a clean, sturdy sealed container or bag that shall not permit loss or contamination of any kind of the material.
2. Clearly label the container or bag of the sample with: Contract location, title and number; the name of the material supplied; and location of the source.
3. The Landscape Architect will approve or disapprove the proposed material within 21 days after receipt of the laboratory certification.
4. Do not deliver material to the construction site from any source until the Landscape Architect has approved the material from that source.

C. Shop Drawings: Submit shop drawings showing layout, inverts, and product components, including accessories for drainage piping and all drainage connections to composites.

D. Submit catalog cuts of pipes and geotextile for the Landscape Architect’s approval.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced to perform work of this type, who has specialized in the installation of work similar to that required for this project who can comply with manufacturer's warranty requirements, and who is an authorized applicator as determined by drainage manufacturer.

2. Manufacturer Qualifications: Manufacturer with a minimum of 10 years experience in underdrainage systems, capable of providing technical support in the application of the drainage system.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

C. The Landscape Architect will visually inspect pipe when delivered to the construction site. Damaged material or material not meeting the requirements of this Section shall be removed from the construction site and replaced at no cost to the Owner.

D. The Landscape Architect may inspect pipe at the place of manufacture.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Schedule deliveries to avoid construction delays but minimize jobsite storage.

B. Comply with the manufacturer's instructions for unloading, storing and moving all materials.

C. Care shall be taken when storing pipe and appurtenances so as not to damage any public or private property. Any property so damaged shall be repaired at the Contractor's expense and at the approval of the Landscape Architect and Construction Manager.

D. Store Aggregate Drainage System Pipe sections under tarp to protect from sunlight, when time from delivery to installation exceeds one week.

1.6 PROJECT CONDITIONS/ SITE CONDITIONS

A. When the pipe is bedded in a drainage layer the pipe shall be installed at the same time as the drainage layer.

1.7 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.

1. Manufacturer's Warranty:

(a) Extended 15 year Drainage Warranty.

PART 2 PRODUCTS

2.1 UNDERDRAIN PIPE

The following two items would be acceptable for the use of the landscape underdrain piping.

A. Provide corrugated single wall heavy duty polyethylene (HDPE) (100% post-consumer recycled) resins pipe, conforming to ASTM F405 and F667.

1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
2. Size as shown on Contract Drawings.
3. Perforations shall occur only on the underside of the pipe.
4. Provide perforated pipe under planted areas and non-perforated pipe under pavements and at connections into drainage structures.
5. Pipe Accessories: Couplings, end caps, tees, wyes, end plugs shall be heavy duty polyethylene resins, conforming to ASTM F405 and F667
6. Perforated High Density Polyethylene (HDPE) Pipe shall be from one of the following manufacturers or an approved equivalent:
   (a) Advanced Drainage Systems, Inc.
   4640 Trueman Blvd.
   Hilliard, OH 43026
   Phone: 800-821-6710
   (b) JM Eagle, Inc.
   5200 West Century Boulevard
   Los Angeles, CA 90045
   Phone: 800-621-4404
   (c) Crumpler Plastic Pipe, Inc.
   PO Box 2068, Highway 24 West;
   Roseboro, NC 28382
   Phone: 800-334-5071
   (d) or approved equal.

B. Provide perforated pipe (PVC, SDR 35), conforming to ASTM D2729.

1. Size as shown on Contract Drawings.
2. Perforations shall occur only on the underside of the pipe.
3. Three perforation rows 60 degree – 60 degree circumferential hole spacing.
4. 5” to 6” longitudinal hole spacing.
5. .5” hole diameter.
6. Pipe Accessories: Couplings, end caps, tees, wyes, end plugs shall be heavy duty polyethylene resins, conforming to ASTM D2729.

2.2 FILTER FABRIC

A. Landscape Drainage Filter Fabric:

1. A drainage-type non-woven geotextile fabric shall be used as a separation layer to prevent the surrounding in-situ subgrade soil from migrating into the underdrainage system. The geotextile is used to line the entire trench excavation prior to placement of any crushed stone and underdrainage piping. The permeability of the drainage fabric shall be a minimum of 120 gal/min/sq.ft.

2. Drainage filter fabric shall meet the following Minimum Average Roll Value (MARV) specifications across the weave:

Property	Requirement	Requirement
Grab Tensite Strength	ASTM D4632	90 lbs. min.
Grab Tensite Elongation	ASTM D4632	25% max.
Trapezoidal Tear Strength	ASTM D4533	40 lb. min
Mullen Burst Strength	ASTM D3786	130 psi. min.
Puncture Strength	ASTM D4833	60 lbs. min.
UV Resistance	ASTM D-4335	70% at 500 hrs min.
Apparent Opening	ASTM-D-4751	40-80 US Sieve
Permeability	ASTM D-4491	120 gal/min/ft.2 min.

3. Acceptable manufacturers include but are not limited to:
   (a) TenCate, Inc.
   365 South Holland Drive
   Pendergrass, GA 30567
   Phone: 706-693-2226
   Phone: 888-795-0808
   (b) Carthage Mills
   4243 Hunt Road
   Cincinnati, OH 45242
   Phone: 513-794-1600
   Phone: 800-543-4430
   (c) Or Approved Equal.

2.3 DRAINAGE GRAVEL

A. Underdrainage Pipe Filtration Gravel:

1. Washed aggregate for use as backfill with Perforated HDPE shall be as shown on the Contract Drawings.
2. The perforated underdrainage pipes shall require a minimum 6 inch gravel filtration encasement to protect the pipe from siltation.
3. In order to best match the sand particle size and allow for laminar inflow of water, an AASHTO gravel size of #7 or #78 is required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify that the substrate conditions are acceptable for product installation in accordance with manufacturer's instructions and in compliance with the Drawings. Do not proceed with drainage installation until substrate conditions are acceptable for compliance with manufacturer's warranty requirements.

B. Notify Construction Manager and Landscape Architect if unacceptable conditions are present and wait to proceed with work until the condition has been corrected. Do not proceed in uncertainty.

3.2 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during installation operations.

B. Substrate Cleaning: Clean substrate that is to receive drainage. Remove loose debris and other harmful contaminants that will affect performance of drainage composite.

3.3 UNDERDRAINAGE SYSTEM INSTALLATION

A. Pipe Installation - General

1. Prior to the start of construction, the method for control of alignment and grade shall be submitted for approval. The method shall be a laser system or grade board setup, to establish a reference grade and alignment control directly above or within the pipe. Use of other equipment may be substituted if in the opinion of the Landscape Architect, the alternate system produces equivalent accuracy. Pipe invert elevations shall be checked at intervals no greater than 25 feet and shall be constructed to the lines and grades as shown on the Drawings.
2. Coordinate Installation of solid pipe under pavements that may need to be in place before the planting soils and under drainage system are installed.
3. All lines shall be positively pitched. Take extreme care to eliminate sags or drops in pipeline that would obstruct or slow down the flow of water.
4. Connect under drainage system to storm drainage structures. Pipe connection shall be fully embedded into the drainage structure and shall be sealed with a non-shrink grout. Coordinate connections to not delay work.
   (a) Use manufacturer's connection system for connecting different drainage pipe/systems to each other.
5. Use fittings for branch connections and bends. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
6. Inspect each pipe and fitting before and after installation; remove those found defective from site and replace with new. Provide proper facilities for lowering sections of pipe into trenches.
7. For plastic pipe installations, remove all rocks or other hard objects larger than 1 1/2 inches in size from the area within 12 inches of the pipe.
8. For plastic pipe installations, do not use blocking or mounding to bring the pipe to grade. Conform to the applicable requirements of ASTM D 2321.

9. Pipe beds in bedding material shall be rounded to accommodate the bottom quadrant of the pipe and to provide full support and uniform bearing for the entire length of the pipe barrel.
10. Take precautions to ensure that the interior of the pipeline remains clean during pipe jointing.
11. Make up the pipe joints in accordance with the manufacturer's instructions.
12. Care shall be taken not to damage or displace installed pipes during construction.
13. Where pipe is damaged or displaced, take remedial measures as directed by the Landscape Architect, at no additional cost to the Owner.
14. Close all opening in the pipeline temporarily with watertight wood blocks or bulkheads when pipelaying is stopped at the conclusion of the work period or interrupted for any reason.
15. Do not cover pipe until the Landscape Architect has approved the installation.
16. Coordinate connection of discharge with the site utility contractor.
17. HDPE Pipe shall be used at the base of planted areas, bio-swales, and as shown on the drawings. Provide vertical clean out pipes for all systems at a minimum of 250’ o.c. Review locations of clean out with Landscape Architect as work proceeds.

B. Aggregate Drainage System Installation

1. Install beginning at the outlet point and work upstream.
2. Use internal couplings provided by the manufacturer to connect pipe sections together.
3. To cut pipe to lengths other than ten-foot intervals, mark the mesh where cut needs to be made and carefully make a cross-sectional cut in the mesh to access Polystyrene Aggregate. Remove and set aside sufficient aggregate to expose the pipe and to re-connect the mesh to the pipe. Using an appropriate connector such as a nylon wire tie, reattach the mesh to the pipe, making sure remaining aggregate is properly contained. Cut the exposed polyethylene pipe to the measured length. Dispose of remaining aggregate properly.
4. At the end of the work day all upstream open ends of pipe shall be covered or plugged to prevent intrusion of dirt, debris and foreign objects.
5. Aggregate Drainage System shall be used on all site walls and as shown on the Drawings.

3.4 CLEANING AND PROTECTION

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before owner's acceptance. Remove construction debris from project site and legally dispose of debris.

B. Take extreme care to protect planting soils installed by others.

C. Protection: Protect installed products finished surfaces from damage during construction.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Landscape Underdrain	LF

1. Landscape underdrain includes all labor, equipment, and materials to procure and install, as shown on the plans within the rain gardens or as directed by the Landscape Architect. Payment of this item should include the excavation, fabric, piping, piping connection to storm structures, and aggregate as shown in the drawings and called for within the rain gardens.

END OF SECTION

SPECIAL PROVISIONS
FOR

TREE GRATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tree Grates.

B. Tree Grate Frames

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Mockups: Verify selections made under sample submittals, demonstrate quality standards for materials and execution.
1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.6 WARRANTY

A. Warranty: Manufacturer's standard limited warranty.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Iron Age Designs
2104 SW 152nd St. Suite #4
Burien, WA 98166
Toll Free Tel: 800-418-3568
Tel: 206-276-0925
Website: www.ironagegrates.com

B. Or Approved Equal

2.2 TREE GRATES

A. Tree Grates: by Iron Age Designs.
1. Style “Rain”:
a. Size: 5’-0” x 10’-0”
b. Tree Opening: 12 inch
c. Weight: 787 pounds per set.
d. Heel Proof.

2. Material:
a.Cast Ductile Iron (Baked Oil Finish).
b.Anti-theft lock down mounts

2.3 TREE GRATE FRAMES

A. Tree Grate Frames: by Iron Age Designs.

1. Size: Custom (5’-0” x 10’-0”)
2. Anchors: R & COR refer to drawings.
3. Material:
a.Cast Ductile Iron (Baked Oil Finish).
b.Anti-theft lock down mounts

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not begin installation until substrates have been properly prepared and necessary building services are installed.

3.2 PREPARATION

A. Clean and prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install tree grates in accordance with manufacturer's written instructions and approved submittals.

1. Comply with manufacturer's requirements for proper support and bearing.
2. Surface of tree grate to be flush with surrounding finish surface. Variation from flush not to exceed plus or minus 1/8 inch (3 mm).

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C.

PART 4 MEASURMENT AND PAYMENT

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM:	PAY UNIT:
Tree Grates and Frame	EA

1. Tree grates and frame includes all labor, equipment, and materials (anchors) to procure and install, as shown on the plans or as directed by the Landscape Architect.

END OF SECTION

SPECIAL PROVISION
FOR
DISINFECTION OF WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution system; and testing and reporting results.

1.2 RELATED SECTIONS

A. Section 33 17 00: Water Distribution

B. Other sections of the specifications apply to the extent required for proper performance of this work

1.3 REFERENCES

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Disinfection.

PART 2 – PRODUCTS

2.1 GENERAL

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Disinfection.

PART 3 – EXECUTION

3.1 GENERAL

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Disinfection.

END OF SECTION

SPECIAL PROVISION
FOR
WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. The work in this section includes water main pipes, fittings, valves, fire hydrants, service connections, valve wells, thrust blocks, thrust restraining, appurtenances and accessories complete as shown on the drawings and specified herein and other related sections of these Specifications.

B. Local jurisdiction takes precedence in specifications for water mains and services.

1.2 RELATED SECTIONS

A Section 31 23 23: Backfill and Compaction

B. Section 31 23 33: Trenching

C. Section 33 13 00: Disinfection of Water Distribution System

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 GENERAL

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Distribution

PART 2 – PRODUCTS

2.1 GENERAL

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Distribution

PART 3 – EXECUTION

3.1 GENERAL

A. Refer to City of Detroit Water And Sewerage Department Master Specifications (latest revision) for detailed specifications related to Water Distribution

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Fire Hydrant, Modified	EA
Hydrant, Relocate, Case 2, Modified	EA
Gate Valve and Box, 6 inch, Modified	EA
Water Main, DI, 6 inch, Modified	Ft

1. Fire Hydrant, Modified includes all labor and equipment to procure the install, as shown on the plans or as directed by the Civil Engineer. The fire hydrant will be provided by the Owner.

2. Hydrant, Relocate, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

3. Gate Valve and Box, 6 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

4. Water Main, DI, 6 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
STORM DRAINAGE

PART 1 - GENERAL

1.1 SCOPE

This Section includes storm sewer Work indicated on the Plans complete with pipes, box culverts, joints, structures, pipe bedding, final inspection and appurtenances.

1.2 RELATED SECTIONS

A. Section 31 23 19: Dewatering

B. Section 31 23 33: Trenching and Backfilling

C. Section 32 13 13: Concrete Paving

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCE STANDARDS

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

A. ANSI - American National Standard Institute

B. ASTM - American Society of Testing & Materials

C. AASHTO - American Association of State Highway Transportation Officials

D. MDOT - Michigan Department of Transportation, 2003 Standard Specifications for Construction

E. NCPI - National Clay Pipe Institute

1.4 SOURCE QUALITY CONTROL

Laboratory test not less than one (1) percent, with a minimum of three (3) pieces each size, material and class of gravity pipe required in the Work. For a pipe smaller than 60-inches, test shall be D-load test. For a pipe greater than 60-inches in diameter, testing may consist of compressive strength testing or D-load tests. D-load testing shall conform to ASTM C 655.

1.5 SUBMITTALS

A. Submit manufacturer’s data for all precast elements.

B. Submit a complete field report of the location of all wye openings and sump pump discharge leads to the Engineer at the end of each sewer section of the Project or on the last day of each week, whichever occurs first.

C. Submit two (2) copies of the laboratory test reports required to the Engineer.

D. Submit complete shop drawings including layout plans, sections, profiles, reinforcing details and joint details for all manhole tees to the Engineer.

E. Submit complete shop drawings including layout plans, sections, profiles, reinforcing details, and joint details for all reinforced concrete pipes, and other precast unit.

1.6 STORAGE OF MATERIALS

Piping material shall not be stacked higher than four (4) feet (1.2 m) or as recommended by the manufacturer, whichever is lowest. Suitable racks, chairs, and other supports shall be provided to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.

Jointing and sealing materials used in the storm sewer system shall be protected from sunlight and protected from damage at all times and stored in a cool and clean place as practicable and as recommended by the manufacturer until ready for application.

1.7 HANDLING OF MATERIAL

Load and unload materials using suitable approved equipment. Material shall not be dropped, bumped or allowed to impact against itself. Damaged material shall be rejected by the Engineer.

Lifting devices shall be suited to the Work and shall protect surfaces from damage.

PART 2 - PRODUCTS

2.1 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to ASTM C76. Twelve (12) inch thru 30-inch (300 mm thru 750 mm) diameter pipe shall be Class II thru V as indicated on the plans, Wall B or Wall C, circular reinforced. Thirty-six (36) inch through 108-inch (900 mm thru 2700 mm) diameter pipe shall be Class I through V as indicated on the plans, Wall B or Wall C, circular reinforced or elliptical reinforced. Pipes greater than 54-inches (1370 mm) shall be provided with stirrups meeting MDOT 2003 requirements.

When elliptical reinforcement is used, the following method of indexing the steel and the pipe barrel shall be used.

A dummy lift pin form shall be set in the outer pipe wall form projecting into the pipe wall a minimum of 1-3/4 inches (45 mm) and a maximum of 2-1/4 inches (55 mm). An additional spacer chair shall be welded to the elliptical steel cage at the proper location so as to engage the dummy lift pin form during the pipe casting operation.

It is the intent of the spacer chair and dummy lift pin arrangement to provide a means of assuring the final position of the elliptical steel cage within the barrel of the pipe and, further, for providing a means of indexing the pipe in the field to assume proper placement of the pipe.

Prior to shipment of the elliptically reinforced pipe, they shall be striped along the inside top with a minimum 1-inch (25 mm) wide indelible marker so that final inspection of the pipe orientation can be made following completion of the installation.

For circular pipe 114 inches (2850 mm) or larger in diameter, the design information in accordance with Section 6 of ASTM C76, shall be submitted to the Engineer for approval, prior to fabrication.

The design of all circular pipes shall meet the D-load requirements for the class of pipe indicated on the Plans.

2.2 JOINTS FOR CONCRETE PIPE

Premium joints for circular pipes shall conform to ASTM C443 limited as follows: Section 5.1 of C443, "Physical Requirements for Gaskets," shall be replaced with Section 6.9 of C361, "Rubber Gaskets." Also, Section 5 of C443 shall be limited to a modified grooved tongue to receive a rubber gasket.

Only lubricant, as supplied by the pipe manufacturer, shall be used on the groove and on the tongue in making up joints, and the joints shall be coupled in accordance with the pipe manufacturer's requirement.

The inside annular space of all concrete pipe 36-inch (900 mm) diameter (or equivalent) and larger shall have the inside annular space filled with cement mortar and troweled flush. Mortar shall consist of 1-part Portland cement and two (2) parts of plaster sand. Mortar for inside joints shall be mixed with only enough water for "dry packing."

2.3 REINFORCED CONCRETE CULVERT

Reinforced concrete culvert shall conform to ASTM C1433. Design and submittals shall be in accordance with this section.

2.4 CORRUGATED PLASTIC EDGE DRAIN/UNDERDRAINS

Piping for edge drain/underdrain shall conform to Section 33 46 00.

2.5 END SECTIONS

Metal end sections shall conform to MDOT 909.05.

2.6 STORM STRUCTURES

Materials for storm sewer structures shall conform to the requirements indicated on the Plans and as specified below.

A. Concrete Block

Block shall conform to ASTM C139, manufactured of Portland cement conforming to ASTM C150, Type II. Blocks shall be solid curved blocks with the inside and outside surfaces parallel and curved to the required radii. The blocks shall have a groove or other approved type of joint at the ends. Blocks intended for use in the cones or tops of manholes shall have such shape as may be required to form the structure as indicated on the Plans.

B. Precast Concrete

Precast concrete manhole base, cone and riser units shall conform to ASTM C478, and shall be circular with circular reinforcement. For manhole depths to 32 feet (9.7 m), the wall thickness of the sections shall be five (5) inches (125 mm). The joints on precast sections shall be the same as the joints on storm sewer.

Precast concrete manhole tee units shall conform to ASTM C76, Class IV and shall be circular with circular reinforcement. Shop Drawings shall be provided for all manhole tees. The joints on the precast manhole tee shall be the same as the joints on the storm sewer section.

Precast concrete base, top slab, and grade ring units shall conform to ASTM C478.

C. Manhole Steps

Steel reinforced plastic steps shall be of suitably approved co-polymer polypropylene conforming to ASTM D4101, PP0344B33534Z02 with 1/2 inch (12 mm) minimum diameter deformed reinforcing bar conforming to ASTM A615, Grade 60.

Manufacturer: M A Industries, Inc. or engineer approved equivalent

Manhole steps shall be of the type and size indicated on the Plans and shall comply with applicable occupational safety and health standards. Manhole steps shall be installed at locations indicated on the Plans.

D. Frames and Covers

Frames and covers for manholes, catch basins, and inlets shall conform to ASTM A48, Class 30, gray iron and shall be of the types and sizes as indicated on the Plans. The castings shall be neatly made and free from cracks, holes and other defects. Surfaces of casting shall be ground to assure proper fit and to prevent rocking.

2.7 CONCRETE

All concrete for all precast members shall be in accordance with MDOT Section 701, use Grade S2; 3,500 psi (24 MPa) strength; Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m^3); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without the Engineer's approval. Concrete for all cast-in-place members shall be in accordance with Section 32 13 13.

2.8 CONCRETE REINFORCEMENT

In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

2.9 PVC PIPE

All PVC Pipe utilized for storm drainage shall be Schedule 80 and conform to ASTM F1803

PART 3 - EXECUTION

3.1 VERIFICATION OF EXCAVATION AND BEDDING

Prior to the installation of any storm sewer piping, structures, or materials, examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new work. Ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive the storm sewer materials to be installed. Correct all defects and deficiencies before proceeding with the work.

3.2 EXISTING STORM SEWERS AND DRAINS

Expose the existing storm sewer and structures to which the new Work is to be connected and notify the Engineer of same. The Engineer will verify the vertical and horizontal locations of the existing

system and shall inform the Contractor as to the necessary adjustments required to align the new storm sewer Work with the existing system.

3.3 PREPARATION

The outside surface of the spigot end and the inside surface of the bell end of the pipe shall be cleaned and free of any foreign materials, other than the sealant recommended by the manufacturer, prior to installation.

All pipe, frames, covers, accessories, and appurtenances shall be examined carefully for damage and other defects immediately prior to installation. Defective or damaged material shall be rejected and removed from the Project by the Contractor.

3.4 INSTALLATION - GENERAL

Each section of pipe, when placed to grade and line, shall have firm bearing on the trench bedding throughout its length.

Cutting of pipe shall be done with approved tools and by approved methods suitable for the pipe material. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize air-borne particles, shall be employed. Pipe cutting shall be performed using the recommendations of the manufacturer of the type of the pipe materials being cut and according to the best trade practices. When cutting pipe, care shall be taken to prevent damage to the interior and exterior surfaces. Damage to either shall be cause for rejection of a complete section of pipe.

During the preparation of the pipe bedding and until the trench has been satisfactorily backfilled, the trench shall be kept free of water. A dewatering system, in accordance with Section 31 2319, Dewatering, shall be provided and maintained by the Contractor. The dewatering system shall remain in operation until the trench is backfilled.

Backfill shall be as indicated on the Plans and as specified in Section 31 2333, Trenching and Backfilling.

3.5 PIPE LAYING

Installation of pipe shall conform to ASTM C12, and as recommended by the pipe manufacturer. The pipe shall be protected during handling against impact shocks and free fall. Hooks shall not be permitted to come in contact with premolded joint surfaces.

Pipes having premolded joint rings or attached couplings shall be handled so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material. Care shall be taken to avoid dragging any pipe on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.

All pipe shall be laid to the line and grade called for on the Plans. Each pipe as laid, shall be checked by the Contractor with line and grade pole or laser system to insure that this result is obtained. When employing a laser system, the Contractor shall have an independent and alternate means of checking the line and grade. The finished work shall be straight and shall be sighted through between manholes.

Construction shall begin at the outlet end and proceed upgrade with spigot ends pointing in direction of flow. Bell holes shall be excavated so that the full length of the barrel will bear uniformly on the bedding material.

Lubricants, primers or adhesives as recommended by the pipe or joint manufacturer shall be used immediately prior to jointing.
The pipe shall be centered in the bells or grooves and pushed tight together to form a smooth and continuous invert. After laying of pipe, care shall be taken so as not to disturb its line and grade. Any pipe found off grade or out of line shall be re-laid properly by the Contractor.

Mechanical means shall be used for pulling home all pipe where manual means will not result in pushing and holding the pipe home. Mechanical means shall consist of a cable placed inside of the pipe with a suitable winch, jack, or come along for pulling the pipe home and holding the pipe in position.

Circular concrete pipe with elliptical reinforcement shall be installed with the lift holes to the top of the pipe. The manufacturer's marks designating the top and bottom of the pipe shall not be more than five degrees from the vertical plane through the longitudinal axis of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs.

3.6 PIPE BEDDING

After the bottom of trench has been excavated the pipe bedding material will be installed in accordance with the requirements for Class B bedding. The pipe shall then be installed strictly in accordance with the manufacturer's recommendations. After the pipe is laid, the bedding shall be continued above the pipe as specified. Particular care shall be taken to assure filling and tamping all spaces under, around and above the top of the pipe.

Class B

The pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding material shall have 100% passing a 3/4-inch (20 mm) sieve and 95% retained on a No. 4 (4.75 mm) sieve. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than 12 inches (300 mm) above the top of the pipe shall be natural bank run sand meeting the requirements of MDOT Class II granular material. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted to 95% maximum density by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

A continuous and uniform bedding shall be provided in the trench for all buried pipe.

3.7 STORM STRUCTURES

Construct storm sewer manholes, catch basins, inlets and other structures to the grades, lines and levels indicated on the Plans and as specified. Structures shall be complete with concrete bases, reinforcing, frames, covers, adjustment bricks, etc., as shown and as required for a complete installation. Storm sewer structures shall conform to the type of material and dimensions indicated on the Plans.

Cast-in-place structures shall be constructed in accordance with Section 32 13 13.

A. Block Structures

Construct concrete block structures in the locations and according to the details on the Plans. The first course of concrete blocks shall be placed on the prepared base or footings in a full bed of mortar. Mortar joints shall be full and close in all courses. Courses shall be level throughout. Stagger joints in adjoining courses by one-half the length of the block as nearly as

practicable. Joints shall be uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

B. Precast Concrete Structures

Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth. Provide three (3) to five (5) courses of 8-inch (200 mm) brick or concrete grade rings at top of structure for future adjustment of castings.

A cement mortar plaster coat shall be applied to the exterior surfaces of block sections of all storm structures as indicated on the Plans. Plaster coat shall be 1/2 inch (10 mm) thick.

Provide and install all frames and covers to the elevations indicated on the Plans. Castings shall be set in a full bed of cement mortar 1/2 inch (10 mm) thick, minimum. Mortar joints shall be struck smooth.

Steps shall be installed at the plant by the manufacturer of precast units. Field install steps for block, or cast in place structures of the types and in the locations indicated on the Plans.

Pipe up to 42 inches (1050 mm) in diameter, shall be connected to storm structures using a grouted joint, as indicated on the Plans. The pipe shall be properly supported, so that any settlement will not disturb the connection.

For pipe, 48 inches (1200 mm) in diameter or larger, the pipe shall be installed as an integral part of the manhole which shall be constructed of 3,500 psi (24 MPa) concrete and reinforcing, as indicated on the Plans.

Manhole tees, as indicated on the Plans, may be used for pipe 42 inches (1050 mm) in diameter or larger. Connection to manhole tees shall be made using tees and pipe having the same type of joint. The pipe and tee shall be properly supported with concrete as indicated on the Plans.

Sump shall be provided, as indicated on the Plans, in all catch basins and storm manholes having outlets of 18 inches (450 mm) in diameter or less.

Flow channels shall be constructed in all structures not requiring a sump and shall be constructed as indicated on the Plans.

3.8 FIELD QUALITY CONTROL

After all the pipe and structures have been laid, constructed and backfilled, the system shall be final inspected. The sewer system shall be ready for the final inspection within two (2) weeks after the completion of each 2,000-foot (600 m) section of sewer installed. Closed circuit television inspections shall comply with NASSCO PACP standards.

The final inspection shall consist of a visible and audible check of the sewers and structures to ascertain that the steps have been placed, all lift holes jointed, the channeling of the manhole bottoms completed, all visible or audible leaks stopped, all pipe has been placed straight and true to the proper slopes and elevations, the required brick courses for adjustment, the frame and cover properly installed, the required end section installed, all trenches and structures backfilled in a workmanlike manner and that the system has been thoroughly cleaned.

The final inspection shall be considered complete when all the repairs have been made.

3.9 REMOVE STORM SEWER

Excavate and remove the existing storm sewer where indicated on the plans. Bulkhead the opening in storm sewers or structures where the existing storm sewer has been removed. Where removal of existing storm sewer is occurring in essentially the same location as a new sewer or structure, the removal of the existing sewer is incidental to the project.

3.10 REMOVE CULVERTS

Excavate and remove culverts where indicated on the plans. Backfill the completed work as specified under “Backfilling Trenches” in Section 31 2333.

3.11 REMOVE STRUCTURE

Excavate and remove structures where indicated on the plans. Bulkhead the ends of any sewers remaining in place. Backfill the completed work as specified in Section 31 2323. Removal of existing storm structures is incidental to the project if a new structure or sewer is being constructed in essentially the same location.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Sewer, CL C, 12 inch, Modified	LF
Dr Structure Cover, ADA Compliant, Modified	EA
Dr Structure Cover, Beehive, Modified	EA
Dr Structure, 48 inch dia, Modified	EA
Dr Structure, Tap, 12 inch, Modified	EA

1. Sewer, CL C, 12 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

2. Dr Structure Cover, ADA Compliant, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

3. Dr Structure Cover, Beehive, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

4. Dr Structure, 48 inch dia, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

5. Dr Structure, Tap, 12 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

SPECIAL PROVISION
FOR
SUBDRAINAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Under-Slab Drainage Systems.

B. Filter aggregate and fabric and bedding.

1.2 RELATED SECTIONS

A. Section 31 2316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.

B. Section 31 2323 – Fill and Compaction: Backfilling over filter aggregate, up to subgrade elevation.

C. Section 31 2333 – Trenching and Backfilling: Excavating and backfilling for site subdrainage systems.

D. Other sections of the specifications apply to the extent required for proper performance of this work.

1.3 REFERENCES

A. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

B. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings

C. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe

D. Michigan Department of Transportation (MDOT) Standard Specification for Construction

1.4 SUBMITTALS

A. See applicable Specification Section for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, and gradient of slope between corners and intersections.

C. Product Data: Provide data on pipe drainage products and pipe accessories.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

F. Samples: Two pieces, minimum 12 inches by 12 inches, of filter fabric.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. General: Comply with MDOT 404.

B. Polyvinyl Chloride Pipe: ASTM D2729 or ASTM D2751; MDOT 909.07; Class 40, plain end, 6 inch inside diameter; with required fittings.

C. HDPE Pipe: Perforated, corrugated high density polyethylene in accordance with AASHTO M252 (4 inch diameter or less). ADS N-12 or approved equal with required fittings.

D. Use perforated pipe at subdrainage system; unperforated pipe through sleeved walls and at lateral outlets.

2.2 AGGREGATE AND BEDDING

A. Filter Aggregate and Bedding Material: Open-graded aggregates conforming to MDOT 902.07 34R.

2.3 ACCESSORIES

A. Pipe Couplings: Solid plastic.

B. Geotextile Fabric: Non-woven fabric conforming to MDOT 910.03 A.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation in accordance with Section 31 2323.

B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions and in accordance with MDOT 404.

B. Place drainage pipe on clean cut subsoil.

C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of

1/8 inch in 10 feet.

D. Loosely butt pipe ends. Place joint cover strip 12 inches wide, around pipe diameter centered over joint.

E. Place pipe with perforations facing down. Mechanically join pipe ends.

F. Install pipe couplings.

G. Prior to installing filter aggregate, verify that drain ends are plugged and no sections are collapsed or otherwise obstructed.

H. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.

I. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.

J. Place aggregate in maximum 4 inch lifts, consolidating each lift.

K. Refer to Section 31 2323 for compaction requirements. Do not displace or damage pipe when compacting.

L. Place impervious fill over drainage pipe aggregate cover and compact.

M. Connect to storm sewer system with unperforated pipe, through installed sleeves.

N. Coordinate the Work with connection to municipal sewer utility service and trenching.

3.4 FIELD QUALITY CONTROL

A. Per Specification Section for Quality Requirements: Field inspection and testing.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.5 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

PART 4 – MEASUREMENTS AND PAYMENTS

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

PAY ITEM	PAY UNIT
Underdrain, Subgrade, 6 inch, Modified	LF

1. Underdrain, Subgrade, 6 inch, Modified includes all labor, equipment, and materials to procure the install, as shown on the plans or as directed by the Civil Engineer.

END OF SECTION

CITY OF DETROIT

SPECIAL PROVISION FOR DELINEATOR POST

Description. This work consists of furnishing and installing delineator posts as shown on the plans and as directed by the Engineer. Complete this work in accordance to the applicable sections of the standard specifications and this special provision. Follow industry standards and conform to the details as shown on the plans.

Materials. Furnish tools and equipment as recommended by the manufacturer and as approved by the Engineer. Use equipment and materials from a single manufacturer throughout the entire project.

Design - The delineator post shall consist of a modified T-shaped tubular post a minimum of 3.00 inches wide by 2.00 inches deep, with 0.125 inch (min.) walls, comprised of flat front and curved rear surfaces and sides to create areas of opposing compression stresses on the inner and outer walls when impacted resulting in superior rebound. All delineator posts shall be capable of sustaining a minimum of twenty five (25) direct wheel-over impacts at 60 MPH (100 km/h) without damage to the post or the reflective sheeting applied to the post. All posts shall be easily replaceable. All posts shall be constructed of UV-stabilized thermo-plastic polyurethane (TPU) for superior durability, conforming to the following material specifications:

Property	ASTM Test	Results
Specific Gravity (min.)	D 792	1.10
Hardness (min.)	D 2240	80 A
Tear Strength (min PSI)	D 624, Die C	600
Tensile Strength @ yield, (min PSI)	D 412	4,000
Tensile Elongation @ break (min. %)	D 412	600
Cold Temp. Impact Test (-7° F)	FL/DOT	Pass

Bases - Delineator posts shall mount to a base unit with two (2) plastic locking pins. For highest visibility and durability, posts shall be mounted to bases of the same color as the post and curb and the corresponding lane line (yellow & yellow, white & white, etc.) and shall be 1.5 # in weight. All bases shall be constructed of a high-impact thermo-plastic styrenic alloy conforming to the following material specifications:

Property	ASTM Test	Results
Specific Gravity (min.)	D 792	1.02
Gardner Impact (min.)	N/A	160
Flexural Strength (min.)	D 790	5,500

Florescent and Standard Colors - Delineator posts and bases shall be constructed of UV-stabilized polymers and colors. The color shall be solid throughout and stabilized to resist UV degradation. In construction work zone areas where orange devices are used, all materials shall be Florescent Orange to improve visibility in low light conditions.

Locking Pins - The delineator posts shall secured to the base units with rust-proof black plastic locking pins conforming to the same material specifications as the base units to prevent dislocation when posts are impacted and to ease replacement of old posts.

Reflective Sheeting - All posts shall have retro-reflective sheeting applied. The minimum reflective sheeting shall be two (2) 4-inch wide wraps of sheeting, one (1) inch down from the top of the post with a two (2) inch gap between wraps. The sheeting shall be Reflexite ® AR 1000 cube-corner micro-prismatic reflective sheeting for superior brightness, scratch resistance and durability. The color of sheeting shall be as specified in the construction plans.

Lengths - Delineator posts shall be available in lengths from 16 to 48 inches, as specified in the construction plans or procurement details.

NCHRP 350 Acceptance - The delineator posts shall be fully crash-tested on the AASHTO's NTPEP Test Deck and meet requirements for Category 1 devices as specified in NCHRP Report # 350. All delineator posts shall have the acceptance of the U.S. Department of Transportation, Federal Highway Administration. Certifications of acceptance to these standards must be supplied by the manufacturer upon request.

Construction. Delineator posts shall be secured to the roadway with removable and reusable one-piece anchor bolts with a finished hex head, integral washer, dual lead threads and chamfered tip. One-piece bolts shall be used to eliminate improper assembly; dual-thread bolts shall be used to prevent bolts spinning in holes when tightened. All delineator posts shall be completely removable with standard power tools. On bridges, posts shall be adhered to the roadway with approved bituminous adhesive or pressure-sensitive synthetic butyl rubber pads, min. 0.125" thick.

Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Delineator Post, 36 inch, White, Modified	Each

Delineator Post will be measured and paid for at the contract unit price per each unit installed. The unit price shall be payment in full for furnishing all labor, equipment and material to furnish and install posts as shown on the plans or as directed by the Engineer.

SPECIAL PROVISION
FOR
VEHICLE BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

The Work under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing guardrail, regular bollards as shown on the Drawings.

Related Sections:

1. Section 32 1216, ASPHALT PAVING
2. Section 32 1313, CONCRETE PAVING
3. Other sections of the specifications apply to the extent required for proper performance of this work.

1.2 REFERENCES

A. AASHTO HB-17 - (2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges
AASHTO M 180, Class A, Type II
AASHTO M 133
AASHTO M 232

B. AWS D1.1/D1.1M - (2010) Structural Welding Code - Steel

C. ASTM A36 – Standard Specification for Carbon Structural Steel
ASTM A413 – Standard Specification for Carbon Steel Chain.
ASTM A536 – Standard Specification for Ductile Iron Castings.
ASTM B26 – Standard Specification for Aluminum-Alloy Sand Castings.
ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
ASTM A106/A106M - (2010) Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service
ASTM D 3034 - (2008) Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F 2656 - (2007) Standard Test Method for Vehicle Crash Testing of Perimeter Barriers

D. MDOT 2012 Specifications Section 807
MDOT 2012 Specifications Section 912

MDOT Special Detail R-60-J for Guardrails

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Indicate dimensions, required clearances, method of field assembly, and location and size of each field connection.

C. Certificate test reports confirming compliance's with specified resistive rating.

D. Comply with the applicable Specification for Submittal Procedures.

E. Product Data: Provide for each type of bollard, component, finish, and accessory specified.

F. Setting Drawings: Show embedded items and cutouts required for work specified in other Sections.

G. Maintenance Data: Submit manufacturer's field touch-up, cleaning, and maintenance instructions.

H. Warranty Documentation: Submit sample of manufacturer's warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain parking control equipment through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect components placed in storage from the weather, humidity, and temperature variation, dirt and dust, or other contaminants. Store structural materials on sleepers or pallets and protect them from rust and objectionable materials such as dirt, grease, or oil.

1.6 EXTRA MATERIALS

A. Provide a manufacturer's standard recommended spare parts package, with current unit prices and source of supply complete with detailed manuals on parts replacement, with each barrier to facilitate 1 year of normal operation. Give particular consideration to system components which are not readily available from local or commercial sources and which are critical to the operation of the system.

1.7 COORDINATION

A. Coordinate installation of anchorages for parking control equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products to be in accordance with MDOT Standard Specification for Construction 2012

2.2 MATERIALS

A. All materials shall conform to MDOT 2012 Specifications Section 807, and as specified below.

B. Rail elements shall conform to AASHTO M 180, Class A, Type II, unless otherwise specified on the Drawings.

C. Bolts and nuts shall be galvanized steel conforming to ASTM A 153, Class C and ASTM A 307.

D. Wooden guardrail posts and blocks:

- Construction grade (stress grade of 1,200 psi or more) posts and timbers (or better) as rated by an agency accredited by the American Lumber Standard Committee (ALSC), and fabricated from one of the following timber species, Douglas Fir, Southern Pine, Red Oak, or any of the species listed in Table 912-2 of MDOT 2012 Specifications Section 912.
- Length and cross section: as shown on the Drawings and MDOT Special Detail R-60-J for Guardrails.
  Posts: receive a preservative treatment in accordance with AASHTO M 133. Use only one combination of post and block finish for any continuous length of guardrail.

E. All fittings, bolts, washers and other accessories: galvanized in accordance with the requirements of AASHTO M 232. All galvanizing shall be done after fabrication.

F. Concrete for anchors: meet the requirements of Section 32 1313 – Concrete Paving.

G. Paint for galvanized coating repair: "Zinc Clad II Ethyl Silicate" as manufactured by Sherwin Williams Ind. & Marine Coatings, or "Cold Galvanized Product No. 7002, 7007, 7008 & 7009 and Galva Bright Product No. 7707, 7708 & 7709," as manufactured by Crown North American Professional Products.

H. Stainless Steel: ASTM A941; 60 percent recycled-material content.

I. BOLLARDS: Conform to MDOT 2012 Standard Specifications for Construction

J. CONCRETE: Conform to MDOT 2012 Standard Specifications for Construction.

K. WELDING: Welding In accordance with AWS D1.1/D1.1M

L. Installation Hardware: Provide anchor bolts or other types of hardware as recommended by manufacturer for substrates and installation condition. Provide for permanently fixed installation, except where otherwise shown on Drawings.

M. Security/Anti-Ram Bollards.

- Security Post: Stainless steel pipe, size as shown on Drawings.
- Footing and Fill: 3000 psi minimum concrete. Concrete as specified in Conform to MDOT 2012 Standard Specifications for Construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine paving or other substrates for compliance with manufacturer's requirements for placement and location of embedded items, condition of substrate, and other conditions affecting installation of bollards.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's installation requirements and setting drawings.

B. Damaged, cracked, chipped, deformed or marred bollards, barriers or guardrails are not acceptable. Field touch-up minor imperfections in accordance with manufacturer's instructions.

C. Embedded Mounting:
1. Install Bollards in accordance with manufacturer's recommendations. Securely anchor Bollards, at locations shown.
2. Footings: Install top elevation of Bollards footings at the subbase of surfacing. Excavate holes for posts and footings in firm, compacted soil. Set post with concrete footing in accordance with ACI 301. Embed items in accordance with manufacturer's recommendations. Smooth the top of concrete footing and slope for water shed.

D. PAVEMENT: After placement of the vehicle barrier, replace the pavement sections to match the section and depth of the surrounding pavement. Wrap the pavement to match the elevations of existing pavement. Provide positive surface drainage, away from the vehicle barrier by pavement slope.

E. Set guardrail posts plumb. See MDOT Special Detail R-60-J for Guardrails and MDOT 2012 Specifications Section 807. When the Drawings require that the ends of a section of guardrail be curved outward or downward, set the posts to accommodate the curve. Backfill the posts with acceptable material and thoroughly compact to the satisfaction of the Engineer. Repair any damage to the posts, pavement, shoulders and adjacent slopes resulting from post driving at the Contractor's expense.

F. Erect the rail element according to the Drawings in a manner resulting in a smooth, continuous installation with laps in the direction of traffic flow.

G. Fabricate all metal work in the shop. Do not perform punching, cutting, or welding in the field, except that holes necessary when additional posts are required, or for special details in extraordinary cases, may be drilled in the field when approved by the Engineer. Erect the rail so that the bolts at expansion joints will be located at the centers of the slotted holes. Treat field-drilled holes in accordance with AASHTO M 36.

H. Drawn all bolts tight and extend at least one-fourth-inch beyond the nuts. Except where required for adjustments, do not extend bolts more than one-half-inch beyond the nuts. Where the spelter coat on galvanized rail or post elements has been damaged, make repairs to the spelter coat in accordance with AASHTO M 36.

3.3 CLEANING & PROTECTION

A. Protect bollards and guardrail against damage.

B. Immediately prior to Substantial Completion, clean bollards and barriers in accordance with manufacturer’s instructions to remove dust, dirt, adhesives, and other foreign materials.

3.4 CLOSEOUT ACTIVITIES

A. Provide maintenance information to Owner’s representative.

B. Provide warranty paperwork to Owner’s representative.

END OF SECTION

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
DEBRIS OR MATERIALS IN TRAFFIC LANES

CFS:BRZ 1 of 1 APPR:EMB:DAJ:01-10-08
FHWA:APPR:06-01-11

Delete Subsection 104.07.B.2 on page 36 of the Standard Specifications for Construction, in its entirety and replace it with the following:

2. **Construction Safety Program.** Before beginning work on the project, the Contractor must submit a written "Construction Safety Program" that outlines the plan and procedures for preventing and mitigating accidents and fires on the project and meeting all health and safety requirements of the contract. Also in the program include provisions for meeting the requirements of subsection 812.03 and details for the materials and equipment that will be used to prevent construction related debris or materials from entering the open lanes of traffic and what actions, including traffic control measures, will be taken to immediately and safely remove the debris or material from the roadway. The Contractor must meet with the Engineer to discuss the "Construction Safety Program" and to develop mutual understandings to govern the administration and enforcement of the program.

Replace the second sentence in the first paragraph of Subsection 104.07.C.3 on page 37 of the Standard Specifications for Construction with the following:

The Contractor is responsible, at the Contractor's expense, to provide the necessary materials and equipment to prevent construction related debris or materials from entering the open lanes of traffic. This includes protection of traffic controls, removal of spilled materials or debris from the roadbed or drainage courses, and repair of damaged facilities necessary for public travel and safety.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
HIGH VISIBILITY CLOTHING

SSA:JDG 1 of 1 APPR:MWB:CRB:06-18-14
FHWA:APPR:06-27-14

Add the following, to the end, of subsection 104.07.B, Safety and Health Requirements, on page 36 of the Standard Specification for Construction:

4. **Worker Visibility.** Effective November 24, 2008, all workers within the right-of-way who are exposed to traffic or to construction equipment within the work area, must wear high visibility clothing.

   High visibility clothing or high visibility safety apparel is personal protective safety clothing that is intended to provide conspicuity during both daytime and nighttime usage. High Visibility safety apparel must meet the Performance Class 2 or 3 requirements of the American National Standards Institute/International Safety Equipment Association (ANSI/ISEA) 107-2004 for High-Visibility Safety Apparel and subsequent revisions thereof.

   Costs incurred to comply with this requirement will be the responsibility of the Contractor.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SWEEPING

CFS:DBP 1 of 1 APPR:JKG:GCT:03-10-06
FHWA:APPR:06-01-11

a. Description. This work consists of sweeping pavements in the construction area, including service roads and cross streets, as directed by the Engineer.

b. Equipment. The sweeper must be a self-propelled or towed street sweeper equipped with pickup attachments and curb brushes.

c. Sweeping. Paved surfaces must be swept as often as necessary as directed by the Engineer.

Paved roadbeds must be given a final cleaning within 5 working days prior to opening the pavement surface to traffic or notification by the Contractor that the work is completed, whichever occurs first.

d. Measurement and Payment. The work of sweeping will not be paid for separately, but payment will be considered as having been included in other contract items.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CONSTRUCTION STAGING AREAS

DES:LFS 1 of 1 APPR:JJG:KAS:10-06-11
FHWA:APPR:10-11-11

Add the following subsection to section 107, on page 70 of the 2012 Standard Specifications for Construction:

107.22 Construction Staging Areas. The contractor must not use any public recreation area as a staging area, marshalling yard, storage facility, or for any other construction support unless it is defined in the contract.

Public recreation areas include: parks, trails, game areas, wildlife and waterfowl refuges, playgrounds, golf courses, athletic fields or similar areas which are publically owned by public school districts, local, state, or federal governments.

Any agreements negotiated between the Contractor and the owner of the public recreation area, before or after the award of the contract will not be considered valid by the Department.

If the Engineer determines the Contractor is in non-compliance with this subsection, penalties up to and including termination of the contract, in accordance with subsection 108.12, may be enacted as well as the immediate restoration of the public recreation area at the Contractor's cost.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TRAFFIC SIGNAL MAST ARM POLE AND MAST ARM

SIG:EMS 1 of 4 APPR:RWS:MJF:06-08-18
FHWA:APPR:06-11-18

a. Description. This work consists of furnishing, fabricating, and erecting a traffic signal mast arm pole and mast arm as shown on the plans, in accordance with the standard specifications, and as specified herein. This special provision is for an anchor base type steel mast arm pole, including mast arms, and other associated hardware required to complete the work.

b. Material. Provide material in accordance with sections 906 and 908 of the Standard Specifications for Construction and this special provision.

Material specifications for the traffic signal mast arm pole and mast arm are included in Table 1.

Table1: Material and Coating Specifications

Component	Specifications
Pole Tube	*ASTM A 595 GR A or ASTM A 572 GR 50*
Mast Arm Tube	*ASTM A 595 GR A* or *ASTM A 572 GR 50*
Mast Arm Clamp	*ASTM A 36*
Gusset Plate	*ASTM A 36*
Hand Hole Frame	*ASTM A 705 GR 50* or *ASTM A 572 GR 50*
Lifting Pipe	*ASTM A 53 GR B or ASTM A 501*
Handhole Cover	*ASTM A 1011 GR 36*
Pole Top	*ASTM B 26 (356F or 43)*
Stainless Steel Hardware	*AISI 300 SERIES (18-8)*
Luminaire Arm High Strength Bolts	*ASTM F 3125 GR A325*
Mast Arm Studs	*ASTM A 449*
“ANCO” Lock Nuts or Equivalent	*ASTM A 563 GR DH*
Flat Washers	*ASTM F 436*
Lock Washers	*ANSI B18.21.1*
Steel Plate and Shape Finish	*ASTM A 123*
Hardware Finish	*ASTM A 153*
Telescopic Field Splice Bolt	*ASTM A 307*
C-Hook	*ASTM A 36*
J-Hook	*ASTM A 36*

Use high strength bolts, nuts, and washers in accordance with subsection 906.07 of the Standard Specifications for Construction.

Structural steel material used to fabricate the traffic signal mast arm pole and mast arm is required to be accepted based on "Fabrication Inspection" per subsection 4.06 of the *Materials Quality Assurance Procedures (MQAP)* manual.

c. Fabrication. Fabricate and weld in accordance with section 707 of the Standard Specifications for Construction and the *American Welding Society (AWS) D1.1:2010*, *Structural Welding Code – Steel* (as modified by 12SP-707A - Structural Steel and Aluminum Construction), hereafter called *AWS D1.1*, except as modified herein). Fabricator must possess an active *American Institute of Steel Construction (AISC)* - Bridge Component QMS Certification (CPT) and Sophisticated Paint Endorsement (SPE) if painting steel surface areas greater than 500 square feet. The Engineer will accept *Society of Protective Coatings (SSPC) QP3* - Standard Procedure for Evaluating the Qualifications of Shop Application Firms.

1. The pole and arm tubes must have a uniform taper.

2. Tolerance for overall length of pole tube and arm tube(s) is ±1/8 inch. Tolerance for sweep and camber of pole tube and arm tube(s) is 1/8 inch per 10 foot. Tolerance for twist of pole tube and arm tube(s) is ±10 degrees.

3. The pole tube and arm tube cannot have more than one longitudinal seam weld. Roll or grind flush the longitudinal seam weld. Transverse welds in the pole and arm tubes are prohibited.

4. Attach the arm tube to a connection plate by a full penetration weld. Bolt the arm tube to the pole tube as shown on the plans. Control distortion of flange plates for flatness to assure full contact between mating surfaces in an unbolted, relaxed condition.

5. Weld the longitudinal arm seam on the male and female sections of the telescopic (i.e. slip-type) field splice with a complete joint penetration (CJP) weld a minimum of 36 inches long. When the field splice is erected and in its final position the lap of the arm sections cannot extend beyond the longitudinal arm seam CJP weld.

6. All welds must be 100 percent visual test (VT) inspected by an *AWS* Certified Welding Inspector (CWI).

7. All fillet welds must be 25 percent magnetic particle test (MT) inspected by a technician qualified in accordance with *American Society for Nondestructive Testing (ASNT)* Level II. Perform MT inspection in accordance with *ASTM E 709*, using the yoke, or aluminum prod method with half-wave rectified alternating current (direct current).

8. All partial joint penetration (PJP) longitudinal seam welds must be 10 percent MT inspected by a technician qualified in accordance with *ASNT* Level II. Perform MT inspection in accordance with *ASTM E 709*, using the yoke, or aluminum prod method with half-wave rectified alternating current (direct current).

9. All complete joint penetration (CJP) welds must be 100 percent ultrasonic test (UT) inspected by a technician qualified in accordance with ASNT Level II per subsection 918.10 of the Standard Specifications for Construction, except the acceptance/rejection criteria for material thickness equal to or greater than 5/16 inch will be in accordance with AWS Section 6.13 and Table 6.3.

10. Evenly space the pole base plate holes so the pole may be bolted to a concrete foundation as shown on the plans. Finish the lower surface of the base plate flat and at 90 degrees to the pole axis.

11. Provide a hand hole opening and cover. Weld a reinforcing frame to the pole for the handhole opening. Ensure the placement of the handhole does not reduce the strength of the pole. Securely fasten the handhole cover using stainless steel hex head cap screws or by an approved locking device.

12. Provide a suitable pole top with means for securing it to the top of the pole.

13. Provide a hook or other suitable device for the support of cable on the inside of the pole near the top.

14. Weld square stock that has been drilled and tapped to the inside of the hand hole so that it is readily accessible from the hand hole for grounding purposes.

15. Fabricate the arm to pole upright connection to compensate for mast arm deflection. Show this detail on shop drawings for approval by the Engineer.

d. Erection. Snug tighten anchor bolts in accordance with subsection 810.03.N.2 of the Standard Specifications for Construction.

Tighten pole cap, mast arm cap, and luminaire arm high strength bolts to a snug tight condition. Snug tight is the tightness attained by the full effort of an iron worker using an ordinary spud wrench.

Ensure all installation procedures are witnessed by the Engineer.

e. Construction. Ensure all work complies with sections 819, 820, and subsection 810.03 of the Standard Specifications for Construction, the applicable signal construction plan sheets, and this special provision.

For repair coating, apply a coating 1½ times the thickness or thickness equivalent specified for galvanizing on the item, but not less than 5 mils. Use zinc-based solder, zinc-rich primer, or zinc metallizing in accordance with *ASTM A 780*. Obtain the Engineer's approval before using zinc metalizing.

f. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Mast Arm Pole, Cat __	Each
Mast Arm, __ foot, Cat __	Each

Mast Arm Pole, Cat __ and **Mast Arm, __ foot, Cat __** includes furnishing all materials, fabrication, shop cleaning, galvanizing, shipping, and erection.

No extension of time or additional compensation will be granted due to obtaining the proper *AISC* certifications and/or endorsements required for this project.

Construction of the foundation will be included in other items.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
MAST ARM POLE FOUNDATION AND ANCHOR BOLTS

SIG:EMS 1 of 2 APPR:RWS:POJ:07-05-16
FHWA:APPR:07-05-16

a. Description. This work consists of providing all labor, equipment, and materials to install a mast arm pole foundation, including anchor bolts and other associated hardware required to complete the work.

b. Material.

1. Provide anchor bolts, nuts, and washers in accordance with subsections 105.10, 908.14.A and 908.14.B of the Standard Specifications for Construction.

2. Ensure steel reinforcement for all drilled shafts is as specified in section 905, and subsection 105.10 of the Standard Specifications for Construction.

3. Ensure the concrete mix is as specified in subsection 718.02 of the Standard Specifications for Construction.

4. Ensure slurry is as specified in subsection 718.03.E of the Standard Specifications for Construction. Use only polymer type slurries.

5. Use conduit material in accordance with section 819, and subsection 105.10 of the Standard Specifications for Construction.

c. Construction. Ensure all work is in accordance with sections 718, 819 and 820, and subsection 810.03 of the Standard Specifications for Construction, the applicable signal construction details, and this special provision.

1. The safety of the drilled shaft excavation, surrounding soil and material supported by the soil, and the stability of the sidewalls is the Contractor's responsibility. The hydrovac type method is allowed for the first 4 feet below grade with the remaining excavation method as determined by the Contractor and approved by the Engineer.

2. Do not leave drilled shaft excavations unfilled overnight unless the following conditions are met. Dry drilled shafts are drilled shafts where the flow rate of water into the excavation does not exceed 12 inches within 1 hour.

A. Ensure all open drilled shafts have appropriately sized and attached covers.

B. Ensure all open drilled shafts in soil are cased overnight.

(1) Dry Drilled Shafts. Temporary casing in dry drilled shafts is acceptable. However, the consequences and the associated costs are the responsibility of the

Contractor. Consequences may include, but are not limited to, hole collapse after the temporary casing is withdrawn or the need to leave temporary casing in place when it was not indicated in the contract. No additional payment will be made when temporary casing used to keep the hole open overnight must be left in place.

(2) Wet Drilled Shafts. Ensure wet drilled shafts have casing installed to the plan bottom of drilled shaft and the excavation within the casing is stopped a minimum distance of 5 feet above the plan bottom of drilled shaft during the nighttime shutdown period. Excavation to the plan bottom of drilled shaft elevation must be made the following day, prior to pouring the concrete.

3. Water within drilled shafts in excess of 3 inches may be pumped provided the flow rate of water into the excavation is less than 12 inches per hour.

4. Using the tremie method is acceptable whether placing the concrete in a wet or dry drilled shaft excavation. Use a watertight tremie, consisting of a tube of sufficient length, weight, and diameter (8 inch minimum inside diameter) to discharge concrete at the shaft base elevation. Ensure that the inside and outside surfaces of the tremie are clean and smooth. Pumped concrete must be placed in accordance with subsection 718.03.H.3 of the Standard Specifications for Construction.

5. Completely assemble a cage of reinforcing steel which consists of longitudinal and horizontal bars as indicated on the appropriate signal construction details. Provide a fully assembled steel reinforcement cage for inspection after inspection of the excavation and prior to placement of concrete. Support the cage to control vertical displacement during concrete placement. Steel reinforcement must have a clear cover of 3 inches, unless otherwise noted, and may be adjusted to ensure proper clear cover.

6. Ensure anchor bolt installation and tightening is in accordance with subsection 810.03.N of the Standard Specifications for Construction. Ensure all installation procedures are witnessed by the Engineer. Ensure anchor bolts and conduits are rigidly installed before the concrete is placed. Space anchor bolts by means of a template. The center of the template must coincide with the center of the foundation.

7. Continuously cast concrete once placement has commenced, until shaft concrete casting is completed. Exposed concrete surfaces must be cast in forms and exposed concrete edges must be beveled 3/4 inches.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Mast Arm Pole Fdn, 6 Bolt	Foot

Mast Arm Pole Fdn, 6 Bolt includes storage and disposal of removed material in the pay item. Disposal of removed material must comply with section 204 of the Standard Specifications for Construction or as directed by the Engineer. Steel casing is not included in this pay item and will be paid for separately.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
HANDHOLE, ROUND

OPR:EMS 1 of 2 APPR:BMB:DBP:01-29-14

a. Description. This work consists of constructing a round handhole, and providing hardware, connectors, fittings and all material necessary to complete the work.

b. Materials. Material must meet section 918 of the Standard Specifications for Construction.

1. Provide handhole with live loads meeting the requirements of *AASHTO HS 20* for wheel loading.

2. Ensure Grade S2 concrete in accordance with section 701 attains a 28-day compressive strength of 4,500psi

3. Provide smooth or deformed welded wire fabric in accordance with *ASTM A 185* or *ASTM A 497*.

4. Provide reinforcing steel meeting the requirements of *ASTM A 615, Grade 60* rebar, if required. Bend bars and place in accordance with the latest *ACI* standards.

5. Provide precast handhole with the following characteristics:

A. An inside diameter of 22½ inches, capable of accommodating a round cover.

B. Integral wall and base.

C. A height of 39½ inches.

D. An outside diameter of 30¾ inches.

E. One, 6-inch knockout in the base for a sump drain hole.

F. Walls with four tapered knock-outs for conduits entering the handhole, 2 inches deep from the inside and 11 inches to 10 inches in diameter.

G. For frame and cover, provide a heavy duty frame and cover manufactured by East Jordan, Neenah Foundry, or a Department approved equal, with “MDOT Traffic Signal” cast into the cover. For non-MDOT installation “Traffic Signal” will be cast into the cover.

c. Construction. Construct the handhole to accept a heavy duty frame and cover centered on top of the handhole. The inner surface of handhole must be smooth.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Hh, Round	Each

Hh, Round includes all labor, equipment and materials required to construct a round handhole and provide hardware, connectors, fittings and all material necessary to complete the work.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CASING USED WITH STRAIN POLES AND MAST ARM POLES

SIG:EMS 1 of 1 APPR:RWS:POJ:07-10-14
FHWA:APPR:07-23-14

a. Description. This work consists of providing all labor, equipment, and materials to install a steel casing when constructing a steel strain pole or mast arm pole foundation.

b. Material. Use casings that conform with subsections 105.10 and 919.10 of the Standard Specifications for Construction. Ensure the outside diameter of casing is not less than the specified size of the shaft.

c. Construction. Install the steel casing as indicated on the plans or as directed by the Engineer. Install the steel casing in a manner that produces either a positive seal at the bottom of the casing to prevent the entry of water and/or soil into the shaft excavation or install the steel casing to the bottom of the foundation, whichever is less in length. Leave the steel casing in place. The steel casing may stop at the conduit entrance into the foundations. The top of the foundation may be formed separately without steel casing. Ensure a suitable method of compaction is employed to ensure the soil immediately outside the casing is compacted properly and complies with section 206 of the Standard Specifications for Construction.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Casing	Foot

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PUSHBUTTON AND SIGN

OPR:EMS 1 of 3 APPR:PC:DBP:02-10-16
FHWA:APPR:02-11-16

a. Description. This work consists of completing one or more of the following work types at locations shown on the plans:

1. Furnishing and installing a pushbutton.

2. Furnishing and installing a pushbutton and sign.

3. Removing and disposing of an existing pushbutton.

4. Removing, storing and reinstalling an existing pushbutton and sign.

As applicable, this work includes removal or installation of interface equipment, mounting assembly, brackets, hardware, fittings, connectors, wiring, cable to controller, grounding, risers, conduit and any other material required to ensure a complete removal or installation, as specified for a location.

b. Materials. Where installation of new equipment is called for on the plans, provide material in accordance with sections 918 and 921 of the Standard Specifications for Construction and this special provision. Comply with subsection 105.10 of the Standard Specifications for Construction.

1. General Pushbutton Requirements. Provide a pushbutton that meets all of the following:

A. Constructed of *AISI 304*, 316 stainless steel.

B. Designed with a non-moving, pressure activated button that cannot be jammed, glued or made to stick in the activated position.

C. Resistant to flame and ice and capable of withstanding severe impacts from hard objects.

D. Capable of being retrofitted to most existing pedestrian pushbuttons currently in use by the MDOT. Provide required adapters to mount the pushbutton to existing pushbutton housings.

E. Extends no more than 1.25 inches when installed in the mount assembly.

2. General Pushbutton Mount Assembly Requirements. Provide a pushbutton mount assembly that meets all of the following:

A. Fabricated from 319 die cast aluminum or equivalent, and available powder coated in yellow, black, silver, and green.

B. Finished size no more than 3.30 inches in diameter.

C. Equipped with a terminal strip made of nickel-plated brass or other non-corrosive material.

D. Equipped with a weep hole for drainage of moisture.

E. Includes four stainless steel nuts embedded in the housing to accept four 1/4 inch × 20 stainless steel mounting bolts.

F. Includes *AISI Series 304*, 316 stainless steel fasteners, such as screws, nuts, bolts, etc. Provide spanner head type tamper resistant screw sets and head bits, as directed by the Engineer, as an alternative to the standard Philips head screws typically supplied with each button.

3. Pushbutton Control Unit. Provide an interface pushbutton control unit to be installed in the intersection traffic signal controller unit.

4. Functional Requirements. Provide a pushbutton with no moving parts. Provide a Piezo driven type solid state switch that requires no more than three pounds of force to activate the pushbutton.

Ensure the pushbutton when activated, provides a two-tone audible beep (2.6kHz and 2.3kHz dB levels) with a visible momentary or latched red Light Emitting Diode (LED) light to notify the pedestrian the button was activated. Ensure the LED is ultra bright red in color and provides a luminous intensity greater than 1200 millicandela (mcd).

The LED latched option is required to ensure the LED is activated only during the pedestrian clearance and steady “hand” (Don’t Walk) phase and is extinguished at the beginning of the “walking person” (Walk) phase.

Ensure the pushbutton tone and light do not operate during the night time flash, and do not conflict with or preempt traffic signal controller operations.

5. Sign. Provide R10-3 Series pedestrian sign of the size and type shown on the plans, or as directed by the Engineer. Install the pedestrian sign parallel to the associated pedestrian crosswalk.

6. Warranty. Provide materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specifications for Construction.

1. Installation. When installing new equipment is specified, furnish and install the pushbutton or pushbutton and sign as shown on the plans. Installation includes interface equipment, mounting assembly, brackets, hardware, fittings, connectors, wiring, cable to controller, grounding, risers, conduit and any other material required to ensure a complete installation, as specified for a location.

2. Removal. When removal is specified, remove an existing pushbutton, and sign if one is present, as shown on the plans. Removal includes interface equipment, mounting assembly, brackets, hardware, fittings, connectors, wiring, cable to controller, grounding, risers, conduit and any other material required to ensure a complete removal, as specified for a location.

3. Salvage. When salvage is specified, remove an existing pushbutton and sign, store salvaged materials in a protected and clean environment, and re-install the materials.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Pushbutton	Each
Pushbutton and Sign	Each
Pushbutton, Rem	Each
Pushbutton and Sign, Salv	Each

These pay items include furnishing and installing, or removing, as applicable, interface equipment, mounting assembly, brackets, hardware, fittings, connectors, wiring, cable to controller, grounding, risers, conduit and any other material required to ensure a complete removal or installation, as specified for a location. These pay items also include proper disposal of removed materials not reinstalled on the project.

1. **Pushbutton** includes all labor, equipment, and materials required to furnish and install a new pushbutton at a location shown on the plans.

2. **Pushbutton and Sign** includes all labor, equipment, and materials required to furnish and install a new pushbutton and sign at a location shown on the plans.

3. **Pushbutton, Rem** includes all labor, equipment, and materials required to remove a pushbutton, and a sign if one is present, at a location shown on the plans.

4. **Pushbutton and Sign, Salv** includes all labor, equipment, and materials required to remove a pushbutton, and sign if one is present, store the removed materials on site and reinstall materials at a location shown on the plans.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
WIRELESS VEHICLE DETECTION SYSTEM

SIG:EMS 1 of 6 APPR:MDW:DBP:06-08-18
FHWA:APPR:06-18-18

a. Description. This work consists of completing one or more of the following work types at locations shown on the plans:

1. Furnishing and installing a wireless vehicle detection system (VDS) including serial port protocol (SPP) radios, master interface access point contact closure (APCC) card, extension (EX) cards, and Isolator Module.

2. Furnishing and installing a repeater (RP).

3. Furnishing and installing a vehicle sensor node (VSN).

4. Removing and disposing of an existing wireless VDS.

5. Removing, storing and reinstalling an existing wireless VDS.

6. Removing and disposing of an existing RP.

7. Removing, storing, and reinstalling an existing RP.

8. Removing and disposing of an existing VSN.

9. Removing, storing, and reinstalling an existing VSN.

As applicable, this work includes removal or installation of mounting brackets, hardware, cable, connectors, grounding, sensors and orange epoxy and any other material required to ensure a complete removal or installation, as specified for a location.

b. Materials. Provide materials, as directed by the Engineer, necessary to provide a complete and operating job. Provide materials in accordance with sections 918 and 921 of the Standard Specifications for Constructions and this special provision.

1. Vehicle Detection System (VDS).

   A. A complete VDS consists of:

      (1) Master interface APCC card;

      (2) EX card if required;

      (3) Isolator Module;

(4) Mounting rack and hardware;

(5) The quantity of SPP radios as specified on the plans including *NEMA 4X type* enclosure with mounting bracket and hardware and Category 5e (CAT-5e) 600 volt (V) rated cable from the SSP to the Isolator Module;

(6) Any associated cable, connectors and hardware necessary to complete the work.

B. Provide a VDS that:

(1) Detects and counts vehicles using battery powered magnetometers utilizing wireless communications to transmit detection information;

(2) Provides vehicle counts per lane, lane occupancy, vehicle speed (when more than one VSN is installed per lane), and vehicle classification (when one or more VSN is installed per lane);

(3) Allows the time intervals for the above measurements to be user selectable from 30 seconds to 24 hours.

C. Provide an SPP radio that:

(1) Consists of a 2.4 gigahertz (Ghz) Master transceiver powered via CAT-5e cable;

(2) Includes 600V rated CAT-5e cable from the SPP to the Isolator Module;

(3) Includes an enclosure with mounting bracket, and associated hardware;

(4) Transmits detection information to a 170, 2070 or *NEMA type* controller in real-time;

(5) Operates on 48 volt direct current (VDC) at 3 watt power or via non-isolated external 10 to 15VDC at 2 watt power;

(6) Operates in an ambient temperature range of -37 degrees Fahrenheit (F) to +176 degrees F (-38 degrees Celsius [C] to +80 degrees C);

(7) Provides 1500V isolation and 5 kilovolt (kV) surge protection;

(8) Is housed in a plastic enclosure, no larger than 12 inches high, 8 inches wide, and 4 inches deep, meeting *NEMA 4X* and *International Protection Rating (IP67) standards*.

D. Provide a master interface APCC card that functions as the hub of the sensor network, communicating with up to 96 VSN's transmitting detection information to the APCC.

2. Vehicle Sensor Node (VSN).

A. A complete VSN consists of:

(1) A magnetometer,

(2) A microprocessor,

(3) A wireless transceiver,

(4) A battery, and

(5) Orange epoxy for securing the node in the pavement.

B. Provide a VSN that:

(1) Is 1.9 inches high, 2.9 inches square;

(2) Is contained in a fully encapsulated housing to prevent moisture from degrading the components;

(3) Operates in an ambient temperature range of -37 degrees F to +176 degrees F (-38 degrees C to +80 degrees C);

(4) Operates on battery power for a minimum of 10 years under normal traffic conditions;

(5) Detects a vehicle by measuring a change in the earth's magnetic field and transmits the detected information within 125 milliseconds (ms) of receiving the detected vehicle;

(6) Can be programmed with a unique identifying code and transmits this code and detector information via a wireless radio communication method;

(7) Automatically recalibrates in the event of a detector lock;

(8) Responds within 100 seconds after the AP is powered up.

3. Wireless Repeater (RP).

A. A complete RP consists of:

(1) A battery operated transceiver;

(2) A battery with a minimum 8 year life; and

(3) An enclosure with mounting bracket and associated hardware.

B. Provide an RP that:

(1) Is housed in a plastic enclosure, no larger than 12 inches high, 8 inches wide, and 4 inches deep, meeting *NEMA 4X* and *International Protection Rating (IP67) standards*;

(2) Extends the effective communication range of the VSN to the SPP up to 1000 feet; and

(3) Operates in an ambient temperature range of -37 degrees F to +176 degrees F (-38 degrees C to +80 degrees C).

4. Bus Interface Unit (BIU). Provide a BUI that meets the requirements of *Section 8 of the NEMA TS2-Specification*. Provide one 6 foot Port 1 communications cable to connect from the detector rack BIU to the controller unit.

5. Wireless Communication. Provide a VDS, RP, or VSN that operates in the unlicensed Industrial, Scientific and Medical (ISM) 2.4GHz band. Ensure the SPP and VSN operate in any one of the 16 channels available in the band. Provide two-way communication between the SPP and VSN to ensure integrity over the RP interface. Provide a VSN that uses a Time Division Multiple Access (TDMA) protocol wherein each sensor is assigned a time slot during which it transmits and receives one or more data packets. Ensure all system components are synchronized to the same time reference sourced by the APCC.

6. Software. Provide a VDS that is capable of accepting software and firmware upgrades. Provide software required to configure the VSN, SPP and RP units and to store and retrieve the detection data. Ensure the VSN and RP are reconfigurable by a user over the wireless communication interface.

7. Warranty. Provide materials with a manufacturer's warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete the work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans, and as directed by the Engineer. Remove, store, and dispose of material in accordance with section 204 of the Standard Specifications for Construction.

1. Installation. When installing new equipment is specified, furnish and install the VDS, RP or VSN as shown on the plans. Installation includes master interface APCC card, EX card as required, Isolator Module, mounting brackets, hardware, cable, connectors, grounding, sensors and other appurtenances required for a complete system.

Install the VSN in a 4 inch by 2¼ inch hole, cored in the pavement in the traffic lane as indicated on the plans, or as directed by the Engineer. Encapsulate the VSN with orange epoxy.

Install the SPP and RP within range of the sensors and as indicated on the plans, or as directed by the Engineer.

2. Removal. When removal is specified, remove the existing VDS, VSN or RP units, associated enclosures, mounting brackets, hardware, and other appurtenances required for a complete removal. Dispose of removed materials.

3. Salvage. When salvage is specified, remove the existing VDS, VSN, or RP units, associated enclosures, mounting brackets, hardware, and other appurtenances required for a complete removal, store salvaged materials in a protected and clean environment, and re-install the materials. Complete reinstallation in accordance with subsection c.1 of this special provision.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Wireless Vehicle Detection System	Each
Wireless Vehicle Sensor Node	Each
Wireless Repeater	Each
Wireless Vehicle Detection System, Rem	Each
Wireless Vehicle Sensor Node, Rem	Each
Wireless Repeater, Rem	Each
Wireless Vehicle Detection System, Salv	Each
Wireless Repeater, Salv	Each
Wireless Vehicle Sensor Node, Salv	Each

1. **Wireless Vehicle Detection System** includes all labor, equipment, and materials required to install a wireless vehicle detection system including the SPP radios, the master interface APCC card, BIU, the EX cards, and the Isolator Module. The work includes all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work.

2. **Wireless Vehicle Sensor Node** includes all labor, equipment, and materials required to install a wireless vehicle sensor node including the sensors, orange epoxy, and all appurtenant material required to complete the work.

3. **Wireless Repeater** includes all labor, equipment, and materials required to install a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work.

4. **Wireless Vehicle Detection System, Rem** includes all labor, equipment, and materials required to remove a wireless vehicle detection system including the SPP radios, the master interface APCC card, the EX cards, and the Isolator Module. The work includes removing all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work. **Wireless Vehicle Detection System, Rem** also includes storage or disposal of removed material.

5. **Wireless Vehicle Sensor Node, Rem** includes:

A. All labor, equipment, and materials required to remove a wireless vehicle sensor node including the sensor, epoxy, and all appurtenant material required to complete the work;

B. Storage and or disposal of removed material;

C. Filling the old hole with black epoxy;

6. **Wireless Repeater, Rem** includes all labor, equipment, and materials required to remove a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work. **Wireless Repeater, Rem** also includes storage or disposal of removed material;

7. **Wireless Vehicle Detection System, Salv** includes all labor, equipment, and materials required to remove a wireless vehicle detection system including the SPP radios, the master interface APCC card, the EX cards, and the Isolator Module. The work includes removing all mounting brackets, hardware, cable, connectors, grounding, and all appurtenant material required to complete the work. **Wireless Vehicle Detection System, Salv** also includes storage and reinstallation on the project;

8. **Wireless Repeater, Salv** includes all labor, equipment, and materials required to remove a wireless repeater including the RP, mounting brackets, hardware, and all appurtenant material required to complete the work. **Wireless Repeater, Salv** also includes storage and reinstallation on the project;

9. **Wireless Vehicle Sensor Node, Salv** includes:

A. All labor, equipment, and materials required to remove a wireless vehicle sensor node including the sensor, epoxy, and all appurtenant material required to complete the work;

B. Storage and reinstallation on the project;

C. Core drilling a new 4 inch by 2¼ inch hole, as indicated on the plans, or as directed by the Engineer, and encapsulating the VSN with orange epoxy; and

D. Filling the old hole with black epoxy.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
24 - 48 CIRCUIT DIGITAL NATIONAL ELECTRICAL MANUFATURERS' ASSOCIATION TYPE TRAFFIC CONTROLLER AND CABINET

OFS:PJC 1 of 47 APPR:LWB:DBP:07-17-15
FHWA:APPR:07-28-15

a. Description. This work consists of completing one or more of the following work types at locations shown on the plans:

1. Furnishing, delivering, and installing a controller and cabinet, digital type for locations where the controller does not need to function as the master for a closed loop system.

2. Furnishing, delivering, and installing a controller and cabinet, digital type, master for locations where the controller functions as the master for a closed loop system.

This work includes furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup. This work includes transporting the cabinet from the maintaining agency to the job site for installation. This work includes installation of the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operations as shown on the plans, in accordance with the *MMUTCD* and this special provision. As applicable this work includes mounting brackets and hardware, conduit risers, wiring, connectors, grounding, rewiring of existing signal heads, and all appurtenant materials required to ensure a complete installation.

b. Material. Provide materials meeting the requirements in sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. Controller Unit (CU).

A. Provide a CU that is capable of running:

(1) Fully actuated (4 to 16 phase).

(2) 24-36 circuit solid state pretimed.

(3) Fully actuated (4 to 16 phase) closed loop master.

(4) Solid state pretimed closed loop master.

(5) A full complement of operational, programming and diagnostic capabilities.

(6) A menu structured traffic oriented/English language operator interface providing comprehensive traffic control, analytical and management capabilities.

B. Environmental Standards. Ensure the CU performs all of its functions within the environment as defined by *NEMA Standards Publication TS 1* and *TS 2*. Ensure the CU meets or exceeds the applicable sections and clauses of *NEMA Standards Publication TS 1* and *TS 2*, *Section 2*, with respect to each of the following functions:

Operating Voltage	Transients, Power Service
Operating Frequency	Transients, Input-Output Terminals
Power Interruption	Non-destruct Transient Immunity
Temperature and Humidity	Vibration and Shock

C. Provide a CU that meets the following physical, interface and functional requirements of solid state controller shelf mounted unit and complies with the Advanced Transportation Controller (ATC) *5.2b Specification*, *NEMA Standards Publication TS 2* - Type 2, A2 and P2, with MS A, B, and C connectors. Optionally, *NEMA* configurations A2N and P2N providing *NTCIP* requirements will be available via embedded Web Server to switch between software in the CU.

Ensure the control processor unit (CPU) is a bit type, running at 266 megahertz (Mhz) and is provided with a Linux operating system with runtime license and Kernel x.y.z. Ensure the CPU is installed on a separate printed circuit board for ease of maintenance and upgrading.

D. Memory. Provide a minimum of 512 megabyte (MB) of Flash memory organized as a disk drive. Ensure traffic application and intersection data resides in Flash memory. Ensure the Flash memory retains data without power, capacitor, or battery backup, and remains permanent until changed by user data entry or a new download.

Provide a minimum of 64 MB of dynamic random-access memory (DRAM) to be used to execute the traffic application software. Ensure DRAM can be reloaded from Flash upon power restoration since it does not retain memory during power failures.

Provide 2 MB of static random-access memory (SRAM), for use as a scratchpad for temporary data storage, backed by a capacitor during power failures for a minimum of 30 days.

Time of Day (TOD) clock with hours, minutes, seconds, month, year, and automatic daylight savings time adjustment. TOD may be implemented in the CPU via electronic circuitry, operating system software, or a combination.

During power failures, power the SRAM and TOD by STANDBY voltage from the power supply.

E. Power Supply. Provide the CU with a modular power supply.

Provide the power supply with +5 volts direct current (VDC) for the CU electronics and +24VDC to power devices in the control cabinet. Protect both these power supplies by 5 millimeter 2 amperes (A) slow blow glass cartridge fuses accessible from the front panel.

Include added safety circuitry to the power supply to measure line voltage and output voltage, as well as generate power fail interrupts, power up reset, and a 120 hertz (Hz) signal for a time base.

Provide the power supply with a line frequency reference signal generated by a crystal oscillator that must synchronize to the 60Hz volt alternating current (VAC) incoming power line at 120 and 300 degrees. A continuous square wave signal must be +5VDC amplitude, 8.333 milliseconds half-cycle pulse duration and 50 ±1 percent duty-cycle. Ensure the line frequency reference compensates for missing pulses and line noise during normal operation and continues through 450 milliseconds power interruptions.

Provide STANDBY voltage via supercapacitor for backup power during loss of service voltage. Provide a supercapacitor with a minimum of 15-farad nominal size. No batteries of any type are allowed.

F. Physical Standards. *NEMA Standards Publication* apply and are supplemented as follows:

(1) Dimensions. Ensure the maximum dimensions of the CU enclosure conforms to the following limits:

Height = 7 inches Width = 16 inches Depth = 9½ inches

(2) Design. Ensure the CU housing is formed of polycarbonate except the back panel, rear mounting tab, and power supply mounting plate must be aluminum. Ensure the housing has a built-in carrying handle and is provided with two adjustable front mounting feet.

(3) Expansion. Ensure there are seven slots with card guides for standard 3U size Versa Module Europe expansion modules. Ensure the controller also has two slots with card guides for standard joint *NEMA/AASHTO/ITE/ATC* modems.

Ensure the CU also includes two expansion slots that may be used to house standard 2070 *ATC* modules such as series modems.

The CU will have ability to be configured for either *ATC NEMA* configuration or configured to comply with the *NEMA ATC 5.2b specification*.

It should be possible to initially setup the controller for a *NEMA TS-2* Type 2 configuration without *ATC* compliance.

The controller will be suitable for both a direct parallel connection to load switches and detectors and a Synchronous Data Link Control (SDLC) port to communicate with *NEMA* Buss Interface Units (BIU).

Vendor will have available a field upgrade kit to easily upgrade a standard *NEMA* configuration to a compliant *ATC* configuration.

G. Interface Standards. Ensure the CU provides an input-output interface that meets the following requirements.

(1) Ethernet Port. Ensure there is a built-in base-T Ethernet with RJ-45 connector on the controller front panel. Ensure there is a unique, built-in internet protocol (IP) address for each controller.

(2) *NEMA* Port 1 SDLC. Provide a CU with a 15-pin "D" connector to communicate to hardware devices within the cabinet.

(3) *NEMA* Port 2. Provide a CU with a 25-pin connector compliant with the *Electronics Industry Association* (EIA)-*232* communications standard that serves two functions.

Ensure Port 2 provides hardwired data communications to devices nearby such as laptop personal computers (PCs), personal digital assistants (PDA's), phone modems, or printers. Ensure communications baud rates are user selectable baud rates of up to 38,400 bits per second (bps).

Ensure Port 2 also provides signals that implement the C50 function of the joint *NEMA/AASHTO/ITE* Specification of the *ATC* and is present on the secondary transmit and receive pins described in the *EIA-232* specification for a 25-pin connection.

(4) *NEMA* Port 3. Provide a CU with an internal *NEMA* Port 3 communications port. This port must provide systems communications to on-street masters or central office computers. Ensure this port is addressable with user selectable baud rates of up to 38,400bps.

Equip the CU, when called for on the plans, with a modular internal frequency shift keying (FSK) two wire port 3 modem that is accessed on the controller front panel by way of an 9-pin "D" connector, and by way of the 37-pin "D" connector. The communications must be half duplex, time division multiplexed, 1200bps, asynchronous, bit serial. Ensure output power is 0 decibels per minute (dBM) ±15 percent into a 600 ohm load. Ensure receiver sensitivity is a minimum of -34dBm. Ensure the FSK modem has an anti-streaming option that will turn the modem transmitter off if the modem consistently transmits for greater than 7 seconds. Ensure the FSK modem interfaces with existing FSK systems in use by the MDOT.

Provide a CU with a module that contains an additional 9-Pin RS-232 port and a 25-Pin RS-232 port. Ensure the module provides a light emitting diode (LED) display for the Transmit Data (TXD), Receive Data (RXD), Request to Send (RTS) and Clear to Send (CTS) commands. Ensure the module also provides a data key receptacle to program and read serial data keys. Ensure the data key provided has enough capacity to store data used by the software application. Ensure the data key is removable and can be transferred to another controller. Ensure the data key is designed for harsh environments with large contacts that are wiped by the rotation of the key within the receptacle. Ensure the data key conforms to Data Key™ "Key Link" serial data protocol. Ensure the data key receptacle is attached to *NEMA Port 2.* Provide one data key with each CU.

Provide a built in Universal Serial Bus (USB) 2.0 port that will enable data transfer used by the software application to another CU or local or central system database.

Ensure CU timing plan from legacy MDOT CU is compatible with CU via upload/download procedures utilizing existing MDOT CU support software.

Provide an optional Port 3 fiber optic modem when called for on the plans.

(5) C60 Connector. Provide a built-in C60 connector for use with a removable keyboard and display, PC, or PDA. Ensure the C60 protocol conforms to the joint *NEMA/AASHTO/ITE ATC standard*.

(6) Keyboard and Display. Ensure the keyboard and display is contained in one unit that is removable from the front of the CU by pulling off, installed by pushing on, and secured with a retaining screw. Keyboard and display may be removed for cost savings by the Agency. Ensure the keyboard functions and terminal emulation conforms to the joint *NEMA/AASHTO/ITE ATC standards*. Key quantity and function per Joint *NEMA/AASHTO/ITE ATC* Standard. Ensure the liquid crystal display (LCD) displays 16 lines of 40 characters and uses a LED for backlighting. Ensure the LCD provides a keypad contrast adjustment. No contrast knob is allowed.

(a) Programming. Ensure programming the CU variables is via a front panel keyboard and display. The controller must utilize English language menus.

Ensure the CU prevents the alteration of keyboard set unit variables prior to the user having entered a specific code. Ensure the "Access" code is also user programmable via the keyboard.

Ensure all variables are displayed for visual verification concurrent with entry.

Provide ability to view the active status screens simultaneously with other programming menu screens, in order to reduce errors.

Provide ability to assign a specific menu screen to one of the available function buttons on the keyboard.

Provide ability to evoke a context sensitive help screen using a clearly identified HELP button.

Provide a clearly identified Auxiliary ON/OFF switch on the keypad that is user programmable as either stop time or interval advance.

(b) Programming Security. Ensure the CU maintains user programmable variables in non-volatile memory to assure continued safe and efficient CU operation in the event of power loss.

(7) A, B, C Connectors. Ensure the CU includes the A, B, and C connectors with inputs and outputs as defined by *NEMA TS2*-Type 2, A2 and P2. A number of the input definitions must be programmable in the CU to differ from *NEMA* specifications. Example: the phase omit, hold, and ped omit inputs can be redefined to provide an additional 24 vehicle detector inputs. A number of the output definitions must be programmable in the CU to differ from *NEMA* specifications. Example: the phase on, next, and check outputs can be redefined to provide an additional eight sets of green, yellow, red outputs.

(8) D Connector. Ensure there is a 37-pin connector D on the front of the unit to provide for additional input/output functions and for systems communications. These functions must be manufacturer specified. A number of the input and output definitions must be programmable in the CU. Ensure this connector provides the ability of the controller to be used in a systems environment.

H. Actuated Control. *NEMA Standards Publication*, *TS-2*, Section 3 applies and are supplemented as follows:

(1) Per Phase. Ensure the CU provides four alternate banks for all phase timing data parameters. Provide the following functional capability on a per phase basis:

(a) Conditional Service. Ensure conditional service provides an optional method for phase selection and apply to vehicle phases only. If two concurrent phases are timing and a call exists on the other side of the barrier and one of the phases is prepared to terminate due to gap out or max time out, the ring containing the timed out phase must revert to a preceding vehicle phase if:

(i) A call exists on a preceding actuated vehicle phase. (Non-Actuated Phases must not be conditionally re-serviced).

(ii) The gapped/maxed phase is programmed for conditional service.

(iii) There is sufficient time remaining before max time of the other phase has elapsed.

(b) Special Detector Functions. Ensure there are 64 vehicle detector assignments, 8 pedestrian detectors, and 8 special detectors. Ensure each detector is programmable for a standard vehicle detector input, pedestrian detector input, one call, stop bar A or stop bar B, Adaptive Protected Permissive Left Turn, Adaptive Protected Permissive Thru, and an AND code that only allows a call to be entered if calls are active on all detectors so programmed. Also ensure that each detector is capable of being programmed to extend, delay, or switch.

(c) Extended Pedestrian Clearance. Ensure the CU design provides an alternate mode of operation for the Pedestrian `Don't Walk' Output to extend the flashing period (Ped Clearance) for each phase so programmed, so a portion (equal to the sum of the Yellow Change and/or Red Clearance time settings) may appear concurrently with the vehicle change intervals. Provide a setting in the CU that allows a 3 inch buffer from the termination of the flashing period until the start of a conflicting movement.

(d) Pedestrian Overlaps. Ensure it is possible to program phase ped outputs such that the ped outputs are active with two separate phases.

(e) Pedestrian Extend and Delay. Ensure it must be possible to delay or advance the start of the walk display relative to the same phase green by up to 99.9 seconds in 0.1 second increments.

(f) Actuated Rest in Walk. Ensure the CU design provides an alternate mode pedestrian dwell for actuated phases. Ensure the actuated phase rests in Walk when so programmed and there is no serviceable conflicting call at the end of the Walk timing.

(g) Automatic Pedestrian Clearance. Ensure the CU design provides an alternate mode of operation to enable timing of the pedestrian clearance interval when Manual Control Enable is active.

(h) Last Car Passage. Ensure the CU provides this alternate method of operation to control green termination with volume density operation.

(2) Per Unit. Ensure the CU provides the following functional capability on a per unit basis:

(a) Simultaneous Gap Out. Ensure green timing termination in multiple ring controller configurations provides for simultaneous termination. Simultaneous termination, when timing phases concurrently with the next serviceable call on a phase that conflicts with more than one of the phases timing (about to cross a barrier), insures that all phases which will terminate must simultaneously reach a point of being committed to terminate before green timing termination must begin (i.e., Gap-Out, Max-Out and/or Force-Off).

(b) Dual Entry. Dual entry is a mode of operation (in a multiple ring CU) in which one phase in each ring must be in service, where possible subject to compatibility, at all times. If a call does not exist in a ring when it is committed to cross a barrier, a phase must be selected in that ring to be activated by the CU based on this programming.

(c) Variable Sequence. Ensure the CU provides controls for 16 vehicle phases, 16 pedestrian phases, and 4 timing rings with each phase being able to be assigned to any ring with the user definition of Ring, Phase Next, and Concurrent Phases.

(d) Overlaps. Ensure the CU provides controls for 16 overlaps with each phase being able to be assigned to any overlap with the user definition of Trailing Green, Yellow, and Red Timing when needed.

(e) Detectors. Ensure the CU provides controls for 80 detectors with each detector being able to be assigned as phase vehicle, pedestrian, stop bar A, stop bar B, protected/permissive through, and red protect or bike detector with delay, extend, and switch capability, and assigned as system, speed trap, and count detector function.

(f) Signal Driver Outputs. Ensure the CU is capable to assign the Type 2 CU Signal Driver Outputs to any pin set (i.e., Overlap E outputs to Ped 1 output pins) or use Phase On, Phase Next, and Phase Check for signal driver outputs via alternate ABC connector Input/Output (I/O) modes.

(g) Special Function Mapping Routines.

(i) Adaptive Maximum Routines. Ensure the CU provides, via Time Base Control (TBC), up to three separate Step values to cause the running maximum to increase or decrease smoothly based on current traffic conditions. Ensure Separate Dynamic Maximum Parameters are available for each Step value. The Dynamic Maximum Value can be either larger or smaller than the normal maximum limit.

(ii) Adaptive Protected/Permissive Routines. Ensure the CU provides routines which measure the volume of left-turn vehicle traffic and available gap windows in the conflicting through-vehicle traffic to determine whether the Left Turn should operate protected or permissive.

(iii) Adaptive Variable Passage Time and Maximum Routine. Ensure the CU provides routines that have up to three separate values to increase or decrease the default passage time enabled via TBC.

(iv) Coordinated Adaptive Split. Ensure the CU provides a routine to allow the utilization of unused coord split time to be allocated to a split that is being forced during coordination.

(v) Permissive Red Flash Routine. Ensure the CU provides a routine to allow an in-cycle red flash during the through green phase(s), enabled via TBC.

(vi) Ensure there is a Flashing Yellow Arrow (FYA) routine that is programmable in the CU. Use this routine to provide for operation of a 4 section FYA left turn signal per *National Cooperative Highway Research Program (NCHRP) project 3-54.* Data entries in the CU must define when the signal face displays the protected (green arrow) and the permissive (flashing yellow arrow). Ensure it is possible to logically AND a minimum of two phases as the control defining the permissive display.

(h) Alternate Sequences. Ensure the CU provides the capability of 15 alternates to the standard sequence. The alternate sequences may also be selected by the Alternate Sequence external interface inputs or the coordinator as a function of the pattern (Dial/Split/Offset) in effect or as defined by the Start Up menu selection.

(3) Priority of Input Functions. Ensure the priority of input functions are in the following order:

(a) Power-Up;

(b) External Start;

(c) Phase Omit;

(d) Pedestrian Omit;

(e) Interval Advance;

(f) Stop Time;

(g) Remote Flash;

(h) Manual Control Enable;

(i) Ring Force Off;

(j) Phase Hold; and

(k) Pedestrian Recycle.

I. Concurrent Real Time Displays. Ensure the CU displays a dynamic current real time status of six active timers and status per ring for any combination of two of the four rings simultaneously. Ensure real time displays are provided for ring timer status, coordination, telemetry, preemption, detectors, intersection status, communications, connector input and output status, and TBC. As a minimum, the real time displays must provide concurrent active status for the following conditions:

(1) Ring timer status for 16 phases for any 2 of the 4 rings, minimum green, added initial, walk, ped clear, time before reduction, cars before reduction, time to reduce, effective gap in effect, MAX 1 or 2, passage time, gap out, max. out, force off, last car passage, walk hold or rest, green rest, yellow clearance, red clearance, red rest and red revert state. Phase status indicators for 16 phases concurrently displayed with the ring status indicators must be phase on or rest, vehicle call, non-actuated vehicle recall, minimum vehicle recall, maximum vehicle recall, soft vehicle recall, pedestrian call, pedestrian non-actuated recall, pedestrian recall, phase hold, omit and pedestrian omit. Additionally, the program and pattern in effect, cycle countdown, preemption program in effect, and stop time in effect must also be concurrently displayed. In addition, vehicle and detector calls may be placed through front panel entry while in the active ring timer display.

(2) Coordination active timers must simultaneously display, for up to four rings, the active phase(s) and/or force off active, current cycle length in seconds, offset in seconds, correction mode in effect, local cycle countdown, system cycle count up, offset in last cycle zero, correction of current cycle, time base interconnect, system, backup, manual control, or standby in effect or control.

(3) Telemetry status must simultaneously display the on line-off line status, active or non-active carrier frequency, receiving or transmitting data and the validity of data received and/or transmitted for two ports.

(4) Preemption status must concurrently display the real time status for preemption in control, preemption call (preemption or low priority call), timing of (ped or minimum green, ped or vehicle clearance, track greens and clearance, dwell green), delay before preemption, and duration of preemption.

(5) Detector status display must simultaneously indicate the current status of up to 16 detectors. It must indicate the status of both special and phase detectors and whether they are on line or failed. The display must indicate, as a minimum, whether the failure was due to max presence, no activity or erratic count.

(6) Intersection display must simultaneously indicate the active status of 16 phases and the red, yellow, green, walk, don't walk and overlap status of each phase and whether the vehicle and/or pedestrian detectors have a call or recall. Vehicle and pedestrian calls may be placed through front panel entry while in the active intersection display.

(7) TBC must simultaneously display the current month, day, year, time (hour, minute, second) and whether it is standard or daylight savings time; the day and week program in effect, the dial, split, and offset in effect, phase function mapping for 16 phases, 8 phase functions, the status of 3 auxiliary and diagnostic outputs, and the status of the dimming function. It must be possible to enable the auxiliary, special functions, and phase function options through front panel entry while in the TBC active status display.

J. Coordination. Ensure the CU has a special program for internal coordination. Provide 16 Timing Plans (one for each Dial/Split combination) with 3 offsets in each. Ensure each Timing Plan provides a separate Cycle Timing, Phase Split Timing, and Phase Modes.

(1) Operation Modes. Ensure there are six operational modes which may be selected for continual operation or to operate only with a specific pattern (Dial/Split/Offset). Operational modes must be as follows:

(a) Permissive mode provides non-actuated coord phase vehicle and pedestrian modes with permissive windows opened phase-by-phase to the non-coord phases.

(b) Yield Mode provides non-actuated coord phase vehicle and pedestrian modes with a single permissive window for all non-coord phases.

(c) Permissive Yield Mode provides for actuated coord phase vehicle and pedestrian modes with permissive windows opened phase-by-phase to the non-coord phases. Additionally, the coord phase vehicle can extend its green time at the beginning of the first permissive window.

(d) Permissive Omit Mode provides operation similar to Permissive Yield except the coord phase, once terminated, is prevented from occurring prior to the end of the last permissive.

(e) Sequential Omit Mode provides operation similar to Permissive Yield except the permissive is a phase-by-phase sliding window (only one phase in a ring will be allowed service at any time).

(f) Full Actuated Mode provides operation similar to Permissive Yield except any phase can be serviced and re-serviced in the standard sequence following the first permissive and through the last permissive.

(2) Offset Correction Modes. Ensure there are a number of offset correction modes used to determine the method in which the coordinator will bring the running

cycle in sync with the background cycle. These correction modes must include as a minimum:

(a) Dwell, correction will take place within one cycle.

(b) Max Dwell, maximum amount of correction per cycle user programmable.

(c) Shortway, cycle will be either shortened or lengthened by a maximum of 18.25 percent when correcting and will automatically take into consideration phase minimum times. When adding time to change the actual offset, the time is added to the coordinated phases only.

(d) Shortway+, when changing offset by Shortway+, the coordinator establishes a new offset by dwelling in the coordinated phase green. The maximum time the coordinator can dwell will be 18.25 percent of the cycle length.

(e) Shortway 2, same as Shortway except the amount of correction will be proportional to the running split times.

(3) Maximum Modes. Ensure there are three Maximum Modes to determine whether Maximum 1, Maximum 2, or Maximum Inhibit will be effective when coordination is in control.

(4) Force Modes. Ensure there are two Force Modes to determine whether the non-coord phase force will be based on a position in the background cycle or on the Timing Plan Phase Split Time.

(5) Offset Position Modes. Ensure there are two Offset Position Modes to determine whether the Offset is calculated based on the Start or End of the first coord phase Green.

(6) Local Traffic Responsive Override. Ensure there is a Local Traffic Responsive Override to enable selection of patterns based on computed volume plus occupancy of selected detectors.

(7) Virtual Split Routine. Ensure there is a Virtual Split Routine on all operational modes that provides for actuated coord phase vehicle and pedestrian modes. This control provides for a period of time or each cycle that is distributed to the Coord Phase(s) or non-coord phases, based on Coord Phase vehicle traffic activity.

When coord adaptive split is selected, the running pattern must automatically seek the most advantageous split possible for all non-coordinated phases. If a phase is forced, it is a candidate for an increase in its split. If a phase is gapped out, it is a candidate for a decrease in its split. Time will never be subtracted from a phase split except to give it to another phase. Time will only be added to a phase split if such addition does not cause the cycle length to change.

(8) Phase Times. Ensure the coordinator provides an adjustable time for each phase for each of the 16 programs. The phase time must be adjustable from 1 to 99 seconds. For the coord phase(s) this must become the minimum phase time and for the actuated phases it must become the maximum phase times. Green time for a

phase is the phase time minus the phase vehicle clearance (yellow and red) times. The phase time begins when the respective phase is ON except for the coord phase(s) whose phase times may not begin until the local time zero.

(9) Phase Modes.

(a) Coord Phase(s). Ensure the coordinator provides for selecting in each of the 16 programs which phase(s) is/are to be the coord phase(s). Ensure the coord phase(s) operates as non-actuated when coordinated. When no phases have been selected as the coord phases(s), the controller must run Free. When operating in multiple ring controller configurations, a phase in each ring must be selected as the coord phase unless compatibility does not exist within that ring to the coord phase in Ring 1.

(b) Dual Coord Phase(s). Ensure the coordinator provides for selecting in each of the 16 timing programs secondary coord phase(s) in each ring. Ensure the secondary coord phases operates as non-actuated when coordinated.

Ensure the secondary coord phases maintains a fixed position in the pattern cycle in relationship to the coord phase. It may begin early but must not terminate later than the allocated times would imply.

(c) Actuated Phase(s). Ensure the coordinator provides for operation modifiers to be selected for each actuated phases in each of the 16 timing programs. The five modifiers must be:

(i) Minimum Vehicle Recall;

(ii) Maximum Vehicle Recall;

(iii) Pedestrian Recall;

(iv) Maximum Vehicle Recall and Pedestrian Recall; and

(v) Phase Omit.

(d) Alternate Sequences. Ensure the coordinator provides a means to select one of the alternate sequences or the standard sequence as a function of the pattern (Dial/Split/Offset) in effect.

When the coordinator is running a pattern, the external interface inputs must not override the pattern sequence.

(e) Permissive Periods. Ensure the coordinator provides two types of permissive periods. Ensure the permissive period controls the time period during which the coordinator releases the coord phase(s), allowing the CU to begin servicing calls on the non-coord phases.

(i) The first type of permissive operation consists of a standard vehicle permissive. The length of the period must be determined by the phase time

and the minimum time (minimum time = Minimum Green or Maximum Initial + Vehicle Yellow and Red Clear).

Minimum time must be based on the longer of Minimum Green or Maximum Initial when the Seconds/Actuation setting is greater than zero, otherwise minimum time must be based on Minimum Green. The minimum time must be internally set to 5 seconds in cases where the timings are programmed for less.

(ii) The second type of permissive operation consists of a separate pedestrian permissive concurrent with the vehicle permissive. The length of this period must be determined by the phase time and Walk + Ped Clear + Phase Yellow + Red Clear.

In no case will the pedestrian permissive period be longer than the vehicle permissive period. When a phase is selected as next during the pedestrian permissive period, the pedestrian movement may start with the beginning of the associated vehicle movement (phase green) regardless of when the pedestrian call is received.

When the CU yields during any permissive period, the coordinator must allow the CU to service all the subsequent phase(s) in normal order before returning to the coord phase(s) and it must not yield on subsequent permissive periods in the same cycle.

(iii) Sync Monitor. Ensure the coordinator monitors the Offset command request for validity of the imposed sync reference.

Ensure the coordinator discontinues offset correction when the length of time between sync pulses exceed the cycle in effect by 5 seconds and until the next sync pulse is received.

Ensure the coordinator causes the CU to revert to Free mode when:

1) No sync pulse is received for three consecutive cycles;

2) No offset line is active for 15 seconds; and/or

3) More than one offset line is active for 15 seconds.

The Sync Monitor "Free" mode may be replaced by a TBC event. See the "On-Line" definition in the Time Base section.

(iv) Manual Control. Ensure the coordinator is capable of being set to manually operate in any pattern (Dial/Split/Offset) by an entry through the front panel. A manual selection of pattern overrides the pattern interface commands.

Ensure a manual sync of the pattern is controlled by an entry through the front panel.

(v) Free Mode. Ensure the coordinator is capable of Free mode of operation defined under Sync Monitor and by an entry through the front panel. During this mode all coordinator control of the CU operation must be removed.

Ensure the coordinator recognizes input requests that conflict with the internal coordination operation and automatically revert to Free mode when the inputs are active. The inputs that conflict with internal coordination are:

1) Manual Control Enable;

2) Stop Time (Either Ring);

3) Remote Flash; and

4) Preemption (Any).

(vi) Master Line Drivers. Ensure eight outputs for master type interconnect interface drivers are available. The master line driver outputs echo the active program. Ensure all outputs are constantly "on" when active except offset which is "off" for 3 seconds once each cycle beginning at the zero point of the cycle.

K. Preemption. Ensure the CU has a special program for Internal Preemption. The preemption program must accept commands from six high priority preempt inputs and six low priority inputs. Ensure that four alternate banks of control/timing data for preempt routines are available.

Ensure the high priority preemption is capable of cycling while in dwell. Ensure it is capable of being linked to another preempt. Ensure it provides for two modes of priority inputs, one for preempt (railroad, emergency vehicle) and one for low priority (bus or transit vehicles).

Ensure high priority preemption sequences are programmable, as a minimum, for minimum green/walk, delay and duration, lock/non-lock memory, dwell, selective ped clearance, selective yellow, selective red, track green, track ped clear, track yellow, tract red, return ped clear, return yellow, return red, exit phases, flash override, lockout, exit calls and max recalls.

Using low priority routines it will be possible to provide an advantage to buses and transit vehicles without losing coordination with adjacent intersections. Ensure a method exists to define phases that can be lengthened or shortened when a low priority demand exists.

Ensure low priority routines include 3 modes:

(1) Minimal Priority. No change to the phase timing or phase sequence except the extension of the phase utilized for the approached vehicle may be extended.

(2) Partial Priority. Extension for the phase utilized for the approaching vehicle may be extended and non-desired phase times may be shortened. No change to the phase sequence will be allowed.

(3) Full Priority. Extension for the phase utilized for the approaching vehicle may be extended and non-desired phase times may be shortened. Non desired phases may be skipped.

The low priority routines will also provide a method to control a queue jump signals by way of overlap outputs.

L. Time Base Coordination. Ensure the CU has a special program for internal TBC. Ensure a minimum of 250 different TBC events are capable of being programmed over a 99 year time frame on a Time-Of-Day, Day-Of-Week, and Month Day-Of-Year basis.

Ensure TBC events are entered through the CU front panel or transferred from another like CU. Ensure TBC settings and activity is monitored on the CU display.

Ensure the TBC program outputs dial, split and offset commands to the coordination program. Ensure it is possible to perform functions not necessarily traffic related within the TBC program by programming and using the three auxiliary outputs.

(1) Clock Calendar. Ensure the TBC is provided with a line frequency driven clock and backed up by a super capacitor crystal controlled clock. Ensure during normal operation, the line frequency driven clock controls all timings and re-sync the crystal controlled clock to the line frequency clock once per minute. Ensure when power is removed and reapplied, the crystal controlled clock provides the current time to the line frequency clock.

Ensure the TBC provides a 99 year calendar for automatically determining the current day of week, day of month, month of year and year based on the data set as a starting point. Ensure the calendar provides automatic compensation for leap years.

(2) Time of Day Clock. Ensure a TOD Clock that displays hours, minutes, seconds, month, year and automatic daylight savings time adjustment is provided. Ensure the TOD is implemented in the CPU via electronic circuitry, operating system software, Global Positioning System (GPS), or a combination. Ensure the GPS interface requires simple data entries in the CU to implement and does not require cycling power off/on to enable or disable the GPS function.

(3) Backup Power. Ensure a super-capacitor provides backup power during loss of service voltage. Ensure the super-capacitor has a minimum of 15-farad nominal size. No batteries of any type are allowed.

(4) Daylight Savings Time. Ensure the TBC provides for Daylight Savings Time to be programmed to occur automatically as defined by law in Michigan, to occur automatically at any user selected date, or not to occur.

When programmed to occur automatically at a user selected date, time must advance 1 hour on the date programmed at 02:00:00 a.m. and decrement 1 hour on the date programmed at 02:00:00 a.m.

Ensure Daylight Savings Time can only be implemented once per year.

(5) Program Day. Ensure a program day is the list of traffic and/or auxiliary events to occur in a 24-hour period. Ensure the TBC program provides for 99 program days to be defined.

Ensure it is possible to equate program days which may require the same event listing to effectively multiply the event capacity.

Ensure it is possible to copy an entire program day event listing to another program day to establish a data base for editing to create a similar but different program day event listing.

(6) Special Days. Ensure the exceptions to the normal day-of-week event listings utilize Time-Of-Year Special program days. Ensure Time-Of-Year Special program days 01 through 49 are utilized for special day programs which occur on the same date (month and month day) every year. Ensure Program days 50 through 99 are utilized for special days which occur on one date (year, month, and month day).

(7) Alternate Week. Ensure the TBC events are implemented from a weekly schedule of program days on a day-of-week (except for special days) basis.

Ensure the normal day-of-week (Sunday through Saturday) event listing utilizes program days 01 through 07 with Sunday being program day 01.

Ensure the Time-Of-Year event structure provides a means of substituting 10 alternate weekly schedules for the normal weekly schedule.

(8) Event Capacity. Ensure a minimum of 250 traffic and/or auxiliary events are capable of being programmed. Ensure a minimum of 180 special days are capable of being programmed.

(a) A traffic event consists of a coordination pattern (Dial #, Split #, and Offset #) flash or free mode, Phase Function Mapping and the time of occurrence (hour, minute, and program day).

(b) An auxiliary event consists of the condition of three Auxiliary outputs, Dimming control, detector diagnostics, special function outputs, and the time of occurrence (hour, minute, and program day).

(c) A time-of-year event consists of a special day or alternate week plus date of occurrence (year, month, and month day).

(9) Traffic Programs. Ensure the TBC program provides the following as traffic events in addition to dial, split and offset commands:

(a) Flashing (Voltage Monitor inactive);

(b) Free; and

(c) Phase Function Mapping by phase for 16 phases.

(i) Phase function mapping includes: Max 2, phase omit, pedestrian omit, minimum vehicle recall, max vehicle recall, pedestrian recall, detector switching omit, detector switching now, detector switching also (switch and assigned detector input simultaneously) and overlap omits.

(ii) Phase Function Mapping features are Free Mode modifiers and not part of an event which selects a pattern (Dial/Split/Offset) or Flash.

(10) Auxiliary Events. Ensure there are three auxiliary outputs available. Ensure each output is non-cyclic, each totally independent of any other output. Ensure the outputs are not affected by any other input including the On-Line input. The auxiliary outputs may begin and/or end concurrently with another program.

(11) Detector Diagnostics. Ensure there are three detector functions available. One must set the value of the detector diagnostic to be selected (four parameters can be set for each detector) and one to initiate or stop the detector log report. The third function is reserved for future use.

(12) Dimming. Ensure there is a dimming function that allows signals so programmed to dim their outputs.

(13) Special Function Mapping. Ensure there are eight special function mapping outputs available. Ensure there are eight special functions, three alternate passage and maximum times, three adaptive maximum settings, an Adaptive Protected/Permissive feature, an In Cycle Flashing Red feature, four sign control outputs, three diamond intersection control outputs, four queuing controls, and coord adaptive split. Ensure it is possible to map more than one function to the same logical control.

(14) Input and Program Priorities. Ensure the coordination programs are capable of being selected based on manual (keyboard) inputs, TBC events and interconnect inputs. Program select priority must be:

(a) Manual Inputs;

(b) System Interface;

(c) TBC Events; and

(d) Interconnect Inputs.

When the TBC On-Line input is active, the TBC events have no priority and program selection must be based on manual inputs or interconnect inputs.

When the On-Line input is active, the coordination routine reverts to TBC control based on sync monitor failure.

M. Flash.

(1) Start-Up Flash. Ensure the CU has provisions whereby an adjustable timed period/state (Start-Up Flash) must occur prior to the Initialization routine.

The time range for Start-Up Flash must be 0 to 99 seconds in increments of 1 second.

When power is restored following a defined power interruption or Watchdog restart, the Start-Up Flash state must become operational. No input, other than alternating current (AC) Power, must prevent this state from the completion and/or exit to the Initialization routine.

(2) Remote Flash. Ensure activation of this input causes vehicle and pedestrian calls to be placed on all phases. Ensure the CU assures the completion of the Minimum Green or Walk plus Red Clearance time on the current phase(s) and proceeds immediately, thereafter, to the vehicle clearance intervals followed by the phase(s) programmed as the Entry Phase(s).

After the Entry Phase(s) Minimum Green or Walk plus Red Clearance, the CU must proceed to the vehicle clearance intervals.

Upon completion of the vehicle RED CLEARANCE interval, ensure the CU initiates flashing operation (Voltage Monitor output inactive). Ensure the CU maintains this condition, Voltage Monitor inactive and Red Dwell as long as the Test A (Remote Flash) input is active. When the input becomes inactive, ensure the CU moves immediately to the beginning of the phase(s) programmed as the Exit Phase(s), with a Green/Walk display, calls on all phase vehicle and pedestrian, and ceases flashing operation (Voltage Monitor output active).

N. Pretimed Control. These specifications cover the minimum acceptable operating requirements for a pretimed fixed cycle traffic signal CU of solid-state microprocessor type, per *NEMA TS-2, P2*. The CU must be designed for operation on 120 volt (V), 60Hz, single phase AC electrical systems.

(1) Ensure the pretimed CU is an interval oriented device. Ensure the conditions of the output circuits (load switch drivers) are programmable as to condition in each of the Signal Plan intervals. Ensure the CU is capable of operating as a master controller, isolated controller, or secondary controller without changes or additions.

(2) Ensure the CU accepts Timing Plan (Dial/Split) and Offset commands from traditional interconnect systems, the internal systems interface, and/or from a companion Time Base program.

O. Functional Operation.

(1) General. Ensure the CU provides the following operational features:

(a) A minimum of four Dials (cycles);

(b) Four Splits per Dial (cycle);

(c) Three Offsets per Dial/Split combination;

(d) A minimum of 32 intervals per Dial/Split;

(e) A minimum of 24 signal circuits but capable of 36 circuits;

(f) Four Signal Plans, each with alternate path programming and inputs from four vehicle and four ped detectors;

(g) Up to six complete and separate Preemption Programs and six Low Priority routines;

(h) Sync out for use as system master; and

(i) Operation on standard 120 volt, 60 Hz, AC pretimed interconnect inputs without external interface.

(2) Dial (Cycle).

(a) The minimum of the four cycles must provide a total of 30-999 seconds minimum in 1 second increments. The cycle time of each Timing Plan is the sum of the interval times of the longest path in the signal plan.

(b) Ensure the Dial (Cycle) is selected by application of 120V, 60Hz, AC to the input connector and also by manual selection from the keyboard.

(c) Ensure a visual indication of the Dial currently in effect and a dynamic display of the cycle seconds is provided.

(d) Ensure transfer from one Dial to another occurs at the end of the interval in effect at the time of request for transfer, unless that interval is programmed to prohibit transfer.

(3) Offset.

(a) Ensure three Offsets are provided for each Dial/Split combination.

(b) Ensure each Offset for each Dial/Split is individually programmable from 0-999 seconds in 1 second increments. Ensure the programmed Offset defines the number of seconds by which the beginning of interval #1, local time zero, must follow the system sync pulse.

(c) Ensure offset is selected by TBC or via “D” Connector input and be manually synchronized from the keyboard.

(d) Ensure a visual indication of the offset currently in effect is provided.

(e) Ensure offset adjustment is programmable to use shortway or dwell transfer procedures. Ensure if shortway method is programmed, the CU seeks a new offset in the shortest direction by adding or subtracting with the rate of offset change never exceeding 18.75 percent points per cycle. Ensure Shortway Add Only - only adds up to 18.87 percent. Ensure if dwell (maximum or variable) is called for, the CU dwells in the programmed interval for a maximum (0-999 seconds in 1 second increments) or until a sync pulse is received while the CU is dwelling. Following the timing of a full offset dwell interval, the absence of a

synchronization pulse prior to the beginning of the next dwell interval must cause the CU to ignore the dwell time and run free (non-interconnected) until the receipt of a valid synchronization pulse.

(4) Split.

(a) Ensure four Splits are provided for each Dial (cycle). Ensure Splits are capable of being programmed independently of any signal plan and also are capable of being "tied" to the corresponding signal plan.

(b) Ensure each Split for each Timing Plan consists of a programmed number of intervals, a minimum of 32 and is individually programmed. Ensure the same number of intervals are not necessary for all splits.

(c) Ensure Split is selected by application of 120V, 60Hz, AC to the input connector and also is able to be manually selected from the keyboard.

(d) Ensure a visual indication of the split currently in effect is provided.

(e) Ensure transfer from one split to another occurs, upon command, at the end of the interval in effect at the time of request for transfer, unless that interval is programmed to prohibit transfer.

(5) Interval.

(a) Ensure a minimum of 32 intervals are provided for each combination of Dial and Split.

(b) Ensure the timing for each interval is programmable between 0-999.9 in 0.1 second increments for each of the four Splits in each of the four Dials.

(c) Ensure it is possible to copy the timing values for any Dial and Split into any other Dial and Split in one operation.

(d) Ensure when less than 32 intervals are required, it is possible to specify and program only the number used. Ensure programming zero times for unused intervals is not required.

(e) Ensure the following interval related intersection configuration is programmed in non-volatile Electrically Erasable Programmable Read-Only Memory (EEPROM) memory for each interval of each signal plan:

(i) Ensure each interval is capable of being named as an actuation interval through input 1 and/or through input 2. Ensure if a valid call is not placed on this interval, the allotted time is automatically added to a designated default interval. Ensure each interval also has the capability of being a RESET interval of input 1 and/or input 2.

(ii) Ensure each interval is programmed as either fixed or variable for purposes of shortway offset changes. Ensure each interval is programmed as either self-timing or non self-timing when Manual Control Enable or

System Control is asserted. Ensure Operation of Interval Advance input immediately terminates non self-timing intervals, but has no effect on self-timing intervals.

(iii) Ensure minimum time for the intervals is 0-99.9 seconds in 0.1 second increments. Ensure minimum interval time is not violated by programmed time. Ensure the CU will time no less than the minimum and indicate an error in programming.

(iv) Ensure each interval is able to be programmed to control the display shown on up to 12 load switches. Ensure the status of each load switch is one of the following: RED, GREEN, YELLOW, FL-RED, FL-GREEN, FL-YELLOW, RED GREEN, or DARK.

(v) Ensure each interval is capable of specifying the signal plans (if any) to which transfer would be safely allowed.

(vi) Ensure each signal plan provides for a selection of three alternate signal sequences, plus a default sequence, based upon a detector 1, detector 2 or detector 1 plus 2 input. Ensure an alternate set of detectors (detector 3 and detector 4) may be used if required for the proposed sequence. Ensure this provides a means of selecting one of the interval sequences in response to a detector input without the necessity of changing signal plans. Ensure different interval paths, within a signal plan, may be followed during a given cycle, depending upon an external detector(s) input.

(f) Ensure Driver and Remote Flash control is provided to allow:

(i) Driver control as either vehicle or pedestrian so that the intersection display status and preemption operation are correct.

(ii) Remote flash control to allow the CU to flash certain load switches when remote flash is called for. Ensure it is possible to flash either Red or Yellow and alternate if desired.

(6) Displays. Ensure the CU provides a simultaneous dynamic display of the following operational status:

(a) Dial, offset, signal plan, split, preempt, and interval in effect.

(b) Time remaining in the cycle.

(c) Offset correction method in effect.

(d) Ensure it is possible to display data previously programmed through the keyboard. Ensure the parameter called for and its current programmed value is displayed. Ensure the CU continues in uninterrupted cyclic operation during any interrogation of currently programmed values. Ensure after entry of the proper access code, it is possible to change any front panel programmable values.

(e) Concurrent Real Time Displays. Ensure the CU displays a dynamic current real time status of interval, interval time, and signal plan. Ensure concurrent real time displays are provided for, coordination timing, telemetry, preemption, detectors, intersection status and TBC. Ensure as a minimum, the real time displays provide concurrent active status for the following conditions:

(i) Ensure coordination active timers simultaneously display, for interval timing cycle timing, offset active, current cycle length in seconds, offset in seconds, correction mode in effect, local cycle countdown, system cycle count up, offset in last cycle zero, correction of current cycle, time base interconnect, system, backup, manual control or standby in effect or control and interval minimum time set.

(ii) Ensure the telemetry status simultaneously displays the on line-off line status, active or non-active carrier frequency, receiving or transmitting data and the validity of data received and/or transmitted for two ports.

(iii) Ensure the preemption status concurrently displays the real time status of a minimum of six preemptions for preemption in control, preemption call (preemption or low priority call), timing of (ped or min. green, ped or vehicle clearance, track greens and clearance, dwell green), delay before preemption, and duration of preemption.

(iv) Ensure the detector status display simultaneously indicates the current status of up to 12 detectors. Ensure it indicates the status of both special and group detectors and whether they are on line or failed. Ensure the display indicates whether the failure was due to max presence, no activity or erratic count.

(v) Ensure the intersection display simultaneously indicates the active status of 12 load drivers and the red, yellow, green, and walk, and don't walk status of each driver and whether the vehicle and/or pedestrian detectors have a call or recall.

(vi) Ensure the TBC simultaneously displays the current month, day, year, time (hour, minute, second) and whether it is standard or daylight savings time; the day and week program in effect, the dial, split, and offset in effect, the status of three auxiliary and diagnostic outputs and the status of the dimming function.

(7) Signal Circuits.

(a) Ensure the CU provides a minimum of 36 signal circuits. Ensure the number implemented are those required to provide the specified signal sequence.

(b) Ensure the ON/OFF FLASH and COLOR state of each implemented signal circuit during each interval for each signal plan are programmed in EEPROM.

(c) Ensure the flash rate of any signal circuit programmed to FLASH is 60 times per minute with a 50 percent duty cycle.

(8) Signal Plans.

(a) Ensure the CU is capable of implementing four different signal plans.

(b) Ensure all signal plans need not have the same number of intervals.

(c) Ensure signal plans are selected via program entry or manually from the keyboard.

(d) Ensure each of the four vehicle detector input is capable of being programmed to operate in (1) NON-LOCK mode, (2) LOCK mode and (3) RECALL mode.

Ensure the following special vehicle detector functions are provided for each of the four group detectors:

(i) Delay. Ensure the group vehicle detector actuation (input recognition) is capable of being delayed, by an adjustable (00-999 seconds), when not in the actuated interval associated with the detector. Ensure once the actuation has been present for the delay time it is continued for as long as it is present.

(ii) Extend. Ensure the group vehicle detector actuation (input duration) is capable of being extended from the point of termination by an adjustable time (0-99.9 seconds).

(iii) Ensure the special vehicle detector functions are capable of being used in any combination. Ensure the sequence is that an actuation is extended first and delayed second.

(e) Ensure the CU operates in accordance with the programmed values for the selected dial, offset and split for the signal plan in effect. Ensure Signal Plan EEPROM programming affects the ON/OFF/FLASH and COLOR condition of the load drivers for each interval.

(f) Ensure during any CU cycle, it is possible to operate in any 1, 2, 3, or all 4 signal plans independent of split.

(g) Ensure a visual indication of the signal plan currently in effect is provided.

(9) Preemption.

(a) Ensure the CU provides for preemption capable of containing a minimum of six complete and separate sequences.

(b) Ensure it is possible to program the ON/OFF FLASH and COLOR condition of all implemented signal circuits independently for each preempt interval.

(c) Ensure it is possible to program preempt operation to proceed sequentially through the preempt intervals and hold at the end of a specified interval.

(d) Ensure it is possible to specify the interval(s) in the preempt plan during which normal cyclic operation resumes.

(e) Ensure it is possible to program a delay between the time the preempt input is asserted and implementation of the preempt plan. Ensure the range of this delay is 0-999 seconds in 1 second increments.

(f) Ensure it is possible to program the preempt input to operate as a LOCK or NON-LOCK input. Ensure when programmed NON-LOCK, termination of the preempt input during the delay before preemption does not initiate preempt operation.

(g) Ensure a visual display is provided of the condition of the preempt inputs and the preempt plan interval in effect.

(10) Master-Secondary.

(a) Ensure the CU provides a sync output for 3 seconds of the cycle length.

(b) Ensure any CU is able to operate as a master controller or as a secondary without requiring any changes in the unit itself.

(c) Ensure when used as a master controller, it is not necessary to program the CU's offsets to 0.

P. Diagnostics. Ensure the CU is provided with a resident series of diagnostic capabilities describing its own internal state. Ensure it does not require internal access or changes to the CU to initiate diagnostic programs.

(1) Automatic Diagnostics. Ensure the CU performs diagnostics enabling operator verification of proper operation.

Ensure the "automatic" diagnostics are performed without an operator request. Ensure the diagnostics evaluation is displayed on the CU front panel display.

(a) Processor Monitor. Ensure the CU contains provisions to monitor the operation of the microprocessor. Ensure the monitor receives signals, at least, once every 100 milliseconds from the microprocessor.

(b) Ensure when the signal is not received for 200 milliseconds ±20 percent, the processor monitor initiates flashing operation (Voltage Monitor output inactive). Ensure when flashing is initiated as a result of the processor monitor, it illuminates a front panel indication labeled "Watchdog." Ensure the monitor is deactivated when there is a power failure and becomes active when restored.

(c) Ensure the monitor attempts an automatic restart of the microprocessor to the power up Start Flash timing condition. Ensure the CU operates as though

power had been removed long enough for a full restart and reapplied. Ensure the front panel Watchdog indicator remains illuminated until the CU front panel has been manually addressed.

(2) Operator Initiated Diagnostics. Ensure the CU performs diagnostics enabling operator verification of properly operating inputs, outputs, keyboard and display.

Ensure the "operator initiated" diagnostics are performed only after an operator request through the CU front panel. Ensure the technique used is relatively simple and suspends normal traffic operation during the test and the CU is plugged into Suitcase-Sized *NEMA Standards* Controller Test Set. Ensure the diagnostics evaluation is displayed on the CU front panel display and/or indicators on the suitcase tester as an operator interface.

(a) Inputs. Ensure the CU provides test routines to enable operator verification that input functions are proper. Ensure this test determines whether the input buffers are operating correctly.

(b) Outputs. Ensure the CU provides test routines to enable operator verification that output functions are proper. Ensure this test determines whether the output drivers are operating correctly.

Ensure each output is actuated in a fixed sequence. Ensure the user observes the output sequence and determine correct operation.

(c) Display. Ensure the CU provides test routines to enable operator verification that display functions are proper. Ensure this test determines whether front panel drivers and decoders are operating properly. Ensure all the indicators are activated. Ensure the user observes the front panel display and determine correct operation.

(d) Keyboard. Ensure the CU provides test routines to enable operator verification that keyboard functions are proper. Ensure this test determines whether the keyboard is operating correctly. Ensure the operator tests each of the CU keys. Ensure the numeric display indicates the key pressed. Ensure the user observes the front panel display and determine correct operation.

Q. Traffic Analysis Functions.

(1) Alarm Monitoring/Events Logging. Ensure the CU monitors and logs the status of the following functions for subsequent uploading to an on-street or central office master:

Cycle Fault	Voltage Monitor	Preempt
Coord Fault	Conflict Flash	Local Free
Coord Failure	Local Flash	Special Status
Cycle Failure	Remote Flash	Power On/Off

(2) Local Alarms Report. Ensure a Local Alarms Report is generated with the capacity for up to 120 alarm events, including date and time of occurrence. Ensure once logged, the alarms remain until the report capacity is exceeded at which time

the oldest alarm is deleted and the new one added. Ensure this report is output to the front panel display, to the printer port, and to the 25 pin RS-232 port.

(3) System Detectors.

(a) Detector Data. Ensure the CU has the ability to receive input data from up to eight special (system) detectors in addition to the normal actuated CU phase detectors as `system detectors.

Ensure the CU processes all system detector data, consisting of volume and occupancy, and is capable of transmitting the results of this processing to either the on-street or central office master monitor. Ensure as a minimum the following parameters are determined:

Raw volume count, raw occupancy
Average occupancy percent
Average volume percent
Volume + occupancy percent

(b) Detector Report. Ensure the CU generates a System Detector Report based on an operator determined logging interval and sample period. Ensure the report includes raw volume and occupancy along with averaged volume and occupancy percent for the sample period. Ensure this report has the capacity to store up to 96 sample periods. Ensure a sample period data set remains until the report capacity is exceeded at which time the oldest sample period data set will be replaced by the new data set.

Ensure the CU provides a volume count report. Ensure means are provided to enable the use and vehicle, special or pedestrian detector inputs as count detector inputs for the volume count report. Ensure the detector volume count report has the capacity to store up to 72 count periods.

(c) Detector Diagnostics. Ensure each detector, both phase and special system is tested by a diagnostics routine for conformance to specified parameters. Ensure the detector diagnostics monitors activity on each detector for constant calls, absence of calls, and erratic output. Ensure these parameters are user programmable.

Ensure a detector is classified as 'on-line' when the results of the monitoring and diagnostic procedures determine that data from the detector is within the allowable range.

Ensure detectors which have failed the diagnostics and those subsequently operating within diagnostic parameters are automatically logged in a Detector Failure Report, including date and time of occurrence. Ensure this report has the capacity to store up to 60 diagnostic events and the event must remain until the report capacity is exceeded.

(4) Ensure measures of effectiveness (MOE's) are accumulated and reported to enable the evaluation of coordination pattern parameters based on actual data collected during the periods the pattern is in control. Ensure MOE calculations are

made once each sequence cycle for Volume, Stops, Delay and Utilization for each phase in the CU and then averaged over the duration of the pattern. Ensure a MOE Report is provided and has the capacity to store up to 24 patterns of MOE's. Ensure the pattern MOE's set remains until the report capacity is exceeded at which time the oldest pattern set is deleted and the new MOE pattern added.

(a) Ensure Volume represents the average number of actuations during the sequence cycle, for each phase, over the duration of the pattern.

(b) Ensure the Stops measurement represents the average number of vehicles which stop at an intersection during the cycle, for each phase, over the duration of the pattern.

(c) Ensure Delay represents the average time, in seconds, that vehicles are stopped during the sequence cycle, for each phase, over the duration of the pattern.

(d) Ensure the Utilization measurement represents the average seconds of green time used by each phase during the sequence cycle for the duration of the pattern.

(5) Speed Traps. Ensure the CU provides speed monitoring capability in the form of a Speed Trap function. Ensure the CU provides for up to two independent Speed Traps with operator selectable detector spacing of either 11 or 22 feet, dependent upon the application. Ensure provision is made in the CU to monitor the speed in miles per hour (MPH).

Ensure a nominal speed range is settable for each pattern, with the percent of vehicles higher, within and lower than this nominal speed ranged logged for reporting.

Ensure a Speed Report is provided and has the capacity to store up to 24 patterns of Speed data. Ensure the pattern Speed data remains until the report capacity is exceeded at which time the oldest pattern speed data is deleted and the new data added.

(6) Reports. In addition to the above-described reports, ensure the CU provides a Communications Report which will allow the user to view a list of communications failures along with date and time of occurrence. Ensure this report has a minimum capacity of storing up to 60 events (faults). Ensure the fault event, including date and time of occurrence, remains until the report capacity is exceeded at which time the oldest fault is deleted and the new fault event added.

In regard to communications, ensure indication is provided on the front panel of the CU to denote when a carrier signal is being received, valid data is being received and when the unit is transmitting.

(7) Signal Phasing and Timing (SPaT). Provide SPaT data per Federal Highway Administration report #FHWA-JPO-13-002 for use in connected vehicle applications. This data stream will be accessible via the IP addressable Ethernet port.

(8) High-resolution performance data as recommended by NCHRP 3-79a must be provided. The CU will be capable of logging time-stamped controller event data at 100 millisecond (ms) resolution. The events collected are logged in the MDOT specified data file format and will include but are not limited to, start and termination of all phase green, amber, and red, pattern changes, and all detector actuations and terminations. Ensure data log file is accessible for standard File Transfer Protocol (FTP) retrieval directly from the CU via the IP addressable RJ-45 Ethernet port.

R. Quality. Ensure the CU successfully meets the *NEMA Standards Publication* requirements, as applicable, and has been tested and certified by an independent test laboratory. An independent test laboratory is defined as one that has no relationship to the controller manufacturer, except as a supplier of services. Supply the Engineer with documents certifying conformance to the requirements.

S. Compliance. The supplier is required to complete, sign, and attach a Specification Compliance Sheet with respect to the equipment bid. Ensure appropriate supporting documentation, including one complete set of instructions for installation and maintenance of the CU, manufacturer's literature, and wiring diagrams are provided. Failure to provide this documentation will result in evaluation of equipment based on information already on file.

2. Cabinet. This special provision defines the minimum acceptable requirements for a series of cabinets that differ in size, to house the CU and related devices. Provide the base mounted size 6 cabinet unless the plans indicate otherwise.

A. Outline Dimensions. Ensure outline dimensions are as shown in Table 1. These dimensions are outside dimensions exclusive of hinges, handles, overhang(s), vent housing, and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. Ensure the combined overhangs of the four sides of the cabinet does not exceed 4 inches.

Table 1: Minimum Outline Dimensions

Size	Height (inches)	Width (inches)	Depth (inches)
M30	51	30	16
M36	51	36	16
6	56	44	25.5
M30-ITS	61	30	16
6-ITS	66	44	25.5

B. Cabinet Types and Mountings.

(1) Base Mounted (Size 6 and 6-ITS). Ensure the size 6 and 6-ITS cabinet can be constructed so that it can be mounted on a 30 inch by 48 inch foundation. Anchor bolt mounting provisions for four bolts on 40¾ inch centers (side-to-side) on 18½ inch centers (front-to-back). Include one Base Adaptor, 15 inches in height, with the same dimensions and bolt pattern as the cabinet. Provide eight nuts and eight washers with each size 6 and 6-ITS cabinet.

(2) Pole Mounted/Base Mounted (M30 and M30-ITS). Ensure cabinets intended for side of pole mounting are provided with any necessary adapter, exclusive steel banding, to permit mounting to a 4½ inch or larger diameter pole. Ensure the adapter

accommodates lag bolts up to 3/8 inch and steel banding up to 1 inch wide. Ensure mounting points are provided at or near the top and bottom of the cabinet. Ensure the adapter has provisions for two holes spaced horizontally, which will have a center-to-center distance of 3½ inches. Furnish cabinets without conduit holes. In addition, ensure the cabinet is provided with a removable bottom to enable it to be pole or base mounted.

(3) Base Mounted (M36). Ensure the M36 cabinet is constructed so that it can be mounted on a 24 inch by 42 inch foundation. Ensure anchor bolt mounting provisions are dimensioned for two bolts on 18 inch centers (side to side).

(4) Anchor Bolts. Provide anchor bolts for base mounted cabinets which are 3/4 inch in diameter by 42 inches long which includes a 90 degree bend with a 3 inch leg. Ensure the long leg is threaded for at least 3 inches with a 3/4 inch Unified Coarse Thread (UNC) -10 thread. Ensure anchor bolts are steel with a hot-dipped galvanized.

C. Materials. Construct the traffic control cabinet of aluminum alloy. Ensure the aluminum material is a minimum of 1/8 inch alloy sheet, *ASTM B 209*, 5052-H32 or equivalent.

D. Finish and Surface Preparation. Paint and prepare cabinets as specified herein.

(1) The surface of the cabinet must be suitably prepared prior to painting, to avoid paint peeling.

(2) Interior surface must be painted white.

(3) Ensure the exterior of the controller cabinet and all mounting attachments are finished with a durable and weather-resistant protective coating having a total dry film thickness of not less than 1.5 mils. Ensure the final coat is aluminum in color, gives complete coverage, and must be at least 0.75 mil in thickness.

(4) Repaint any scratched or damaged surface area.

E. Top Surface Construction. Ensure the cabinet is manufactured to prevent the accumulation of water on its top surface.

F. Doors.

(1) Main Cabinet Door. Ensure the cabinet has a main door which permits access to all equipment within the cabinet. Ensure doors are hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. Ensure the door has a handle of one piece construction and swings away from the locking mechanism.

(2) Hinges. Ensure all cabinet doors incorporate a piano type hinge utilizing stainless steel hinge pins.

(3) Door Stop. Ensure the cabinet door is provided with a door stop which holds the door open at 90 degrees and at 180 degrees (±20 degrees at each stop).

(4) Latches and Locking Mechanism.

(a) Ensure all cabinets incorporate a main door lock, Corbin No. 15481RS, Pelco (Type II) SM-1025 or equivalent, constructed of nonferrous or stainless materials, which operates with a Traffic Industry conventional #2 key, Corbin No. 1R6380 or Pelco (Type II) SM-0198-2 or equivalent. Ensure a minimum of two keys are included for the main door of each cabinet.

(b) Ensure the cabinet door(s) is provided with a three-point latch. Ensure the top and bottom has rollers to secure the door in a closed position.

(c) When in the locked position, ensure the lock prevents the movement of the three-point latching mechanism.

(d) Ensure the cabinets provide with a means of externally padlocking the latching mechanism. Ensure a minimum of 3/8 inch diameter lock shackle is accommodated.

(5) Door Opening. Ensure the main door opening of all cabinets is at least 80 percent of the area of the cabinet side which the door closes, exclusive of the area of plenums.

(6) Switch Compartment.

(a) Mount a hinged switch compartment door to the outside of the main cabinet door. Ensure the door permits access to a switch panel, but does not allow access to exposed electrical terminals or other equipment within the cabinet.

(b) Ensure the switch compartment with the door closed has minimum internal dimensions of 3½ inches high, 7½ inches wide, and 2 inches deep. Additionally, ensure the volume is not less than 70 cubic inches.

(c) Ensure switch compartment doors are equipped with a lock, which can be operated by a police key, Corbin Type Blank 04266 or Pelco Type SM-0200 long keys, or equivalent. Ensure a minimum of two keys are included for the switch compartment of each cabinet.

(7) Plastic Doors. Ensure when called for on the plans, doors for the M30, M36 and Size 6 are vacuum formed from gray ultra violet (UV) inhibited 3/8 inch GPX 3800 Acrylonitrile Butadiene Styrene (ABS) plastic. Ensure exterior surfaces of the door are laminated during the extrusion process with a 0.010 inch minimum thickness Pearl Gray Korad acrylic film for additional protection against ultraviolet degradation.

Ensure the doors have vacuum formed louvers for the cabinet ventilation system. Ensure the interior panel is vacuum formed from 1/4 inch GPX 3800 gray ABS plastic and molded with ribs for rigidity and stability of the door and be provided with channels opposite the louvers for holding the cabinet's air filter. Ensure the door has a 3/8 inch wide door flange around the perimeter of the door that will properly fit the cabinet and gasket to provide a moisture proof seal.

Ensure the exterior of the door has a hair cell pattern with an overlay of the gray Korad. Ensure the interior and inside panel has a smooth finish without the overlay of gray

Korad. Ensure all fasteners are stainless steel. Ensure a three point locking mechanism is provided. Ensure a heavy gauge continuous hinge has a 3/16 inch non-removable pin and is attached to the cabinet with carriage bolts for vandal resistance. Ensure the door stop accommodates the standard cabinet door stop rod in the cabinet. A police door is not required on the plastic doors.

Ensure there is no wiring attached to the plastic door. Ensure switches and other circuits normally attached to the aluminum doors are mounted on a panel located between the shelves when the plans call for a plastic door on the cabinet.

(8) Intelligent Transportation System (ITS) Compartment

(a) M30-ITS and 6-ITS cabinets must include a hinged compartment door mounted to the outside front of the cabinet, above the main door. The door must permit access to shelf mounted ITS devices and electrical power components to power these devices.

(b) In order to allow for the ITS and power components, the ITS compartment door will have a minimum opening size of 8 inches high by 27 inches wide for the M30-ITS cabinet and 8 inches high by 41 inches wide for the 6-ITS cabinet. The depth of the compartment will be the full depth of the cabinet.

(c) The ITS compartment door is to be equipped with a Type 2 lock, cut for the Traffic Industry standard #1 key. A minimum of two keys must be included for the ITS compartment.

(d) Accommodation will be made to allow free air movement from the ITS compartment to the controller compartment.

(e) The ITS compartment will include U-channels mounted to the sides of the compartment for future mounting of shelves and/or DIN rail(s). Four U-channels, two on each side, will run vertically up the entire height of the compartment. Two additional U-channels will run horizontally across the entire back of the compartment.

(f) Flexible conduit must be attached to the dedicated ITS conduit at the bottom of the cabinet. The flexible conduit must run up the back left corner inside the main compartment of the cabinet into the ITS compartment. The flexible conduit must be installed in such a way that wires and cables can be run into the ITS compartment from outside the cabinet without accessing the main compartment of the cabinet.

G. Shelves. Ensure the cabinet is provided with two shelves for supporting the control equipment. Ensure the shelves are at least 10 inches in depth.

Ensure all cabinets have a provision for positioning shelves to within 12 inches of the bottom of the cabinet and to within 6 inches of the top of the cabinet in increments not more than 1/2 inch.

H. Cabinet Risers. Ensure the M30, M30-ITS (when specified as base mount), M36, the Size 6 and 6-ITS are provided with a 15 inch high cabinet riser. Ensure the riser

matches the mounting base of the cabinet and is provided with anchor bolt holes on the top and bottom of the risers. Ensure the risers come in two parts for ease of assembly.

I. Ventilation System. Ensure all cabinets incorporate a ventilation system so as to provide for the circulation of external air through the enclosure to remove excess heat, fumes, or vapors. When forced ventilation is required, ensure each cabinet is equipped with an electric fan with a capacity of at least 100 cubic feet of air per minute.

(1) Fan. Ensure the fan on all aluminum door cabinets is installed so that it operates in the filtered incoming air stream so as not to create a negative pressure within the cabinet relative to its outside environment. Ensure all fans are equipped with a guard which inhibits a user from making contact with the blades of the fan.

(2) Fan Controls. Ensure all cabinets equipped with a fan has a device to control the operation of the fan. Ensure the device switch-on point is manually adjustable at least in the range from 80 degrees F to 120 degrees F.

Ensure the device has a differential between its switch-on point and its switch-off point. Ensure this differential is not be greater than 25 degrees F. Ensure the device is located in the inside of the top of the cabinet not lower than 6 inches from the top of the cabinet.

(3) Filter. Ensure the cabinet is equipped with a device to filter the incoming air. Ensure the cabinets are provided with louvered vents in the main door with a replaceable air filter having a width of 16 inches, a height of 12 inches, and a thickness of 1 inch.

J. Terminal Facility. This special provision defines the minimum acceptable requirements for terminal facilities to interconnect the related devices within a traffic control cabinet.

(1) Mechanical Construction. Ensure the terminal facility conforms to the following mechanical requirements.

(a) Terminal Identification. Ensure all terminals are permanently identified in accordance with the cabinet wiring diagram. Ensure where through-panel terminal blocks are used, both sides of the panel have the terminals properly identified with the terminal position number.

Ensure identification is permanently attached and close as possible to the terminal strip and is not affixed to any part which is easily removable from the terminal block panel.

Ensure each input or output terminated on a terminal block is identified on the front of the panel by position number and function terminology (e.g., Ph 1 Red, Ph 2 Hold, etc.). Ensure the same identification is used consistently on the cabinet wiring diagram.

(b) Component Identification. Ensure all components which make up the basic terminal facility are permanently identified in accordance with the cabinet wiring

diagram. The following components are considered part of the basic terminal facility:

(i) Load Switch Sockets;

(ii) Flash Transfer Relay Sockets;

(iii) Flasher Socket;

(iv) Main and Auxiliary Circuit Breakers;

(v) Radio Interference Suppressor and Surge Protector;

(vi) Solid State Signal Power Relay; and

(vii) Power Terminal Bus Bars.

Ensure where through-panel components are used, both sides of the panel have the components properly identified by relative symbols (e.g., FRI, LS1, etc.).

Ensure identification is permanently attached and as close to the component as possible and is not affixed to any part which is easily removable from the panel.

Ensure each component is identified on the front of the panel by symbol and function terminology (e.g., LF1 Filter, BR1 Signal Bus, etc.).

(c) Load Switch and Flasher Support. Design and construct load switch and flasher bases to receive all such devices which may be manufactured to the maximum size requirements permitted under the *NEMA Standards Publication*.

Ensure all support(s) are provided so that, at a minimum, it is supporting the flasher and load switch of the maximum size at some point(s) between 3 inches and 7 inches from the panel.

Ensure at least 90 percent of the area beneath the load switch or flasher is open to allow for the free flow of air across the load switches or flasher. Ensure there is no obstruction within 1 inch above or below the units within the open area.

(d) Load Switch, Flasher, and Flasher Transfer Positions. Ensure wired load switch, flasher, and flash transfer relay sockets are provided in the quantities listed in Table 2.

Table 2: Load Switch, Flasher, and Flash Transfer Socket Relay Quantities

Configuration	Load Switch	Flasher	Flash Transfer
A2	8	1	4
A5	12	1	6
A16	16	1	6

Ensure the flasher socket is wired for a Type 3 solid state flasher conforming to Section 8 of *NEMA Standards Publication*. Ensure flashing of even numbered load

switch output indications are placed on one circuit and flashing for odd numbered load switch output indications are placed on the other circuit. Ensure it is possible to flash either the amber or red indication on any load switch outputs. Ensure it is possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or re-solder connections.

Ensure the load switch sockets are wired for triple-signal load switches conforming to Section 5 of *NEMA Standards Publication TS 2* for Type 2 CUs. Ensure all load switch driver outputs coming out of the CU are on separate terminal points from the respective inputs to the load switches. Ensure these separate termination points are bussed for normal operation. Ensure all load switch outputs are on separate points from the respective inputs to the malfunction management unit (MMU) inputs. Ensure these separate points are bussed for normal operation.

Ensure load switch sockets for the A2 configuration are oriented in a single row of eight. Ensure socket positions one thru four are for phase one thru four vehicles, respectively. Ensure socket positions five thru eight are for phases one thru four pedestrians, respectively.

Ensure load switch sockets for the A5 configuration are oriented in a single row of 12. Ensure socket positions one thru eight are for phase one thru eight vehicles, respectively. Ensure socket positions 9 thru 12 are for phases 2, 4, 6, and 8 pedestrians, respectively.

Ensure load switch sockets for the A16 configuration are oriented in two rows of eight positions each. Ensure the top row includes socket positions one thru eight and is for phase one thru eight vehicle respectively. Ensure the lower row includes socket positions 9, 10, 11, and 12 for overlaps A thru D, respectively, and are located below socket positions 1, 3, 5, and 7 respectively. Ensure socket positions 13, 14, 15, and 16 in the lower row are below and to the right of socket position 8, and is for pedestrian phases 2, 4, 6, and 8 respectively.

(e) Terminal Blocks. Ensure terminal blocks have mechanical characteristics to properly support the wiring connected without warping the terminal block. Ensure all materials including screws and threaded portions used in terminals and terminal blocks are stainless steel.

(i) Field Terminal Blocks. Include field terminal blocks for all inputs and outputs for a fully expanded CU. Ensure these blocks are either single terminal type with through-panel connection on the rear side of the mounting panel or double binder head screw terminals. Ensure either type of terminal block uses the correct ampacity for the application. Minimum acceptable ratings are 30A, 300V, with 10 - 32 binder head screws.

(ii) Control Terminal Blocks. Include control terminal blocks for inputs and outputs of the CU, MMU, flash transfer relays, load switches, etc. Ensure these blocks are either single terminal type with through-panel connections or double binder head screw terminals. Ensure either type of terminal block uses the correct ampacity for the application. Minimum acceptable ratings are 15A, 250V, with 6-32 x 1/4 inch pan or binder screws.

Ensure the control terminal block wiring provides groupings of functions based on probable interconnect (bussing) for normal operation rather than based on the source of the wiring (e.g., CU, MMU, etc.).

(iii) Detector Terminal Blocks. Include detector terminal blocks for loop and push button inputs. Ensure these blocks are either single terminal type with through-panel connections or double binder head screw terminals. Ensure either terminal block is of the correct ampacity for the application. Minimum acceptable ratings are 20A, 250V with 8 - 32 pan or binder screws.

(f) Controller Unit (CU) and MMU Harnesses. Ensure the CU and MMU harnesses is neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel which must be mounted directly below the CU shelf. Ensure the harness connectors do not have any sharp edges and the stress relief attachment screws do not extend greater than 1/4 inch beyond the stress relief.

Ensure terminal positions are provided, completely wired and neatly arranged, providing access to all inputs and outputs listed in the CU specification. Ensure all *NEMA Standards Publication* functions of the CU for the configuration selected are terminated, except those designated by *NEMA* as spares, reserved, no connection, and manufacturer's use need not be installed in the harness.

Ensure terminal positions are provided, completely wired and neatly arranged, providing access to inputs and outputs in the MMU. Ensure all MMU input is terminated. Ensure provisions are made to terminate any unused red monitoring inputs. Ensure type select and port one disable inputs are terminated.

Ensure the MMU harness is configured for a 16 channel MMU operating in the type 12 mode. Ensure the MMU harness is configured as specified in Table 3.

Table 3: MMU Harness Configuration

Configuration	Load Switch	MMU
A2	8	12 Channel
A5	12	12 Channel
A16	16	12 Channel

(g) Power Distribution. Supply the following equipment as part of the power distribution panel:

(i) Main Circuit Breaker;

(ii) Six Auxiliary Circuit Breakers;

(iii) Solid State Signal Power Relay;

(iv) Primary and Secondary Surge Protector;

(v) AC-Common Bus Bar;

(vi) Safety Ground Bus Bar;

(vii) AC+ Power (Filtered) Bus Bar; and

(viii) AC+ Power (Unfiltered) Bus Bar.

(h) The following equipment must be supplied as part of the ITS compartment power panel:

(i) Three Auxiliary Circuit Breakers;

(ii) AC-Common Bus Bar; and

(iii) Safety Ground Bus Bar.

(i) Practices. Design and construct the basic facility to be made of a minimum number of separate assemblies to reduce maintenance and handling time for knockdown and retrofit applications.

(2) Electrical Requirements. Ensure the terminal facility conforms to the following electrical requirements:

(a) Power Distribution. Ensure the terminal facility operates properly when supplied with single-phase AC power [95-135V, 57-63Hz] when non-ITS cabinets and 240V when an ITS type cabinet. Ensure all breakers and grounding devices are wired in accordance with the *NEC* and the *Michigan Electrical Code*.

(i) Circuit Breakers. Ensure provisions are made for mounting and wiring up to nine circuit breakers in the terminal facility. Ensure a quantity of seven circuit breakers are provided with ampacities as specified in Table 4.

Table 4: Circuit Breaker Ampacity (in A)

Configuration	Main	Veh LS	Ped LS	Flasher	Misc	Ch Reds	Illum Sign
A2	30	10	10	10	10	10	20
A5	30	10	10	10	10	10	20
A16	30	10	10	10	10	10	20

The M30-ITS and the 6-ITS cabinets will include an additional 30A circuit breaker mounted on the main cabinet power panel, utilizing a single phase of the AC power to power the ITS compartment devices. Two 15A and one 10A circuit breakers will be provided in the ITS compartment, wired to the load side of the 30A breaker. This 30A breaker will have the surge protection device wired to its load side.

Ensure the main circuit breaker is wired to protect the entire facility and is identified as the “MAIN” breaker. Ensure the Vehicle Load Switch breaker and the Pedestrian Load Switch breaker are fed by the load side of the solid state bus relay and provides power to the vehicle and pedestrian load switches, respectively. Ensure the Flasher breaker has the flasher connected to its load side. Ensure the miscellaneous breaker has the cabinet fan, light, and door

mounted duplex receptacle connected to its load side. Ensure the Channel Reds breaker has the inputs to the MMU for the reds of unused channels and cabinet control relay coils connected to its load side. Ensure the Illuminated Sign breaker is available to power auxiliary devices such as illuminated signs. Ensure the breaker for the ITS compartment (if used) will be fed by a separate phase connected to the power disconnect. Ensure the circuit breakers are capable of manual operation with markings to indicate rating and whether it is in the open or closed position. Ensure Square D series QOB circuit breakers are used and mounted on QON3B triple position breaker blocks.

Ensure a four pole fuse holder with screw terminals for connecting individual illuminated sign loads is provided and wired to the load side of Illum Sign breaker.

(ii) Cabinet Surge Protection. Ensure the power panel has devices to provide both primary and secondary surge protection devices. Ensure the Line In, Neutral In and Ground leads of the primary device are to be kept as short as possible (18 inches maximum), with no sharp bends and must NOT be bundled with other conductors.

Ensure the primary surge protection device (SPD) has two separate hot legs. For the non-ITS cabinets, ensure both legs of the SPD are connected to the load side of the main circuit breaker. For the M30-ITS and the 6-ITS cabinets, the second leg must be connected to the load side of the main circuit breaker for the ITS compartment. Ensure the primary SPD is connected in parallel to the load and have a surge capacity of 160 kiloamperes (kA) per phase or greater. Ensure the let through voltage measured 6 inches outside the unit does not exceed 430V = 3kA 8/20 microseconds(u/s) pulse and 650V = 10kA 8/20 u/s pulse. Ensure modes protected are Line to Ground, Line to Neutral, Line to Line and Neutral to Ground. Ensure the SPD provides Green LED indications that protection is operational and Red LED indications that a fault has occurred. Ensure in addition, an audible alarm sounds indicating a fault has occurred. Ensure there is a set of normally open and normally closed contacts available for remote monitoring of the SPD. Ensure the SPD is no larger than 9.3 inches wide by 3 inches high by 4.93 inches deep. Ensure the SPD is mounted on the lower right hand side of the cabinet and easily accessible for replacement.

Ensure the secondary SPD is connected to the load side of the main circuit breaker and its output will be used to supply AC power the CU, MMU, and cabinet electronics power strip. Ensure the surge current capacity is 50kA or greater, with the unit connected in series to the load. Ensure the secondary SPD is a 5 stage hybrid design with integrated filter with series load current of 12A. Ensure the let through voltage measured 6 inches outside the unit does not exceed 260V = 2kA 8/20 u/s pulse and 300V = 3kA 8/20 u/s pulse. Ensure modes protected are Line to Ground, Line to Neutral, and Neutral to Ground.

Ensure a gas tube device is installed on the load side of the main circuit breaker. Ensure it is possible to replace this device without interrupting power to the rest of the terminal facility. The M30-ITS and the 6-ITS cabinets must have a second gas tube device installed on the load side of the main circuit

breaker feeding the ITS compartment. For the ITS cabinets, ensure that the ITS compartment includes a switched, surge protected, metal enclosed, outlet strip. This outlet strip is to provide a minimum 3,300 joule suppression rating and is wired to the load side of one of the 15A ITS compartment breakers. Ensure the outlet strip is mounted on the rails on the back of the cabinet.

(iii) Solid State Signal Power Relay. Ensure the terminal facility includes a single-pole, single-throw (SPST)-NO signal power relay wired to provide power from the main circuit breaker and Radio Frequency Interference (RFI) filter to the AC signal power bus bar and load switches. Ensure the solid state relay is energized to provide power to the signal bus and have ampacity of 75A. Ensure it provides zero voltage switching from 47 – 63Hz. Ensure the Signal Power Relay is mounted on a panel on the lower right side of the controller cabinet and easily accessible for replacement.

(iv) AC-Common Bus Bar. Terminate the AC-common (Neutral) on a solid metallic multi-terminal bus bar that will accept #4 - #16 American Wire Gage (AWG) copper conductors. Ensure this bus bar is insulated from the cabinet. Ensure separate wires are run from this bus bar to each unit or group of similar units in the terminal facility which requires AC-common connection. Ensure only one conductor is allowed in each termination position. Ensure a minimum of 24 open termination positions are available for field wiring common return connections.

(v) Safety Ground Bus Bar. Terminate the safety (Earth/Chassis) ground on a solid metallic multi-terminal bus bar that will accept #4 - #16 AWG copper conductors. Ensure this bus bar is connected to the cabinet. Ensure only one conductor is allowed in each termination position. Ensure a minimum of 24 open termination positions are available for field wiring ground connections.

Ensure separate wires are run from this bus bar to each unit or group of similar units in the terminal facility which requires safety ground connection.

(vi) In addition to the three breakers and surge protected outlet strip, ensure the upper ITS compartment includes: GFI outlet wired to the load side of one of the 15A breakers, a minimum 6 position ground bus, led lighting mounted above the air plenum above the door powered via a door switch and 10A breaker, and a minimum 12 inch long piece of DIN rail mounted across the channels on the back of the cabinet.

(b) Conductors. Ensure all conductors used in the terminal facility wiring are #22 AWG, or larger, with a minimum of 19 strands. Ensure conductors terminated on the AC-Common Bus Bar and Safety Ground Bus bar are tinned and a minimum size of #16 AWG. Ensure conductors conform to *Military Specification MIL-W-16878,* Type B or D. Ensure the insulation has a minimum thickness of 10 mils and is nylon jacketed polyvinyl chloride or is irradiated cross-link polyvinyl chloride. Ensure conductors #8 AWG are UL Type THHN.

Ensure all conductors used in the terminal facility wiring conform to the following color-code requirements:

(i) Ensure the AC-common conductor of a circuit is a continuous white color.

(ii) Ensure the safety (Earth/Chassis) ground conductor of a circuit is a continuous green color or a continuous white color with one or more green stripes.

(iii) Ensure the AC+ power conductor of a circuit is a continuous black color.

(iv) Ensure the low level DC (+24 or less) conductor of a circuit is a continuous blue color.

(v) Ensure other conductors, not conforming to one of the above, are any continuous color not defined above.

(c) Wiring (Power Distribution within the Facility). Ensure all terminal facility wiring is neat, firm, and routed, where practical, to minimize crosstalk and electrical interference. Do not use printed circuit boards to eliminate or reduce facility wiring.

Ensure all terminal facility conductors are of sufficient size to carry the maximum current of the circuit or circuits they are provided for. Ensure they are sized based on the ampacity ratings per Table 5.

Table 5: Terminal Facility Conductor Size

AWG Wire Size	Ampacity Rating
#22	5A
#16	10A
#14	15A
#12	20A
#10	30A
# 8	50A
# 6	70A

The ampacity ratings are calculated based on the current required to raise the temperature of a single insulated conductor in free air (86 degrees F ambient) to the limit of the insulation and applying a bundle de-rating factor of 0.5 for wires #22 AWG through #10 AWG and a de-rating factor of 0.7 for wires #8 AWG and #6 AWG.

Ensure the conductor feeding power from the main circuit breaker to the auxiliary breakers, solid state signal power relay, primary and secondary SPD terminal blocks, and AC+ signal power bus bar has an ampacity of 40A.

Ensure the conductor feeding power to the flasher socket has, as a minimum, an ampacity of 30A.

Ensure the conductor feeding power from the AC+ signal power bus bar to each load switch socket has an ampacity of 10A and must be capable of being easily programmed to supply the load switch from another point or interrupt AC+ signal power to an individual load switch for special applications.

Ensure the conductors feeding power from the load switch to the field signal terminals has an ampacity of 10A.

Ensure the conductors feeding power from the flasher socket to the flash transfer relay sockets, which feed flashing power to same, has an ampacity of 15A. The remaining wires to and from the flash transfer relay socket, which are in the circuit between the load switch socket and the field signal terminals, are covered in the previous paragraph.

(d) Control Circuits.

(i) Flash Transfer Control. Ensure the control circuit to the flash transfer relay sockets can provide flashing operation when the MMU or optional auxiliary equipment call for flash (e.g., police panel flash switch and maintenance panel). Ensure the flash transfer control also conforms to the following:

Ensure the flash transfer relay socket is wired so the coil of the relay(s) must be de-energized for flashing operation. Ensure the flash transfer relay sockets are located in close proximity to the load switches, flasher, and field signal terminals.

(ii) MMU Control. Ensure the MMU is wired so as to provide flashing operation when the fault relay de-energizes or if the MMU is disconnected. Ensure it also provides "Stop Time" to the CU when the fault relay de-energizes. Ensure the MMU is wired to provide an "External Start" signal to the CU upon the application of AC power to the MMU following a power interruption or upon initial turn-on.

(iii) Detector Rack. All cabinets must include a 20 channel detector rack that meets *NEMA TS2- Section 5 specifications*. Ensure the detector rack accommodates 16 channels of vehicle detection and an additional 4 channels of pedestrian detection push button isolation. Ensure all cabinets include one BIU that meets the requirements of Section 8 of the *NEMA TS2-Specification*. Ensure the BIU is located in the first (furthest to the left) slot in the detector rack. Ensure the 16 channels of vehicle detection are located immediately to the right of the BIU. Ensure the four channels of pedestrian detection are located in the last (furthest to the right) slot positions. Ensure each terminal facility includes one 6 foot Port 1 communications cable to connect from the detector rack BIU to the CU. Ensure each cabinet includes one power supply for the detector rack that meets the *NEMA TS2-* specification for power supplies.

(3) Field Wire Terminal Locations. Ensure the terminal facility provides Field Wire Terminals located to conform to the following requirements:

(a) AC Service Hookup. Terminate incoming AC power service on the right side of the cabinet on the power distribution panel. Terminate the incoming AC power service using compression fittings capable of accepting a #4 AWG or #6 AWG conductor for AC+ and AC- and accepting a #8 AWG conductor for safety (Earth/Chassis) ground. Terminate the AC+ line directly to the main circuit

breaker. Terminate the AC- and safety ground lines directly to their respective bus bars. Ensure this service hookup meets *NEC* code, and the Michigan Electrical Code.

(b) Signal Hookup. Terminate signal wires on terminal blocks on the back of the cabinet at least 3 inches but not over 6 inches from the bottom of the cabinet. Locate the field terminal block for signal circuits a minimum of 4 inches below the load switches and angled up 30 to 45 degrees from vertical for ease of access. Ensure signal terminals are directly accessible from the front of the cabinet. Provide one terminal for each load switch output. Ensure each field terminal includes a SLUM-35 or equivalent pressure connector that will allow multiple field conductors to be attached to a single output terminal. Ensure it is possible to terminate a minimum of 16 #14 AWG or 5 #10 AWG neutral leads on the signal common bus.

(c) Detector Panel. Terminate vehicle loop and pedestrian pushbutton inputs on terminal blocks on the left side of the cabinet at least 3 inches from the bottom of the cabinet. Provide a minimum of three terminals for each vehicle detector and four terminals for each pedestrian detector. Ensure the terminal block meets the specifications of the detector terminal blocks. Ensure the detector panel is wired completely to the detector rack, providing 20 channels total and includes the power supply.

(4) Auxiliary Equipment.

(a) Ensure the terminal facility includes provisions for the following equipment in a panel accessible from a police door on the front of the cabinet.

(i) Signals On-Off Switch. Ensure a signals on-off switch is included, installed, and wired.

Ensure the switch and wiring energizes or de-energizes the solid state signal power relay. Ensure the AC signal power is not routed through this switch. Label the switch "Signal-Off". Ensure when in the “Off” position, all signal field terminal are de-energized and the Red Enable input to the MMU is inactive.

(ii) Flash Normal Switch. Ensure a flash-normal switch is included.

Ensure when in the Flash position, the flash transfer relays and solid state signal power relay is de-energized, and power is removed from the MMU and CU, resulting in flash being displayed to traffic. Ensure neither AC signal power nor flashing power is routed through this switch. Ensure the switch is labeled "flash-normal".

Ensure when the switch is returned to the “Normal” position, the signals return to the initialization phase and begin cycling.

Ensure operation of the signal-off switch overrides this switch. That is, when in the "Off" position, the signal-off switch prevents flashing operation as called for by all flash control circuits.

(iii) Manual Control Cord and Switch. Install a manual control cord and auto-hand switch and wired in the police panel of the cabinet.

Ensure the switch and wiring energizes the "manual control enable" input to the CU and connects the Manual Control Cord to the "interval advance" input to the CU. Label the switch "auto-hand".

(b) Maintenance Panel Options.

(i) Detector Test Switches. Provide a detector test push-button switch for each vehicle and pedestrian detector circuit in a panel on the inside of the front cabinet door. The A2 configuration requires eight test push-buttons for phases one thru four vehicle and pedestrian inputs. The A5 and A16 configurations require 12 test push-buttons for phases 1 thru 8 vehicle inputs and phases 2, 4, 6, and 8 pedestrian inputs.

Ensure the switch and wiring places an actuation for the respective vehicle or pedestrian phase when pushed. Label the switch(s) "call switch" and the phase # as well as whether it is vehicle or pedestrian (e.g., Ph 1 Veh, Ph 1 Ped, etc.).

(ii) Stop Time Switch. Provide a stop time switch in a panel on the inside of the front cabinet door. Ensure the switch and wiring provides three modes of operation which are:

1) Normal. Provides "Stop time" to the CU as required by the MMU.

2) Run. Prevents "Stop time" from being applied to the CU from other devices.

3) Stop. Applies "Stop time" to the CU.

Ensure this switch is labeled "stop-run-normal".

(iii) Flash-Normal Switch. Provide a flash-normal switch in a panel on the inside of the front cabinet door.

Ensure the switch and wiring provides flashing operation as defined for police panel flash-normal switch except that it does not terminate power to the CU. Ensure provisions are provided so that this flash-normal switch operates as a CU power switch by removing a control terminal link. Label this switch "flash-normal".

(iv) Duplex Receptacle. Provide a duplex receptacle of a three-wire ground fault interrupter (GFI) type in a panel on the inside of the front cabinet door.

For the M30-ITS and 6-ITS cabinets provide a duplex receptacle of a three-wire GFI type in the ITS compartment on the right side, towards the front. The receptacle must be wired to one of the 15A circuit breakers in the ITS compartment.

(c) Miscellaneous Options.

(i) Cabinet Forced Air Heater. Provide a forced air heater for all cabinets, rated with at least 100W. for the M30 and M30 ITS cabinets, and 200W. for all other configuration cabinets, completely wired and operational. Provide a temperature and humidity level controller to operate the heater. Ensure the temperature control has an adjustable set point from 32 to 95 degrees F. Ensure the humidity control has an adjustable set point from 50 to 90 percent relative humidity. The heater is to be mounted below the bottom shelf and offset from the cabinet walls with air forced downward. Care must be taken to mount the heater clear of the field wiring.

(ii) Cabinet Lights. Two LED lighting panels with a switch must be installed in the cabinet. Provide a door switch to activate the lights when the door is opened. Install one lighting panel above the top shelf and install the second to the bottom of the lower shelf's storage drawer. Each panel must provide at least 450 lumens of light and consume no more than 15W of power.

Wire the switches and lights to the Misc circuit breaker.

Install one light socket in the upper right wall of the control cabinet and the second light socket on the left wall of the cabinet immediately below the lower shelf.

Install one LED light strip in the ITS compartment of M30-ITS and 6-ITS cabinets. Ensure the door switch activates the light when the door is opened.

(ii) Outlet Strips. Install a multiple outlet strip on the upper right side of the cabinet. Wire the outlet strip to the load side of the secondary SPD.

For the M30-ITS and 6-ITS cabinets install a 15A, industrial grade surge protected multiple outlet strip with no less than six outlets in the ITS compartment. The outlet strip must be wired to one of the 15A circuit breakers in the ITS compartment. The outlet strip must be attached to the bottom U-channel running horizontally across the back of the ITS compartment.

(5) Prints, Functional Data, and Parts List. Ensure the manufacturer supplies each of the following items with each cabinet:

(a) Two complete set of schematic and wiring diagrams of the cabinet and terminal facilities.

(b) Cabinet mounting diagram.

(c) Complete parts list of cabinet and accessories.

Ensure each of these items applies directly to the cabinet with which it is applied. One set is to be put in the installed cabinet, and one set is to be furnished to the maintaining agency.

3. Accessories. This special provision defines the minimum acceptable requirements for plug-in accessories for the traffic controller assembly within a traffic control cabinet.

A. Malfunction Management Unit (MMU). This subsection defines the minimum requirements for a shelf-mountable, 16 channel, MMU. Ensure the MMU meets, all applicable sections of the *NEMA Standard TS-2-2003 (R2008)* for MMU2 configuration while maintaining compatibility with *NEMA TS1-1989* assemblies. Where differences occur, this special provision governs.

Provide the following monitoring functions in addition to those required by the *NEMA standard*:

(1) Dual Indication Monitoring. Ensure the MMU is capable of detecting simultaneous input combinations of active Green (or Walk), Yellow and Red inputs on the same channel. Ensure the channels enabled for Dual Indication monitoring are user determined. Ensure Dual Indication monitor is disabled when the Red Enable input is not active.

(2) Field Check Monitoring. Ensure when the field signal inputs states sensed by the MMU do not correspond with the data provided by the CU in the type #0 message for 10 consecutive messages, the MMU enters the fault mode and indicates the Field Check Fail fault.

(3) Recurrent Pulse Monitoring. Ensure the MMU detects Conflict, Red Fail, and Dual Indication faults that result from intermittent or flickering field signal inputs.

(4) Ensure when the MMU detects a conflict flash indication it provides an output to the “D” connector indicating an MMU/Conflict Flash Status input.

(5) Ensure the MMU monitors an intersection with up to four approaches using the four section FYA movement outlined by the *National Cooperative Highway Research Program (NCHRP) Research Project 3-54* on Protected/Permissive signal displays with Flashing Yellow Arrows. Ensure the MMU provides the same fault coverage for the FYA approaches as it does for conventional movements including Conflict, Red Fail, Dual Indications, and Minimum Clearance monitoring.

Ensure the MMU provides alternate configuration options as follows:

(a) Red Yellow Green (RYG) Only Red Fail Option. This function excludes the Walk input from the Red Fail Fault algorithm when operating the Type 12 mode.

(b) LED Signal Threshold Adjust. This function provides the capability to sense field inputs with an alternate set of voltage thresholds to better determine the state of LED signal indications. Conflict and Dual Indication thresholds for Green/Yellow/Red inputs are set for: No Detect is less than 15 Root-Mean-Square Voltage (Vrms), Detect is greater than 25Vrms. Red Fail thresholds for Green/Yellow/Red are set for: No Detect is less than 50Vrms, Detect is greater than 70Vrms.

(c) Controller Voltage Monitor (CVM) Log Disable Option. Ensure the MMU provides a means to disable the logging of CVM faults events.

(d) Provide a 4 line by 20 character LCD display to report MMU Status, time and date, and menu navigation. Provide a separate Red, Yellow, Green LCD indicator, display for the input status of signal inputs. Provide individual icons to indicate channels involved in a fault.

(e) Provide a mode to display the Root mean square (RMS) voltage of each field signal input and each cabinet control signal voltage, and the frequency of the AC Line, the ambient temperature measured at the MMU.

(f) Ensure when the MMU is in the fault mode, a display screen is provided to identify all field signal inputs with Field Check status, and all field signal inputs with Recurrent Pulse status.

(g) Additional display functions include a configuration display of settings and all MMU configuration parameters; logs of Previous Fault, AC Line, and MMU reset logs; Clock set.

(h) Ensure the program card supplied with the MMU provides non-volatile memory that contains the configuration parameters for the enhanced features of the MMU, such that transferring the program card to a different MMU completely configures that MMU. Ensure the non-volatile memory device used on the program card does not utilize any Input/Output (I/O) pins designated as “Reserved” by *NEMA TS-2*.

(i) Ensure a minimum of five logs are provided that graphically display all field signal states and Red Enable for up to 30 seconds prior to the current fault trigger event. Ensure the resolution of the display is at least 50 milliseconds. Ensure these signal sequence logs are accessible from the front panel RJ-45 Ethernet port with software available from the manufacture.

B. Flasher. Provide a *NEMA* two-circuit, 15A per circuit, flasher for installation in the cabinet. Ensure each flashing circuit contains zero-voltage switching, a 25A power triac, a snubber and a LED across the AC circuitry, directly indicating the AC load that is activated. Ensure the flasher conforms to a Type 3 per Section 8 of the current *NEMA Standards Publication*. Fabricate the flasher such that internal components are completely enclosed by the chassis.

C. Flash Transfer Relay. Provide flash transfer relays in the quantity of two each for the A2 configuration and six each for the A5 and A16 configurations for installation in the cabinet. Ensure the flash transfer relays conform to the following requirements:

(1) Mechanical Requirements. Enclose the relay in a transparent plastic case which protects the relay from dust, moisture, and other contamination. Ensure the case protects the user from contact with live parts and be sufficiently rugged to permit insertion and removal of the relay from its mating socket.

(2) Connector. Mount the relay on an eight-pin spade plus base and the socket and relay/base must be wired as follows:

Pin 1 - Coil Pin 2 - Coil

Pin 3 - #1 Closed	Pin 4 - #2 Closed
Pin 5 - #1 Common	Pin 6 - #2 Common
Pin 7 - #1 Open	Pin 8 - #2 Open

(3) Contacts. Provide the relay with four single-pole, double-throw (form C) contact sets. Pin 8 - #2 Open each contact is rated to switch a 20A tungsten load for a minimum of 30,000 operations. The contact material must minimize welding.

(4) Coil Rating. Ensure the relay coil is rated for continuous duty from 95 to 135VAC. Ensure this rating is valid at 158 degrees F ambient temperature outside the relay case. Ensure the relay coil measures less than 10V, amps at 120VAC. Ensure the relay picks up by 95VAC and drops out by 50VAC, and makes the transfer within 50 milliseconds. Ensure the magnetic circuit in the relay reverses concurrently with the 60Hz AC input voltage.

D. Load Switches. Use solid-state load switching assemblies for opening and closing signal light circuits and be jack-mounted external to the CU. Ensure each load switch provides three independent switching circuits. Ensure each of the three circuits contains a zero-voltage switching optical coupler electrically isolating the DC input circuitry from the AC output circuitry, a 25A power triac and LED indicators on both the DC input circuitry and the AC output circuitry. Provide eight load switch assemblies (24 circuits) for the A2 configuration unit. Provide 12 load switch assemblies (36 circuits) for the A5 configuration unit. Provide 16 load switch assemblies (48 circuits) for the A16 configuration unit

4. Packing and Marking. Ensure each CU is packed separately in such a manner that there will be no injury or defacement to the CU during transportation to the point of destination, unless otherwise specified in the contract. Ensure each carton is legibly marked with the CU description, purchase order number, and vendor's name.

5. Warranty. Provide materials with a manufacturer’s warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Controller and Cabinet, Digital Type	Each
Controller and Cabinet, Digital Type, Master	Each
Controller, Digital Type	Each
Controller, Digital Type, Master	Each
Controller, Rem	Each

1. **Controller and Cabinet, Digital Type** includes:

A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the *MMUTCD* and this special provision.

B. Furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup.

C. Transporting the cabinet from the maintaining agency to the job site for installation.

2. **Controller and Cabinet, Digital Type, Master** includes:

A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), cabinet, and accessories required to provide the traffic signal control operation as a master for a closed loop system as shown on the plans and in accordance with the *MMUTCD* and this special provision.

B. Furnishing and delivering the controller and cabinet to the maintaining agency for controller timing and cabinet setup.

C. Transporting the cabinet from the maintaining agency to the job site for installation.

3. **Controller, Digital Type** includes:

A. All labor, equipment, and materials required to install the traffic signal controller unit (CU), and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the *MMUTCD* and this special provision.

B. Furnishing and delivering the controller to the maintaining agency for controller timing setup.

4. **Controller, Digital Type, Master** includes:

A. All labor, equipment, and materials required to install the traffic signal controller unit (CU) and accessories required to provide the traffic signal control operation as a master for a closed loop system as shown on the plans and in accordance with the *MMUTCD* and this special provision.

B. Transporting the cabinet from the maintaining agency to the job site for installation.

5. **Controller, Rem** includes all labor, equipment, and materials required to remove an existing traffic signal controller unit (CU) from an existing cabinet.

The Engineer may process a partial payment for units delivered to MDOT signals shop or other approved location after initial inspection and acceptance and after the contractor provides either a paid invoice/proof of payment or a receipt for delivery. If payment is based on the delivery invoice, the Contractor must provide a copy of the paid invoice/proof of payment to the supplier within 10 calendar days of the prime Contractor receiving payment for the materials. Partial payments for delivered materials/units meeting all project specifications will be limited to the smaller of the actual invoice amount or 96 percent of the contract bid amount. Final payment will be processed after final acceptance of the individual traffic signal installation.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
WIRELESS INTERCONNECT FOR CLOSED LOOP TRAFFIC SIGNAL SYSTEM

OFS:EMS 1 of 5 APPR:LWB:DBP:07-17-14
APPR FHWA: 07-30-14

a. Description. This work consists of one or more of the following work types, at locations shown on the plans:

1. Furnishing and installing a wireless interconnect, closed loop, master, repeater, or remote.

2. Removing and disposing of an existing wireless interconnect, closed loop system, including the master, repeater, and remote.

3. Removing, storing and reinstalling an existing wireless interconnect, closed loop system master, repeater, and remote.

As applicable, this work includes removal or installation of interface equipment, mounting assembly, brackets, hardware, fittings, connectors, wiring, cable to controller, grounding, risers, conduit, and any other material required to ensure a complete removal or installation, as specified for a location.

b. Materials. Provide materials, as directed by the Engineer, necessary to provide a complete and operating wireless interconnect, closed loop traffic signal system. Provide materials in accordance with sections 918 and 921 of the Standard Specifications for Constructions and this special provision.

Provide wireless interconnect, closed loop, master, repeater, or remote in accordance with this special provision. Provide wireless interconnect, closed loop package compatible with solid state pre-timed or actuated traffic signal control equipment and cabinet environments.

1. Wireless Interconnect, Closed Loop, Package. Provide equipment meeting the following requirements:

A. Operate in the license-free, Spread Spectrum band [902-928 megahertz (MHz)], utilizing Frequency Hopping technology.

B. Be compatible with the communications protocol of an on-street master type traffic signal system equipped with both Recommended Standard (RS)-232 and Frequency Shift Key (FSK) interfaces.

C. Utilize 139 user-selectable channels, with 62 available hopping sequences, (ensure two are non-overlapping).

D. Be completely configurable via included software for hop pattern, operation as

master-repeater or remote, baud rate, drivers to interface to units currently in the field, and compatible with the wireless systems.

E. Have software features to provide:

(1) Spectrum analysis at each radio.

(2) Remote programming and remote maintenance from the master location.

F. Have an RS-232 interface capable of 1200 bit per second (bps) to 115.2 Kilobits per second (Kbps) with an 8 or 9 bit format or 1200 bps Bell 202 FSK (2 or 4-wire); RS-485 interface is optional.

G. Have a maximum 8 millisecond end-to-end latency.

H. Have light emitting diode (LED) indicators for power (PWR), transmit (TX) data, Receive (RX) data, and for the active data port.

I. Have DB9F connector for RS-232 port and Registered Jacks (RJ)-22 for FSK.

J. Have an operating temperature of -30 degrees Fahrenheit (F) to 165 degrees F (-35 degrees Celsius [C] to 74 degrees C).

K. Operate with voltages between 10.8 volts (V) direct current (DC) and 30V fDC, with a maximum current draw of 265 milliamperes (mA).

L. Have a radio sleep mode with a maximum current draw of less than 1 mA.

M. Be programmable for radio frequency (RF) output levels of 1 milliwatt (mW), 10mW, 100mW or 1 watt (W).

N. Provide 16-bit cyclic redundancy check (CRC) error checking with auto re-transmit.

O. Be available as shelf mounted, rack-mounted or *NEMA 4X* weatherproof versions.

P. Not require controller hardware or software modifications,

Q. Have built-in store-and-forward repeater.

2. Shelf mount unit option: Provide FSK type interface equipment meeting the following additional requirements:

A. Not exceed 9 inches long by 2 inches wide by 5 inches high.

B. Have threaded Neill-Concelman (TNC) female antenna connector.

C. Be supplied with 120V alternating current (AC) wall cube power supply.

D. Have received signal strength indicators (RSSI) signal strength LEDs.

3. Shelf mount unit option: Ensure RS-232 type interface equipment meets the following

additional requirements:

A. Not exceed 4.38 inches in depth by 3.56 inches in width by 1.69 inches in height (not including connectors or mounting bracket).

B. Have TNC female antenna connector.

C. Have power cable supplied with radio modem.

D. Have RSSI signal strength LEDs.

4. Ensure antennas, connectors, and cable meet the following requirements, as applicable:

A. Master Location. Provide from 2 to 4, 10 decibel (dB) Yagi Antennas for a back-to-back operation, specified for the frequency range of the radio, connected to a Pasternack PE 2047 or Encom Wireless EP Splitter type power divider, or approved equal.

B. Repeater Location. Provide 2, 10 dB Yagi Antennas for a back-to-back operation, specified for the frequency range of the radio, connected to a Pasternack PE 2047 or Encom Wireless EP Splitter type power divider, or approved equal.

C. Remote Location. Provide 1, 10 dB Yagi Antenna, specified for the frequency range of the radio.

D. Use Times Microwave Land Mobile Radio (LMR) or Andrew CNT 400 dB cable, or approved equal, for connection between both the polyphaser and power divider and power divider and antenna for the master location. Use a LMR or CNT 400 dB type cable between the polyphaser and the antenna for secondary locations.

E. Use Times Microwave TC-400-NMH or RF Industries RFN-1006-31 Type N male connectors, or approved equal, fastened at the ends of the LMR or CNT 400 dB type cable for connection to polyphaser, power divider, and antenna.

F. Use one 2/C #16 PJ type traffic signal cable to connect the phone drop to the traffic signal controller at the master location, as shown on the plans, or as directed by the Engineer.

5. Surge Protection. Provide a broadband DC blocked polyphaser type surge protection device installed between the antenna/power divider and the radio equipment. Provide N Female type connectors for both the protected and surge sides of this device. Ensure the electrical and RF characteristics are as follows: Surge minimum 50 Kiloampere (kA), Turn on 600VDC (±20 percent), Frequency Range 1.25 Megahertz (MHz) to 1Gigahertz (GHz), Insertion Loss less than 0.1 dB over the frequency range.

6. Documentation. Provide manufacturer's instructions for hardware installation, programming, and system commissioning to the Engineer at the time of installation.

7. Software. Ensure software meets the following requirements:

A. Be compatible with "Windows" type graphical user interface (GUI).

B. Supports remote diagnostics and radio link tests with no additional hardware.

C. Provides up to 3 message lengths to test various network configuration and link requirements.

D. Supports system wide remote configuration from master radio location.

E. Provides method for radio system optimization.

8. Warranty. Provide materials with a manufacturer warranty, transferable to the MDOT, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

c. Construction. Complete this work in accordance with sections 819 and 820 of the Standard Specifications for Construction, the typical signal construction detail(s), and this special provision.

1. Installation. When installing new equipment is specified, furnish and install the wireless interconnect closed loop master, repeater, or remote as shown on the plans. When installing salvaged equipment is specified, install wireless interconnection closed loop equipment, salvaged on the project, as shown on the plans.

Install the radio antennas after the rest of the signal equipment (signal heads, poles, case signs, span wire, etc.) has been installed. Obtain the Engineer's approval prior to beginning antenna installation. Correct radio antenna installation that was completed prior to the approval of the Engineer, and which is found to be non-optimal placement of the antennas at no additional cost to the contract. The Engineer will not authorize extra payment or time extensions for work required to reorient or move the radio antenna.

2. Removal. When removal is specified, remove the wireless interconnect, closed loop as shown on the plans. Removal includes the wireless closed loop interconnect package, shelf mounted unit, processor (with radio modem, when appropriate), power supply, surge protection, antennas, mounting brackets, hardware assembly, fittings, cable, connectors, grounding, and other appurtenances required for a complete removal.

3. Salvage and Disposal. Salvage and store, or dispose of, removed material as directed by the Engineer and section 204 of the Standard Specifications for Construction. Store salvaged equipment to be re-installed on the project in a protected and clean environment.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Wireless Intercn, Closed Loop, Master	Each
Wireless Intercn, Closed Loop, Repeater	Each
Wireless Intercn, Closed Loop, Remote	Each
Wireless Intercn, Closed Loop, Rem	Each
Wireless Intercn, Closed Loop, Salv	Each

1. **Wireless Intercn, Closed Loop**, of the type specified, includes all labor, equipment, and materials required to furnish and install a new master, repeater, or remote at the location(s) shown on the plans.

2. **Wireless Intercn, Closed Loop, Rem** includes all labor, equipment, and materials required to remove and dispose of an existing wireless interconnect, closed loop package at the location(s) shown on the plans.

3. **Wireless Intercn, Closed Loop, Salv** includes all labor, equipment, and materials required to remove an existing wireless interconnect, closed loop package, store the removed materials on site, and reinstall materials at the location(s) shown on the plans.

CITY OF DETROIT

SPECIAL PROVISION
FOR
TRAFFIC SIGNAL LOUVERED BACKPLATES

a. General

The backplates shall meet the following specifications and/or be approved by Traffic Engineering Division, Department of Public Works, City of Detroit.

(a) The backplates shall be one piece construction unless otherwise directed by the engineer.
(b) The backplates shall be louvered horizontally or vertically on the left and right flanges and horizontally on the top and bottom flanges in order to reduce wind load.
(c) The backplates shall be vacuum formed from 0.125 inch thick black ABS plastic. One-piece backplates shall be provided for 3, 4 or 5-section in line signal heads. Five-section doghouse signal head combinations shall be provided with no more than 3 vacuum formed pieces.
(d) The backplates shall be provided with a hair cell finish on the front side to reduce glare.
(e) The backplates shall extend approximately 5 inches around the perimeter of the signal after installation.
(f) The backplates shall be provided with a 5/8 inch flange on all sides to provide structural rigidity. There shall be a 3 inch corner radius provided on the backplate.
(g) The backplates shall be provided with a 1 inch thick border of yellow retroreflective tape of diamond grade of 3M DG^3 type or equivalent approved by Engineer. This taping shall be warranted for performance for (1) year from date of shipment.
(h) The backplates shall be designed to precisely fit the manufacturer's signal head and supplied with the necessary hardware to attach the backplate to the signal.
(i) The backplates shall guarantee that all material supplied shall be free from all defects in materials and workmanship for a period of one (1) year from date of shipment.

b. Special Tools

No special tools shall be required. If special tools are required for any other application in the repair, assembly or installation of this equipment, forty (40) complete sets of such tools shall be furnished.

a. Tests, inspection and Sampling

(a) All equipment is to be tested as necessary and inspected for conformance with this specification before shipment.

(b) Failure of any piece of equipment to meet the requirements of this specification shall be cause for rejection. The City shall reserve the right to pull out and reject any piece of equipment for non-conformance with specifications. The bidder shall replace any rejects at his own expense, including all handling and transportation charges.

b. Drawings & Information

(a) If required, two (2) copies of a detailed drawing and material specification list of all equipment shall be supplied.
(b) The information required under paragraph (a) along with sample, if requested, will be held as standards for acceptance.

c. Samples

(a) If required, a sample backplate shall be delivered within seven (7) working days after the request is submitted.
(b) Special consideration shall be given to workmanship, materials and superior features demonstrated by the sample.

d. Measurement and Payment

Backplates are required to be installed with all traffic signals installed on span wire as specified on plans.

Pay Item	Pay Unit
Louvered Backplate	Each

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TWO-WAY ILLUMINATED STREET NAME SIGN, REMOVE

DET:JLL 1 of 1 APPR:DMG:DBP:08-30-13

a. Description. This work consists of furnishing labor and equipment necessary to remove an illuminated street name sign which includes the associated assembly, brackets, hardware, fittings, cable, connectors, wiring, grounding and all other associated materials required to complete the work.

b. Materials. None specified.

c. Construction. Remove the illuminated street name sign at locations shown on the plans or as directed by the Engineer. All work must comply with sections 819 and 820 of the Standard Specifications for Construction and this special provision. Dispose of all removed materials as directed by the Engineer and in accordance with section 204 of the Standard Specifications for Construction.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the pay item:

Pay Item	**Pay Unit**
Street Name Sign, Two Way, Illuminated, Rem	Each

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TWO-WAY ILLUMINATED STREET NAME SIGNS LIGHT EMITTING DIODE

GLD:CRK 1 of 3 APPR:EMS:DBP:08-07-13

a. Description. This work consists of furnishing all labor, equipment, and material to install a light emitting diode (LED) illuminated street name sign, which includes the associated assembly, brackets, hardware, fittings, cable, connectors, wiring, grounding, and all other material required to complete the work.

b. Materials. Material must meet sections 918 and 921 of the Standard Specifications for Construction and this special provision.

1. General Requirements. The sign assembly must consist of a 6 or 8 foot aluminum body with white LEDs. The sign assembly must consist of two faces, as specified. Overall sign dimensions must be 72⅜ inches long by $22^{5}/_{16}$ inches high for the 6 foot sign and 96⅜ inches long by $22^{5}/_{16}$ inches high for the 8 foot sign. Signs must be 10¾inches deep at the top (including the drip edge) and 5⅞ inches deep at the bottom. The 6 foot sign must weigh no more than 75 pounds and the 8 foot sign must weight no more than 90 pounds. When mounted, the sign must provide a five degree downward angle for increased visibility.

The body of the sign must consist of an aluminum housing. The top must be extruded from 6063-T5 aluminum alloy with a minimum thickness of 0.140 inches. There must be drip rails overhanging the sign face to prevent water from entering the electrical housing.

The bottom of the sign must be extruded from 6063-T5 aluminum alloy with a minimum thickness of 0.09 inches. The ends of the sign must be cast from 356 aluminum and have a minimum thickness of 0.250 inches.

Continuously weld all seams for a weather tight seal. Locate four drain holes in the bottom of the body, two at each end of the sign.

Etch and prime the exterior of the sign in accordance with industry standards before receiving two color coats of industrial enamel. All fasteners and hardware must be corrosion resistant.

The legend of the sign must be as indicated on the plans.

The size of the sign must be as indicated on the plans.

2. Door Requirements. The aluminum doors must have one side removable for access to the sign face. Each door must have a full length 0.040 inch by 1⅛ inch open stainless steel hinge on the bottom edge. The door must be secured from opening by six quarter turn air lock fasteners. PVC foam gaskets or a neoprene gasket, 5/32 inch thick by 1 inch wide, must be installed to provide a watertight seal between the door and housing.

3. Sign Face Requirements. The sign face must be constructed of 0.125 inch thick Lexan SG404-7329 white translucent polycarbonate. Letter style must be Clearview Highway 2W font with 12 inch upper case and proportional lower case letters. The sign face legend background must be translucent with vinyl green electrically cuttable film applied to the front of the sign face. The legend must be framed by a white polycarbonate border.

4. Electrical. The LED case sign must be designed to operate on 120 Volt, 60 Hertz, single phase alternating current (AC) power. The input voltage must be reduced and power-conditioning circuitry must be provided so that the LED's current will operate at the manufacturer's recommended current.

The LED light module must consist of adequate LED's to provide a minimum of 200 nits or an equivalence of 660 lux over a -40 degrees F to 165 degrees F ambient temperature consistent with the *NEMA* temperature specifications. There must be a sufficient quantity of white LEDs to uniformly illuminate the viewing area.

The LED light module must consist of a circuit board comprised of an insulate aluminum substrate, with a minimum thickness of 0.050 inch.

The LED light module must operate for a minimum of 50,000 hour life with no more than 30 percent lumen depreciation. The LED supplier must provide operational documentation, if requested, based on actual temperature measurements (taken after 12 continuous hours of operation) correlated against lumen depreciation and LED mortality curves.

The LED light engine electronics must be entirely coated not thinner than 0.002 inch (dry), to adequately protect the light engine from moisture and corrosion. The LED module must be Reduction of Hazardous Substances (ROHS) compliant.

Provide a sufficient quantity of white LED's to uniformly illuminate the view area. The failure of one LED must not reduce the light output by more than eight percent per foot of sign face.

Circuit conductors and LED attachment adhesive must be minimally 90 percent silver to insure optimal electrical and thermal conductivity.

The LED light module must be attached to the case sign housing in such a manner that will remain properly in place during maintenance or retro-fit activities. The LED light module must pass the following tests per *NEMA* standards:

A. Thermal Shock Test. 85/-40 degrees F with 2 hour dwells for five cycles with a 2 hour presoak at -40 degrees F.

B. Salt Spray and Soak Test. The LED light module must endure 48 hours on continuous salt spray and 240 hours of salt-water soak.

All LED light modules must be burned-in for 24 hours and certified for compliance by the manufacturer. The manufacturer's name and date of manufacture along with a Quality Control (QC) tracking sticker must be mounted on the inside of the LED light module.

The LED light modules must not exceed a 59 degree F (15 degree C) temperature rise under continuous operating conditions.
Provide power supplies rated for 100 watts by UL for Class 2 operation (24 volts direct

current D.C.) and IP66 rated for outdoor use. Ensure two power supply are used for two-way signs. Ensure the temperature rise of the LED panel does not exceed 59 degrees F (15 degrees C) under continuous operating conditions at the rated output.

5. Mounting Brackets. Mount the signs as specified on the plans.

6. Warranty. Provide materials with a manufacturer's warranty/guarantee, transferable to MDOT, that the supplied materials will be free from all defects in materials and workmanship for the stated time period from the date of shipment. Supply the Engineer with warranty/guarantee documents from the manufacturer and a copy of the invoice showing the date of shipment.

c. Construction. Furnish and install, a LED Street Name Sign, as indicated on the plans or as directed by the Engineer. Ensure work complies with sections 819 and 820 of the Standard Specifications for Construction and this special provision.

Design the wiring for 600 volts at 90 degrees F using a minimum #18 AWG stranded soft annealed copper wire. Secure all wiring using insulated wire compression nuts. Furnish a wire entrance junction box with the sign assembly which provides a weather-tight seal. No wiring is allowed within the optical cavity.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
St Name Sign, Two Way, (LED), __ foot	Each

CITY OF DETROIT

SPECIAL PROVISION
FOR
Aluminum Traffic Signal Pedestal and Foundation

a. Description:

The work shall consist of furnishing and installing a aluminum traffic signal pedestal and foundation. The pedestal for mounting pedestrian signals and traffic signals shall be equipped with slip fitters for a 4½ inch O.D. (Outside Diameter) pipe. The pedestal height, including base, shall be 10, 11, 12, 13, 14 or 15 feet as necessary to mount the traffic signal equipment as indicated on the plans.

b. Materials:

The material shall meet following requirements:

1. The pedestal base shall be the square style, approximately 14 inches in height.
2. The pedestal base shall be designed for bolting to a concrete foundation having four ¾ inch anchor bolts arranged on a 12¾ inch diameter bolt circle with bolts projecting 2¾ inches above the foundation surface.
3. The pedestal base shall be provided with an access door of sufficient dimensions to facilitate installation and wiring. The door shall be securely held in place by stainless steel hex head cap screws or by an approved locking device.
4. The pedestal assembly shall consist of an aluminum shaft threaded into a cast aluminum base.
5. Nuts must turn freely on bolts after galvanizing.
6. The pedestals shall not be painted.
7. A reinforcement ring shall be installed on top of the pedestal base for pedestal heights of 11 feet or higher.
8. Four steel anchor bolts shall be furnished with each pedestal. The anchor bolts shall be ¾ inch in diameter and 22 inches in length, this length to include a 4-inch "L" bend at the lower end. Each bolt shall have a minimum thread length of 3 inches on the upper end and shall be hot-dip galvanized for at least 6 inches on the upper end after threading.
9. Each bolt shall be furnished with a hex nut and washer. Nuts and washers shall be hot-dip galvanized.

c. Construction:

The installation of pedestal foundation and aluminum traffic signal pedestal, grounding and associated hardware shall comply the Michigan Department of Transportation Standard Specifications for Construction.

d. Measurement and Payment:

The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Pedestal Alum, Modified	Each
Pedestal Fdn, Modified	Each

The contract unit price each for **Pedestal Alum, Modified** will be payment in full for furnishing and installing pedestal fittings, pedestal base and all other materials, labor and equipment required to complete work as specified herein and as shown on the plans.

The contract unit price each for **Pedestal Fdn, Modified** will be payment in full for excavating, for constructing a new concrete foundation and installing grounding and ground rod(s), conduits, anchor bolts, and all other materials, labor and equipment required to complete work as specified herein and as shown on the plans. Pavement, sod, curb and sidewalk removal and replacement, excavation, granular material backfill and disposal of waste excavated material is also included in the pay item and will not be paid separately.

CITY OF DETROIT

SPECIAL PROVISION
FOR
24-48 CIRCUIT DIGITAL NEMA TYPE TRAFFIC CONTROLLER ASSEMBLY

a. Description.

This work consists of furnishing delivering and installing a controller and cabinet, digital type, at locations shown on the plans.

Work includes installation of the traffic signal controller unit (CU), cabinet and accessories required to provide traffic signal control operations as shown on the plans, in accordance with the MMUTCD and this special provision. As applicable this work includes mounting brackets and hardware, conduit risers, wiring, connectors, grounding, rewiring of existing signal heads, and all appurtenant materials required to ensure a complete installation.

b. Material.

Provide materials that meet sections 918 and 921 of the MDOT Standard Specifications for Construction and this special provision.

1. Controller Unit (CU)

This specification sets forth the minimum requirements for software that operates a 2 (two) through 16 (sixteen) phase, fully-actuated, digital, solid-state traffic controller. The controller shall meet, as a minimum, all applicable sections of the NEMA Standards Publications for TS2 and NTCIP 1202 and ATC standard 6.10. Where differences occur, these specifications shall govern. Controller versions shall be available to comply with NEMA TS2 Types 1 and 2. Type 2 versions of the controller shall be capable of operating as a Type 1 controller.

1.1 Supports Linux-based software

a) Fully compliant with the ATC Standard version 5.2b and proposed ATC Standard 6.10

b) 233 MHz PowerQUICC II Pro-processor

c) 128 Mbytes of DDR2 DRAM memory for application and OS program execution

d) 64 Mbytes of FLASH for storage of OS Software and user applications

e) 2MB of SRAM memory for non-volatile parameter storage

1.2 Two integral Ethernet switches for two networks, ENET1 and ENET2

1.3 Two USB 2.0 ports to:

a) Update application software

b) Upload or download configuration

c) Upload logged data

1.4 Data key socket for an optional 3.3V Data key, 2 through 32MB

1.5 SD Memory Card socket

1.6 CPU Active LED

1.7 Three communications ports standard:

a) NEMA-ATC SDLC serial port 1

b) 25 pin serial port 2

c) 9 pin console serial port

1.8 Built in speaker for enhanced audio controller feedback

1.9 Integral carrying handle in back of controller

1.10 Power Supply:

a) Meets all requirements of ATC standard v6.10.

b) 110VAC @ 50/60 HZ or optional 220/240 VAC @ 50/60 HZ

c) Fuse protection for either 110 or 220/240V

d) External 24VDC protected by a self-resetting electronic fuse

1.11 Operating system

a) Linux 2.6.3x or later kernel and Board Support Package (BSP)

b) Compliant to ATC Standard V. 5.2.b Annex B specifications

1.12 Two user interface options:

a) Advanced Display with graphics and touch-screen (Standard)

b) Basic Display with text and textual menus only—no touch or graphics (Optional and if specified in plans)

1.13 Two models,

a) TS2 type 2 connectors

b) TS2 type 1 connector

1.14 Communications module options:

a) FSK Module that can be configured for RS232 operation

b) 2070 TEES 2009 standard 6A, 6B, and 7A plug-in modules

1.15 Data key 3.3V, 2 through 32MB

1.16 Temperature: -34.6°F to +165°F (-37°C to +74°C)

1.17 Dimensions: 14.84”W x 8.50”H x 6.13”D

1.18 Designed to support a Connected Vehicle Co-Processor (CVCP) module:

a) The CVCP module is intended to allow third-party-developed and processor intensive connected vehicle applications, including leveraging SAE J2735 (5.9

GHz DSRC), to be used with any other properly equipped ATC-compliant traffic controller.

1.19 Signal Phase and Timing (SPaT):

a) ATC contoller, combined with the CVCP, fully supports Signal Phase and Timing (SPaT)/MAP data messaging capabilities to provide a fundamental V2I component for connected vehicle applications.

2. Dynamic Displays

2.1 The dynamic displays listed below shall be provided to show the operational status of the controller. Additional displays shall be offered for programming. It shall be possible to jump from a status screen to the appropriate programming screen and return after viewing is complete. When the cursor is moved to a dynamic location on the screen, an audible tone shall be provided when the display changes. When the cursor is moved around the status screen and the help key is pressed, a context sensitive help shall be displayed. The intersection, controller, coordination, preempt, and time-of-day (TOD) status displays shall contain a title line that displays the status being viewed, the controller status, the current date, and time.

2.2 The INTERSECTION STATUS DISPLAY shall indicate a summary of ring, phase, coordination, preemption, TSP, communications, logic processor flags, and time-based control status. It shall be possible to place vehicle, pedestrian, preemption, and TSP calls from the keyboard while displaying status information.

2.3 The CONTROLLER STATUS DISPLAY shall indicate current interval, pedestrian, density, maximum, and maximum extension timing by phase and ring. The status of vehicle, pedestrian, and overlap signal outputs shall be displayed in combination with vehicle and pedestrian calls. The display shall also show the split plan, timing plan, sequence, event plan, and day plan in effect. The display shall include the status of the first sixteen logic processor flags.

2.4 The PREEMPTOR STATUS DISPLAY shall indicate the status of vehicle, pedestrian overlap and overlap signal outputs shall be displayed in combination with vehicle and pedestrian calls. Priority (railroad, fire, emergency) preemptors and bus preemptors with calls, preemptor active, inhibit, and delay status. When a preemptor is active, the display shall also indicate preemptor interval, timing, duration, and dwell status. A portion of the display shall indicate the controller status during preemption including current status, interval, and timing by phase and ring and the status of vehicle and pedestrian signals for each phase.

2.5 The TIME BASE STATUS display shall indicate the current time and date the source of event plan selection, the next event plan to be selected, the current schedule, day of the week, event plan number and event plan start time. This status screen shall display a total of 30 TOD events.

2.6 The COMMUNICATION STATUS displays shall be communications status displays for Ethernet, Port 1 (SDLC), Port 2 (terminal) Port 3, and NTCIP.

2.7 An Ethernet status display shall indicate the line speed, the line status, the total number of transmits and receive counts and the number of transmit and receive error counts.

2.8 Port 1 (SDLC) status display shall indicate the frame responses from the MMU, the terminal and facilities BIUs and the detector BIUs. (applies to NEMA controllers hardware only)

2.9 Ports 2 and 3 status display shall indicate the interconnect format, transmit, valid data, data error, carrier detect and the last valid command. (when ports exist on controller hardware)

2.10 An NTCIP status display shall indicate the total number of SNMP and STMP transmit and receive counts.

2.11 The DETECTOR STATUS display shall indicate activity for up to 64 detectors. The display shall show detector calls as they are processed by the controller. The display shall also show the extension and delay timers for the selected detector. In addition the failure status of the detector shall be displayed.

2.12 The FLASH/MALFUNCTION MANAGEMENT UNIT (MMU) status display shall indicate flash status plus MMU channel, conflict, and monitoring function status. A separate display shall indicate the results of the controller's comparison of its MMU programming to the programming in the controller. (not available for cabinet configurations that use a 2010 CMU)

2.13 The INPUT AND OUTPUT STATUS displays shall indicate the activity of all of the logic level inputs and outputs to the controller.

3. Programming Displays

3.1 Programming displays in the form of menus shall aid the operator in entering data from the front-panel keyboard.

3.2 A main menu shall allow the user to select a major function of the controller. A submenu shall then be displayed to allow the user to select a sub-function within the major function.

3.3 English language and traffic engineering terminology shall be used throughout to facilitate programming. The display organization shall allow traffic personnel to program the controller without using reference cards or manuals. All data entry and data screens shall be in logical order.

3.4 Four (4) arrow cursor key shall allow the user to scroll through all programmed data.

3.5 Programming entries shall consist of alpha-numerical values, YES/NO and ON/OFF entries. During program entry, the new data shall be displayed as it is entered. Warning and consistency checks shall be performed when ENTER or cursor key is pressed. On constrained data (entries that are constrained by other programmed data), entries shall only be stored when the consistency check is

validated. On non-constrained data the entries shall be stored only when the new values are within valid value thresholds.

3.6 An example of constrained data is the sequence of the phases within a ring. They need to be checked with the phase compatibility, phases in the ring and start phases among others.

3.7 An example of non-constrained data is the vehicular extension time entry.

3.8 The keyboard entry software shall include context sensitive help screens. Help information shall be accessed by placing the cursor on the data entry in question then pressing the HELP key. Help screens shall be provided for all keyboard-entered data and shall include at a minimum range, description, and functional operation information for the data entry.

4. Programming Methods

4.1 The methods listed below shall be available for controller configuration and timing entries. The manufacturer shall be able to provide as off-the-shelf items all of the software and software required to affect the listed methods and to implement network operation with system masters and host PC's.

4.2 Manual data entry via the front panel keyboard.

4.3 Downloading from a portable PC-compatible computer via NTCIP interfaces.

4.4 Transfer from one controller to another, or restoring for a back-up copy, using a data key, USB thumb drive, or an SD card. (dependent upon controller hardware support)

4.5 A PC web interface shall allow the operator to view the current status and programming for the controller. It shall be possible to change programming from a remote device like a PC and if the device is connected to the controller, the programming changes shall take effect the next time that interval or function is used.

5. Programming Security

5.1 A minimum of three access levels shall be available to provide programming security.

5.2 The highest or administrator level shall have access to all programming entries including setting access codes.

5.3 The second or data change level shall have read-write privileges for all programming entries except access codes and CRC enable/disable.

5.4 The third or data display level shall only have access to read programmed data and status screen.

5.5 User selectable, access codes shall be provided for the administrator and data change and read only access levels. Each user shall have a user name that is

entered using from 6 to 15 characters. Access codes shall initially be set to provide unrestricted access.

5.6 If there has been no keyboard activity the controller shall automatically logoff the user after 30 minutes.

6. Programming Utility Functions

6.1 A copy function shall permit copying all timing plan data from one phase to another. It shall also permit copying all timing plans from one timing plan to another, one detector plan and detector options plan to another, all event plan data from one event plan to another and one sequence to another. This feature will facilitate data entry when programming any two or more phases with the same timing values, or detectors with the same programming, and/or two or more event plans with the same plan data.

6.2 The controller unit shall contain a backup database with user specified values stored in non-volatile memory. A copy function shall permit transferring the backup database to the active database. The user shall be able to create their database and copy it to the default database.

6.3 A sign-on message shall allow the user to view the controller software version number. It shall also be possible to display the sign-on message by keyboard selection. The sign-on display shall allow a user-defined message of up to two lines with 38 characters per line.

6.4 The controller shall have the capability to output a memory image of the user programmed settings and intersection configuration data in binary format. This shall allow transferring the memory image data to a data key, USB thumb drive, or a SD card.

7. Actuated Control Functions

The controller software shall provide all actuated control functions and operations required by the NEMA TS2 Standard (subject to controller and cabinet I/O capabilities). In addition, it shall provide the features described in the following sub sections.

7.1 Phase Sequence

a. The phase sequence of the controller shall be programmable in any combination of 16 phases, using up to 16 concurrent groups, and four timing rings.
b. The phase sequence of the controller shall be programmable in any combination of sixteen phases, using up to 16 concurrent groups and four timing rings.
c. Up to 16 unique phase sequences shall be user configurable and used in the controller.
d. Four additional fixed sequences shall conform to the following TxDOT “Diamond” configurations:
    i. 3-phase diamond
    ii. 4-phase diamond
    iii. NEMA 8-phase diamond
    iv. Intersection diamond control

e. Phase sequence information shall be changeable from the keyboard and stored in data memory.
f. The standard phase sequence of the controller shall also be capable of being altered by coordination, TOD or external alternate sequence command, by selection 1 of the 16 configurable sequences.
g. An exclusive pedestrian phase feature shall be provided which will time and display the pedestrian indications with the vehicle movements remaining in all red.
h. A ring group feature shall allow independent timing of rings 1 & 2 from rings 3 & 4.

7.2 Timing Intervals

a. Timing intervals shall be programmable from 0-255 in one second increments or from 0-25.5 in one-tenth second increments, depending on the function.

b. Four independent timing plans shall be provided. Any plan shall be selectable on a TOD basis, by event plan, or for one cycle following preemption.

c. Each timing plan shall contain the following interval timings:

Minimum Green	Maximum 3
Bike Green	Dynamic Maximum
Delay Green	Dynamic Maximum Step
Conditional Service Minimum Green	Yellow Clearance
Walk	Red Clearance
Walk 2	Red Maximum
Walk Maximum	Red Revert
Pedestrian Clearance	Actuations before Reduction
Pedestrian Clearance 2	Seconds per Actuation
Pedestrian Clearance Maximum	Maximum Initial
Pedestrian Carryover	Time before Reduction
Vehicle Extension	Cars Waiting
Vehicle Extension 2	Time to Reduce
Maximum 1	Min Gap
Maximum 2	Steps to Reduce

d. The bike green interval shall replace the phase minimum green if the interval time is larger than the min green time and if a detector input designated as a bike detector has been activated.

e. Two Walk and Pedestrian Clearance intervals shall be provided for each phase per timing plan. The second Walk and Pedestrian Clearance shall be activated by a time base action plan.

f. Two vehicle extension intervals shall be provided for each phase per timing plan. The active vehicle extension interval shall be selected by a time base action plan.

g. If enabled, a Delay Green timer shall delay the vehicle phase from starting until the timer has expired. This shall provide an additional all red for the vehicles movement and allow the pedestrian indications to precede the vehicle movement.

h. The Pedestrian Walk interval shall extend from Walk to the smaller of the Walk Max time or the phase maximum in effect with a constant input from the “Walk Extension detector”. The Pedestrian Clearance interval shall also extend Pedestrian Clearance to the smaller of the Pedestrian Clearance Max time or the phase maximum in effect with a constant input from the “Walk Extension detector.”

i. Volume density intervals shall include actuations before and cars waiting. Actuations before added shall provide a user-specified number of actuations that must occur before adding variable (added) initial time. Cars waiting shall provide a user specified number of actuations, or cars waiting, that must occur before starting gap reduction. Gap reduction shall be initiated by either time before reduction or cars waiting, whichever reaches its maximum value first.

j. The controller shall be capable of dynamically extending the maximum green time for each phase based on vehicle demand. Three maximum green intervals shall be selectable per phase based on TOD, coordination pattern or external input. The initial interval shall be selectable as Max 1, Max 2, or Max 3. If the phase terminates due to max-out for two successive cycles, then the maximum green time in effect shall automatically be extended by a dynamic max step interval on each successive cycle until it is equal to dynamic maximum. If the phase gaps out for two successive cycles, then the maximum green time shall be reduced by the dynamic max step time until it reaches to the original max value.

k. Each phase shall have a red maximum timing interval. An input (red extension) shall extend the all red period of the assigned phase as long as the detector input is true. This input must be true within the all red time of the assigned phase to be able to extend the all red period. If this detector fails then the all red extension feature shall be disabled.

l. Guaranteed minimum interval values shall be settable and shall not be overridden by the controller. Values shall be provided for the following intervals:

Minimum green	Yellow clearance
Red clearance	Walk
Overlap green	Pedestrian clearance

m. The controller shall provide sixteen internally-generated overlaps (A - P). All Overlap functions shall be programmable from the controller keyboard.

n. Overlaps shall be individually programmable as standard (normal), other (to include minus green / yellow, protected, pedestrian protected and protected permissive flashing arrow), with lag overlap timing capabilities. The green, yellow and red and lag interval timings shall be individually programmable with respect to the activation or termination of the parent phase, respectively.

o. The standard overlap shall require only included phases to be configured

p. A protected overlap shall operate according to the following rules:

(i) Overlap shall be green, yellow or red like a normal overlap except its outputs shall be blank when the protected phase is green, or the controller is transitioning to a non-included phase.

q. Minus green / yellow overlaps shall operate according to the following rules:

(i) Overlap shall indicate green when any of the overlap phases are green or when in transition between overlapped phases and a modifier phase is not green.

(ii) The overlap shall be yellow when an overlapped phase is yellow and the modifier phase is not yellow and none of the overlapped phases are next.

r. A pedestrian protected overlap shall be green under the following conditions:

(i) When an included phase is green and the protected pedestrian is NOT in walk or pedestrian clearance

(ii) When the controller is in transition between included phases and a pedestrian protected phase is not next

(iii) After servicing an included phase pedestrian demand if there is enough time before max out to service the overlap minimum green

s. The controller shall provide an overlap selection for Protected/Permissive Left Turn PPLT Flashing Yellow Arrow FYA operation. PPLT/FYA shall allow selection of the protected phase, permissive phase, flash yellow output to either the overlap output, or a pedestrian clearance (yellow) output. The PPLT/FYA shall also allow the yellow arrow to continue flashing once the permissive through phase reaches yellow clearance. PPLT/FYA shall be enabled on a time of day basis.

t. The controller shall provide the capability of sixteen pedestrian overlaps. These shall be capable of overlapping the pedestrian displays of any combination of phases with a pedestrian movement.

8. Conditional Service

8.1. The controller shall provide a programmable conditional service feature. When selected, the controller shall service an odd-numbered phase once normal service to that phase has been completed and enough time for additional service exists on the concurrent even phase.

8.2. A conditional service minimum green time shall be programmable for each phase. This interval shall ensure a minimum green if the phase is conditionally served.

8.3 It shall be possible to program the controller to re-service the even phase after conditionally serving an odd phase. Once an even phase has been conditionally re-serviced, the odd phase shall not be conditionally served again until returning to the concurrent group that is timing.

9.0 Additional Features

The following features shall be programmable for each phase in each of four separate timing plans:

Locking/non-locking detector memory

Vehicle recall

Pedestrian recall

Maximum recall

Soft recall

No-rest phase

Enable Added Initial

9.1. Also programmed by phase shall be:

a. Phase in use

b. Exclusive Pedestrian phase

9.2 Soft recall shall return the controller to the programmed phase in the absence of other calls.

9.3 If a phase is designated as a no-rest phase the controller shall not rest in the phase, and proceed to the next phase with serviceable demand, or if no demand is present the next soft recalled phase.

9.4 The controller shall permit power start and external start to be programmed by phase and interval. Start intervals shall be green, yellow red, or yellow with overlaps forced yellow.

9.5 During a power start condition, the controller shall be capable of timing an all-red or flash interval before the power start phase(s) and interval are displayed. The controller shall support the MUTCD 2009 that requires a minimum of 6 seconds of all red following red/red flash.

9.6 The controller shall provide guaranteed passage operation on a per phase basis. When selected, this feature shall provide a full passage (vehicle extension) interval

when a phase gaps out with a gap in effect less than the vehicle extension interval (preset gap).

9.7 The controller shall provide both single and dual entry operation. When selected, dual entry shall cause the controller to ensure that one phase is timing in each ring.

9.8 It shall be possible via keyboard selection to inhibit the service of a phase with other phase(s) within the same concurrent group.

9.9 The controller shall provide the following additional selectable pedestrian functions:

a. Actuated phase rest in WALK

b. Flashing WALK output

c. Pedestrian clearance protection during manual control

d. Pedestrian clearance through yellow

9.10. Pedestrian timing shall be capable of being carried over from one phase to another

9.11. Solid Don't Walk for a minimum of 3 seconds prior to the release of any conflicting vehicle movement.

9.12. Programming shall be provided to inhibit re-service of odd phases (left turns) within the same concurrent group. Also, programming shall be provided to place a demand on a phase in another concurrent group to cause the controller to leave the concurrent group prior to servicing the odd phases in the same concurrent group.

9.13. The controller shall provide a programmable simultaneous gap termination feature. When programmed, phases in both rings shall gap out together in order to terminate the green interval and cross the barrier.

9.14. The controller shall provide automatic flash selection per the requirements of the MUTCD. Both the flash entrance and exit phases shall be programmable through the keyboard, and flashing shall be controlled by either setting the fault/voltage monitor output to be FALSE or by flashing through the load switch driver outputs. If flash desired through the load switches, both the phase and overlap outputs shall be flashed either yellow or red as selected by the operator. Automatic flash shall be selectable by external input, system command, or TOD action plan.

9.15. The controller shall provide dimming for selectable load switch outputs. Dimming shall be accomplished by inhibiting the selected outputs for alternate half cycles of the 120 VAC line. Dimming shall be controllable by time of day and an external input; both functions must be TRUE for dimming to occur. Programming shall permit individual dimming of the Green/Walk, Yellow/Ped Clear, Red/Don't Walk outputs for each load switch. Based upon controller programming the controller shall automatically compute the MMU channel compatibility The compatibility

computed shall be based on phases-in-use, phase concurrency, valid pedestrian movements, vehicle and pedestrian overlaps, and pedestrian carryover.

10. Coordination

Coordination functions to control intersection cycle lengths, system offset relationships, and phase split percentages shall be provided as a standard feature, with no need for additional modules or software.

10.1 Coordination Patterns

A minimum of 120 coordination patterns shall be provided. Each pattern shall allow selection of an independent cycle length, offset value, and split pattern. The coordination patterns shall be selected using telemetry (system), hardwire, or non-interconnected (time base) coordination commands. Offset and Split values shall be entered in either seconds or percentage.

10.2 The coordination patterns shall be selected by the coordination command using the following formats:

a. Pattern - This format shall allow selecting the coordination patterns directly, that is, commanding Plan 1 selects Pattern 1. Pattern command shall include 1-120 patterns, pattern 254 shall select free, and pattern 255 shall select flash.

b. Standard - This format shall allow selecting the coordination patterns using a pattern number derived from a cycle offset-split command. Each pattern shall be assignable to a specific cycle-offset-split combination. The coordination pattern shall be selected programmed by the user to each pattern used.

c. TS2 - This format shall allow selecting the coordination patterns as a function of Timing Plan and one of three offsets. With this format a minimum of 20 Timing Plans shall be available for selection of one of sixty coordination patterns.

10.3 The following functions shall be programmable in each coordination pattern:

a. Cycle length

b. Split pattern number

c. Offset value

d. Dwell/Add time

e. Actuated coordination

f. Timing plan

g. Actuated walk rest

h. Phase sequence

i. Phase re-service

j. Action plan

k. Maximum select

l. Fixed/Floating force off

m. Split timing per phase in seconds of percentage

n. Directed split preferences

o. Coordinated phase split extension

p. Crossing artery pattern

q. Permissive timing

r. Ring extension

s. Split demand pattern

t. Ring displacement

u. Coordinated phase

v. Split value by phase

w. Omit by phase

x. Min recall by phase

y. Max recall by phase

z. Pedestrian recall by phase

a-a. Special function outputs

10.4. The following functions shall be programmable for each of the 120 Split patterns:

h. Coordinated phase

i. Split value by phase

j. Omit by phase

k. Min recall by phase

l. Max recall by phase

m. Pedestrian recall by phase

n. Max and Pedestrian recall by phase

10.5 Cycle Length

a. One cycle length shall be provided for each coordination pattern. The cycle shall be adjustable over a range of 30-999 seconds in 1-second increments.

b. The cycle length shall serve as the reference time for all coordination timing.

10.6 Synchronization

a. For systems with a single system sync pulse, coordination timing shall be synchronized to the leading edge of that pulse, which shall serve as the master zero reference for all offset timing.

b. For hardwire systems with multiple sync pulses, the coordinator shall lock onto the correct sync by trying different syncs and checking for reoccurrence during successive cycles.

c. After a valid system sync pulse has been received the coordinator shall check for the proper occurrence of the system sync pulse during each subsequent cycle. If a sync pulse does not occur, the coordinator shall self-sync and continue to operate with the last set of coordination commands for a programmable number of cycles from 0-255. If a sync pulse does not occur within the programmed period (or until the first sync pulse is received), the coordinator shall revert to the non-interconnected coordination mode.

10.7 Offset

a. Offset shall normally be defined as the time period from the system sync pulse to the beginning of the leading coordinated phase green (local zero). The coordinator shall also be capable of referencing the offset to the beginning of the lagging coordinated phase green, coordinated phase yield, start of yellow point or the start of the ring 1 coordinated phase

b. Offsets shall be programmable using both percent and seconds. The range shall be from 0-99% of the cycle length in 1% increments or 0-255 seconds in 1-second increments.

c. Offset changes shall be achieved by adding or subtracting cycle time over a maximum of three cycle periods to allow a smooth transition to the new offset. Other offset change methods shall be adding 20% or a user-selectable value to each cycle or to snap to the sync point once the permissive period are complete and the coordinated phases are green. Offset correction using dwell shall also be selectable.

10.8. Split

a. Each split shall provide a split interval for each of sixteen phases. The split interval shall be programmable using percent or seconds. The range shall be from 0-99% of the cycle length in 1% increments or 0-255 seconds in 1-second increments.

b. Split interval settings shall determine the maximum time, including vehicle clearance (yellow and red), for a non-coordinated phase, or the minimum time for a

coordinated phase. Phase termination shall be controlled by establishing a force-off point for each phase within the cycle. Except for the coordinated phases the force-off point shall be selectable to be a fixed point within the cycle or allowed to float. If floating force-offs are selected each phase shall time no more than its own split interval.

c. During coordination, it shall be possible to operate a coordinated phase as actuated or non-actuated. If a coordinated phase is actuated, vehicle detections shall permit the coordinator to extend a phase beyond the normal yield point. Extended coordinated phase green shall be selectable using the same range as split interval settings (percent or seconds). If actuated coordinated phases are used they shall be able to have actuated or non-actuated (walk rest) pedestrian movements.

10.9. Permissive Periods

a. Permissive periods shall be provided to control the time period during which coordinated phases are released to service calls on non-coordinated phases.

b. All permissive timing shall begin at the lead coordinated phase yield point. A yield point shall be automatically computed for the coordinated phase in each ring. The coordinated phase yield points shall allow the coordinated phases to yield independent of each other. The yield point shall be the point at which the coordinated phase is released to allow the controller to service calls on non-coordinated phases. The computation shall take into account the coordinated phase split interval plus pedestrian and vehicle clearance times.

c. Automatic permissive period operation shall be provided by automatically calculating a permissive period for each non-coordinated phase. The permissive period shall consist of a separate vehicle and pedestrian period computed from the phase split interval and the vehicle/pedestrian minimum time. The controller shall answer a call only during the associated phase permissive period. However, once the controller has been released to answer a call, all remaining phases shall be served in normal sequence.

d. Single permissive period operation shall be provided by defining a single time period per cycle beginning with the yield point during which the controller is allowed to answer phase calls for any phase. The duration of this period shall be selectable in each coordination pattern.

e. Dual-permissive period operation shall also be provided. During the first permissive period, the controller shall answer only vehicle or pedestrian calls on the phases following the coordinated phase. If the controller yields to a call during this period, calls on the remaining phases are served in normal rotation. During the second permissive period, the controller shall answer calls on all remaining phases except the first permissive phase. The duration of the two permissive periods, and the time at which to start the second permissive period (displacement), shall be selectable in each coordination pattern.

10.10 Phase Re-service

a. If actuated coordinated phases are in use it shall be possible to re-service non-coordinated phases within the same cycle if sufficient time remains. A phase shall be re-serviced only if the permissive period for the phase indicates there is sufficient time remaining in the cycle to service the phase.

b. Phase re-service shall be capable of being enabled/disabled in each coordination pattern.

10.11. Transition Cycles

a. It shall be possible to program the controller to ignore the pedestrian timing when calculating the minimum cycle length for offset correction.

b. The controller shall provide a smooth and orderly transition when changing from free operation to coordinated operation and from one coordination command to another.

c. During a free-to-coordinated transition, the controller shall initiate a pick-up cycle beginning upon receipt of a sync pulse and a valid coordination command. The controller shall then enter coordination mode upon crossing a barrier or if resting in the coordinated phases.

d. Each coordination command shall select a pattern. A command change shall be implemented concurrent with a sync pulse. Cycle, offset, and split changes shall not take effect until local zero.

10.12. Local Split Demand

a. The coordinator shall provide a minimum of two split demand detector inputs, which shall allow the selection of a preferred split plan based on intersection demand.

b. If the split demand detector indicates continuous vehicle presence during a programmed monitoring period beginning with the onset of a selected phase green, the coordinator shall force a selectable split plan to be in effect during the next cycle. This split plan shall remain in effect for a selected number of cycles from 0-255. A specific split plan shall be capable of being selected in each coordination pattern.

10.13. Adaptive Split Demand

The coordinator shall provide a method to select the split using measurement of each phase’s green utilization. From the measurement the coordinator shall determine which phase or phases had excess time that was not used during the last measurement period. Then the excess time shall be added to the first set of preferential phases. If the first set of preferential phases gapped out during the last measurement period, then the excess time will be added to a second set of preferential phases. If both sets of preferential phases gapped out during the last measurement period then the time shall be added to the beginning of the coordinated phases.

10.14. Free Mode

a. The coordinator shall provide a free mode of operation, where all coordination control is removed.

b. Free mode operation shall be selectable by coordination commands, by external input or by keyboard entry.

c. The coordinator shall revert to the free mode when active controller inputs or functions would interfere with coordination. Such inputs or functions shall include the following:

(i) Manual control enable

(ii) Stop time

(iii) Automatic flash

(iv) Preemption

e. The coordinator shall provide an active free mode, where coordination control is removed but the coordinator continues to monitor system sync so as to keep its timing in step with the system or TOD if operating under TOD or central system control.

10.15. Manual Control

The controller shall allow manual override of the current coordination command from the keyboard. The manual command shall allow selection of any coordination pattern to be in effect.

10.16. Interconnect Modes

The coordinator shall be capable of operating with any of the following interconnect types:

a. Non-interconnected coordination (time-based)

b. Telemetry

c. Hardwired

10.17 The coordinator shall be compatible with fixed-time interconnect, which provides the sync pulse superimposed on the offset lines. It shall also operate within an interconnected system using a separate sync line. The non-interconnected coordination mode shall serve as a backup when using telemetry or hardwired interconnect.

11. Pre-emption

The controller shall provide a minimum of ten preemption sequences that can be programmed as either railroad-fire-emergency or bus vehicle preemption sequences.

Preemption capability shall be standard and shall not require additional modules or software.

11.1. Railroad-Fire-Emergency Vehicle Preemption

a. The ten railroad-fire-emergency vehicle preemptors shall be selectable as a priority or non-priority type. Priority preemptor calls shall override non-priority preemptor calls. Low-numbered priority preemptors shall override higher-numbered priority preemptor calls. Non-priority preemptor calls shall be serviced in the order received.

b. Each preemptor shall provide a locking and non-locking memory feature for preemptor calls. If a preemptor is in the non-locking mode and a call is received and dropped during the delay time, the preemptor shall not be serviced.

c. Preemptor timing intervals shall be programmable from 0-255 in one-second increments or 0-25.5 in one-tenth second increments, depending on function. Delay, max presence, and duration timing intervals shall be programmed from 0 – 65535 seconds in one-second increments.

d. A programmable delay time interval shall be provided to inhibit the start of the preemption sequence. This interval shall begin timing upon receipt of a preemption call. This time shall be programmable from 0-65535 seconds in one-second increments.

e. An inhibit time shall be provided as the last portion of the delay time interval. During this time, phases that are not part of the preempt sequence shall be inhibited from service. This time shall be programmable from 0-255 seconds in one-second increments.

f. A programming option shall be available that allows termination of all phases prior to entering preemption.

g. A programmable extend input shall cause the preemptor to remain in the dwell interval following the removal of the preempt call. If a preempt call is reapplied during this time, the preemptor shall revert to start of dwell interval. This time shall be programmable from 0-25.5 seconds in one-tenth second increments.

h. A programmable duration time shall be provided to control the minimum time that a preemptor remains active. This time shall be programmable from 0-65535 seconds in one-second increments.

i. A programmable maximum presence time shall be provided to control the maximum time that a preemptor input remains active and still be recognized by the controller. Once failed, the input must return to inactive state to be recognized again. This time shall be programmable from 0-65535 seconds in one-second increments.

j. Phases timing at the beginning of a preemption sequence shall remain in effect for a minimum time before the controller advances to the next sequential interval. If the phase has been timing for longer than the programmed preemptor minimum time, the controller shall immediately advance to the next sequential interval. Minimum times shall be programmable for the following intervals:

(i) Green/walk/pedestrian clearance

(ii) Yellow

(iii) Red

k. A phase shall advance immediately to pedestrian clearance if it has been timing a WALK interval at the beginning of a preemption sequence. It shall be possible to time the minimum pedestrian clearance through the yellow interval, or alternately to advance immediately to yellow. During preemption, pedestrian indicators shall be selectable as being a solid DONT WALK, OFF (blank) or fully operational.

l. If an overlap is in effect when the preemption sequence begins, it shall be possible to terminate the overlap so that it remains red for the remainder of the preemption sequence. Overlaps terminating or forced to terminate shall time the preemptor minimum yellow and red clearance times.

m. Each preemptor shall provide user-programmable green, yellow and red track clearance intervals. These shall begin timing immediately after the preemptor minimum red interval.

n. Each preemptor shall provide a user-programmable gate down extension and gate down max green. The gate down extension shall extend the track clearance green time after the gate down input in received. The gate down max green is the maximum the track clearance green time will be extended. If the gate down max green is exceeded the intersection shall be forced to flash.

o. The forced flash shall be programmable to be either hard or soft. If hard flash is enabled then exiting flash to normal operation shall require either pressing the clear key or the MMU reset. A programmed soft flash shall automatically return to normal once the fault condition no longer exits. For gate down fault this shall be once preemption is deactivated.

p. Up to four permissive phases shall be selectable as track clearance phases. During the track clearance period, the selected phases shall time the track clearance green, yellow and red intervals once, and then advance to the hold interval. If track clearance phases are not selected the track clearance interval shall be omitted from the preempt sequence. Controller interval timing shall be used if track clearance interval times have been programmed as zero.

q. The preemption hold interval shall begin immediately after track clearance. It shall remain in effect until the preemptor duration time and minimum hold times have elapsed and the preemptor call has been removed or the preemptor maximum time has been exceeded. During the preemption hold interval, any one of the following conditions shall be selectable:

(i) y. Hold phase green

(ii) z. Limited phase service

(iii) aa. All red

(iv) bb. Flash

r. Any valid phase, except a track clearance phase, shall be selectable as a hold phase. If hold phases are not selected, the controller shall remain in all red during the hold interval. If flash is selected for the hold interval, up to two permissive phases shall be selectable to flash yellow, and the remaining phases shall flash red. Overlaps associated with the phases flashing yellow shall also flash yellow unless they have been forced to terminate, in which case they shall remain red.

s. The preemptor shall immediately cause flashing operation if the preemption input and the track interlock input are not in opposite states and the track interlock function is enabled.

t. Each preemptor shall provide a user-programmable green, yellow and red dwell interval, during which the dwell phase(s) shall operate normally, except that the minimum green interval time shall equal the hold green time. At the completion of the dwell green interval, the controller shall time the dwell yellow and red clearance intervals prior to transfer to the exit phases.

u. Up to four permissive exit phases shall be selectable to time after the preemption sequence has been completed. These shall serve as transition phases to return the controller to normal operation. It shall also be possible to place calls on selected phases upon exiting preemption. The option shall be provided to cause the preemptor to exit preemption to the correct phase to maintain coordination.

v. Each preemptor shall provide a user-selectable exit timing plan. Upon exiting the preemption sequence, this timing plan shall serve as the phase times in effect for one controller cycle for all phases.

w. Preemptor linking shall permit preemption sequences, where lower-priority preemptors may call the higher-priority preemptors from their preemption sequence.

x. Each preemptor shall allow programming of an inhibit extension timer. This timer shall be the length of time, the max call inhibit can be extended.

y. Preemptor active outputs shall be provided for each of the preemptors. The output shall be set to ON when the preemption sequence begins and shall remain ON for the duration of the sequence. It shall also be possible to program preempt active outputs to be ON only during preempt hold intervals. Additionally, it shall be possible to program the non-active, non-priority preemptor outputs to flash while another preemptor is active.

z. Preemptors shall normally override automatic flash. It shall be possible to inhibit this feature for each preemptor.

a-a Each preemptor shall provide the ability to delay the preempt input based on vehicle and pedestrian service request in relation to the coordinated cycle. The preemptor will compare the preempt delay time to the minimum time required to service a phase or pedestrian and then skip the phase or pedestrian movement if there is not enough time left in the delay to service the movement.

a-b. Each preemptor shall allow pedestrian movements which were interrupted by a preempt call to be dynamically selected as that Preemptor's exit phases.

a-c. Each preemptor shall allow vehicle phases which have been interrupted by a preempt call to be dynamically selected as that Preemptor's exit phases. The preemptor shall calculate the percentage of green time served of phases interrupted by a preempt call. If the amount serviced does not meet the limits defined by the Priority Return % data entries then the preemptor run shall select those interrupted movements as exit phases.

a-d. Each preemptor shall allow phases which have been waiting the longest to be serviced or which have the most cars waiting to be dynamically selected as that Preemptor's exit phases.

a-e. The conditional delay, interrupted pedestrian, interrupted vehicle and queue delay functions shall be programmed for enable, disable or time of day selection.

a-f. Each preemptor shall, if free one cycle is enabled, allow the preemptor to exit to free for one cycle before returning to coordination.

a-g. Each preemptor shall, if exit phase once is enabled, allow the preemptor to exit to specific phases in free mode (for a special minimum green time as defined in a new timing plan) before returning to coordination.

11.2. Bus Preemption

a. Ten bus preemptors shall provide control for bus or other low-priority vehicles. Bus preemptors shall have low priority and shall be overridden by railroad-fire-emergency vehicle preemptor calls.

b. The preemptor shall be programmed to accept either a 6.25 pulse-per-second signal with a 50% duty cycle or a solid input to identify a bus preemptor call. Bus preemptor calls shall be capable of preemptor call memory and shall be served in the order received.

c. . Bus preemptor timing intervals shall be programmable from 0-255 in one second increments or 0-25.5 in one-tenth second increments depending on the function.

d. A re-service time shall be provided to avoid excessive utilization of the same bus preemptor. If a call is received before the re-service time has elapsed, the bus preemptor shall not be re-serviced. If re-service time has not been entered then all phases with a call when leaving the bus preemption sequence shall be serviced before the bus preemptor may be served again.

e. Bus preemptors shall provide delay, inhibit, and maximum time functions similar to those for railroad-fire-emergency vehicle preemptors described above.

f. Bus preemptors shall provide the following entrance intervals:

Green/walk/pedestrian clearance

Yellow

Red

g. At the completion of the entrance red clearance, the bus preemptor shall advance to the hold green interval. During this interval, up to four permissive phases shall be selectable to remain green until the minimum hold time has elapsed and the bus preemptor call has been removed or the preemptor maximum time has been exceeded.

h. It shall be possible to program the controller to allow concurrent phases to be serviced for a bus preemptor with only one phase selected as the hold interval phase.

11.3 Preemption Safeguards

a. If a preemptor call is active when power is restored to a controller, the fault/voltage monitor output shall be set to FALSE, placing the intersection in flash. Similarly, if external start is applied during a preemption sequence, the intersection shall be set to flash. Intersection flash shall remain in effect until the preemptor call has been removed and the preemptor duration time has elapsed.

b. An input shall be provided to stop timing of the current active preemptor under control of the MMU/CMU.

c. A preemptor safety interlock shall be provided to cause the intersection to go into flash whenever the controller has been replaced and/or has not been programmed for preemption. This shall be achieved with an appropriate signal to the MMU/CMU.

11.4 Transit Signal Priority (TSP)

a) The controller shall include a transit signal priority algorithm that provides for transit vehicle movement through the intersection, while not interrupting coordination or skipping phases.

b) A check-in detector input shall be provided that senses the arrival of the transit vehicle. When active this input shall initiate TSP.

c) A TSP delay shall delay the beginning of TSP operation until a set interval after check-in.

d) A check-out detector input shall determine the departure of the transit vehicle.

e) Assignment of a single pulse from the check-in detector and check-out detector to the controller inputs shall be programmable to any controller preempt input.

f) When under coordination the TSP sequence shall use adjusted split times to accommodate transit vehicles while maintaining coordination.

g) When under free operation the TSP sequence shall use adjusted maximum times to accommodate transit vehicle while not skipping phase.

h) TSP Offset Reference - TSP shall support Lead, Lag, Yield and Yellow offset references.

12. Time-Based Control (Non-Interconnected) Coordination

The controller shall include time-based control. This capability shall be a standard feature and shall not require additional modules or software.

12.1 Clock/Calendar Functions

a) The controller shall provide a TOD clock, which shall be used for all time-based control functions. The only required clock settings shall be the current time (hour, minute and second) and date (month, day and year). Day of week and week of year shall be automatically computed from the date setting. It shall also be possible to set the number of hours that the local standard time is ahead or behind Greenwich Mean Time.

b) During normal operation, the TOD clock shall use the power line frequency as its time base. When power is removed, the time shall be maintained by a crystal oscillator for up to 30 days. The oscillator shall have a timing accuracy of +/- 0.005% over the entire NEMA temperature range as compared to the Universal Coordinated Time Standard.

c) In addition to entering time and date via the keyboard, it shall be possible to download the information from a central system.

d) The controller shall include a time reset input. This feature shall reset the TOD clock to 03:30 whenever the time reset input is TRUE.

e) The controller shall provide support for a serial input from a GPS clock that supports NMEA protocol to set the time and date of the controller.

f) The TOD clock shall automatically compensate for leap year and shall be programmable to automatically switch to daylight savings time.

12.2 Time-Based Control

a) Time-based control shall utilize a day plan program format. The month program shall consist of 200 programmable schedules, each assignable to one of sixteen day programs. Each day program shall consist of from 1 to 50 program steps which define a program for the entire day. Each program step shall be programmed with a starting time and an action plan number. The day plans shall also be assigned to days of the week and days of the month.

b) Time based control shall use action plans to assign:

(i) Coordination pattern number

(ii) Vehicle detector plan number

(iii) Controller sequence

(iv) Timing plan

(v) Vehicle detector diagnostic plan

(vi) Pedestrian detector diagnostic plan

c) Time based control shall also use action plans to enable:

(i) Automatic flash

(ii) System override

(iii) Detector log

(iv) Dimming

(v) Special functions

(vi) PPLT/FYA

(vii) Priority return

(viii) Ped priority return

(ix) Queue Delay

(x) Conditional delay

(xi) Auxiliary functions

(xii) Logic Processor statements

(xiii) By-Phase functions

(xiv) Pedestrian recall

(xv) Walk 2 enable

(xvi) Vehicle extension 2 enable

(xvii) Vehicle recall

(xviii) Vehicle max recall

(xix) Max 2 enable

(xx) Max 3 enable

(xxi) Conditional service inhibit

(xxii) Phase omit

d) There shall be a minimum of 90 holiday or exception day programs, which override the normal day program. Holiday programs shall be capable of being set as floating (occurs

on a specific day and week of the month) or fixed (occurs on a specific day of the year). It shall be possible to program a fixed holiday so that it automatically repeats in the following year.

e) It shall be possible to manually force any of the action plans to override the current action plan. The forced plan shall be entered from the keyboard and shall remain in effect until removed.

12.3 Time-Based Coordination

a) A minimum of 200 time base schedule programs shall be available for the day-programs. There shall be up to 16 day plans with up to 50 events per day plan; these shall not have to be entered in any special sequence. It shall be possible to add and delete steps from a day-program without affecting any other day-program. Each of the program steps shall permit selection of the following functions:

    i. Day program assignment

    ii. Start time

    iii. Action plan

b) Selection of system override in an action plan shall allow the coordination pattern selected by the action plan to override the current telemetry or hardwire system commanded coordination pattern.

c) When operating in the time-based coordination mode the synchronization point for all cycles shall be referenced to a user selected reference time (sync reference), last event or last sync as selected from the keyboard. The sync reference time is that time at which all cycles shall be reset to zero.

d) If the sync reference time is selected, the synchronization point for the cycle selected by the current program step shall be computed using the present time, sync reference time, and cycle length. The synchronization point shall occur whenever the present time is such that an even number of cycle length periods has occurred since the sync reference time.

13.Detectors

13.1 Detector Functions

a) The controller shall provide a minimum of 64 vehicle detector inputs. Each input shall be assignable to one or more phases and be configured with optional detector functions.

    ✓ Extend and delay timing shall be provided for each detector.

    ✓ Each detector shall be capable of operating in a lock or non-lock mode.

b) The controller shall also be capable of providing 16 pedestrian detector inputs. Each pedestrian detector shall be assignable to one or more phases.

13.2 Detector Cross Switching

a) The controller shall provide detector cross switching, permitting a vehicle detector to alternately place calls on assigned phases and assigned cross switch phases.

b) If the assigned phase is not green and the cross-switch phase is green, the detector shall place calls on the cross switch phase.

c) If the assigned phase is omitted for any reason, the detector shall place calls on the cross switch phase.

13.3 Detector Types

a) Each vehicle detector shall be user-programmable to operate as one of the following seven (7) detector types:

(i) Type N (NTCIP): supports all NTCIP detector functionality.

(ii) Type S (Standard): supports all standard detector functionality except the call and extend options will always be enabled.

(iii) Type D (Disconnect queue/stop bar): This detector will disconnect from extending the phase during green if either there is a gap in the detector input OR the detectors disconnect time times out. The detector's input must be active before the phase turns green for this detector to operate.

(iv) Type P (Passage queue/stop bar): If the detector input is active when the phase turns green the detector passage time is reset as long as the input is active. When the detector input becomes inactive the detector passage timer begins running. If addition calls are received before the detector passage timer expires, the detector passage timer shall be reset until the input becomes inactive. Once the detector passage timer times out the detector is disconnected for the balance of the phase green.

(v) Type C (Calling): This detector shall place calls on the phase only when the phase is NOT green.

(vi) Type R: (Red Extend): An actuation on a red extend detector during the red clearance of the assigned phase shall extend the red up to the red max phase time.

(vii) Type G (Green Delay/Extend): When the phase is red the detector input becoming active to the controller shall be delayed by the amount of time programmed in the delay time. When the phase is green, the detector input shall be extended after removed by the amount of time programmed in the detector extension timer.

(viii) Type B (Bike): Activation shall cause the phase to use the Bike minimum green in place of the minimum green.

13.4 System Detectors

a) Each detector input shall be capable of functioning as 1 (one) of 16 (sixteen) system detectors.

b) Vehicle detectors shall be capable of being assigned to a minimum of 16 speed detectors. Speed shall be detected using both one and two detector configurations. Speed shall be computed using a keyboard entered average vehicle length and loop length for a one-detector configuration. When using two detectors, speed shall be calculated using a keyboard entered distance between detectors and travel time between detectors.

14.Logic Processor Commands

14.1 Standard Logic Commands

a) One Hundred (100) logic processor commands shall be assessable from the front panel of the controller or through remote database management software.

b) Each logic command shall be allowed to be enabled or disabled by TOD control

c) Each logic command shall consist of 10 “IF” statements, 5 “THEN” statements and 5 “ELSE” statements. At least 1 “IF” statement and 1 “THEN” statement are required to create a valid command.

(i) “IF” statements shall be logically grouped using Boolean gating including:

- AND

- OR

- XOR

- NAND

- NOR

(ii) When combined “IF” statements create one single “TRUE” result, the “THEN” statements shall be implemented.

(iii) When combined “IF” statements create one single “FALSE” result, the “ELSE” statements shall be implemented.

(iv) The “IF” statements shall monitor controller functions and timer including, but not limited to the following:

Phase/Overlap Green	Phase Calls
Phase/Overlap Yellow	Phase Omits
Phase/Overlap Red	Phase Force Offs
Phase/Overlap Active	Detector Fails

Detector Plan Number	Ring Timers
Detector Activity	Preemption Activity
Detector Volume	Preemption Dwell
Detector Occupancy	Preemption Exit
Coordination Timers	Stop Time
Coordination Holds	Manual Control
Phase Holds	Overlap timers (lagging/leading grn)
Phase Walks	Active Coordination Plan Number
Phase Don't Walks	TBC parameter
Phase Next	Input / Output Bits
Phase Checks	Logic Flags

(v) The "THEN" and "ELSE" statements shall be used to control functions and events (on/off) in the controller, including, but not limited to, the following:

Set Logic Flags	Set Phase/OVL Greens
Set Phase calls	Set Phase/OVL Yellows
Set Input or Output Bits	Set Phase/OVL Reds
Set Delays	Set Walk / Ped Clear / Don't Walk
Set Load Switch circuits (R/Y/G)	Set Pedestrian Detectors
Set Vehicle Detectors	Set Holds
Omit Phase / Peds	Set Force-offs
Change Max Timers (max1, max 2)	Set Red Rest
Set Stop Time	Set Flash
Set Alarms	Set External Start
Set Recalls, CNA1, CNA2, etc	Set Manual Control Enable
Set Coordination Plan	Set Manual Advance
Set Free	Call Preempt
Call TSP	Call Phase

Set Action Plan Set Timing Plan

14.2 Extended Options Logic Commands

a) An additional one-hundred logic commands (101-200) shall be available in the controller, but hidden from front panel access.

   (i) These commands shall be stored and used for easy implementation of common logic required at multiple intersections.

   (ii) These commands shall only be assessable through computer software and shall be uploaded and downloaded to the controller using the same computer software.

b) Once downloaded to the controller, the logic shall be activated using an extended options file.

   (i) This file shall be downloaded to the controller and used to initialize the logic statements.

   (ii) This file shall be used to create a custom menu on the controller. From this menu the user shall be able to enable or disable any of the extended options hidden in the upper one hundred logic commands.

14.3 Peer-to-Peer

a) There are a number of applications that require traffic controllers to share information with one another, independent of the central management system.

b) Three applications are:

   ✓ Light rail preemption along a corridor

   ✓ Mitigating spill back from a freeway on-ramp onto a surface arterial

   ✓ Congestion mitigation from a critical intersection to during free operation

   ✓ Many more due to the power of the logic processor

c) Each controller can communicate through Ethernet up to 15 peers

d) The peer configuration shall allow the user to specify for each peer:

   ✓ UDP port

   ✓ IP address

   ✓ Timeout value

e) The screen also contains the port on which the peer will listen for messages from other peers

f) The protocol shall also identify peers that have gone off-line

g) A “heartbeat” or “keep alive” packet shall be exchanged with each peer periodically to ensure that the communications link is still active and that the peer is responding.

If the peer does not respond to the heartbeat packet the peer shall be tagged as off-line and any testable elements from that peer shall be set to their failed state.

h) The Logic Processor from an intersection shall be able to test it peers for:

i. Any input on or off

ii. Any output on or off

iii. Any preempt state

iv. Additional tests

15. System Communications

15.1 System Commands

a) The telemetry module shall allow the controller to receive, as a minimum, the following commands:

i. Cycle, offset, and split (coordination pattern)

ii. System sync

iii. Special function commands (minimum of four)

iv. Free and flash mode commands

v. Time and date

vi. Request for local status

vii. Recall to Max

b) All commands must occur more than once in any three-second period in order to be recognized.

c) All mode and special function commands shall be cleared after 20 minutes of loss of communication between controller and central system

d) The status of each of the following functions shall be transmitted to the central system in response to a local status request:

(i) Green and yellow status for all phases and overlaps

(ii) Walk and pedestrian clearance status for all phases

(iii) Vehicle and pedestrian detector status

(iv) Phase termination status

(v) Local time

(vi) Coordination status

(vii) Command source

(viii) Sync or transitioning status of coordinator

(ix) Conflict flash status

(x) Local flash status

(xi) Preempt activity and calls

(xii) Volume and occupancy data from a minimum of 16 system detectors

(xiii) Speed data from a minimum of two speed detectors

(xiv) Maintenance required (cabinet door open) status

(xv) Status of two user-defined alarms

e) The status of each of the following parameters shall be calculated on a per-cycle basis and transmitted to the central system for Split Monitor Reporting:

(i) Actual time spent in each phase

(ii) Time of day at end of cycle

(iii) Phases forced off during cycle

(iv) Type of coordination operation

(v) Whether transitioning to new offset

(vi) Cycle, offset, and split in effect during last cycle

(vii) Flash status if operation is Free

f) Upload/Download Capability – The controller shall provide the capability to upload/download the entire intersection database. Phase assignments for overlaps and preemptors shall not be downloaded to preclude unsafe controller operation. Data transfer shall not require the intersection to be in flash.

15.2 Telemetry

a) Telemetry shall utilize TDM/FSK data transmission from 1200 baud to 9600 baud over two pairs of wires. These may be leased lines (Type 3002, voice grade, unconditioned) or dedicated cable. Optional external fiber optic or wireless communications capability shall also be available.

b) The nominal transmitter output level shall be 0 dbm into a 600-ohm load. The receiver sensitivity shall be -34 dbm and shall be adjustable from -40 to +6 dbm.

c) Parity and error checking shall be employed to assure transmission and reception of valid data. Indicators shall be provided on the telemetry module to show telemetry activity as follows: transmit, receive carrier, and valid data.

d) In the event of a telemetry failure, the controller shall revert to the non-interconnected coordination mode after it has self-synchronized for a number of cycles, which shall be selectable from 1-254. If the number of cycles is set to 255, the controller will self-synchronize until a synchronizations pulse is detected.

15.3 Communications Protocols

a) The controller shall have the capability of supporting communications with traffic management systems using industry standard protocols with the installation of appropriate optional software.

b) At a minimum the controller shall have optional software to support the following protocol: NTCIP Level 2 as defined by Section 3.3.6 of NEMA TS2- 2003. NTCIP v02.06 capabilities shall include all NTCIP mandatory and optional objects.

c) The controller vendor shall provide access to all controller data via vendor specific objects. These and all other objects supported by the controller shall be defined in a standard MIB file.

15.4 Ethernet Communications

a) The controller shall have the capability of supporting Ethernet communications, using TCP/IP communications protocols.

b) This communications protocol shall utilize the controller’s built-in switches and shall not require Ethernet-to-Serial converters.

15.5 External Clock

a) The controller shall have the capability of communicating with an external clock like a GPS or WWV clock for setting its internal time of day clock.

b) The controller shall include a time reset input. This feature shall reset the TOD clock to 03:30 whenever the time reset input from the GPS of WWV clock is TRUE.

16. Diagnostics

16.1 General Diagnostics Features

a) The controller shall include both automatic and operator-initiated diagnostics. This capability shall be a standard feature and shall not require additional modules or software.

b) Automatic diagnostics shall verify memory and microprocessor operation each time power is reapplied to the controller. After power has been applied, diagnostics shall continually verify the operation of essential elements of the controller including at a minimum communications.

16.2 Detector Diagnostics

a) TOD controlled detectors diagnostics shall be provided that allow testing vehicle and pedestrian detectors for no activity, maximum presence, and erratic output.

b) A minimum of four detector diagnostic plans shall be provided. These plans shall be selectable on a TOD basis. This shall allow varying the detector diagnostic intervals to correspond with changes in detector activity.

c) If a detector is diagnosed as failed, the associated phase shall be placed in one of the following keyboard selectable modes:

I. Detector fail recall from 1 to 255 seconds

II. Disable the detector from calling or extending.

d) Diagnostics for NEMA TS2 detectors connected to the controller using a Bus Interface Unit (BIU) shall also include detection of watchdog, open and shorted loop, and excessive inductance change failures.

17. Logging

The controller shall be capable of logging and reporting detector activity, detector failures, and the occurrence of selected events or alarms. Logs shall be capable of being printed or displayed on the front of the controller.

17.1 Detector Logging

a) The controller shall include a detector log buffer capable of logging volume, occupancy and average speed for selected vehicle and speed detectors.

b) The detector-logging interval shall be keyboard selectable as 5, 15, 30, or 60 minutes.

c) Detector logging shall be capable of being enabled or disabled by TOD.

d) TSP offset reference – TSP shall support Lead, Lag, Yield, and Yellow references (new 10.4).

17.2 Detector Failure Logging

a) The controller shall include a detector failure log buffer capable of storing a minimum of 100 time and date-stamped detector failure events. Once logged, detector failure events shall remain in the log until cleared or the log buffer capacity is exceeded at which time the oldest detector failure events shall be overwritten.

b) All detector diagnostic failures shall be recorded in the detector failure log including: no activity, maximum presence, erratic output, watchdog failure, open loop, shorted loop, and excessive inductance change. If a detector recovers after a diagnostic failure, a detector on-line event shall be stored in the detector failure log.

c) Detector failure logging shall be capable of being disabled.

17.3 Event Logging

a) The controller shall include an event log buffer capable of storing a minimum of 200 time and date-stamped events or alarms. Once logged, events shall remain in the buffer until cleared or the log buffer capacity is exceeded at which time the oldest events shall be overwritten.

b) At a minimum the following events shall be logged: communication failures, coordination faults, MMU and local flash status, preempt, preempt gate down, power ON/OFF, low battery, and status of a minimum of two alarm inputs. An on-line event shall be logged when an event or alarm returns to normal status.

c) If security is enabled, an event shall be logged when a user enters a data change. This event shall include the user's ID. It is necessary to log the first change only and not every change. Also an entry shall be recorded when a user logs in and out of the controller.

d) Event logging shall be capable of being enabled or disabled for each category of event or alarm.

17.4 SD Card

a) An SD card shall optionally be used as:

A storage and back-up device, shall store configuration logs, and shall provide automatic backup configurations.

Enabler for special feature licenses

b) High resolution data collection

The controller shall store vehicle and pedestrian detector data, phase color indications, pattern changes, and preemption events 10 times per second. These logs shall be available for upload to calculation MOEs.

18. Optional Software Modules

The optional software modules shall not be considered as base features of the controller. These features shall be enabled through a special function data key, which when inserted in the controller shall unlock the software features and allow the controller to activate the functionality.

Central Traffic Management Software

The controller shall provide an interface to the Central Traffic Management Software (equivalent to Centracs Adaptive control software). The controller shall provide both NTCIP and Adaptive objects to provide detector and phase data. The controller shall accept new splits and offsets from the Central Traffic Management Software.

19.Cabinet.

A. Scope. This section defines the minimum acceptable requirements for a series of cabinets that differ in size, to house the CU and related devices. Provide the base mounted size M36 cabinet unless the plans indicate otherwise.

B. Outline Dimensions. Ensure outline dimensions are as shown in Table 1. These dimensions are outside dimensions exclusive of hinges, handles, overhang(s), vent housing and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. The combined overhangs of the four sides of the cabinet must not exceed 4 inches.

TABLE 1: Minimum Outline Dimensions

Size	Height (Inches)	Width (Inches)	Depth (Inches)
M30	51	30	16
M36	51	36	16
M36-ITS	62	36	16
P44	56	44	25.5

C. Cabinet types and mountings.

(a) Pole Mounted (M30 or M36 or M36-ITS). All pole mounted cabinets, unless otherwise indicated shall be M36 type. Cabinets intended for side of pole mounting must be provided with any necessary adapter, exclusive of steel banding, to permit mounting to a 4-1/2 inch or larger diameter pole. The adapter must accommodate lag bolts up to 3/8 inch and steel banding up to 1 inch wide. Mounting points must be provided at or near the top and bottom of the cabinet. The adapter must have provisions for two holes spaced horizontally, which will have a center-to-center distance of 3-1/2 inches. Cabinets must be furnished without conduit holes. In addition, the cabinet must be provided with a removable bottom to enable it to be pole or base mounted.

(b) Base Mounted (M36 or M36-ITS). All base mounted cabinets shall be M36 type unless otherwise indicated. Both M36 and M36-ITS cabinets shall be constructed for mounting on a 24 inch by 42 inch foundation. Anchor bolt mounting provisions must be dimensioned for two bolts on 18 inch centers (side to side).

(c) Base Mounted (P44). The P44 cabinet must be so constructed that it can be mounted on a 30 inch by 48 inch foundation. Anchor bolt mounting provisions for four bolts on 40-3/4 inch centers (side-to-side) on 18-1/2 inch centers (front-to-back). One Base Adaptor that is 15 inches in height with the same dimensions and bolt pattern as the cabinet must be included. Provide eight nuts and eight washers with each P44 cabinet.

(d) Anchor Bolts. Anchor bolts for base mounted cabinets must be ¾ inch diameter by 42 inches long which includes a 90 degree bend with a 3 inch leg. The end opposite the leg must be threaded for at least 3 inches with a ¾-10 UNC thread. Anchor bolts must be steel with a hot-dipped galvanized or zinc plated surface.

D. Materials. The traffic control cabinet must be constructed of aluminum alloy. The aluminum material must be a minimum of 1/8 inch alloy sheet, ASTM B 209, 5052-H32 or equivalent.

E. Finish and Surface Preparation.

(a) Painted Cabinets.

(i) The surface of the cabinet must be suitably prepared prior to painting, to avoid paint peeling.

(ii) Interior surfaces must be painted white.

(iii) The exterior of the controller cabinet and all mounting attachments shall be finished with a durable and weather-resistant protective coating having a total dry film thickness of not less than 1.5 mils. The final coat must be grey in color, must give complete hiding, and must have a minimum 0.75 mil thickness.

(iv) If the painted surface is scratched or damaged, the affected area must be repainted.

F. Top Surface Construction. The cabinet must be manufactured so as to prevent the accumulation of water on its top surface.

G. Doors.

(a) Main Cabinet Door. The cabinet must have a main door which permits access to all equipment within the cabinet. Doors must be hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. They shall have a handle made of one piece construction and swing away from the locking mechanism.

(b) Hinges. All cabinet doors must incorporate a piano type hinge utilizing stainless steel hinge pins.

(c) Door Stop. The cabinet door must be provided with a door stop which holds the door open at 90 degrees and 180 degrees (+/- 20 degrees) at a minimum.

(d) Latches and Locking Mechanism.

(i) All cabinets shall incorporate a main door lock, Corbin No. 15481RS or Pelco (Type II) SM-1025 or equivalent, constructed of nonferrous or stainless materials, which must operate with a Traffic Industry conventional #2 key, Corbin No. 1R6380 or Pelco (Type II) SM-0198-2 or equivalent. A minimum of two keys must be included for the main door of each cabinet.

(ii) The cabinet door shall be provided with a three-point latch. The top and bottom must have rollers to secure the door in a closed position.

(iii) When in the locked position, the lock must prevent the movement of the three-point latching mechanism.

(iv) The cabinets shall be provided with a means of externally padlocking the latching mechanism. A minimum of 3/8 inch diameter lock shackle must be accommodated.

(e) Door Opening. The main door opening of all cabinets must be at least 80 percent of the area of the side which the door secures, exclusive of the area of plenums.

(f) Non-metallic Doors. All cabinet door shall be metallic, unless it is specified in plan sheet or directed by Engineer. Doors for the M30, M36, M36ITS and P44 shall be vacuum formed from grey ultraviolet inhibited 3/8 inch GPX 3800 Acrylonitrile Butadiene Styrene (ABS) plastic. Exterior surfaces of the door shall be laminated during the extrusion process with a 0.010 inch minimum thickness Pearl Gray Korad acrylic film for additional protection against ultraviolet degradation.

The doors shall have vacuum formed louvers for the cabinet ventilation system. The interior panel shall be vacuum formed from 1/4 inch GPX 3800 grey ABS plastic and molded with ribs for rigidity and stability of the door and be provided with channels opposite the louvers for holding the cabinet's air filter. The door shall have a 3/8 inch wide door flange around the perimeter of the door that will properly fit the cabinet and gasket to provide a moisture proof seal.

The exterior of the door shall have a hair cell pattern with an overlay of the grey Korad. The interior and inside panel must have a smooth finish without the overlay of grey Korad. All fasteners must be stainless steel. A heavy gauge continuous hinge shall have a 3/16 inch non-removable pin and attached to the cabinet with carriage bolts for vandal resistance. The door stop shall accommodate the standard cabinet door stop rod in the cabinet.

H. Shelves. All cabinets must be provided at least two shelves for supporting the control equipment. The M36-ITS style cabinet shall have at least three shelves. The shelves must be at least 10 inches in depth. The bottom shelf shall have an integral pull out covered drawer that fully extends from underneath the shelf. The drawer shall be at least 1" in height and have a non-stick surface for holding equipment while extended.

All cabinets must have a provision for positioning shelves to within 12 inches of the bottom of the cabinet and to within 6 inches of the top of the cabinet in increments not more than 1/2 inch.

I. Cabinet Risers. The M36 (when specified as base mount), M36-ITS and the P44 must be provided with a 15 inch high cabinet riser. The riser must match the mounting base of the cabinet and be provided with anchor bolt holes on the top and bottom of the risers. The risers must come in two parts for ease of assembly.

J. Ventilation System. All cabinets shall incorporate a ventilation system to provide external air circulation through the enclosure to remove excess heat, fumes or vapors. When forced ventilation is required: each cabinet must be equipped with an electric fan with a capacity of at least 100 cubic feet of air per minute.

(i) Fan. The fan must be installed so that it operates in the filtered incoming air stream so as not to create a negative pressure within the cabinet relative to its outside environment. All fans must be equipped with a guard which inhibits a user from making contact with the blades of the fan.

(ii) Fan Controls. All cabinets equipped with a fan shall have a device to control fan operation. The device switch-on point must be manually adjustable with a range of at least 80 degrees F to 120 degrees F.

(iii) The device must have a differential between its switch-on point and its switch-off point. This differential must not be greater than 25 degrees F. The device must be located in the inside of the top of the cabinet not lower than 6 inches from the top of the cabinet.

(iv) Filter. The cabinet must be equipped with a device to filter the incoming air. The cabinets must be provided with louvered vents in the main door with a replaceable air filter having a width of 16 inches, a height of 12 inches, and a thickness of 1 inch.

20.Power Supply.

The complete unit, including all accessories, shall be designed for operation on a 240 V, 60 Hz, single phase ungrounded AC supply. The equipment shall operate satisfactorily through a voltage range of 15 percent above and below the nominal 240 V rating with no adverse effects on expected life or increased maintenance requirements. The complete unit will be supplied power through an auxiliary step down transformer.

A. Service Disconnect

All new traffic signal installations shall have a service disconnect installed. The service disconnect shall be installed on a mast arm standard, strain pole or wood pole in close proximity to the traffic controller or as specified in plans. The service disconnect shall be mounted at least 12 feet off of the ground.

B. Step Down Transformer.

If required, A specialty dry type transformer shall be provided with each controller cabinet assembly. The transformer shall be a single phase, two winding, 60 Hz, 176 degrees F rise above 104 degrees F ambient, 240-120 volt, with full capacity low voltage taps as follows:

240 V – 120 V
228 V – 120 V
216 V – 120 V
204 V – 120 V

192 V – 120 V
180 V – 120 V

The transformer shall have a 2 KVA rating.

(a) Special Requirements:

(i) The transformer shall conform to all applicable provisions of A.N.S.I. C89.1 or NEMA ST 20 or UL 506 and be preferably UL or CSA listed under specialty transformers.

(ii) The transformer shall be of weatherproof construction suitable for outdoor application and shall be furnished with a junction box or have suitable space for making both primary and secondary connections.

(iii) The design of the transformer shall be such that it can be mounted inside or outside of traffic signal controllers in use on the City of Detroit Traffic Engineering Division, Department of Public Works system. The maximum dimensions will be as shown in table below:

Length = 11 inches Width = 6-1/2 inches Height = 8-1/2 inches

(iv) The insulation shall be at least Class B.

(v) The transformer shall have the following electrical characteristics:

MAX LOSSES IN WATTS		MAX PERCENT REGULATION		PERCENT EFFICIENCY				
		100%	80%	FULL				PERCENT
CORE	TOTAL	PF	PF	LOAD	¾ L	½ L	¼ L	IMPEDANCE
24	82	3.0	3.1	96	96	96	95	3.1

(vi) Tolerances for the above values shall be as specified in the applicable standard to which the transformer conforms. Tolerances not given shall be 7% maximum.

(vii) The transformer leads shall be at least 5 inches in length or there shall be provided a pressure type terminal block for making primary and secondary connections. The leads, in either case, shall be sufficient size to carry 125% of transformer capacity and in no case shall be smaller than 10 AWG for primary and 8 AWG for secondary. Leads shall be marked in accordance with the Standard.

(viii) The transformer nameplate shall include a connection diagram in addition to the information required by the Standard.

(ix) The exterior of the transformer shall be finished with one coat of a high quality primer and 2 coats of light grey enamel.

(b) Transformer Installation.

(i) The transformer shall be mounted outside of the traffic signal controller cabinet just below the service disconnect with a minimum 10 feet of clearance to grade. The service disconnect and transformer shall be located

on the nearest mast arm standard, strain pole or wood pole that serves as incoming utility connection point.

(ii) The transformer primary shall be connected so that the secondary voltage, under load, shall fall within the range of 115 Vac to 120 Vac.

(iii) Connection to both transformer secondary leads and the H-1 primary lead shall be made with crimp type connectors. The secondary primary lead connection shall be made with a split-bolt type connector to facilitate future adjustment of taps. All splices and the ends of unused taps shall be insulated.

C. Power Conditioner.

A power conditioner shall be integral to the terminal facilities. The power conditioner shall provide a constant, fully isolated, 120 Vac, 60 Hz supply as the input voltage varies from 85 to 155 Vac and 40 to 70 Hz. The power conditioner shall have a continuous capacity of at least 1000 VA and a battery backup providing at least 3 minutes of run time under full load. The backup batteries shall be changeable without removing the traffic signal from operation. The unit shall be rated for operation in a temperature range of -40 to 165 degrees F and a humidity range 0 to 95 percent on-condensing.

Only the traffic signal equipment is required to be connected to the power conditioner. Auxiliaries such as the convenience outlet and cabinet lighting as well as case signs are not required to be connected to the power conditioner.

21.Terminal Facility.

A. Scope. This section defines the minimum acceptable requirements for terminal facilities to interconnect the related devices within a traffic control cabinet.

B. Mechanical Construction. The terminal facility must conform to the following mechanical requirements.

(a) Terminal Identification. All terminals must be permanently identified in accordance with the cabinet wiring diagram. Where through-panel terminal blocks are used, both sides of the panel must have the terminals properly identified with the terminal position number.

Identification must be permanently attached and close as possible to the terminal strip and must not be affixed to any part which is easily removable from the terminal block panel.

Each input or output terminated on a terminal block must be identified on the front of the panel by position number and function terminology (e.g., Ph 1 Red, Ph 2 Hold, etc.). The same identification must be used consistently on the cabinet wiring diagram.

(b) Component Identification. Ail components which make up the basic terminal facility must be permanently identified in accordance with the cabinet wiring

diagram. The following components are considered part of the basic terminal facility:

(i) Load Switch Sockets.

(ii) Flash Transfer Relay Sockets.

(iii) Flasher Socket.

(iv) Main and Auxiliary Circuit Breakers.

(v) Radio Interference Suppressor and Surge Protector.

(vi) Solid State Signal Power Relay.

(vii) Power Terminal Bus Bars.

Where through-panel components are used, both sides of the panel must have the components properly identified by relative symbols (e.g., FR1, LSI, etc.).

Identification must be permanently attached and as close to the component as possible and must not be affixed to any part which is easily removable from the panel.

Each component must be identified on the front of the panel by symbol and function terminology (e.g., LF1 Filter, BRI Signal Bus, etc.).

(c) Load Switch and Flasher Support. Load switch and flasher bases must be so designed and constructed as to receive all such devices which may be manufactured to the maximum size requirements permitted under the NEMA Standards Publication.

All support(s) must be provided so that, as a minimum: it is supporting the flasher and load switch of the maximum size at some point(s) between 3 inches and 7 inches from the panel.

At least 90 percent of the area beneath the load switch or flasher must be open to allow for the free flow of air across the load switches or flasher. There must be no obstruction within 1 inch above or below the units within the open area.

(d) Load Switch, Flasher and Flasher Transfer Positions. Wired load switch, flasher, and flash transfer relay sockets must be provided in the quantities listed below:

TABLE 2: Load Switch, Flasher and
Flash Transfer Socket Relay Quantities

Configuration	Load Switch	Flasher	Flash Transfer
A2	8	1	4
A5	12	1	6
A16	16	1	6

The flasher socket must be wired for a Type 3 solid state flasher conforming to Section 8 of NEMA Standards Publication. Flashing of even numbered load switch output indications must be placed on one circuit and flashing for odd numbered load switch output indications must be placed on the other circuit. It must be possible to flash either the amber or red indication on any load switch outputs. It must be possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or re-solder connections.

The load switch sockets must be wired for triple-signal load switches conforming to Section 5 of NEMA Standards Publication TS 2 for Type 2 CUs. All load switch driver outputs coming out of the CU must be on separate terminal points from the respective inputs to the load switches. These separate termination points must be bussed for normal operation. All load switch outputs must be on separate points from the respective inputs to the malfunction management unit (MMU) inputs. These separate points must be bussed for normal operation. The above is to allow the pedestrian load switch position to function as a vehicle position or vice versa and to allow isolation for trouble-shooting purposes.

Load switch sockets for the A2 configuration must be oriented in a single row of eight. Socket positions one thru four must be for vehicle phase one thru four respectively. Socket positions five thru eight must be for pedestrian phase one thru four respectively.

Load switch sockets for the A5 configuration must be oriented in a single row of 12. Socket positions one thru eight must be for vehicle phase one thru eight respectively. Socket positions 9 thru 12 must be for pedestrian phase 2, 4, 6, and 8 respectively.

Load switch sockets for the A16 configuration must be oriented in two rows of eight positions each. The top row must be socket positions one thru eight and must be for phase one thru eight vehicle respectively. The lower row must include socket positions 9, 10, 11, and 12 for overlaps A thru D, respectively, and must each be located below socket positions 1, 3, 5, and 7 respectively. Socket positions 13, 14, 15, and 16 in the lower row must be below and to the right of socket position 8, and must be for pedestrian phases 2, 4, 6, and 8 respectively.

(e) Terminal Blocks. Terminal blocks must have mechanical characteristics to properly support the wiring connected without warping the terminal block. All materials including screws and threaded portions used in terminals and terminal blocks must be stainless steel.

(i) Field Terminal Blocks. Field terminal blocks for all inputs and outputs for a fully expanded CU must be included. These blocks must be either single terminal type with through-panel connection on the rear side of the mounting panel or double binder head screw terminals. Either type of terminal block used must be of the correct ampacity for the application. Minimum acceptable ratings are 30 amperes, 300 V, with 10 - 32 binder head screws.

(ii) Control Terminal Blocks. Control terminal blocks for inputs and outputs of the CU, MMU, flash transfer relays, load switches, etc., must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either type of terminal block used must be of the correct ampacity for the application. Minimum acceptable ratings are 15 amperes, 250V, with 6-32 x 1/4 inch pan or binder screws.

The control terminal block wiring must provide groupings of functions based on probable interconnect (bussing) for normal operation rather than based on the source of the wiring (e.g., CU, MMU, etc.). The above is to allow for easy reprogramming or isolation for trouble shooting purposes.

(iii) Detector Terminal Blocks. Detector terminal blocks for loop and push button inputs must be included. These blocks must be either single terminal type with through-panel connections or double binder head screw terminals. Either terminal block must be of the correct ampacity for the application. Minimum acceptable ratings are 20 amps, 250 V with 8 - 32 pan or binder screws.

(f) Controller Unit and Malfunction Management Unit Harnesses. The CU and MMU harnesses must be neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel which must be mounted directly below the CU shelf. The harness connectors must not have any sharp edges and the stress relief attachment screws must not extend greater than 1/4 inch beyond the stress relief.

Terminal positions must be provided, completely wired and neatly arranged, providing access to all inputs and outputs listed in the CU specification. As a minimum, all NEMA Standards Publication functions of the CU for the configuration selected must be terminated except those designated by NEMA as spares, reserved, no connection, and manufacturer's use need not be installed in the harness.

Terminal positions must be provided, completely wired and neatly arranged, providing access to inputs and outputs in the MMU. All MMU input must be terminated. Provisions must be made to terminate any unused red monitoring inputs. Type select and port one disable inputs must be terminated.

The MMU harness must be configured for a 16 channel MMU operating in the type 12 mode. The MMU harness must be configured as follows:

TABLE 3: MMU Harness Configuration

Configuration	Load Switch	MMU
A2	8	12 Channel
A5	12	12 Channel
A16	16	12 Channel

(g) Power Distribution. The following equipment must be supplied as part of the power distribution panel:

(i) Main Circuit Breaker.

(ii) Three Auxiliary Circuit Breakers.

(iii) Solid State Signal Power Relay.

(iv) Primary and Secondary Surge Protector.

(v) AC-Common Bus Bar.

(vi) Safety Ground Bus Bar.

(vii) AC+ Power (Filtered) Bus Bar.

(viii) AC+ Power (Unfiltered) Bus Bar.

(h) Practices. The basic facility must be so designed and constructed as to be made of a minimum number of separate assemblies to reduce maintenance and handling time for knockdown and retrofit applications.

C. Electrical Requirements. The terminal facility must conform to the following electrical requirements:

(a) Power Distribution. The terminal facility must operate properly when supplied with single-phase AC power (95-135V, 57-63 Hz). All breakers and grounding devices must be wired in accordance with the NEC and the Michigan Electrical Code.

(i) Circuit Breakers. Provisions must be made for mounting and wiring up to seven circuit breakers in the terminal facility. A quantity of four circuit breakers must be provided with ampacities as noted below:

TABLE 4: Circuit Breaker Ampacity

Configuration	Main	Signal	Case Sign	Misc
A2	30	20	20	20
A5	30	20	20	20
A16	30	20	20	20

The main circuit breaker must be so wired to protect the entire facility and must be identified as the Main breaker. The Signal breaker must be fed by the load side of the solid state bus relay and must provide power to the vehicle and pedestrian load switches. The Case Sign breaker must be available to powering auxiliary devices such as illuminated signs. The Miscellaneous breaker must have the cabinet fan, lights, heater and shelf mounted duplex receptacle connected to its load side. The circuit breakers must be capable of manual operation with markings to indicate rating and whether it is in the open or dosed position. Square D series QOB circuit breakers must be used and mounted on QON3B triple position breaker

blocks. Breakers shall be of a bolt-on type to reduce the risk of a breaker being knocked loose.

A four pole fuse holder with screw terminals for connecting individual illuminated sign loads must be provided and wired to the load side of Case Sign breaker.

(ii) Cabinet Surge Protection. The power panel must have devices to provide both primary and secondary surge protection devices. All cabinet surge protection devices must be terminated to a single terminal block for ease of replacement.

The primary surge protection device (SPD) must be connected to the load side of the main circuit breaker. The primary SPD must be connected in parallel to the load and have a surge capacity of 120 kA per phase or greater. The let through voltage measured 6 inches outside the unit must not exceed 580V = 3kA 8/20 u/s pulse and 800V = 10kA 8/20 u/s pulse. Modes protected must be Line to Ground, Line to Neutral, Line to Line and Neutral to Ground. The SPD must provide Green LED indications that protection is operational and Red LED indications that a fault has occurred. In addition, an audible alarm must sound indicating a fault has occurred. There must be a set of normally open and normally closed contacts available for remote monitoring of the SPD. The SPD must be no larger than 5 inches W x 3 inches H x 4.93 inches D. The SPD must be mounted on the lower right hand side of the cabinet and easily accessible for replacement.

The secondary SPD must be connected to the load side of the main circuit breaker and its output will be used to supply AC power to the CU, MMU and cabinet electronics power strip. The surge current capacity must be 50 kA or greater, with the unit connected in series to the load. The secondary SPD must be a 5 stage hybrid design with integrated filter with series load current of 12 amps. The let through voltage measured 6 inches outside the unit must not exceed 260 V = 2kA 8/20 u/s pulse and 300 V = 3kA 8/20 u/s pulse. Modes protected must be Line to Ground, Line to Neutral, and Neutral to Ground.

A gas tube device must be installed on the load side of the main circuit breaker. It must be possible to replace this device without interrupting power to the rest of the terminal facility.

(iii) Solid State Signal Power Relay. The terminal facility must include a SPST-NO signal power relay wired to provide power from the main circuit breaker and RFI filter to the AC signal power bus bar and load switches. The solid state relay must be energized to provide power to the signal bus and have ampacity of 75 amps. It must provide zero voltage switching from 47 - 63Hz. The Signal Power Relay must be mounted on a panel on the lower right side of the controller cabinet and easily accessible for replacement.

(iv) AC-Common Bus Bar. The AC-common (Neutral) must be terminated on a solid metallic multi-terminal bus bar that will accept 4-16 AWG copper

conductors. This bus bar must be insulated from the cabinet. Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires AC-common connection. A quantity of one conductor only must be allowed in each termination position. A minimum of 24 open termination positions must be available for field wiring common return connections.

(v) Safety Ground Bus Bar. The safety (Earth/Chassis) ground must be terminated on a solid metallic multi-terminal bus bar that will accept 4 to 16 AWG copper conductors. This bus bar must be connected to the cabinet. A quantity of one conductor only must be allowed in each termination position. A minimum of 24 open termination positions must be available for field wiring ground connections.

Separate wires must be run from this bus bar to each unit or group of similar units in the terminal facility which requires safety ground connection.

(b) Conductors. All conductors used in the terminal facility wiring must be 22 AWG, or larger, with a minimum of 19 strands. Conductors terminated on the AC-Common Bus Bar and Safety Ground Bus bar must be tinned and a minimum size of 16 AWG. Conductors must conform to Military Specification MIL-W-16878, Type B or D. The insulation must have a minimum thickness of 10 mils and must be nylon jacketed polyvinyl chloride or must be irradiated cross-link polyvinyl chloride. Conductors 8 AWG must be UL Type THHN.

All conductors used in the terminal facility wiring must conform to the following color-code requirements:

(i) The AC-common conductor of a circuit must be identified by a continuous white color.

(ii) The safety (Earth/Chassis) ground conductor of a circuit must be identified by a continuous green color or a continuous white color with one or more green stripes.

(iii) The AC+ power conductor of a circuit must be identified by a continuous black color.

(iv) The low level DC (+24 V or less) conductor of a circuit must be identified by a continuous blue color.

(v) Other conductors, not conforming to one of the above, must be identified by any continuous color not defined above.

(c) Wiring (Power Distribution within the Facility). All terminal facility wiring must be neat, firm and routed, where practical, to minimize crosstalk and electrical interference. Printed circuit boards may not be used to eliminate or reduce facility wiring.

All terminal facility conductors must be sufficiently sized to carry the maximum current of the circuit(s) they are provided for. They must be sized based on the ampacity ratings as follows:

TABLE 5: Terminal Facility Conductor Size

AWG Size	Ampacity Rating
22	5
16	10
14	15
12	20
10	30
8	50
6	70

The ampacity ratings are calculated based on the current required to raise the temperature of a single insulated conductor in free air (86 degrees F ambient) to the limit of the insulation and applying a bundle de-rating factor of 0.5 for wires 22 AWG through 10 AWG and a de-rating factor of 0.7 for wires 8 AWG and 6 AWG.

The conductor feeding power from the main circuit breaker to the auxiliary breakers, solid state signal power relay, primary and secondary SPD terminal blocks, and AC+ signal power bus bar must have an ampacity of 40 amps.

The conductor feeding power to the flasher socket must have, as a minimum, an ampacity of 30 amperes.

The conductor feeding power from the AC+ signal power bus bar to each load switch socket must have an ampacity of 10 amperes and must be capable of being easily programmed to supply the load switch from another point or interrupt AC signal power to an individual load switch for special applications.

The conductors feeding power from the load switch to the field signal terminals must have an ampacity of 10 amperes.

The conductors feeding power from the flasher socket to the flash transfer relay sockets, which feed flashing power to same, must have an ampacity of 15 amperes. The remaining wires to and from the flash transfer relay socket, which are in the circuit between the load switch socket and the field signal terminals, are covered in the previous paragraph.

(d) Control Circuits.

(i) Flash Transfer Control. The flash transfer relay socket control circuit must be connected to provide flashing operation when the MMU or optional auxiliary equipment calls for flash (e.g., maintenance panel flash switch). The flash transfer control must also conform to the following:

The flash transfer relay socket must be wired so the coil of the relay(s) must be de-energized for flashing operation. The flash transfer relay sockets must be located in close proximity to the load switches, flasher and field signal terminals.

(ii) Malfunction Management Unit Control. The MMU must be wired so as to provide flashing operation when the fault relay de-energizes or if the MMU is disconnected. It must also provide “Stop Time” to the CU when the fault relay de-energized. The MMU must be wired so as to provide an “External Start” signal to the CU upon the application of AC power to the MMU following a power interruption or upon initial turn-on.

(iii) Detector Rack. All cabinets must include a 20 channel detector rack that meets NEMA TS2-2003 Section 5 specifications. The detector rack must accommodate 16 channels of vehicle detection and an additional 4 channels of pedestrian detection push button isolation. All cabinets must include one buss interface unit (BIU) that meets the requirements of Section 8 of the NEMA TS2-2003 Specification. The BIU must be located in the first (furthest to the left) slot in the detector rack. The 16 channels of vehicle detection must be located immediately to the right of the BIU. The four channels of pedestrian detection must be located in the last (furthest to the right) slot positions. Each terminal facility must include one 6 foot Port 1 communications cable to connect from the detector rack BIU to the CU. Each cabinet must include one power supply for the detector rack that meets the NEMA TS2-2003 specification for power supplies.

D. Field Wire Terminal Locations. The terminal facility must provide Field Wire Terminals located to conform to the following requirements:

(a) AC Service Hookup. Incoming AC power service must terminate on the right side of the cabinet on the power distribution panel. The incoming AC power service must terminate in compression fittings capable of accepting a 4 AWG or 6 AWG conductors for AC+ and AC- and accepting an 8 AWG conductor for safety (Earth/Chassis) ground. The AC+ line must terminate directly to the main circuit breaker. The AC- and safety ground lines must terminate directly to their respective bus bars. This service hookup must meet the NEC and the applicable local electric codes.

(b) Signal Hookup. Signal wires must terminate on terminal blocks on the back of the cabinet at least 3 inches but not over 6 inches from the bottom of the cabinet. The field terminal block for signal circuits must be located a minimum of 4 inches below the load switches and must be angled up 30 to 45 degrees from vertical for ease of access. Signal terminals must be directly accessible from the front of the cabinet. One terminal must be provided for each load switch output. Each field terminal must include a SLU M-35 or equivalent pressure connector that will allow multiple field conductors to be attached to a single output terminal. It must be possible to terminate a minimum of sixteen (16) 14 AWG or five (5) 10 AWG neutral leads on the signal common bus.

(c) Detector Panel. Vehicle loop and pedestrian pushbutton inputs must terminate on terminal blocks on the left side of the cabinet at least 3 inches from the bottom of the cabinet. A minimum of two terminals must be provided for each of the 8 vehicle detectors and 4 pedestrian detectors. The terminal block must meet the specifications of the detector terminal blocks. The detector panel must be wired complete to the detector rack providing 20 channels total and is to include the power supply.

E. Auxiliary Equipment.

(a) Maintenance Panel

The terminal facility must include provisions for the following equipment on a panel mounted between equipment shelves and readily accessible when the door is opened.

(i) Signal On-Off Switch. A signal on-off switch must be included, installed and wired.

The switch and wiring must energize or de-energize the solid state signal power relay. AC signal power must not be routed through this switch. The switch must be labeled “Signal-Off”. When in the “Off” position, all signal field terminals must be de-energized and the Red Enable input to the MMU must be inactive.

(ii) Flash-Normal Switch. A flash-normal switch must be included.

When in the Flash position, the flash transfer relays and solid state signal power relay must be de-energized resulting in the flash program being displayed to traffic. Neither AC signal power nor flashing power must be routed through this switch. The switch must be labeled “Flash-Normal”.

Operation of the signal-off switch must override this switch. That is, when in the “Off” position, the signal-off switch prevents flashing operation as called for by all flash control circuits.

(iii) Stop Time Switch. A stop time switch must be provided. The switch and wiring must provide three modes of operation which are:

i. Normal. “Stop time” to the CU must be provided by the MMU as required.

ii. Run. “Stop time” is prevented from being applied to the CU from other devices.

iii. Stop. “Stop time” is applied to the CU.

This switch must be labeled “Stop-Run-Normal”.

(iv) Convenience Duplex Receptacle. A duplex receptacle of a three-wire ground fault interrupter (GFI) type must be provided.

(b) Cabinet Lights

Two LED lighting panels with a switch must be installed in the cabinet. A door switch to activate the lights when the door is opened shall be provided. One lighting panel shall be installed above the top shelf and the second panel shall be mounted to the bottom of the lower shelf's storage drawer.

Each panel must provide at least 450 lumens of light and consume no more than 15 W of power.

The switches and lights must be wired to the Misc circuit breaker.

(c) Forced Air Heater

Each cabinet shall be provided with a forced air heater rated for at least 100 W.

The heater shall be controlled for operation due to temperature or humidity levels. The temperature control shall have an adjustable set point from 32 to 95 degrees F. The humidity control shall have an adjustable set point from 50 to 90 percent relative humidity.

The heater shall be mounted below the bottom shelf and offset from the cabinet walls. Care shall be taken to mount the heater clear of the field wiring.

(d) Outlet Strips

A multiple outlet strip must be installed on the upper right side of the cabinet. The outlet strip must be wired to the load side of the secondary SPD and is intended to power accessory cabinet electronic devices.

(e) Prints, Functional Data, and Parts List. The manufacturer must supply each of the following items with each cabinet:

(i) Two complete sets of schematic and wiring diagrams of the cabinet and terminal facilities.

(ii) Cabinet mounting diagram.

(iii) Complete parts list of cabinet and accessories.

Each of these items must apply directly to the cabinet with which it is supplied. One set is to be put in the installed cabinet, and one set is to be furnished to the City of Detroit Department of Public Works Traffic Engineering Division.

22. Accessories.

A. Scope. This section defines the minimum acceptable requirements for plug-in accessories for the traffic controller assembly within a traffic control cabinet.

B. Malfunction Management Unit. This section defines the minimum requirements for a shelf-mountable, 16 channel, MMU. The MMU must meet all applicable sections of the NEMA TS2-2003. Where differences occur, this specification must govern.

The following monitoring functions must be provided in addition to those required by the NEMA standard:

(a) Dual Indication Monitoring. The MMU must be capable of detecting simultaneous input combinations of active Green (or Walk), Yellow and Red inputs on the same channel. The channels enabled for Dual Indication monitoring must be user determined. Dual Indication monitor must be disabled when the Red Enable input is not active.

(b) Field Check Monitoring. When the field signal inputs states sensed by the MMU do not correspond with the data provided by the CU in the type #0 message for 10 consecutive messages, the MMU must enter the fault mode and indicate the Field Check Fail fault.

(c) Recurrent Pulse Monitoring. The MMU must detect Conflict, Red Fail, and Dual Indication faults that result from intermittent or flickering field signal inputs.

(d) When the MMU detects a conflict flash indication it must provide an output to the “D’ connector indicating an MMU/Conflict Flash Status input.

(e) The MMU must monitor an intersection with up to four approaches using the four section FYA movement outlined by the NCHRP Research Project 3-54 on protected/permissive signal displays with FYAs. The MMU must provide the same fault coverage for the FYA approaches as it does for conventional movements including Conflict, Red Fail, Dual Indications, and Minimum Clearance monitoring.

The MMU must provide alternate configuration options as follows:

(i) RYG Only Red Fail Option. This function excludes the Walk input from the Red Fail Fault algorithm when operating the Type 12 mode.

(ii) LED Signal Threshold Adjust This function must provide the capability to sense field inputs with an alternate set of voltage thresholds to better determine the state of LED signal indications. Conflict and Dual Indication thresholds for Green/Yellow/Red inputs are set for: No Detect is less than 15 Vrms and Detect is greater than 25 Vrms. Red Fail thresholds for green, yellow and red are set for No Detect is less than 50 Vrms, Detect is greater than 70 Vrms.

(iii) CVM Log Disable Option. The MMU must provide a means to disable the logging of CVM faults events.

(iv) A 4 line by 20 character LCD display must be provided to report MMU Status, time and date, and menu navigation. A separate Red, Yellow, Green LCD indicator, display must be provided for the input status of signal inputs. Individual icons must also be provided to indicate channels involved in a fault.

(v) A mode must be provided to display the RMS voltage of each field signal input and each cabinet control signal voltage, and the frequency of the AC Line, the ambient temperature measured at the MMU.

(vi) When the MMU is in the fault mode, a display screen must be provided to identify all field signal inputs with Field Check status, and all field signal inputs with Recurrent Pulse status.

(vii) Additional display functions include a configuration display of settings and all MMU configuration parameters; logs of Previous Fault, AC Line, and MMU reset logs; Clock set.

(viii) The program card supplied with the MMU must provide non-volatile memory that contains the configuration parameters for the enhanced features of the MMU, such that transferring the program card to a different MMU completely configures that MMU. The non-volatile memory device used on the program card must not utilize any input/output pins designated as “Reserved” by NEMA TS-2.

(ix) A minimum of five logs must be provided that graphically display all field signal states and Red Enable for up to 30 seconds prior to the current fault trigger event. The resolution of the display must be at least 50 milliseconds. These signal sequence logs must be accessible from the front panel RS-232 port with software available from the manufacture.

C. Flasher. A NEMA two-circuit, 15 Amp per circuit, flasher must be provided for installation in the cabinet. Each flashing circuit must contain zero-voltage switching, a 25 ampere power triac, a snubber and a light emitting diode across the AC circuitry, directly indicating the AC load that is activated. The flasher must conform to a Type 3 per Section 8 of the current NEMA Standards Publication. The flasher must be fabricated such that internal components are completely enclosed by the chassis.

D. Flash Transfer Relay. Flash transfer relays in the quantity of two each for the A2 configuration and six each for the A5 and A16 configurations must be provided for installation in the cabinet. The flash transfer relays must conform to the following requirements:

(a) Mechanical Requirements. The relay must be enclosed in a transparent plastic case which protects the relay from dust, moisture, and other contamination. The case must protect the user from contact with live parts and be sufficiently rugged to permit insertion and removal of the relay from its mating socket.

(b) Connector. The relay must mount on an eight-pin spade plus base and the socket and relay/base must be wired as follows:

Pin 1 - Coil	Pin 2 - Coil
Pin 3 - #1 Closed	Pin 4 - #2 Closed
Pin 5 - #1 Common	Pin 6 - #2 Common
Pin 7 - #1 Open	Pin 8 - #2 Open

(c) Contacts. The relay must be provided with four single-pole, double-throw (Form C) contact sets. Each contact must be rated to switch a 20 ampere tungsten load for a minimum of 30,000 operations. The contact material must minimize welding.

(d) Coil Rating. The relay coil must be rated for continuous duty from 95 to 135 Vac. This rating must be valid at 158 degrees F ambient temperature outside the relay case. The relay coil must measure less than 10 VA at 120 Vac. The relay must pick up by 95 Vac and drop out by 50 Vac, and make the transfer within 50 ms. The magnetic circuit in the relay must reverse concurrently with the 60 Hz AC input voltage.

E. Load Switches. Solid-state load switching assemblies must be used for opening and closing signal light circuits and must be jack-mounted external to the CU. Each load switch must provide three independent switching circuits. Each of the three circuits must contain a zero-voltage switching optical coupler electrically isolating the DC input circuitry from the AC output circuitry, a 25 ampere power triac and light emitting diode (LED) indicators on both the DC input circuitry and the AC output circuitry. Eight load switch assemblies (24 circuits) must be provided for the A2 configuration unit. Twelve load switch assemblies (36 circuits) must be provided for the A5 configuration unit. Sixteen load switch assemblies (48 circuits) must be provided for the A16 configuration unit

23. Packing and Marking. Except as otherwise specified in the request for quotation, each CU must be packed separately in such a manner that there will be no injury or defacement to the CU during transportation to the point of destination. Each carton must be legibly marked with the CU description, purchase order number, and vendor's name.

24. Patented Processes and Materials. The vendor must defend any and all patent infringement suits resulting from the use of any design, device, material or process, or portion or phase thereof, employed in the manufacture or use of this equipment in accordance with the department's plans and specifications, and he must save harmless and indemnify the department on account of any and all such suits or claims for royalties, damages, or costs.

25. Warranty. Provide materials with a manufacturer's warranty, transferable to the City of Detroit, that the supplied materials are free from all defects in materials and workmanship. Furnish the warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to acceptance.

k. Construction.

Complete this work in accordance with sections 819 and 820 of the MDOT Standard Specifications for Construction, as shown on the plans and as directed by the Engineer.

l. Measurement and Payment.

The completed work, as described, will be measured and paid for at the contract unit price, in accordance with the table below, using the following pay items:

Contract Item (Pay Item)	**Pay Unit**
Controller and Cabinet, Digital Type, Modified	Each
Controller and Cabinet, Digital Type, ITS	Each
Controller and Cabinet, Digital Type, Railroad	Each

The contract unit price each for **Controller and Cabinet, Digital Type, Modified** will be payment in full for furnishing and installing traffic signal controller unit, cabinet, and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision including all other materials, labor and equipment required to complete work. A power conditioner and/or battery backups is not required for **Controller and Cabinet, Digital Type, Modified".**

The contract unit price each for **Controller and Cabinet, Digital Type, ITS** will be payment in full for furnishing and installing traffic signal controller unit, cabinet, Power Conditioner and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision including all other materials, labor and equipment required to complete work.

The contract unit price each for **Controller and Cabinet, Digital Type, Railroad** will be payment in full for furnishing and installing traffic signal controller unit, cabinet, Power Conditioner with battery backups and accessories required to provide the traffic signal control operation as shown on the plans and in accordance with the MMUTCD and this special provision including all other materials, labor and equipment required to complete work.

CITY OF DETROIT

SPECIAL PROVISION
FOR
Video Capture, Streaming and Detection System

a. Description:

The work shall consist of complete furnishing, installation, configuration, integration and testing of an environmentally hardened, purpose built device and service coordination with City of Detroit to provide an end-to-end video capture system, video streaming, video detection and all other material, labor and equipment necessary to provide a complete and operating job as specified herein.

The device provides a permanently mounted IP video camera which can be used to generate imagery that will support remote video monitoring, actuating traffic signals via video detection, traffic video analytics. This work must be performed in accordance with the standard specifications as specified herein.

b. Materials:

1. General. Furnish, install, integrate and test all equipment and required components (hardware and software), including cables, power, and all components necessary to provide full and complete functionality in all respects, without additional expense to the City of Detroit.

All cellular data service for video streaming will be paid separately.

Use identical and completely interchangeable equipment at each field location based on the requirement at each field location.

2. Functional and Performance Requirements.

A. Hardware
    1. Camera
    2. Camera Mount
    3. Video Processing Unit
B. Video Detection
C. Traffic Analytics
D. Video Streaming
E. System Integration
    1. Communications Service
    2. Hardware Integration
    3. Software Integration
F. Software
    1. Server
    2. Remote Updates
    3. Detection Configuration and Monitoring
    4. User Interface
    5. Video Streaming and Recall

6. Detector Monitoring
7. Data Display and Download
8. Open Data Support

G. Hardware Testing and Certification
H. Installation
I. Technical Support
J. Intellectual Property
K. Industry References

3. Materials. Provide equipment that meets the following requirements.

A. Hardware

1. Camera:
   i. shall provide 360 degrees of visibility from the point of installation
   ii. shall be powered via Power over Ethernet (PoE) and be IEEE802.3af compliant
   iii. shall support configuration in both spherical "fisheye" configuration, and rectangular "quad view"
   iv. shall support at least 9 megapixel (MP) capture
   v. shall support ability to capture 4K video
   vi. Shall provide H.264 and MJPEG image compression
   vii. shall support RTSP streaming
   viii. shall support maximum aperture ratio of 1:1.9
   ix. shall support focal length of 1.38mm
   x. shall include a clear polycarbonate resin based dome
   xi. shall be rated to IP66 (NEMA 4X compliant)

2. Camera Mount:
   i. shall include all mounting hardware with device
   ii. mounting fixture shall be constructed of weatherproof painted aluminum
   iii. mounting hardware shall be fully assembled to camera and ready to attach to pole or extension arm
   iv. mounting hardware shall support vertical pole installation, horizontal pole installation, or attachment via a 1 ¼" threaded fitting
   v. mounting fixture shall not exceed 19" (483mm) x 14" (356mm) x 8" (204mm) in size, and 5.5lb (2.5kg) in weight
   vi. shall include 40 feet of shielded ethernet cable for connection to PoE power source and internet access
   vii. shall include two-way ethernet coupler rated to IP68 for connection to cabinet ethernet cable
   viii. shall provide 360 degrees of visibility from the point of installation

3. Video Processing Unit:
    i. shall support processing of up to two simultaneous feeds from Camera units
    ii. shall include a USB 2.0 device ports
    iii. shall include 4 x 10/100/1000 Ethernet ports
    iv. shall support PoE on 2 x of the above ports
    v. shall include onboard processing capabilities to perform video-based vehicle detection and generation of traffic analytics
    vi. shall provide 16 NEMA rated, GPIO ports that can be configured for detection actuation
    vii. shall support connection to the traffic controller's Port 1/SDLC bus for detection actuation

B. Video Detection
1. shall support a minimum of 16 detection channels
2. shall support the option of actuation via SDLC, direct wiring of GPIO, or through NEMA A/B/C cables
3. shall support real-time detection of vehicles in an unlimited number of configurable detection zones per camera
4. shall support detection of passenger vehicles, transit vehicles, and cyclists
5. shall support ability to maintain detection when view of a vehicle is temporarily occluded
6. shall support remote configuration of detection zones and system settings via Communications Service and Software
7. shall support output of a constant call on any detection channel if a loss of video signal occurs
8. shall allow zones to be configurable for presence, pulse, extend, and delay outputs
9. shall ensure not less than 98% detection accuracy in good weather conditions, and not less than 96% accuracy under weather conditions which reduce visibility (eg. moderate rain/ snow/fog)
10. shall support detection of unacceptable interference including interrupted video signal or low visibility conditions
11. shall default to a safe condition, such as minimum recall, fixed recall or a constant call on each active detection channel, in the event of unacceptable interference with the video signal or low visibility conditions
12. shall support directional detection zones to reduce false detections from objects traveling in other directions
13. shall support maintaining of multiple detection zone configurations which may be remotely selected and enabled at any time using Software

C. Traffic Analytics

1. shall support generation of on-demand Turning Movement Counts including classifications for Car, Single-Unit Truck, Motorcycle, Articulated Truck, Light-Goods Vehicle, Bus, and Bicycles on Road
2. shall support generation of on-demand Traffic Volume Counts including classifications for Car, Single-Unit Truck, Motorcycle, Articulated Truck, Light-Goods Vehicle, Bus, and Bicycles on Road
3. shall support generation of on-demand Cross-walk Traffic Counts including classifications for pedestrians and bicycles
4. shall support generation of on-demand vehicle gap studies
5. shall support 95% guaranteed accuracy on all above mentioned traffic studies
6. shall support export of traffic study data in the Universal Traffic Data Format (UTDF) for easy import into applications such as Synchro

D. Video Streaming
   1. shall support at least 2 simultaneous and parallel video streams
   2. shall be Onvif compliant

E. System Integration

   1. Communications Service
      i. Shall support integration to a traffic signal cabinet with 4G LTE Cellular Communications Service.
      ii. Shall provide real-time transmission of detector actuation data, video content, and traffic analytics via Communications Service to Software for display and analysis.

   2. Hardware Integration
      i. Shall be certified as compatible with existing and new Miovision Spectrum Smartlink and Miovision Spectrum Interface devices in traffic signal cabinet

   3. Software Integration
      i. Shall be certified and proven as compatible with web based Miovision Signals Software system currently in use
      ii. Shall provide a real-time integration into Miovision Signals which allows overlay of detection data onto signal telemetry data
      iii. Shall provide an integration into Miovision Signals of traffic study data and analytics

F. Software

   1. Server
      i. Software and data storage shall be hosted at a professional cloud hosting facility with redundancy of at least 2 instances,

with automatic load balancing and shall scale to support any simultaneous number of connections
   ii. shall support permanent storage of all detection data and traffic analytics in perpetuity

2. Remote Updates
   i. The device shall be capable of receiving remote updates via the Communications Service
   ii. The device shall include the ability to extend the functionality of Traffic Analytics and Vehicle Detection to include incident detection and traffic event alerts within the next 12 months

3. Detection Configuration and Monitoring
   i. shall provide a web browser based user interface for configuration of detection zones remotely
   ii. shall provide a web browser based user interface for monitoring of detection activity, wherein a detection zone is highlighted on the video overlay display to confirm vehicle detection when a vehicle is detected crossing a detection zone

4. User Interface
   i. shall provide a single user interface containing all Software functionality described herein
   ii. shall provide a secure web-based Graphical User Interface (GUI) using SSL
   iii. shall support an unlimited number of concurrent logins by authenticated users
   iv. shall be fully accessible via desktop, tablet, and mobile products on Chrome, Internet Explorer (Edge, 11.0) and Safari
   v. shall support user login via OAuth Login
   vi. shall provide a secure means of verifying account registration via email
   vii. shall provide a secure means of password reset
   viii. shall support the addition and management of user accounts for users that are both inside and outside of the organization at no additional cost
   ix. shall support access to all detection data, traffic analytics data, and Vehicle Identification Data stored on the Server

5. Video Streaming and Recall
   i. shall support live video streaming and video recall to modern desktop browsers without any third party plugins
   ii. shall support live video streaming and video recall on tablet browsers using the HLS protocol
   iii. shall support live video streaming with a latency of no more than 10 seconds at a frame rate of at least 15 fps

iv. shall support live video streaming with an initial load time of no more than 10 seconds
v. shall support at least 20 concurrent video streams from a single camera to be viewed in multiple browsers
vi. shall support at least 40 concurrent video streams from all cameras active in the system, to be viewed in multiple browsers

6. Detector Monitoring
   i. shall support live display of all detector actuations, with latency not to exceed 1 seconds when LTE connection is active
   ii. shall support historical display of all detector actuations on-demand with load latency not to exceed 1 second
   iii. shall support a viewing mode in which all detector actuations is displayed overlaid onto a diagram of the intersection
   iv. shall provide reporting on detector data

7. Data Display and Download
   i. shall support display and download of data from all traffic studies and counts
   ii. shall support display and download of all detector actuations in real-time and historically

8. Open Data Support
   i. shall support open data to API via REST interface including JSON to all detector data and traffic analytics
   ii. shall support administrator control of level of data API access, including what function calls may be made publicly and what function calls are accessible only through authentication
   iii. shall support Swagger.io documentation of API

G. Hardware Testing and Certification
   1. shall be fully NEMA tested and compliant, including shock, vibration, voltage, and thermal articles 2.2.7-2.2.11 (Please refer "*NEMA TS 2-2016: Traffic Controller Assemblies with NTCIP Requirements — Version 03.07*" for further detail)
   2. shall support NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
   3. shall support NEMA storage temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
   4. shall support humidity operating requirements of 5% - 95% RH non-condensing
   5. shall be FCC tested and compliant
   6. shall be ROHS compliant

H. Installation
   1. shall include all mounting hardware with device(s)

2. all functionality of Video Processing Unit shall be provided in a single self-contained device
3. all hardware functionality Video Processing Unit shall operate off a single UL, CSA certificated LPS NEMA rated power supply

I. Technical Support

1. Vendor shall provide technical support via email and toll-free telephone for all included hardware and software between the hours of 7:00 and 20:00 EST (Eastern Standard Time), Monday to Friday

J. Intellectual Property

1. shall include a license to utilize US Patent 20080270569, “Method and system for analyzing multimedia content”

K. Industry References
1. shall include proof of the device's use for detection and traffic analytics technology having been used in a minimum of 10 North American municipal, county, or state public traffic agencies
2. shall include proof of the device's successful integration with the similar equipment as is in use at the install location, specifically Miovision Spectrum Smartlink and Miovision Spectrum Interface, in a minimum of 10 North American municipal, county, or state public traffic agencies

L. Technical Support
1. Vendor shall provide technical support via email and toll-free telephone for all included hardware and software between the hours of 7:00 and 20:00 EST/EDT, Monday to Friday.

c. Construction:

1. General.

A. Install the device as indicated on the plan and as per guideline from manufacturer.
B. Install cables as needed at the installation site.
C. Install using settings that were approved at equipment mock up (if required per the Special Provision for Testing and Integration) or as approved by the Engineer to ensure interoperability and security, including VPN settings, local IP address, port forwarding and Network Address Translation (NAT), and IP-based filtering.
D. Integrate and test to meet specifications for integration and as shown on the plans.

2. Warranty. Provide device with a standard manufacturer’s warranty, transferable to City of Detroit. The device shall carry a warranty including parts and labor for 5 years from the date of shipment with at least 4 years of warranty remaining at the start of

burn-in. Firmware updates, Web application updates and security updates shall be provided by the vendor for the life of the product.

d. Measurement and Payment:

The completed work as described will be measured and paid for at the contract unit price for the following contract items (pay items):

Contract Item (Pay Item)	**Pay Unit**
Video Capture and Streaming System..	Each
Cellular Data Streaming for 2 hours per month and for 3 Years	Each
Video Detection and Analytics System	Each

The contract unit price each for **Video Capture and Streaming System** will be payment in full for furnishing all labor, material, and equipment necessary to complete the installation of 360 Video Camera with streaming capability in accordance with the plans and the special provisions.

The contract unit price each for **Cellular Data Streaming for 2 hours per month and for ___ Year** will be payment in full for furnishing all labor, material, and equipment necessary to complete the configuration of the software package, and all wireless data charges associated with the functionality outlined. Software updates and bug fixes are provided at no additional charge.

The contract unit price each for **Video Detection and Analytics System** will be payment in full for furnishing all labor, material, and equipment necessary to complete the installation of video spectrum analyzer and associated hardware to add vehicle detection and traffic analytics capability in accordance with the plans and the special provisions.

CITY OF DETROIT

SPECIAL PROVISION
FOR
Wireless Data Acquisition, Alerts and Analytics System

a. Description:

The work shall consist of complete furnishing, installation, integration and testing of an environmentally hardened, purpose built device and service coordination with City of Detroit to provide an end-to-end wireless data acquisition, transmission and alerts system for existing traffic signal controllers and all other material, labor and equipment necessary to provide a complete and operating job as specified herein.

The device provides connectivity from the intelligent transportation systems (ITS) field device(s), including NEMA ABC Traffic Signal Controllers, to the Traffic Management Center (TMC), as well as providing an application to remotely monitor and manage the traffic signal operation and associated traffic signal devices. Integration to the traffic controller will be via NTCIP unless specified by the plan sheet for specific intersection, such as NEMA ABC, and EF-140.This work must be performed in accordance with the standard specifications as specified herein.

b. Materials:

1. General. Furnish, install, integrate and test all equipment and required components (hardware and software), including antennas and antenna cables, interconnect cables, power supplies, and all components necessary to provide full and complete functionality in all respects, without additional expense to the City of Detroit.

All cellular data service will be included with no additional overage costs included with product.

Use identical and completely interchangeable equipment at each field location based on the requirement at each field location.

2. Functional and Performance Requirements.

1. Hardware
2. Data Acquisition
3. Communication Service
4. Software
5. Testing and Certification
6. Installation
7. Support
8. Intellectual Property
9. Industry References

3. Materials. Provide equipment that meets the following requirements.

1. Hardware
   A. Communications Interface Hardware
      a. Shall support 4G LTE cellular connectivity with MiMo and diversity (Bands 2, 4, 5, 13, 17, 25), HSPA+, GSM/GPRS/EDGE, EV-DO Rev A, 1XRTT with peak downlink of 100Mbps and peak uplink of 50Mbps
      b. shall support 802.11 a/b/g/n with MiMo and Diversity antennas with security of at least 64/128 bits WEP, WPA, WPA2
      c. shall support GPS and GLONASS
      d. shall support communication of Telemetry Data, Video Data, Alert Data, and Vehicle Identification Data to the Server via the Communication Service
      e. shall support direct communication between the Server and the devices connected to the Peripheral Interface and Controller Interface

   B. Antenna Hardware
      a. shall provide an externally mounted antenna for supporting functionality of Communications Interface
      b. shall contain the following fully-enclosed antenna elements and quantities in a single enclosure:
         I. 2G/3G/LTE MIMO (quantity: 2)
         II. 2.4GHz/5GHz WIFI MIMO (quantity: 2)
         III. GPS/GLONASS/BEIDOU (quantity: 1)
         IV. DSRC (quantity: 1)
      c. shall have labeled antenna terminations for easy installation
      d. shall not exceed 35mm in height
      e. shall be colored Pantone 427 U for blend with traffic cabinet construction
      f. shall be IP67 rated and mounted on the cabinet with a water-tight seal made of a closed cell rubber type foam and medium-firm acrylic adhesive with bonding features including a high initial adhesion and excellent high/low temperature holding power with excellent peel strength

   C. Controller Interface Hardware
      Unless otherwise specified in plan sheet, traffic signal controller interface shall be performed via NTCIP and the following requirements shall be met:

      a. shall communicate with an NTCIP compliant controller over ethernet providing auto-negotiation to 10/100 Mbps, half or full duplex

b. shall provide an ethernet cable for interfacing with NEMA TS2 type A1N, A2N, P1N, or P2N controllers.
c. the ethernet cable shall meet NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
d. the ethernet cable shall be shielded with stranded conductor and jacket meeting UL 2556d
e. shall communicate to the controller over TCP/IP.
f. shall support communication over SNMP v1, v2c, and v3 protocols
g. shall support communication over STMP NTCIP protocols reading all objects defined in NTCIP 1201 and 1202 supported by the controller
h. shall acquire and record phase, channel, detector, pedestrian detector, pre-emption, alarm and overlap statuses at a frequency of no less than 10 times per second including whether a phase is next or has a call for service on it
i. shall read and distinguish between detector, pedestrian detection and pre-emption device information from all detectors, pedestrian detectors and pre-emption devices wired into the cabinet
j. shall detect failure of a detector, pedestrian detector or pre-emption device in either always high, or always low mode based on user configuration.
k. shall detect all controller defined failures of a detector defined in NTCIP-1202::ASC.vehicleDetectorAlarms
l. shall detect all detector defined failures of a detector defined in NTCIP-1202::ASC.vehicleDetectorReportedAlarms
m. shall detect the free mode status of the controller
n. where provided by the controller shall read coordination information including cycle and sync status, as well as current and future coordination plan parameters
o. shall support distinguishing between minimum green, extension, maximum, green rest, yellow change, red clearance and red rest intervals of a phase.
p. shall identify flash status, stop time, external start, power restart, low battery, a serviceable call exists and has not been serviced for two cycles, or SDLC response fault.
q. shall support measurement of the existing sequence selected
r. shall support reading of the phase table, sequence table, channel table and overlap table
s. shall support controller clock re-syncing
t. shall support placing a call on a phase if a detector is in fault
u. shall support running the traffic controller in free mode through force, hold and omit directions
v. shall support setting the current timing plan dial, split, or offset
w. shall support setting of coordination plan parameters including but not limited to splits, offsets, and cycle length
x. shall support setting of phase table parameters

y. shall support capturing and reporting Controller Faults based on controller reported flash status reasons of 'other', 'automatic', 'localManual', 'faultMonitor', 'mmu', 'startup', and 'preempt'

If specified in the plan sheet that traffic signal controller interface shall be performed via NEMA ABC or EF-140 connection, the following requirements shall be met:

a. shall be installed in series between traffic controller and cabinet on the A,B, and C lines for NEMA ABC controllers, or the A, B, and D lines for EF-140 controllers.
b. shall come equipped with the 3 interface cables required to connect in series between the control and cabinet.
c. shall use input and output connectors for the A,B,C lines which adhere to MIL-DTL-26482 to allow easy interconnection on NEMA ABC controllers.
d. shall include a locking mechanism for the power connector to the ABC (or ABD) interface
e. shall include an Ethernet port for communication with the Peripheral Interface
f. shall support safe failover to pass-thru functionality which shall provide uninterrupted communication between the cabinet and controller in the event of the Controller Interface being unpowered
g. shall provide galvanic isolation between earth ground and logic ground
h. shall provide acquisition of detector state, controller state, and alarms at a frequency of at least 10 times per second
i. shall communicate data read from the ABC (or ABD) lines to the Peripheral Interface via an Ethernet connection
j. shall support reading information from all detectors that are wired into the cabinet
k. shall detect failure of a detector in either always high, or always low, mode.
l. shall detect whether the controller is in free mode vs. coordinated mode (NEMA ABC controllers only)
m. shall support distinguishing between preemption and detector calls
n. shall support distinguishing between variable and minimum portions of the phase interface (NEMA ABC controllers only)
o. shall support measurement of the existing sequence selected (NEMA ABC controllers only)
p. shall support measurement of the next phase in the sequence
q. shall support measurement of whether a phase has a call on it
r. shall support measurement of current timing plan information including selected dial, selected split, and selected offset

s. shall support measurement of Alarm 1 and Alarm 2 status (NEMA ABC controllers only)
t. shall support remote power cycling of the traffic controller to enable resets
u. shall support controller clock re-syncing to midnight when supported on the controller with a D cable connection
v. shall support putting a detector into recall upon failure and allow modification of the detector value for those in recall
w. shall support running the traffic controller in free mode through force, hold and omit directions (NEMA ABC controllers only)
x. shall support setting the current timing plan dial, split, or offset (NEMA ABC controllers only)
y. shall support switching to secondary maximums of the timing ring (NEMA ABC controllers only)
z. shall support capture and report of Controller Faults based on detecting activity on pins related to stop time, controller output, voltage monitor, and external start.

D. Peripheral Interface Hardware
a. shall support 2 x USB 2.0 device ports
b. shall support 4 x 10/100/1000 Ethernet ports
c. shall support PoE on 2 x of the above ports, with at least one of which capable of supporting PoE+
d. shall support industrial temperature rated storage comprising of a solid state drive of at least 64 GB
e. shall provide light-emitting diode (LED) indicators for Server connectivity, Ethernet link/activity, power, cellular link/activity and signal strength
f. shall support 4 x RS232 serial connections (one port configurable to RS485) with RJ45 connectors
g. shall provide Digital IOs pins 4 x I/O pins (200mA sinking each), digital input, 0~30V, 1 x 24VDC supply pin (200mA max sourcing), 5 x ground
h. shall provide galvanic isolation between earth ground and logic ground
i. shall provide data buffering of all Telemetry Data (controller state, detector actuations, pre-emption events) and Alert Data during periods of loss of cellular connection for at least 12 minutes
j. shall provide data buffering of all Telemetry Data and Alert Data during periods of loss of power for at least 10 seconds

2. Data Acquisition
A. Telemetry Data Acquisition
a. shall acquire vehicle and pedestrian signal telemetry data, detector telemetry data, and pre-emption telemetry data via Controller Interface

b. shall acquire data from peripheral cabinet devices via the Peripheral Interface

B. Alert Data Acquisition

a. shall detect the following alert conditions and transmit them to the Server via the Communications Service
    i. Cabinet power outages
    ii. Traffic signals in flash
    iii. UPS battery backup system in use
    iv. UPS battery backup system falls below a configurable charge level
    v. Any digital I/O signal which has been configured as an alert channel
    vi. Detector failure (stuck high or low)
    vii. Pre-Emption System failure (stuck high or low)
    viii. Controller failures reported by the Controller Interface hardware

C. Video Data Acquisition

a. shall support acquisition of live video data via Peripheral Interface connected video devices that meet the following requirements:
    i. Support RTSP
    ii. Have remotely configurable video stream settings
    iii. Have a configurable frame rate up to 30 fps
    iv. Have a configurable resolution, supporting a minimum resolution of 1280x1280
b. shall support acquisition of live video snapshots at least once per second via Peripheral Interface connected video devices that meet the following requirements:
    i. JPEG file format generation
    ii. Images accessible via HTTP protocol
c. shall support recall of historical video data which has been stored to the solid state drive (on the Peripheral Interface hardware) for at least 7 days of 24 hour-a-day recording

D. Vehicle Identification Data Acquisition

a. shall capture vehicle presence via a wireless traffic probe utilizing Wi-Fi MAC address identification technology
b. shall hash all MAC addresses prior to cellular transmission using the SHA-512 algorithm, with a key cycled every 24 hours.
c. shall transmit hashed MAC addresses and WiFi signal strength information to Server at least once per minute

3. Communication Service
    A. *Cellular Communications*
        a. shall provide 4G LTE cellular data service between the Communications Interface and the Server via a national commercial carrier using Bands 2, 4,and 13
        b. failover support from 4G to 3G to 2G with incremental fallback

    B. *Server*
        a. shall be hosted at a professional cloud hosting facility with redundancy of at least 2 instances, with automatic load balancing and shall scale to support any simultaneous number of connections
        b. shall support permanent storage of all Telemetry Data, Alert Data, and Vehicle Identification Data in perpetuity.

    C. *Secure Communications*
        a. shall provide a Virtual Private Network (VPN) for secure data transmission between the Communications Interface and Server
        b. shall create a private network where IP traffic can be transmitted from a traffic cabinet directly into the traffic management center and any central software systems
        c. shall use authenticated using public key infrastructure (PKI) and encrypting using PKI and the TLS/DTLS1.0+ protocol
        d. shall support HTTPS/SSL communication to the Server from the public internet for access of the User Interface
        e. shall support revoking of all authenticated user names, passwords, or keys at any time
        f. shall support simultaneous integration across a heterogeneous mix of different technologies and providers, including different cellular providers, fiber connected networks, and point-to-point radio solutions.
        g. shall support integrating an unlimited number of intersections with the customers Central Management System and be capable of supporting both IP and serial-over-IP connections to all controller models in the field. The communication system must meet all bandwidth and latency requirements of the customers CMS. (CMS's have different requirements)
        h. shall meet all bandwidth and latency requirements of the Customer's Central Management System

4. Software
    A. User Interface
        a. shall provide a secure web-based Graphical User Interface (GUI) using SSL
        b. shall support an unlimited number of concurrent logins by authenticated users

c. shall be fully accessible via desktop, tablet, and mobile products on Chrome, Internet Explorer (Edge, 11.0) and Safari.
d. shall provide all the functionality of Signal Monitoring, Alerts Management, Inventory & Asset Management, Video Streaming & Recall, Video Analytics, and Traffic Data Analysis from a single software application requiring a single login
e. shall provide a user toggle to allow switching of the user interface language between English, Spanish, and French.
f. must meet the W3C standard for Accessible Rich Internet Applications (WAI-ARIA) 1.0 in order to support users with disabilities.
g. shall support user login via OAuth Login
h. shall provide a secure means of verifying account registration via email
i. shall provide a secure means of password reset
j. shall support the addition and management of user accounts for users that are both inside and outside of the organization at no additional cost
k. shall support access to all Telemetry Data, Alert Data, and Vehicle Identification Data stored on the Server.

B. Signal Monitoring
a. shall support live display of all Telemetry Data with latency not to exceed 1 seconds when LTE connection is active.
b. shall support historical display of all Telemetry Data on-demand with load latency not to exceed 1 second.
c. shall support a viewing mode in which all Telemetry Data is displayed overlaid onto a diagram of the intersection
d. shall support a viewing mode in which all Telemetry Data is displayed in a timing diagram format in which interval length is displayed in seconds for each signal phase
e. shall support display of environmental weather conditions ,including precipitation and temperature, as part of live and historical viewing of Telemetry Data
f. shall provide reporting on signal telemetry, detector and alert data.

C. Alerts Management
a. shall display real-time status of all active alerts including power outages, signals in flash, UPS battery activity, UPS low-charge level, detector failures, pre-empt failures, controller failures, and any custom configured digital I/O alerts.
b. shall display log of all historical alerts including time of alert, resolution time, and notified users.
c. shall support SMS and Email alerts for all Alert events (listed in the Alert Data Acquisition specification)

d. shall support configuration of distribution of SMS and Email alerts based to different user groups based on Alert type
e. shall support reports indicating alert volume by intersection over time.

D. Video Streaming and Recall
   a. shall support live video streaming and video recall to desktop browsers without any third party plugins
   b. shall support live video streaming and video recall on tablet browsers using the HLS protocol
   c. shall support recall of video content stored to the solid state drive of the cabinet installed hardware device for at least 1 week
   d. shall support live video streaming with a latency of no more than 10 seconds at a frame rate of at least 15 fps
   e. shall support live video streaming with an initial load time of no more than 10 seconds
   f. shall support at least 20 concurrent video streams from a single camera to be viewed in multiple browsers
   g. shall support at least 40 concurrent video streams from all cameras active in the system, to be viewed in multiple browsers

E. Video Analytics
   a. shall support generation of traffic studies based on recorded Video Data including Turning Movement Counts (with vehicle classifications), Vehicle Volume Counts (with vehicle classifications), Pedestrian Counts, Bicycle Counts utilizing a 360-degree camera
   b. shall support generation of all above mentioned traffic studies within 72 hours of submission of report request
   c. shall support 95% guaranteed accuracy on all above mentioned traffic studies
   d. shall support export of traffic study data in the Universal Traffic Data Format (UTDF) for easy import into applications such as Synchro

F. Traffic Data Analysis
   a. Data Reporting
      i. shall support generation of any of the below listed Travel Time, Signal Performance Metrics, or Pre-Empt analysis for any 24hr period in under 5 seconds, for all captured data up to 3 years in the past

   b. Travel Time
      i. shall support generation of point-to-point travel time calculations from the Vehicle Identification Data for any two devices in the network

ii. shall support calculation and viewing of travel time data within 15 minutes of capture
iii. shall support generation and overlay of historical travel time trends over any period (minimum 3 months) throughout the 3 year data set
iv. shall support generation of historical variability statistics of travel time over any period (minimum 3 months) throughout the 3 year data

c. Signal Performance Metrics
i. shall support generation of approach volume charts when the intersection includes advance detector data
ii. shall support generation of arrivals-on-red / arrivals-on-green charts when the intersection includes advance detector data
iii. shall support generation of Purdue Split Failure chart when the intersection includes stop-bar detector data
iv. shall support generation of detector occupancy ratio charts (Red, Green, and ROR5) for all intersection movements that include stop-bar detector data
v. shall support generation of phase interval transition charts over any 24 hour period
vi. shall support download of all above mentioned signal performance charts as flat image files or PDF files
vii. shall support generation and overlay of historical trends of approach volumes and arrivals-on-red over any period (minimum 3 months) throughout the 3 year data set
viii. shall support generation of historical variability statistics of approach volumes and arrival-on-red over any period (minimum 3 months) throughout the 3 year data

d. Pre-Empt Analysis
i. shall support generation and recall of logs of pre-empt events, including their time of occurrence and duration
ii. shall support ability to query historical occurrences of pre-empt events into tabular format for export, in perpetuity

G. Device Monitoring
a. shall provide a serial-over-LTE connection and appropriate networking support to enable secure communications between cabinet hardware and existing third party software used by the Customer including Central Management Systems and MMU desktop software applications

H. Inventory and Asset Management
   a. shall support the creation of geographical placeholders for any intersection, including those without a device installed
   b. shall support the ability to record and store cabinet equipment inventory information associated with each intersection
   c. shall support the ability to upload and store an unlimited number of arbitrary files including, image and video files, with each node in the network up to a size of 1 GB per file
   d. shall support the ability to view all inventory and asset information, including uploaded files

I. Open Data Support
   a. Shall support open data to API via REST interface including JSON to all Telemetry Data, Alert Data, and Vehicle Identification Data
   b. shall support administrator control of level of data API access, including what function calls may be made publicly and what function calls are accessible only through authentication
   c. shall support Swagger.io documentation of API
   d. All reports and processed data listed in the Traffic Data Analysis section must also be accessible via this Open Data API

5. Testing and Certification
   A. Hardware Certification Testing
      a. Communications Interface shall be PTCRB and Verizon Safe-For-Network Certified
      b. Communications Interface, Peripheral Interface, and Controller Interface shall meet the following requirements:
         i. shall be fully NEMA tested and compliant, including shock, vibration, voltage, and thermal articles 2.2.7-2.2.11
         ii. shall support NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
         iii. shall support NEMA storage temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
         iv. shall support humidity operating requirements of 5% - 95% RH non-condensing
         v. shall be FCC tested and compliant
         vi. shall be ROHS compliant
   B. Travel Time Accuracy
      a. shall provide testing data showing a match rate of Vehicle Identification Data between adjacent intersections of at least 5%, where the match rate is the portion of the total road vehicle volume for which a successful MAC-address match is performed at two adjacent intersections

6. Installation

A. shall include all mounting hardware with device(s)
B. all functionality of Peripheral Interface and Communications Interface shall be provided in a self contained device not exceeding 250mm x 270mm x 50mm in size
C. all functionality of Controller Interface shall be provided in a self contained device not exceeding 250mm x 270mm x 105mm in size
D. shall not require more than two distinct and self-contained devices to fulfill functionality of Peripheral Interface, Controller Interface, and Communications interface.
E. all hardware shall operate off a single UL, CSA certificated LPS industrial temperature rated power supply

7. Support
   A. Vendor shall provide technical support via email and toll-free telephone for all included hardware and software between the hours of 7:00 and 20:00 EST/EDT, Monday to Friday.

8. Intellectual Property
   A. shall include a license to utilize Patent Pending USA 15/150,128 & PCT/CA2016/050531 "System and Method for Connecting Traffic Intersections"

9. Industry References
   A. shall provide evidence of successful installation of the above mentioned hardware and software system in a minimum of 25 North American municipal, county, or state public traffic agencies.

   B. shall provide evidence of a successful installation of the above mentioned hardware and software system in a single location for a continuous period of at least 30 weeks

c. Construction:

1. General.

A. Install the device as indicated on the plans.

B. Install antenna(s) on the cabinet per provided instructions.

C. Install using settings that were approved at equipment mock up (if required per the Special Provision for Testing and Integration) or as approved by the Engineer to ensure interoperability and security, including VPN settings, local IP address, port forwarding and Network Address Translation (NAT), and IP-based filtering.

D. Integrate and test to meet specifications for integration and as shown on the plans.

2. Warranty. Provide device with a standard manufacturer's warranty, transferable to City of Detroit. The device shall carry a warranty including parts and labor for 5 years from the date of shipment with at least 4 years of warranty remaining at the start of burn-in. Firmware and Software are updated for the life of the product. Firmware updates, web application updates, and security patches, shall be provided by the vendor over the term of the contract.

d. Measurement and Payment:

The completed work as described will be measured and paid for at the contract unit price for the following contract items (pay items):

Contract Item (Pay Item)	**Pay Unit**
Wireless Data Acquisition, Alerts and Analytics System	Each
Cellular Data Service for 3 Years...	Each
Wireless Data Acquisition and Alerts System, Salv	Each
Antenna, Spectrum	Each

The contract unit price each for **Wireless Data Acquisition, Alerts and Analytics System** will be payment in full for furnishing all labor, material, and equipment including cellular modem, spectrum antenna, interface unit, cables and other mounting hardware necessary to complete the traffic cabinet installation in accordance with the plans and the special provisions.

The contract unit price each for **Cellular Data Service for ___ Year** will be payment in full for furnishing all labor, material, and equipment necessary to complete the configuration of the software package, and all wireless data charges associated with the functionality outlined. The Cellular Data service is for 2GB shared data plan for each device for specified number of years. Software updates and bug fixes are provided at no additional charge.

The contract unit price each for **Wireless Data Acquisition and Alerts System, Salv** will be payment in full for removing, storing and reinstalling all equipment, cable from existing traffic cabinet necessary to complete the installation into proposed traffic signal cabinet in accordance with the plans and the special provisions.

The contract unit price each for **Antenna, Spectrum** will be payment in full for furnishing all labor, material, and equipment necessary to complete installation of low-profile externally mounted Spectrum antenna compatible with existing Wireless Data Acquisition, Alerts and Analytics System in accordance with the plans and the special provisions.

CITY OF DETROIT

SPECIAL PROVISION
FOR
ELECTRICAL WORK

a. Description:

The following specifications shall constitute the specifications for electrical construction and/or relocation of lighting facilities with Public Lighting Department Standards of Construction in the City of Detroit.

General:

The following abbreviations will apply to these specifications and to the plans:

	SPECS	PLANS
Institute of Transportation Engineers	I.T.E.	ITE
National Electric Manufacturers Association	N.E.M.A.	NEMA
Public Lighting Department	P.L.D.	PLD
Detroit Edison Company	D.E. CO.	E
Michigan Consolidated Gas Company	M.C.G.	G
Detroit Water and Sewerage Department	D.W.S.	W
Ameritech	T.	T
American Society for Testing and Materials	A.S.T.M.	ASTM
American National Standards Institute	A.N.S.I.	ANSI
Institute of Electrical and Electronic Engineers	I.E.E.E.	IEEE
Illuminating Engineering Society	I.E.S.	IES
Industrial Fasteners Institute	I.F.I.	IFI
International Municipal Signal Association	I.M.S.A.	IMSA

The Contractor shall be held to have inspected all streets and alleys where work is to be done before submitting his proposal. He shall be held to have inspected all conditions which may affect his work, including traffic, and no extras will be allowed for such conditions or for interference with his work by other Contractors or Utilities.

The Contractor shall furnish and maintain the lighting in areas specified for the maintenance of traffic.

All work on any P.L.D. facility is subject to P.L.D. inspection.

The Contractor shall notify the Public Lighting Department System Operator (313-224-0500) 48 hours prior to performing any type of work on Public Lighting Department overhead or underground secondary, street lighting, or primary circuits.

No transformer shall be energized or de-energized without prior approval of the "Public Lighting Department System Operator."

The Contractor shall make arrangements as described above to work on street lighting circuits. Work on street light circuits shall be complete and ready for operation prior to 4 P.M. each day.

Construction must be performed by qualified and experienced personnel. All work must meet standards and practices of the P.L.D., the National Electrical Code, and the Electric Code of the City of Detroit, the National Electrical Safety Code and the Michigan Public Service Commission.

The Contractor shall secure all necessary permits covering his operations, including permits from the Public Authorities having jurisdiction over the streets or other Public Properties in which the work is

located and the improvements therein. The bidder shall ascertain the amount of any charges required by such authorities and shall include the cost thereof in his bid price.

The Contractor shall ascertain the requirements of said authorities and shall include in his bid price all costs of restoring existing improvements, including sidewalks, pavements and landscaping to the satisfaction of the authority having jurisdiction in each case.

The Contractor shall assume all risks and responsibility because of existing soil conditions and shall complete the work in whatever material and under whatever ground conditions he may encounter or create, without additional cost to the Owner.

All material and equipment furnished by the Contractor must be new, unless specified otherwise, and must comply with the specifications for that material and equipment. The Owner shall have the right to reject any equipment which does not meet with specifications.

Manufacturer's test certificates in accordance with the specifications will be required for all wire and cable. These certificates shall be submitted to the City of Detroit, Public Lighting Department immediately upon receipt by the Contractor. No Contractor shall install any wire or cable before it has been approved by the City of Detroit, Traffic Engineering Division.

Contractors should include on their material order, especially on wire and cable, the statement that "Material must be in strict accord with the Specifications".

The Contractor shall not install any salvaged material or equipment unless it has been inspected and approved for reuse by the Owner.

Where the contract calls for the reuse of existing material and equipment, the Contractor shall reuse only the best of the existing material and equipment. The P.L.D. shall have the right to furnish the Contractor a new part for any that is found defective prior to dismantling. Any part or parts damaged subsequent to starting the removal are a liability of the Contractor.

Within five days after completion of each section of the underground conduit or cable work or the overhead line work, the Contractor shall furnish to the "Owner" an exact record of all underground or overhead work installed. This shall include length of duct lines; location of handholes and manholes; and location and size of poles. All removed street lighting, traffic signal, communication and all P.L.D. material shall be salvaged and delivered in usable condition to the City of Detroit, Public Lighting Department.

The locations of existing underground obstructions or facilities of other utilities are not necessarily indicated on the plans. Where facilities of other utilities are shown their locations are only approximate and their exact location is not guaranteed for correctness. The Contractor must exercise caution in avoiding damage to other utilities and must notify the other utilities that he is in fact proposing to break pavement or excavate so that they may provide him with the very latest information or drawings of their existing facilities.

The Contractor shall be responsible for maintenance, vandalism and accident damage to the lighting, traffic signal, conduit, wood pole, overhead wires, cable, etc. and all other material installed, or to be installed, related to, or necessary for the electrical installation of the project until the installation is complete, tested and accepted by City of Detroit, Traffic Engineering Division.

Materials furnished by the P.L.D. to the Contractor shall be picked up by the Contractor at such warehouse as designated by the P.L.D.

During installation of cable and conduit and all related work, the Contractor shall at all times maintain traffic in the manner and requirements of the City of Detroit, Traffic Engineering Division. The City of Detroit, Traffic Engineering Division may impose restrictions regarding particular times of certain days of the week wherein the Contractor cannot perform his work and may in fact be required to clear the area of work obstacles or construction equipment. The Contractor shall take note of this and there will be no extra payment to perform the work with possible restrictions imposed. There will be no extra payment if the Contractor chooses to do his work outside of normally designated work hours.

b. Materials:

1. Conduit:

   Conduits, fittings and bends shall be plastic (acronitrile butadiene or polyvinylchloride) in accordance with N.E.M.A. Standards Publication TC6-1974, "Plastic Utilities Duct for Underground Installation", Type EB for concrete encased installation or Type DB for non-encased direct burial.

   The galvanized pipe conduit for direct burial, or jacking and boring riser or cable raceway shall meet the requirements of the Federal Specification WW-C 581d and must be so identified. If required on the plans, direct buried or Schedule 80 polyvinylchloride conduit shall meet the dimensional and compounding requirements of NEMA TC-2, latest revision.

   Concrete for encased conduit shall be as specified under Concrete.

2. Manholes and Handholes:

   Concrete shall be as specified under Concrete (Section C).

   Brick for P.L.D. manholes and handholes shall be the same as required for City of Detroit Drainage Structures.

   All brick for manhole or handhole shall be of nominal size.

   Steel rails for roofs of manholes or handholes shall be 60 lbs. per yard or heavier. The rails may be scrap railroad rail. Alternates may be as shown on the detail sheets.

   Cable racks and hooks shall be as shown on the detail drawings.

   Precast concrete handholes shall be of the design and dimensions as shown on the plans. Design for all precast manholes and handholes must be submitted to and approved by the PLD prior to installation. The handholes shall be manufactured of vibrated concrete reinforced with an all welded cage containing 0.35 percent longitudinal steel, unless otherwise shown on the plans. The concrete shall have a minimum compressive strength of 3500 psi.

   Manhole Covers - Manhole covers shall be as specified on the plans.

   Handhole Covers - Handhole covers shall be as specified on the plans.

   Manhole and handhole frames and covers shall conform to the requirements of the P.L.D. The patterns for frames and covers will be loaned to the Contractor at no cost but he shall be liable for any damage incurred. The use of the patterns cannot interfere with the P.L.D. needs.

   Cable pulling irons shall be as shown on detail drawings.

Manhole and handhole frames and covers and sewer grates and rings shall conform to the current specifications for Gray Iron Castings, A.S.T.M. Designation: A-48 and shall be finished in accordance with and otherwise meet the P.L.D. Standard Specifications and Details. They shall be made from P.L.D. patterns, or equal, as numbered on the drawings. If the Contractor uses P.L.D. owned patterns such usage must not interfere with time of use by the P.L.D. The Contractor shall be responsible for all damage to P.L.D. Patterns.

3. Concrete:

Concrete for manholes and handholes shall be grade 35S and concrete for foundations and encased conduit shall be grade 30M as specified in Division 7 of the Michigan Department of Transportation (2012) Standard Specifications. The coarse aggregate used for concrete to encase conduits shall be 17A.

A. Concrete shall be placed in the forms in a layer of such thickness that when compacted and finished, the pad will be of the thickness shown on the drawings. The pad shall be continuous between expansion joints. After the concrete has been placed between side forms, a strike-off guided by the side forms shall be used to bring the surface to the proper section to be compacted.

B. Concrete, during and immediately after depositing, shall be compacted by means of rods, forks and other suitable tools. The concrete shall be worked thoroughly around enforcements, around embedded fixtures and into corners. Every precaution shall be taken to produce a dense water-proof concrete free of voids and honeycombs.

C. Temporary enclosures and other protection for concrete shall remain intact for less than twenty-four hours (24 hours after the heating source is removed).

D. Salt, or other chemicals for the prevention of freezing, shall not be used.

4. Granular Materials:

Granular materials for use as fill, backfill, sub-base, and filter aggregates shall be as indicated on the plans.

5. General Overhead Line Section:

A. Description:

This work shall consist of furnishing, installing, removing and relocating wood poles, Overhead Street lighting units, overhead lines, cable poles, transformers, and overhead line material. Included is all related work, materials and equipment required to provide a complete and operating job, as specified herein and as shown on the plans.

B. Crossarms:

All crossarms furnished shall be made of Douglas fir and in accordance with the latest revision of Edison Electric Institute Specification TD90-1960 and the following options specified therein:

(a) Dense or close grain grades or a mixture of the two (2) is satisfactory.

(b) Dimensions, drilling and allowable tolerance shall be in accordance with Public Lighting Department Drawing No.42-0422.

(c) All crossarms shall be incised on all four (4) faces to a depth of 3/16-inch.

(d) Preservative Treatment

The preservative shall be pentachlorophenol-petroleum solution in accordance with the American Wood-Preservers Association Standards P9-64 and P9-65. The solution shall contain not less than five percent (5%) of pentachlorophenol by weight.

The treatment shall be an empty-cell pressure process with 6 pounds per cubic foot retention of pentachlorophenol in accordance with the A.W.P.A. Standard C-26 with the minimum penetration of the preservative longitudinal from ends and holes of not less than 2-1/2 inches.

(e) Cleanliness

In order that crossarms shall be clean for handling upon receipt at destination, there will be no free oil, sludge, or sediment apparent on any face upon completion of the preservative treatment or upon receipt by the user.

(f) Alternate Wood Species, treatment and physical manufacturing details are subject to approval by the Public Lighting Department before purchase and/or use by Contractor.

(g) Contact P.L.D. before purchasing crossarms. Crossarms with holes sized for metal pins may be required.

C. Steel Insulator Pins:

Steel insulator pins for use on wood crossarms shall be hot dip galvanized.

Pins shall have a 5-inch shaft height, 5/8-inch shaft diameter, 6-1/2-inch shank length, 1-inch diameter lead thread, 3-1/4-inch thread length, 2-inch diameter base with one 2-inch round washer, 1-split lockwasher, and 1-square nut from Cooper Power Systems Catalog #DP-2S51 or approved equal.

D. Miscellaneous Hardware:

Miscellaneous pole line hardware shall be hot-dip galvanized and shall be standard products of such manufacturers as Kearney, Line Material, Oliver or approved equal.

E. Guys and Guy Anchors:

Guy wire shall be 7 strand, size as shown on the plans.

1/4-inch guy wire shall be Siemens-Martin Grade.
3/8-inch guy wire shall be Extra High-Strength Grade.
Guy anchors shall be heavy duty, eight blade, and expansion type.
Guy anchor rods shall be galvanized, 3/4-inch x 8 feet, thimble eye type.
All anchor guys shall be provided with metal or plastic guards.

F. Potheads:

Potheads shall be as shown on detail drawings.

G. Wire:

All wire and cable shall be as shown on the drawings.

H. Overhead Wire:

#8 duplex (#8 twin) wire shall be in accordance with the latest revision of the Public Lighting Department Specification #23:0113 for "Wire - Copper, Two - Conductor Parallel".

(a) Triplex Aerial Cable, 600 Volt Rated, #6 AWG:

Triplex aerial cable shall consist of two insulated copper conductors wound spirally around a supporting neutral conductor, right hand lay, 36 inches +- 2 inches length of lay.

The insulated conductors shall be #6 AWG, 7-strand uncoated soft-drawn or annealed copper in accordance with ASTM B-8. The neutral shall be bare, and shall consist of a single strand of copper-clad steel wire and two strands of hard-drawn copper wire, right hand lay, maximum overall resistance of 0.415 ohms per 1000 feet at 60 degrees F. The tensile breaking strength of the neutral shall be 2300 lbs., minimum.

Insulation shall be black cross-linked polyethylene, 0.060 inches thick, in accordance with the latest revision of Interim Standards #2, I.C.E.A. Pub. S-66-524.

One insulated conductor shall be identified throughout by a permanent stripe or rib.

Certified test reports are required in accordance with the above standard, including insulation thickness, insulation physical and aging tests, all insulation electrical tests, water absorption test, heat distortion test, and resistance of each conductor on all reels.

(b) Triplex Aerial Cable, 600 Volt Rated, #2 AWG:

Triplex aerial cable shall consist of a copper messenger and two separately insulated copper conductors wound spirally around the messenger. The two insulated conductors shall be entirely supported by the messenger.

The insulated conductors shall be #2, 7-strand uncoated soft-drawn or annealed copper in accordance with latest revision of ASTM B-8. The messenger shall be used as a bare, grounded circuit neutral conductor, and shall be #2 AWG, 7-strand, uncoated, of hard drawn copper wire, right hand lay.

The insulated conductors shall be spiraled around the neutral conductor (messenger) for mechanical support. The direction of lay of the insulated conductors shall be right hand, the same direction as the neutral conductor strands, and the length of the lay shall be 36 to 42 inches.

Insulation on the two power conductors shall be abrasion resistant, black cross-linked polyethylene, suitable for outdoor use at 90 degree C conductor temperatures. The insulation on each of the power conductors shall be 0.045 inches thick, with a minimum thickness at any point not less than 90% of the nominal thickness. The electrical and physical properties of the insulation shall conform to the latest revision of I.C.E.A. Pub. No. S-66-524.

One of the two insulated conductors shall be identified throughout its length by a permanent stripe, rib or equivalent of which does not reduce the insulation.

Certified test reports, in accordance with the latest revision of I.C.E.A. publication No. S-66-524, shall be furnished by the manufacturers. These test reports shall include:

(1) The results of insulation physical and aging tests, all insulation electrical tests, the accelerated water absorption test, and heat distortion test.

(2) The resistance per 1000 ft. of each of the three conductors on all reels and the tensile strength of the hard drawn copper messenger.

I. Line Wire:

All overhead wire shall be in accordance with P.L.D. #23-0115 Revision R and either of the following Specifications: ANSI No. C8.34-1954 (R-1962) - Weather-Resistant Wire, Neoprene Type, or ANSI/ICEA No. S-70-547-1984-Weather-Resistant Polyolefin covered wire and cable.

Conductors and hardness shall be as follows:

#6	Solid	Hard-drawn
#2	Solid	Hard-drawn
#2/0	Stranded	Hard-drawn
#4/0	Stranded	Medium Hard-drawn

The coverings shall adhere to the conductor, but shall not be bonded to it; shall strip clean, but shall not be free-sliding.

Certified copies of test reports for all tests stipulated in the above specifications are required.

J. Tie Wire:

All tie wire shall be solid, soft-drawn, neoprene-covered and in accordance with the above ANSI Specification C 8.34-1954.

K. Ground Wire and Ground Rods:

Ground wire shall be No. 2 AWG copper, 7 strand, soft-drawn, for all applications except traffic signals, unless otherwise noted in the drawing.

Ground rods shall be 5/8-inch x 8 feet copper clad steel, for all applications, except traffic signals, unless otherwise noted in the drawings.

Traffic signal foundations shall be grounded such that resistance to ground is 10.0 ohms or less. Contact P.L.D. for further information.

All handholes and manholes shall have a 5/8-inch x 8 feet copper clad steel ground rod protruding approximately 4 to 5 inches near the perimeter of the hole, not in the center.

L. Insulators:

Insulators for series street lighting circuits shall be medium blue, pin type, plain glaze (not radio - free type), class 55-2, in accordance with A.N.S.I. Standard C 29-5-1969 (R 1974) for "Wet Process Porcelain Insulator (Low and Medium Voltage Pin Type)".

Insulators for 2.4 KV to 7.2 KV distribution circuits shall be white, pin type, plain glaze (not radio free type) and shall conform to the requirements for a Class 55-4 insulator of the standard for Wet-Process Porcelain Insulators (Low and Medium Voltage Pin Type ANSI-C29-5-1969 (R 1974).

Primary dead end/suspension insulators for street lighting and distribution circuits shall conform to the requirements for ANSI C29.2 Class 52-2 and 52-4 insulators with unibody weathershed construction molded on fiberglass rod. Insulators shall be rated at 15,000 lbs. ultimate with hot dip galvanized ductile iron end fittings.

Spool type insulators shall be white, Class 53-1, or 53-2 in accordance with the latest revision of A.N.S.I. Standard C29.3-1961 (R1974) for "Wet Process Porcelain Insulators (Spool Type)".

Strain insulators shall be white, Class 54-3/Class 54-2, in accordance with the latest revision of A.N.S.I. Standard C29.4-1961 (R1974) for "Wet Process Porcelain Insulators (Strain Type)".

M. Distribution Transformers:

Distribution transformers shall be in accordance with the latest revision of Public Lighting Department Specification #20:0231. Transformers shall be furnished in the sizes and voltage ratings specified in the plans and shall be outdoor, pole type, oil immersed self-cooled.

Transformer primary windings shall be equipped with taps as follows:

Primary Voltage Rating	**Taps**
4800 V.	(2)-2-1/2% above & below normal
7200 V.	(2)-2-1/2% above & below normal
2400 X 4800 V.	1-5% & 2-2-1/2% above & below normal In the 2400V winding and (2) -2-1/2% taps above & below normal in the 4800V winding

There shall be installed, in a permanent manner, a brass identification disk supplied by the Public Lighting Department. The Contractor shall provide the Public Lighting Department, Stores Division, with the manufacturers name, transformer size, primary and secondary voltages, and serial number when requesting the identification disks.

N. Lightning arrester:

Lightning arrester for the series street lighting circuits shall be outdoor, valve type lightning arrester with top series gap, rated at 3,000 volts for use on 7,500 volt ungrounded secondary of a series street lighting current regulator. These arresters shall include an accessible top series gap and a solderless type ground terminal to accommodate #2 to #4 solid wire housed in the best grade of wet processed porcelain. Also, a bracket is to be included for crossarm mounting. All ferrous parts shall be hot-dipped galvanized, in accordance with the Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware A.S.T.M. A-153.

The Contractor shall furnish the Engineer certification of compliance with the following requirements when tested in accordance with the Standard for Lightning Arresters for Alternating-Current Power Circuits ANSI-C62.1-1962.

The critical sparkover shall not exceed 39 KV on impulse breakdown and the 60 cycle breakdown shall not exceed 26 KV. It shall be able to withstand a lightning surge of 100,000 amperes and short circuit current of 20,000 amperes.

O. Lightning Arresters for Distribution Circuits:

The lightning arresters for 2.4 KV, 4.8 KV and 7.2 KV distribution circuits shall be of 3 KV, 6 KV or 9 KV respectively and shall be valve type, distribution class, for crossarm mounting totally porcelain enclosed and for direct connection to the line. They shall have the line connection suitably enclosed.

The Contractor shall furnish the Engineer certification of compliance when tested in accordance with Lightning Arresters for Alternating-Current Power Circuits ANSI-C62.11-1987.

Lightning arresters for multiple street lighting circuits shall be outdoor type secondary arresters, 2 pole, rated 650 volts maximum.

P. Distribution Circuit Cutouts and Disconnects:

On distribution circuits thru 4,800 volts cutouts shall be outdoor type, porcelain, enclosed, 5.2 KV rated, extra heavy duty, rated 200 amperes continuous. Interrupting capacity shall be 15,000 amperes asymmetrical at rated voltage. If specified in the plans, a solid blade door shall be furnished, rated at 400 amperes continuous.

On 7200 volt distribution circuits, cutouts shall be outdoor type, porcelain, enclosed, 7.8 KV rated, extra heavy duty, rated 100 amperes continuous. Maximum interrupting capacity shall be one shot, 12,000 amperes asymmetrical at rated voltage. If specified in the plans, a solid blade door shall be furnished, rated 200 amperes continuous.

Cutouts shall conform with SPECIFICATIONS FOR DISTRIBUTION ENCLOSED, OPEN AND OPEN-LINK CUTOUTS, ANSI C37.42, latest revision.

Dead blade disconnects shall be outdoor, 7.8 KV rated, 400 ampere continuous rating, with a momentary rating of 20,000 amperes.

Cutouts and dead blade disconnects shall be furnished with swivel type crossarm hangers, adjustable for 3-1/4 inches x 4-1/4 inches and 3-3/4-inch x 4-3/4-inch crossarm sections. All hardware shall be hot-dip galvanized in accordance with ASTM Specification A-153.

c. Construction Methods:

1. Cable Section:

Cable shall be pulled into ducts using the proper cable grip for the purpose. The cable shall be handled so that it is not subject to excessive strain or is not kinked when pulled thru the conduit. Damaged or kinked cable shall not be used. Where more than one cable is to be installed in the same duct, cables shall be pulled thru simultaneously.

Splices in ducts will not be permitted.

When cable is installed but not immediately spliced, all cable ends shall be thoroughly sealed and racked out of the way of possible damage.

The ends of the cables which are to be abandoned and left in place shall be sealed with a water tight cap.

Cables shall be neatly racked on cable racks in all manholes after being formed to their final position. Cables shall be racked slightly higher than the duct entrances so that they will not rest on the edges of the duct. Each new cable shall be tagged, and any existing cable which has its

circuit number changed shall be retagged, in all manholes and in all handholes in which it is exposed.

The sheaths of all lead sheathed cables shall be bonded to one another in each manhole and handhole with flexible copper braid approximately equal to #9 AWG.

All new cable installed between lighting standards shall be a continuous pull. Splices between standards will not be permitted.

The use of wire nuts in splices and taps will not be permitted.

2. Steel Standards:

The pole shall be oriented on the foundation so that the handhole is on the side of the pole opposite oncoming traffic.

The upper third of the shaft shall be given one field coat of weather-resistant enamel, color as specified.

3. Conduit:

Conduit runs shall be built in as straight a line as possible. When conduit sweeps are necessary, only one sweep, in one direction will be permitted between manholes or between manhole and cable pole. The radius of the sweep shall not be less than 24 feet.

Factory conduit bends shall only be used when entering foundations or at the base of cable poles.

All excavation for a main conduit run shall be to a depth to leave at least 36 inches from the top of the conduit encasement or top of direct buried rigid conduit to top of finished grade. For lateral conduit runs, the corresponding dimensions shall be 30 inches. Typical depth and widths of excavations will be shown on the plans. The trench shall be graded to handhole and manhole location, so that the finished conduit runs will have no low spots where water might accumulate but will drain into a handhole or manhole.

The contractor shall sheet and brace the trenches as required, and shall adequately support all pipes or other structures exposed in the trenches. The support shall be incidental to the conduit construction and will not be paid for as separate items.

Conduit runs shall be encased in concrete or direct burial as specified. Adjacent conduits shall be spaced a minimum of 1-inch from each other and the concrete on the top, bottom, and side of the conduit encasement. Where steel reinforcement is required the reinforcing bars shall be separated from the conduits by 2 inches of concrete, and there shall be a minimum of 3 inches of concrete from the reinforcing bars to the outside of the encasement. Conduit joints shall be staggered vertically. Separators, spacers, blocks, or supports to be left in the finished concrete structure shall be composed of concrete or plastic.

Spacers shall be not more than every 7 feet when 20 foot lengths of conduit are installed and not more than every 5 feet when 10 foot lengths of conduit are installed.

The concrete mix, used to encase the conduit, shall be designed with enough workability (slump greater than 8 inches) to ensure encasement underneath the conduit. The bottom of the trench shelf shall be lined with a polyethylene sheet to ensure integrity of the concrete.

Concrete, during and immediately after depositing, shall be consolidated by means of mechanical vibrators. The concrete shall be worked thoroughly around enforcements, embedded fixtures, and into corners. Every precaution shall be taken to provide a dense, waterproof encasement, free of voids and honeycomb. The conduit bank shall be prevented from floating up when the concrete is poured, by anchoring to stakes at intervals not to exceed 10 feet in firm soil and not to exceed 5 feet in loose soil.

A bank of encased conduits may be constructed in either of two ways as described herein.

A. Tier-By-Tier Method. A foundation of concrete at least 3 inches thick is first placed on the bottom of the trench after it has been graded. When steel reinforcement is required the thickness of the concrete shall be at least 5 inches with the reinforcing bars in place. On this concrete base the bottom tier of conduits are laid, separated from each other by suitable spacers. The space between conduits of this first tier shall then be filled with concrete and the conduits covered to the height of the next succeeding conduit tier. Succeeding tiers shall be constructed in a similar manner. Work shall proceed as continuous operation with no interruptions in excess of 45 minutes between the placing of successive layers of concrete.

B. Built-Up or Monolithic Method. Masonry supports at intervals of 3 to 5 feet, or a foundation of concrete at least 3 inches thick, shall be first placed in the bottom of the trench after it has been graded. Where steel reinforcement is required, the thickness of the concrete foundations shall be at least 5 inches with reinforcing bars in place. All conduits shall then be placed, using plastic or concrete separators, to erect a rigid, self-supporting structure of conduits in position before the concrete to completely fill the spaces between the conduits without damaging or displacing the conduits.

No conduit shall be encased until it has been inspected and approved by the City of Detroit, Public Lighting Department.

Typical sections and various typical arrangements of conduit will be shown on the plans.

Backfill for trenches shall be as indicated on the plans.

After the conduit runs are built, the Contractor shall pull a mandrel 12 inches long (shorter in conduit runs with bends) and 1/2-inch smaller in diameter than the conduit and a suitable swab or cleaning device designated to clear the conduit of debris. The Contractor shall notify the inspector prior to performing this phase of the work so that he may be present during this work. The contractor shall certify that this work has been done before payment will be made.

A coupling shall be placed on the ends of all conduits terminations and plugged with a suitable removable plug.

Backfill for trenches outside the roadbed may be the material excavated therefrom unless it is unsuitable for backfill material. Backfill for trenches within the limits of the roadbed shall be a Grade A fill material.

Where iron pipe conduit is installed, plastic conduit shall be installed within the iron pipe. Cable then shall be installed in the plastic conduit. Cable shall never be installed in iron pipe without the plastic conduit installed within.

Within five days after completion of the conduit work or of any portion where a working cable is installed, the Contractor shall furnish to City of Detroit, Public Lighting Department., a record of the length of the duct lines as constructed, clearly showing any departures from the original plans.

The lengths shall be measured from the inside walls of manholes and the center of post foundations, cable poles, and handholes. Final payment shall be withheld until work is completed.

No concrete encasement shall be in contact with any obstruction. A vertical clearance of 9 inches shall be provided, except that conduits parallel to water and gas mains shall be separated by not less than 12 inches.

City of Detroit, Public Lighting Department shall be notified 48 hours prior to the pouring of any concrete encasement.

Conduit grades shall be staked at 8 foot intervals or less. Excavation below the bottom line of the trench shall be filled with Grade A backfill, well compacted. Grade shall have a fall to the lowest manhole or handhole, or from the middle of the run toward both holes, of not less than 4 inches per 100 feet.

All surfaces which have been dug up or disturbed for any reason by the Contractor shall be restored in kind to its original condition including but not limited to top soil and grass, sidewalk ramp, curb and gutter, and roadway bed including sub base and pavement materials.

4. Foundations:

No construction rubble, broken sidewalk or other foreign material will be permitted in place of concrete. Cracked or otherwise defective foundations will not be accepted.

Standards shall not be installed on foundations until the concrete has cured for a minimum of seven days.

Foundations shall at all times be properly protected and guarded to prevent injury to persons until the standards are installed.

No foundation shall be poured until the curb is in place. Foundations shall be located as shown on the plans unless otherwise authorized by the Engineer.

Ground rods and ground wires shall be installed as shown on the detail drawings. The ground wire shall be embedded in the foundation and shall be connected to the ground rod with a copper clad steel solderless type clamp. The connection must be electrically solid and mechanically secure.

The lower portion of the foundation shall be poured without forms unless the soil is subject to cave-in and the use of forms is authorized by the Engineer. Forms shall be used to shape the upper part of the foundation, as shown on the plans. The top surface of the foundation shall be horizontal and at the elevation shown on the plans or established by the Engineer.

Concrete shall fill the entire hole excavated for the foundation. Forms shall not be used, except to form the foundation top, without the prior approval of the Project Engineer.

Foundations shall be installed in undisturbed earth. Foundation excavation shall be augured or hand dug only.

Foundation bolts shall be wired in place near the bottom of the excavation in order to prevent movement of the bolts during the pour.

Conduit bends shall be wired in place to the anchor bolts in order to prevent movement of conduit bends during the pour.

Openings of conduit bends shall be sealed prior to pour in order to prevent entry of concrete into conduit.

Anchor bolt projections above grade shall be coated with oil prior to pouring to prevent concrete from adhering to anchor bolts.

Conduit shall extend vertically outside foundation envelope a minimum of 4 inches. A coupling and a straight extension may be used in order to obtain the necessary vertical projection.

The entire foundation, exclusive of the cap, shall be placed with a single pour of concrete.

5. Manholes and Handholes:

Precast or cast-in-place handholes shall be installed or constructed as shown on the plans.

Manholes shall be constructed as shown on the plans.

Unused conduit entrances and conduit openings to be extended by others shall be blanked off, to prevent entrance of earth, with suitable removable plugs of plastic or other material as approved by the Engineer.

Bell ends are required on all conduits entering manholes and handholes.

When a new manhole is built into an existing conduit run, the concrete encasement shall be carefully chipped away and the conduits removed between the inside walls of the new manhole. All existing cables thus exposed shall have additional lengths spliced into them so that they may be properly racked on the walls of the manhole.

Where holes are built in the future roadways, top of manhole frames shall be set for future roadway grade. Where manhole frames built to future roadway grades may interfere with existing roadways, the frames should be set to allow for future adjustments.

Sewer drains shall have a drainage grade of not less than 6 inches per 100 feet. Bell and spigots shall be tight fit, cemented. Saddles shall be installed where required. In some cases, the City Sewer Division will make the main sewer tap and the cost for this work shall be incidental and will not be paid for separately. Open joint sewers for manhole drains will not be permitted.

Backfilling shall conform to the requirements as herein before mentioned.

Upon completion of all manhole, handhole, conduit and sewer drains, the holes shall be free of all rubbish, construction debris and water. All sewer drains shall be free-running and the traps clean.

Adjusting manhole and handhole shall apply where the elevation of the cover is not changed more than 6 inches and no other alterations are necessary. Existing covers shall be adjusted to the proper elevation by removing or chipping enough adjacent pavement, curb, or curb and gutter to remove the frame or castings, and raising or lowering them to the required elevation by supporting them on a concrete roof slab, masonry or steel reinforced rod, so constructed as to hold them firmly in place. The adjacent pavement, curb, or curb and gutter shall be replaced to the original elevation condition and kind of construction.

Reconstructing Manhole and Handhole shall apply where elevation of the cover is changed more than 6 inches and no other alterations are necessary. The scope of work for reconstructing the manhole or handhole otherwise shall be the same as for adjusting the manhole or handhole.

Abandoning manholes and handholes shall be broken down to 24 inches below the required grade of the bottom of the concrete slab and backfilled with granular material. When so noted on the plans the existing conduit shall be spliced through and encased with concrete. The spliced conduit shall be clear of all obstruction.

Removing manholes and handholes shall have the frame and cover removed and the structure shall be broken down below grade as required. The handhole or manhole shall be required to be removed only where a new handhole or manhole is to be built in the same location. Therefore the wall structure of the existing hole to be removed shall be broken down as required to accommodate the new manhole or handhole in the same location.

6. Cable Tags for Installation in Manholes and Handholes:

Material

Tags are to consist of UV inhibited polypropylene, with .040 inch thick black polypropylene character embedded in a colored polypropylene substrate. Material to be non-conductive, non-corrosive, abrasion resistant, chemically inert, and tolerate a temperature range of -50 to +300 degrees F.

Size and Color

Legend to consist of 1-inch high block style letters, except tags with special legends as given below. Text to be black on yellow substrate except for the following characters, which are to consist of black characters on orange substrate:

2.4 KV 4.8 KV 7.2 KV 13.2 KV

In addition, the 24 KV tag is to consist of black characters on a red substrate.

Mounting

Characters comprising tag shall be mounted in a polyethylene holder which shall be fastened to the cable with nylon tie straps.

Legends

Contact P.L.D. Engineering Division for cable and circuit designations.

Method of Construction

Each tag is to be mounted with two nylon tie straps. Tags are to be installed near the duct pocket, and, when conditions allow, in a location on the cable where they may be read without having to enter manholes and handholes.

7. Cable Tags for Use in Lighting Load Centers and Controllers:

Material

Individual tags are to be made of polypropylene, with raised high relief letters. Material to be non-corrosive, non-conductive, weatherproof, stabilized for ultraviolet, resistant to salt water, organic solvents, mild acid or alkali solutions, and high humidity.

Size and Color

Legend to consist of 3/8-inch high block style black letters on a yellow background.

Mounting

Characters comprising tag shall be mounted in a polyethylene holder which is fastened to the cable with nylon tie straps.

8. General Overhead Line:

The Contractor shall relocate all Public Lighting Department and foreign contacts required for right-of-way preparation unless it is noted on the drawings that the owning utility has been requested to relocate its facilities.

All thru splices in line wire shall be made with automatic line splices. The number of such splices shall be kept to a minimum but in no case shall exceed one splice in three consecutive spans of wire.

All wire which is trained under crossarms or vertically on the pole shall be covered with wood or plastic molding.

#6 line wire shall be dead-ended on double pins and double arms. Line wire larger than #6 shall be dead-ended as shown on the plans.

Two street lighting strain insulators or "breakers" shall be used to separate the line conductors on 3-way and 4-way overhead series circuit connections.

Three "breakers" shall be used to separate the conductors of two different series circuits which are dead-ended "back-to-back" at the same crossarms.

A single "breaker" shall be used in the line conductor when installing series ballast.

When installing a series ballast in a two-wire series circuit lead, the ballast shall be connected into that wire of the pair which is physically closest to the luminaire which the ballast will serve. Single wire runs of different series street lighting circuits shall not occupy adjacent pin positions on the same side of the pole.

#6 tie wire shall be used with all line wire #2 and larger. #8 tie wire shall be used with #6 line wire. #12 tie wire shall be used with #8 duplex.

No splice shall be made in a #8 duplex run between ballast and luminaire unless the length of wire required from ballast to luminaire exceeds 500 feet.

9. Traffic Signals:

No traffic signal installation shall be placed in service without the prior approval of the Engineer.

The representative of the manufacturer of the controller and cabinet shall be responsible for programming the controller, wiring of the cabinet, and installation of the transformer. The traffic signal timing permits shall be provided by the City of Detroit, Traffic Engineering Division.

All traffic signal cable shall be installed as shown on the plans. The cable type and size shall be as indicated on the plans. All traffic signal head cables will be of stranded copper construction and meet IMSA 20-1 specifications. Cables shall be installed in one length without joints from the controllers to each traffic signal, except when indicated otherwise on the plans. Cables shall be trained near the top of the wall of manholes and handholes and bends shall not be so small as to

cause damage to cable. Cables shall be bundled together under 1-1/2-inch wide lead straps which shall be secured to the wall with galvanized anchors. A maximum spacing of 2 feet-0 inches shall be maintained between supports.

The Contractor shall make all cable connections at each signal head and at the controller. Controller timing shall be done by the contractor, in the field, and after all above cable connections have been completed.

The traffic signal cable shall be brought into the traffic signal head and shall extend for a minimum of 48 inches into the controller cabinet. All traffic signal cables shall be securely strapped inside the controller cabinet. Each cable in the traffic signal controller shall be tagged or stamped with the number of the traffic signal to which it is connected. Overhead signals are to be prewired with standard wire prior to mounting.

Each signal cable shall be tagged, with the number of the signal head to which it is connected inside the controller cabinet and in each handhole and manhole.

All cables, including interconnect and secondary service cables, shall be tested for continuity and resistance to ground before final connections are made. The complete final installation shall be tested in operation by the Contractor prior to placing in service. Tests shall include verification of proper operation and sequencing of each signal indication and measurement of secondary voltage under load. The tabulated results of these tests shall be furnished to the Project Engineer before the installation is placed in service.

To minimize the entrance of gases from the conduit system into the controller cabinet, all duct openings into the controller foundation shall be plugged with duct-seal, or the equivalent, after all cables have been pulled in and connected.

All cables shall be pulled into the controller cabinet with sheaths intact. Cables shall be trained across the bottom of the cabinet and at least 3 inches up the cabinet wall before the sheath is stripped.

Cable entrance bushings shall be installed in all wire entrance holes in standards and mast arms.

Overhead traffic signal cable splices shall be made with crimp-type connectors; each individual crimp connection shall be wrapped with three (3) layers of PVC (electrical) tape. The crimp connections shall be staggered and the entire group shall be wrapped with three (3) layers of PVC (electrical) tape. Proper crimping tools shall be employed.

Underground traffic signal cable splices shall be made with crimp-type connectors; each individual crimp connection shall be wrapped with three (3) layers of tape and the splices enclosed in a heat-shrink case per manufacturer's specifications. The crimp connections shall be staggered within the encasement. Proper crimping tools shall be employed.

Salvaged signal suspension fittings (mast arm end fittings, span wire clamps, wire entrance fittings, clevises) shall not be reused without prior approval of the Project Engineer.

All mast arm and span wire mounted signal heads shall be furnished with safety chains as shown on the plans.

Signals which cannot be placed in service on the day of installation shall be hooded or covered to avoid traffic confusion.

The signal cable shall be pulled with sheath intact, into the lower frame work member of bracket arm and pedestal signal. The sheath shall not be stripped any closer than 6 inches from the point of entry into the framework.

The signal face shall be aimed as indicated on the plans. In those cases where aiming instructions are not included in the plans, such information will be furnished by the Department of Public Works - Traffic Engineering Division prior to placing the signals in service.

d. Method of Measurement and Basis of Payment

The completed work as described shall be paid for at the contract unit price for the following contract item (pay item):

Conduit Repr, Under Pavt, Modified and Conduit Repr, Under Sidewalk or Earth, Modified will be measured in linear feet of the necessary excavation. The contract unit price each shall be payment in full for locating the conduit breakdown, repairing and sleeving a new conduit section, repairing the concrete encasement, furnishing all labor, materials and equipment. Excavation, granular material backfill, disposal of waste excavated material, together with pavement, sidewalk and curb removal and replacement is also included. No sidewalk slabs shall be patched. All excavated sidewalk slabs shall be replaced in full. The excavation limits shall be approved by the Engineer prior to any repair work commencing.

Conduit, Encased,___, ___ inch, Modified size and number as shown on the plans will be measured in linear feet in place of conduit measured by the length in linear feet in place, from the inside walls of manholes and the centers of handholes, foundation and cable poles. The contract unit price per linear foot shall be payment in full for furnishing all labor, materials and equipment for excavation, installing the conduit, reinforcement where called for and encasement complete. Excavation, granular material backfill, disposal of waste excavated material, together with pavement, sidewalk and curb removal and replacement is also included. Restoration to original condition of surfaces, pumping and cleaning manholes and handholes, disposal of waste excavated materials, and swabbing conduits after installation shall be included in this item and will not be paid for separately.

Conduit, DB, ___, ___ inch, Modified size and number as shown on the plans will be measured in linear feet in place of conduit measured by the length in linear feet in place, from the inside walls of manholes and the centers of handholes, foundation and cable poles. The contract unit price per linear foot shall be payment in full for furnishing all labor, materials and equipment for excavation, installing the conduit. Excavation, granular material backfill, disposal of waste excavated material, together with pavement, sidewalk and curb removal and replacement is also included. Restoration to original condition of surfaces, pumping and cleaning manholes and handholes, disposal of waste excavated materials, and swabbing conduits after installation shall be included in this item and will not be paid for separately.

Pay Item	**Pay Unit**
Conduit Repr, Under Pavt, Modified	Foot
Conduit Repr, Under Sidewalk or Earth, Modified	Foot
Conduit, Encased, ___, ___ inch, Modified	Foot
Conduit, DB, ___, ___ inch, Modifed	Foot

Livernois Streetscape

LIVERNOIS AVENUE FROM 8 MILE ROAD TO MARGARETA AVE, DETROIT

Issued for 60% Construction Documents 21 December 2018

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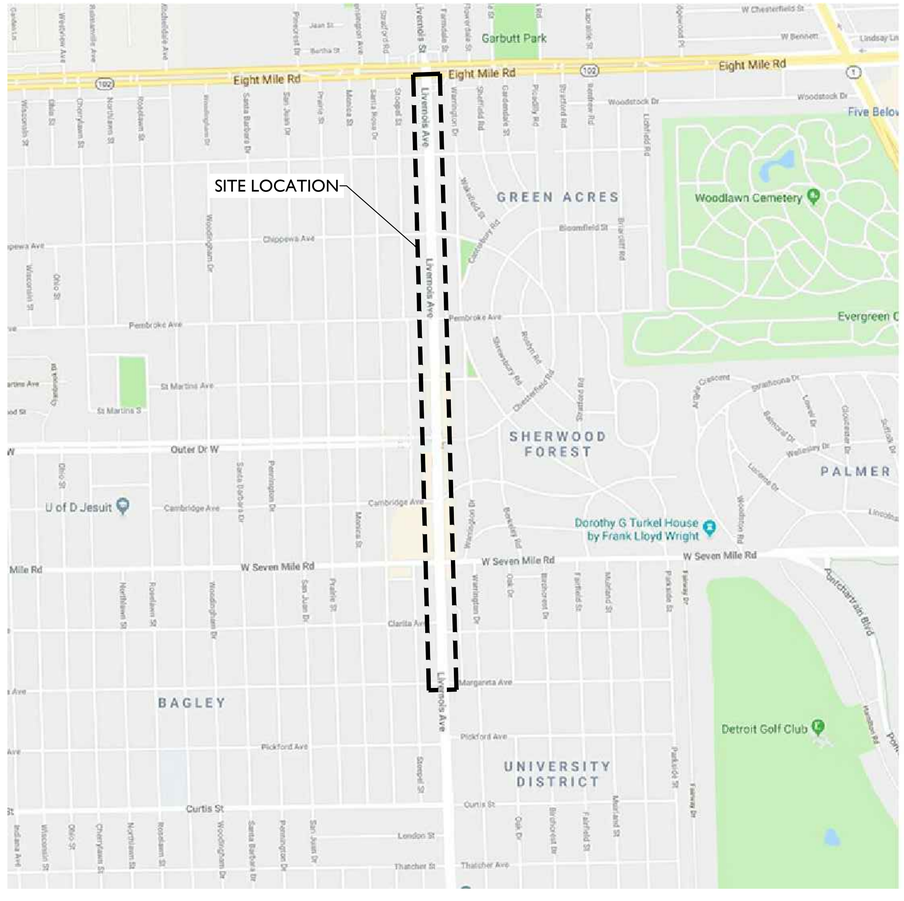
LOCAL AUTHORITY APPROVAL

CITY OF DETROIT
CITY ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS
2 WOODWARD AVENUE
DETROIT, MI 48226

PROJECT DESCRIPTION

Livernois Avenue Streetscape renovations covers 9 blocks along Livernois, from Eight Mile Road to Margareta Avenue. This project reconfigures traffic by reducing the roadway to one lane in each direction and eliminating the existing median.

LOCATION MAP



VICINITY MAP



UTILITY INFORMATION

THE EXISTING UTILITIES SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN LOCATED FROM UTILITY RECORD DRAWINGS. ACTUAL UTILITY LOCATIONS MAY VARY FROM WHAT IS SHOWN. ALL UTILITIES TO BE FIELD VERIFIED BY UTILITY OWNER PRIOR TO CONSTRUCTION.

UTILITIES

DETROIT WATER & SEWER
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DALE ECHOLS
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Phone: 313-267-4857
DALE.ECHOLS@GLWATER.ORG

DETROIT PUBLIC LIGHTING
9449 GRINNEL
DETROIT MI 48226
PHONE: 586.803.3516 EXT. 715

FIRE

CITY OF DETROIT
FIRE CHIEF
ERIC JONES
1301 THIRD STREET
DETROIT, MI 48226
PHONE: 313.596.2900

GAS

DTE GAS COMPANY
BARBARA SAUNDERS
ONE ENERGY PLAZA
DETROIT, MI 48226
Phone: 313.235.5111
SAUNDERSB@DTEENERGY.COM

TELEPHONE

AT&T
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17651 MICHIGAN AVE.
DEARBORN, MI 48126
PHONE: 313.240.5480
DB3451@ATT.COM

ELECTRIC

ITC HOLDING CORP
PAUL BELZAK
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NOVI, MI 48377
PHONE: 248.946.3308
PBELZAK@ITCRANSCO.COM

CABLE

SIGMA NETWORK SERVICES (COMCAST CATV)
TIFFANY FORBES
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PHONE: 419.874.9262 EXT. 144
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CROWN CASTLE FIBER
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ROCHESTER, NY 14618
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PRIME CONSULTANT

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CONSULTANT

PROJECT

LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

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Sheet No: G001

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T913	SIGNAL DETAILS
T914	SIGNAL DETAILS
T915	SIGNAL DETAILS
T916	SIGNAL DETAILS
T917	SIGNAL DETAILS
T918	SIGNAL DETAILS
T919	SIGNAL DETAILS
T920	SIGNAL DETAILS
T921	SIGNAL DETAILS
T922	SIGNAL DETAILS

PRIME CONSULTANT

spackman mossop michaels

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Suite 696
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LANDSCAPE ARCHITECTS

CONSULTANT

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: INDEX SHEET

Sheet No: G001

GENERAL LEGEND

- PROJECT MATCHLINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- EXISTING BUILDING
- EXISTING RIGHT–OF–WAY (ROW)
- EXISTING PROPERTY LINES
- EXISTING FENCE – BARBED WIRE
- EXISTING FENCE – WOOD
- EXISTING GUARDRAIL
- EXISTING SIGN
- PROPOSED GRADE SLOPE
- EXISTING SPOT ELEVATION
- PROPOSED SPOT ELEVATION
- EXISTING WETLANDS
- EXISTING TREE
- EXISTING PLANTER BOX
- EXISTING LANE STRIPING
- EXISTING TURN ARROW STRIPING
- EXISTING CONCRETE
- EXISTING BRICK SIDEWALK
- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERLINE
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION
- ROADWAY/MEDIAN DEMOLITION: MILL AND OVERLAY

UTILITIES LEGEND

- EXISTING GAS LINE
- EXISTING STORMWATER PIPE
- EXISTING SANITARY SEWER PIPE
- EXISTING WATERMAIN
- EXISTING OVERHEAD POWER LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM MANHOLE
- EXISTING LIGHT POLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING CATCH BASIN
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING IRRIGATION CONTROL VALVE
- EXISTING FIRE HYDRANT
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM WATER CATCH BASIN
- PROPOSED STORM WATER MANHOLE
- PROPOSED STORM WATER SEWER PIPE
- PROPOSED STORM WATER UNDERDRAIN PIPE
- PROPOSED WATER MAIN
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT

MAINTENANCE OF TRAFFIC LEGEND (TEMPORARY)

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

MAINTENANCE OF TRAFFIC LEGEND (FINAL)

- DOUBLE YELLOW SOLID PAVEMENT MARKING (6" WIDE, EACH)
- SINGLE SOLID & DASHED YELLOW PAVEMENT MARKING FOR CENTER TURN LANES (6" WIDE, EACH)
- SINGLE SOLID WHITE PAVEMENT MARKING (LANES & CROSSWALKS WHERE APPLICABLE) (4" WIDE)
- DASHED WHITE PAVEMENT MARKING (BICYCLE CROSSINGS) (4" WIDE)
- 1.5' WIDE x 12' LONG SOLID WHITE CROSSWALK BAR (AS SHOWN)
- BICYCLE LANE TRAFFIC CROSSING – SOLID WHITE OUTER BARS WITH SOLID GREEN CENTER BAR (AS SHOWN) (SEE DETAIL ON SHEET No. C508)
- TRAFIC FLOW ARROW (AS SHOWN)
- PERMANENT POLE MOUNTED SIGN
- NEW LIGHT POLE (SEE NOTES REGARDING SIGN PLACMEMENT)

TEMPORARY SIGNAGE AND PAVEMENT MARKING LEGEND

- TEMPORARY DOUBLE YELLOW PAVEMENT MARKING (6" WIDE, EACH)
- TEMPORARY SINGLE WHITE PAVEMENT MARKING (4" WIDE)
- TEMPORARY TRAFIC FLOW ARROW
- TEMPORARY SIGN, TYPE B

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LEGEND

Sheet No: G002

J:\2017\G1\17018\production sets\livernois streetscape\17018-legend.dwg, Plotted: 12/20/2018 10:18 AM by bbassick

GENERAL NOTES

1. PROJECT AREA SPANS THE WIDTH OF THE RIGHT–OF–WAY OF LIVERNOIS AVENUE IN DETROIT, MI. FROM EIGHT MILE ROAD TO MARGARETA AVENUE.
2. THIS PROJECT IS TO SERVE AS THE CIVIL ENGINEERING PLANS FOR THE LIVERNOIS STREETSCAPE REVITALIZATION PROJECT PREPARED BY SPACKMAN MOSSOP MICHAELS (SMM). THIS PROJECT INCLUDES:
   - 2.1. THE DEMOLITION OF THE EXISTING TWENTY–FOUR–FOOT WIDE MEDIAN AND ASSOCIATED TURN LANE AREAS INSTALLED ACROSS LIVERNOIS AVE PER 2005 PLANS (CONTROL SECTION NO. EDCF 82544, FEDERAL PROJECT NO. MG 0582(127))
   - 2.2. EXPANSION OF EXISTING SIDEWALKS AND RELOCATION OF CURB AND GUTTER LINE
   - 2.3. CONSTRUCTION OF PROTECTED BIKE LANES
   - 2.2. REMOVAL/RECONSTRUCTION AND/OR MILL AND OVERLAY OF EXISTING AND PROPOSED TRAVEL LANES
3. HORIZONTAL CONTROL FOR THIS PROJECT IS REFERENCED TO THE MICHIGAN STATE PLANE COORDINATE SYSTEM, LAMBERT PROJECTION, SOUTH ZONE (2113), NORTH AMERICAN DATUM 1983 (NAD83) 2011. THE UNITS ARE INTERNATIONAL FEET. VERTICAL CONTROL FOR THIS PROJECT IS REFERENCED TO THE LOCAL CITY OF DETROIT DATUM.
4. THE SECTION OF PROJECT AREA SPANNING FROM MARGARETA AVENUE NORTHERLY TO PEMBROKE AVENUE INCLUDES A COMPLETE TOPOGRAPHICAL SURVEY INCLUDING PRECISE GRADES USING CONVENTIONAL SURVEYING METHODS, MAPPING UNDERGROUND UTILITIES BASED ON A COMBINATION OF AVAILABLE UTILITY RECORDS ALONG WITH ACTUAL FIELD–MEASUREMENTS, AND RETRACING THE RIGHT–OF–WAY LINES BASED ON ACTUAL FIELD MEASUREMENTS. PARCEL LINES ARE SHOWN ACCORDING TO THE CITY OF DETROIT CARTOGRAPHIC MAPS, WHICH WERE USED FOR REFERENCE. TOPOGRAPHIC SURVEY FOR THIS AREA PERFORMED BY SPALDING DEDECKER (SDA) AND DATED JANUARY 15, 2018.
5. THE SECTION OF PROJECT AREA SPANNING FROM PEMBROKE AVE NORTHERLY TO EIGHT MILE ROAD INCLUDES A COMPLETE TOPOGRAPHICAL SURVEY AS AS DESCRIBED ABOVE, PERFORMED BY SPALDING DEDECKER (SDA) AND DATED OCTOBER 24, 2018.
6. THE SURVEYOR OF RECORD STATES THAT:
   - 6.1. REASONABLE AND PRUDENT ATTEMPTS TO IDENTIFY THE OUTLETS FOR STORM WATER DRAINAGE AND SANITARY SEWER HAVE BEEN MADE, AND NOTE THAT THE OUTLETS FOR THIS SITE MAY BE MASKED BY TRAPS IN THE STRUCTURES AND/OR BLIND TAPS DIRECTLY INTO THE TRUNK LINES.
   - 6.2. BECAUSE THE SEWERS IN THE CITY OF DETROIT ARE PART OF A COMBINED STORM/SANITARY SYSTEM, IN LOCATIONS WHERE THE SURVEYOR OF RECORD HAS NOT BEEN ABLE TO PROPERLY DETERMINE WHETHER A PARTICULAR LINE IS "STORM" OR "SANITARY", THE UTILITY HAS BEEN LABELED AS SEWER (SWR).
   - 6.3. DETROIT WATER AND SEWERAGE DEPARTMENT (DWSD) SEWER MAPS WERE CONSULTED AS REFERENCE FOR THE SEWER SYSTEM. THESE MAPS SHOWED THE MAIN SEWER RUNS WHICH WERE GENERALLY CONSIDERED TO BE THE COMBINED PORTION OF THE SYSTEM. IN MOST CASES, THE CONNECTIONS BETWEEN THE CATCH BASINS AND THE MAIN SEWER RUNS ARE NOT SHOWN ON THESE MAPS. IT APPEARS THAT THERE ARE SMALLER RUNS OF STORM SEWER THAT MAY INTERCONNECT A NUMBER OF CATCH BASINS THAT FEED INTO THE LARGER INTERCEPTORS. THE SURVEYOR OF RECORD DOES NOT HAVE ANY RECORDS FOR THE LOCATION AND CONFIGURATION OF THESE STORM SEWER RUNS. THE SURVEYOR OR RECORD ALSO STATES THAT THERE MAY BE HORIZONTAL BENDS IN THESE SEWER RUNS BASED ON THE DIRECTION OF THE PIPES THAT WERE VIEWED LEAVING THE ACTUAL CATCH BASINS. THE SURVEYOR OF RECORD HAS PLOTTED THESE STORM SEWER CONNECTIONS BASED ON A POSSIBLE CONFIGURATION, BUT THIS SHOULD BE CONSIDERED TO BE APPROXIMATE IN NATURE ONLY AND NOT VERIFIED BY PRIOR RECORDS. THE POSSIBLE PRESENCE OF THE HORIZONTAL BENDS/ELBOWS BETWEEN STRUCTURES INCREASES THE UNCERTAINTY IN THE LOCATIONS FOR THESE RUNS OF PIPES.
   - 6.4. FOR LIST OF UTILITY PROVIDERS, SEE TABLE, THIS SHEET. TABLE PROVIDED BY SDA ALONG WITH TOPOGRAPHIC SURVEY.
   - 6.5. FOR SITE CONTROL POINTS, SEE TABLE, THIS SHEET.REFERENCED TO LOCAL CITY OF DETROIT DATUM. SITE CONTROL POINTS PROVIDED BY THE SURVEYOR OF RECORD. ENGINEER OF RECORD SHALL NOT BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR VARIATIONS. CONTRACTOR TO FIELD VERIFY & NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO BEGINNING WORK.
7. LOCATION OF UTILITIES OR OTHER STRUCTURES SHOWN ON PLANS ARE TAKEN FROM SURVEY OF RECORD. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY OMISSIONS OR VARIATIONS. THE CONTRACTOR SHALL CONTACT MISS DIG A MINIMUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF WORK, AND SHALL VERIFY ALL UNDERGROUND UTILITIES ON–SITE, PRIOR TO CONSTRUCTION. UTILITIES AND ASSOCIATED STRUCTURES SHALL NOT BE REMOVED UNLESS SPECIFIED ON PLANS. CONTRACTOR SHALL FIELD VERIFY AND THE CONTRACTOR SHALL PROTECT, OR HAVE RELOCATED, ANY UTILITIES THAT INTERFERE WITH THE CONSTRUCTION, AS INDICATED IN THESE DRAWINGS. PROTECT ALL EXISTING UTILITY STRUCTURES AND SEWERAGE DURING THE DURATION OF CONSTRUCTION. PROVIDE FOR TEMPORARY BYPASS OF SEWERAGE AS REQUIRED TO FACILITATE CONSTRUCTION.
8. ALL CONSTRUCTION, MATERIALS, AND HOURS OF OPERATION ARE TO BE IN ACCORDANCE WITH THE CURRENT STANDARDS, SPECIFICATIONS AND SITE, LOCAL, COUNTY AND STATE ORDINANCES, WHERE APPLICABLE.
9. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING THEIR OWN HEALTH AND SAFETY PLAN MEETING ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS. THE CONTRACTOR'S HEALTH AND SAFETY PLAN SHALL DESCRIBE THE POTENTIAL HAZARDS AS WELL AS CONTROL STRATEGIES ASSOCIATED WITH COMPLETION OF THIS PROJECT IN THE PLAN.
10. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS TO COMPLETE THE WORK.
11. THE CONTRACTOR SHALL PROTECT ALL EXISTING SIGNAGE UNLESS OTERHWISE INDICATED ON PLANS. THE CONTRACTOR SHALL PROVIDE THE NECESSARY TRAFFIC CONTROL AND SIGNAGE, PER LOCAL UNIFORM TRAFFIC CONTROL REGULATIONS, TO MAINTAIN ACCESS TO AND WITHIN THE PROPERTY THROUGHOUT CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE APPROPRIATE BARRICADES AROUND WORK AREAS FOR PEDESTRIAN AND VEHICULAR SAFETY.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY CONSTRUCTION STAKING AND GRADE AND ALIGNMENT CONTROLS. THE CONTRACTOR SHALL PROVIDE SUFFICIENT GRADE AND ALIGNMENT REFERENCES BY MEANS OF STAKES, STRINGLINES, OR OTHER APPROPRIATE MEANS TO COMPLETE THE WORK.
13. THE CONTRACTOR SHALL USE APPROPRIATE MEANS, METHODS AND EQUIPMENT AND TAKE NECESSARY PRECAUTIONS TO AVOID DAMAGE TO THE EXISTING SITE FEATURES; SUCH AS BUT NOT LIMITED TO: ROAD SIGNS, DRIVES, PAVEMENT, DITCHES, UNDERGROUND UTILITIES, OVERHEAD UTILITIES, CULVERTS, GATES, FENCES, UTILITY POLES, OR UTILITY MARKERS. ANY SITE FEATURE DAMAGE THAT OCCURS AS A RESULT OF THE CONTRACTOR'S MEANS, METHODS AND EQUIPMENT SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
14. ALL STORM AND SANITARY SEWERAGE AND ASSOCIATED STRUCTURES SHALL BE CLEANED AND OPERABLE PRIOR TO CONSTRUCTION AND AGAIN AFTER CONSTRUCTION IS COMPLETE. CONTRACTOR SHALL PRODUCE A LETTER FROM CONSTRUCTION MANAGER DETAILING THAT ALL STORM AND SANITARY STRUCTURES AND SEWERS HAVE BEEN CLEANED AND ARE FREE–FLOWING.
15. THE CONTRACTOR SHALL PROVIDE SIGNS INDICATING THE LOCATION OF OVERHEAD UTILITIES.
16. ALL PROPERTIES OR FACILITIES AND RELATED UTILITIES IN THE SURROUNDING AREAS, PUBLIC OR PRIVATE, DESTROYED OR OTHERWISE DISTURBED DUE TO CONSTRUCTION, SHALL BE REPLACED AND/OR RESTORED TO THE ORIGINAL CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE OWNER OR THE OWNER'S REPRESENTATIVE SHALL BE THE SOLE JUDGE OF THE ACCEPTABILITY OF ANY SUCH REPAIRS OR REPLACEMENTS.
17. THE CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF ANY BRUSH, VEGETATION, TRASH OR OTHER UNWANTED DEBRIS, AT THE OWNER'S DIRECTION.
18. THE CONTRACTOR SHALL PERFORM DEMOLITION AND/OR REMOVALS AS INDICATED ON THE PLANS. ALL EXCESS MATERIALS ARE TO BE REMOVED FROM THE SITE AND DISPOSED OF IN A LAWFUL AND ENVIRONMENTALLY APPROPRIATE MANNER, UNLESS SPECIFIED BY THE OWNER TO REMAIN ON SITE. REMOVAL AND DISPOSAL OF EXCAVATED/ EXCESS MATERIALS IS INCIDENTAL.
19. ALL WORK SHALL BE CONSTRUCTED TO THE ELEVATIONS AS NOTED ON THE PLANS. REFER TO PROJECT SPECIFICATIONS FOR TOLERANCE INFORMATION.

SOIL EROSION AND SEDIMENTATION NOTES

1. DAILY INSPECTIONS SHALL BE MADE BY THE CONTRACTOR TO DETERMINE EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES. ANY NECESSARY REPAIRS SHALL BE PERFORMED WITHOUT DELAY.
2. CONTAIN ANY SEDIMENT FROM WORK ON THE SITE AND DO NOT ALLOW IT TO COLLECT ON ANY OFF–SITE AREAS OR IN WATERWAYS. WATERWAYS INCLUDE BOTH NATURAL AND MANMADE OPEN DITCHES, STREAMS, STORM DRAINS, LAKES, AND PONDS.
3. APPLY TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO BEGINNING ANY WORK AT THE SITE. REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS SOON AS CONSTRUCTION HAS BEEN COMPLETED AND PERMANENT MEASURES HAVE BEEN ESTABLISHED.
4. THE CONTRACTOR SHALL PERIODICALLY REMOVE DEBRIS AND SEDIMENT BUILD–UP FROM EROSION CONTROL MEASURES DURING CONSTRUCTION.
5. PROMPTLY REMOVE ALL MUD, DIRT, AND DEBRIS TRACKED OR SPILLED ONTO EXISTING ROADS FROM THE SITE.
6. COMPLETE PERMANENT SOIL EROSION CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, OR ANY DISTURBED LAND AREAS WITHIN 5 CALENDAR DAYS AFTER FINAL GRADING OR FINAL EARTH CHANGES HAVE BEEN COMPLETED. IMPLEMENT TEMPORARY SOIL EROSION CONTROL MEASURES WHEN IT IS NOT POSSIBLE TO PERMANENTLY STABILIZE A DISTURBED AREA AFTER AN EARTH CHANGE HAS BEEN COMPLETED, OR WHERE SIGNIFICANT EARTH CHANGE ACTIVITY CEASES.
7. MAINTAIN ALL TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURES UNTIL PERMANENT SOIL EROSION AND SEDIMENT CONTROL MEASURES ARE ESTABLISHED.
10. THE CONTRACTOR SHALL PROVIDE SILT FENCES AROUND STOCKPILE AREAS AND APPROPRIATE EROSION CONTROL PROTECTION AT STORM SEWER STRUCTURES. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROL DEVICES THROUGHOUT THE DURATION OF THE PROJECT.
11. SHOULD IT BE NECESSARY FOR THE CONTRACTOR TO DO ANY DEWATERING DURING THE COURSE OF CONSTRUCTION, FILTER ALL DISCHARGE THROUGH A DISCHARGE FILTER BAG OR OTHER SEDIMENT CONTROL DEVICE THAT WILL FILTER ALL DISCHARGE WATER. NO DEWATERING DISCHARGE IS ALLOWED TO FLOW UNFILTERED FROM THE CONSTRUCTION SITE. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS TO DISCHARGE GROUND AND/OR STORM WATER PRIOR TO DEWATERING THE SITE.
12. CONTROL THE DUST CREATED ON THE CONSTRUCTION SITE AT ALL TIMES. ACCOMPLISH DUST CONTROL BY THE APPLICATION OF DUST CONTROL MATERIALS AND APPLICATION METHODS ACCEPTABLE TO THE AGENCY HAVING JURISDICTION. ALL COSTS FOR DUST CONTROL ARE INCIDENTAL TO THE PROJECT.
13. SHOULD THE SOIL EROSION AND SEDIMENTATION CONTROL REQUIREMENTS OR THE DUST CONTROL REQUIREMENTS BE NEGLECTED, THE OWNER OR AGENCY HAVING JURISDICTION MAY REQUIRE THE CONTRACTOR TO CEASE ALL CONSTRUCTION OPERATIONS UNTIL THE REQUIREMENTS ARE SATISFACTORILY MET.
14. CONTRACTOR SHALL DESIGNATE A CERTIFIED STORM WATER OPERATOR (CSWO) TO INSPECT AND MAINTAIN ALL EROSION CONTROL MEASURES FOR THE DURATION OF CONSTRUCTION. THE CSWO SHALL MAINTAIN AN INSPECTION REPORT AND FAX THEM TO THE CONSTRUCTION MANAGER ON–SITE.

UTILITY PROVIDER	MISS-DIG RESULTS	DATE	CONTACT	CONTACT #	CONTACT EMAIL
123.NET, INC.	NOT YET RECEIVED		CHUCK IRVIN	248-228-8223	MISSDIG@123.NET
360 NETWORKS	NOT YET RECEIVED		ROGER BILODEAU	866-213-1756	gt.cbyd@BELL.CA
BP-AMOCO PIPELINE CO	NOT YET RECEIVED		BOBBY ROYE	800-548-6482	MITICKETS@DIGTRACK.COM
ATT (FORMERLY SBC)	PLANS	11/27/2017	LINDA DENNISUK	248-456-8256	ld2154@att.com
BUCKEYE PARTNERS L.P.	CLEAR	11/6/2017	TRACI MCCLERNON	610-904-4475	TMCCLERNON@BUCKEYE.COM
COMCAST	CLEAR	11/15/2017	CRAIG PUDAS	248-809-2715	CRAIG_PUDAS@CABLE.COMCAST.COM
CTLCL-CENTURYLINK	NOT YET RECEIVED		TOM TROMBLEY	734-777-1910	thomas.sturmer@centurylink.com
DETROIT EDISON	PLANS	12/1/2017	NOT PROVIDED	313-235-5632	Design_MissDig@DTEenergy.com
DETROIT PUBLIC LIGHTING	NOT YET RECEIVED		AMY O'ROURKE/URG	586-803-3516	AOROURKE@URGLLC.NET
DETROIT THERMAL LLC	NOT YET RECEIVED		WADE WOODS	313-921-1922	WWOODS@DETROITRENEWABLE.COM
DETROIT WATER & SEWER	NOT YET RECEIVED		DALE ECHOLS	313-267-4857	DALE.ECHOLS@GLWATER.ORG
DETROIT MEDICAL CENTER	CLEAR	11/6/2017	JUDITH GARLAND	313-578-2448	missdig@dmc.org
DETROIT PEOPLE MOVER SYSTEM	NOT YET RECEIVED		ROBERT A CANTALINI	313-224-2212	RCANTALINI@THEPEOPLEMOVER.COM
EVERSTREAM	NOT YET RECEIVED		BRIAN KUNTER	616-608-8945	BKUNTER@EVERSTREAM.NET
FONOROLA FIBER/GABES CONSTR	CLEAR	11/6/2017	VICKIE MORAN	877-459-2690	NOT PROVIDED
FORD MOTOR COMPANY, TELECOMMUNICATIONS	NOT YET RECEIVED		JOE FORSYTHE	269-208-0671	jforsythe@tkns.net
INTERNATIONAL TRANSMISSION COMPANY	CLEAR	11/13/2017	BRIANNA KOTELES	248-946-3322	bkoteles@itctransco.com
KEPS TECHNOLOGIES INC. DBA ACD-NET	NOT YET RECEIVED		TYLER LENSING	517-999-3247	LENSING.TYLER@ACD.NET
KINDER MORGAN COCHIN, LLC.	NOT YET RECEIVED		CLAY POPE	713-369-8319	onecall_liq@kindermorgan.com
LEVEL 3 COMMUNICATIONS	NOT YET RECEIVED		JUDY HENRY	720-888-2061	RELO@LEVEL3.COM
LIGHTOWER FIBER NETWORKS	CLEAR	11/6/2017	STEVEN HERALD	585-568-8449	SHERALD@LIGHTOWER.COM
M-1 RAIL	NOT YET RECEIVED		RYAN EPSTEIN	313-924-4373	RYAN.EPSTEIN@M1RAIL.ORG
MARATHON PIPELINE	NOT YET RECEIVED		CHRISTINA BODINE	419-672-4888	clbodine@MARATHONPETROLEUM.COM
MARATHON PETROLEUM CO. LP: MI REFINING	NOT YET RECEIVED		PAUL FRASER	419-429-5696	MISSDIGDesign@mgrouproot.com
DTE GAS DISTRIBUTION DESIGN CODE	PLANS	11/20/2017	BARBARA SAUNDERS	313-235-5111	SAUNDERSB@DTEENERGY.COM
MCI/VERIZON BUSINESS	PLANS	11/10/2017	OSP / INVESTIGATIONS	972-729-6016	investigations@verizon.com
MERIT NETWORK INC.	NOT YET RECEIVED		KEN LOPEZ	616-393-0132	KENL@WESTERNTEL-COM.COM
ENERGY TRANSFER	CLEAR	11/6/2017	MOLLY CARRIERE	713-989-7079	MISDIG_TICKETS@IRTH.COM
PUBLIC LIGHTING AUTHORITY	NOT YET RECEIVED		MUKESH PATEL	313-558-0191	mpatel@pladetroit.org
PLAINS MARKETING L.P.	NOT YET RECEIVED		BRENT SMITH	713-993-5098	tbsmith@paalp.com
PRAXAIR, INC.	NOT YET RECEIVED		ANDREW BAKER	219-313-2692	ANDREW_BAKER@PRAXAIR.COM
QWEST COMMUNICATIONS	NOT YET RECEIVED		GEORGE MCELVAIN	303-992-9931	THOMAS.STURMER@CENTURYLINK.COM
ROCKET FIBER LLC	NOT YET RECEIVED		SCOTT CERNY	989-277-3149	scottcerny@rocketfiber.com
ROYAL OAK CHARTER TOWNSHIP	NOT YET RECEIVED		SHERRY LEWIS	248-547-9800	SLEWIS@ROYALOAKTWP.COM
SPECTRUM BROADBAND, LLC	NOT YET RECEIVED		EDWARD REIMANN	517-899-2506	EDWARD@GOLIGHTSPEED.COM
SPRINT/NEXTEL	NOT YET RECEIVED		GERRY A. CRAIN/ERICSSON	847-445-1869	gerry.a.crain@sprint.com
SUNOCO PIPELINE LP	PLANS	11/6/2017	TRACY L HOFFMAN	610-670-3256	tlhoffman@sunocologistics.com
TERRADEX	CLEAR	11/6/2017	RIN TRAN	650-227-3254	RIN@TERRADEX.COM
U.S. SIGNAL CORP.	NOT YET RECEIVED		KEITH, VANDER PLOEG	616-295-0868	MISSDIG@TKNS.NET
WINDSTREAM COMMUNICATONS	CLEAR	11/9/2017	JOE GREEN	319-790-7510	JOSEPH.GREEN@WINDSTREAM.COM
WOLVERINE PIPELINE CO	CLEAR	11/6/2017	LOUIS KRAUS	269-323-2491	LOUIS_KRAUS@WPLCO.COM
WIDE OPEN WEST	CLEAR	11/20/2017	JOHN HAJEC	734-237-4319	JOHN.HAJEC@WOWINC.COM
WAYNE STATE UNIVERSITY	NOT YET RECEIVED		KEN LOPEZ	616-393-0138	KENL@WESTERNTEL-COM.COM
XO COMMUNICATIONS	NOT YET RECEIVED		ANTHONY KOWALESKI	248-784-4427	ANTHONY.KOWALESKI@XO.COM
ZAYO BANDWIDTH MIDWEST, LLC	NOT YET RECEIVED		GEORGE HUSS	443-403-2023	GEORGE.HUSS@ZAYO.COM

CONTROL POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	344581.481	13453981.108	175.14	CP #1
4	343889.236	13454022.566	175.77	CP #4
5	343131.866	13454044.770	176.11	CP #5
6	342560.619	13454060.193	176.54	CP #6
7	341950.812	13454091.952	177.86	CP #7
8	341171.342	13454136.769	178.48	CP #8
9	340623.305	13454164.411	175.57	CP #9
11	346932.165	13453884.623	174.77	CP #11
12	346302.760	13453908.556	173.76	CP #12
13	345826.312	13453932.542	173.76	CP #13
14	345491.203	13453944.165	174.11	CP #14
15	344877.923	13453983.439	175.00	CP #15

BENCHMARK	BENCHMARK DESCRIPTION	BENCHMARK ELEVATION
DETROIT CITY BM 27-250	DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF LIVERNOIS AND SEVEN MILE	176.856'
DETROIT CITY BM 27-250A	DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF BERKLEY AND SEVEN MILE	173.678'
DETROIT CITY BM 27-251	DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF LIVERNOIS AND PEMBROKE	173.316'
SITE BM#100	ARROW ON HYDRANT, LOCATED ON THE NORTHWEST CORNER OF LIVERNOIS AND ST. MARTINS	176.86'
SITE BM#101	TOP OF BOLT ON STREET LIGHT POLE, LOCATED ON THE WEST SIDE OF LIVERNOIS AND CENTER OF OUTER DRIVE	176.42'
SITE BM#102	ARROW ON HYDRANT, LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND CAMBRIDGE	178.71'
SITE BM#103	ARROW ON HYDRANT, LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND SEVEN MILE ROAD	180.24'
SITE BM#104	TOP OF BOLT ON LIGHT POLE, LOCATED ON THE NORTHEAST CORNER OF HAND CAR WASH PARKING LOT	178.60'
SITE BM#105	SET BENCH TIE IN LIGHT POLE. LOCATED ON THE SOUTHEAST CORNER OF LIVERNOIS AND MARGARETA	175.19'
SITE BM#106	ARROW ON HYDRANT. LOCATED ON THE NORTHWEST CORNER OF LIVERNOIS AND PEMBROKE	177.06'
SITE BM#107	TOP OF SE BOLT ON STREET LIGHT POLE. LOCATED ON THE SOUTHEAST CORNER OF LIVERNOIS AND EIGHT MILE	175.50'
SITE BM#108	ARROW ON HYDRANT. LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND NORFOLK	176.31'
SITE BM#109	ARROW ON HYDRANT. LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AT CHIPPEWA	176.55'

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Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT
LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

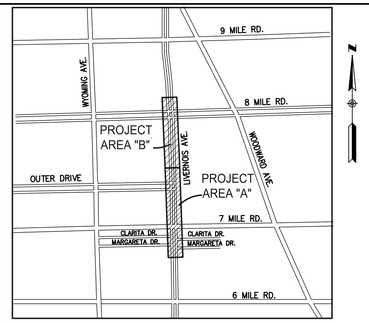
Sheet Title: GENERAL NOTES

Sheet No: G003

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LEGEND

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- SN — SANITARY SEWER (SAN)
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- WM — WATERMAIN (WM)
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- CS — COMBINED SEWER
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- GAS SHUT OFF VALVE
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- T TELEPHONE RISER
- C CABLE TV RISER
- AC AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GP GUY POLE
- GROUND LEVEL OR DECORATIVE LIGHTING
- FLAG POLE
- PP PHONE OR PHONE BOOTH
- CHAIN LINK FENCE (C.L.)
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- BOULDER
- STATUE OR SCULPTURE
- BENCH BENCH
- INV. INVERT ELEVATION
- CMP CORRUGATED METAL PIPE
- CENTERLINE OF DITCH
- CULVERT
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- PROPERTY LINES
- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 655.00 SPOT ELEVATION
- TC TOP OF CURB ELEVATION
- G GUTTER ELEVATION
- TP TOP OF PAVEMENT ELEVATION
- EM EDGE OF METAL ELEVATION
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- ● MAG SET MAGNETIC NAIL
- ● MAG/TAG SET MAGNETIC NAIL W/SDA TAG
- M MEASURED
- R RECORD
- C CALCULATED



LOCATION MAP

NOT TO SCALE

BENCHMARK DESCRIPTIONS

DATUM: CITY OF DETROIT

DETROIT CITY BM 27–250 DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF LIVERNOIS AND SEVEN MILE. ELEV.=176.856'

DETROIT CITY BM 27–250A DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF BERKLEY AND SEVEN MILE. ELEV.=173.678'

DETROIT CITY BM 27–251 DISK IN MONUMENT BOX. LOCATED AT THE NORTHEAST CORNER OF LIVERNOIS AND PEMBROKE. ELEV.=173.76'(M) 173.316'(R)

SITE BM#100 ARROW ON HYDRANT, LOCATED ON THE NORTHWEST CORNER OF LIVERNOIS AND ST. MARTINS. ELEV.=176.86'

SITE BM#101 TOP OF BOLT ON STREET LIGHT POLE, LOCATED ON THE WEST SIDE OF LIVERNOIS AND CENTER OF OUTER DRIVE. ELEV.=176.42'

SITE BM#102 ARROW ON HYDRANT, LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND CAMBRIDGE. ELEV.=178.71'

SITE BM#103 ARROW ON HYDRANT, LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND SEVEN MILE ROAD. ELEV.=180.24'

SITE BM#104 TOP OF BOLT ON LIGHT POLE, LOCATED ON THE NORTHEAST CORNER OF HAND CAR WASH PARKING LOT. ELEV.=178.60'

SITE BM#105 SET BENCH TIE IN LIGHT POLE. LOCATED ON THE SOUTHEAST CORNER OF LIVERNOIS AND MARGARETA. ELEV.=175.19'

SITE BM#106 ARROW ON HYDRANT. LOCATED ON THE NORTHWEST CORNER OF LIVERNOIS AND PEMBROKE. ELEV.=177.06'

SITE BM#107 TOP OF SE BOLT ON STREET LIGHT POLE. LOCATED ON THE SOUTHEAST CORNER OF LIVERNOIS AND EIGHT MILE. ELEV.=175.50

SITE BM#108 ARROW ON HYDRANT. LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND NORFOLK. ELEV.=176.31

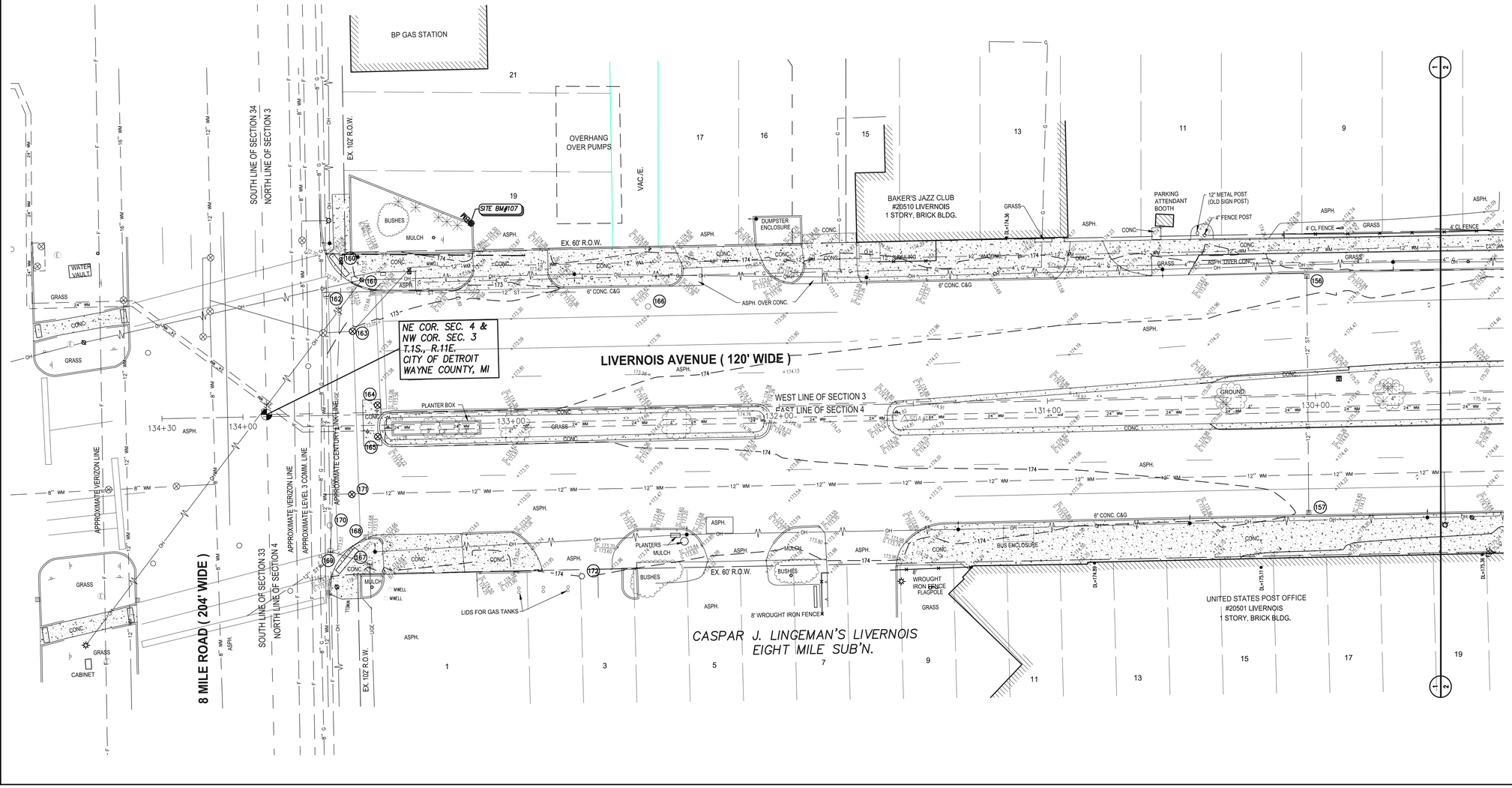
SITE BM#109 ARROW ON HYDRANT. LOCATED ON THE SOUTHWEST CORNER OF LIVERNOIS AND CHIPPEWA. ELEV.=176.55

CONTROL POINTS

POINT NUMBER	NORTH	EASTING	ELEVATION	DESCRIPTION
1	344581.481	13453981.108	175.14	CP #1
4	343889.236	13454022.566	175.77	CP #4
5	343131.866	13454044.770	176.11	CP #5
6	342560.619	13454060.193	176.54	CP #6
7	341950.812	13454091.952	177.86	CP #7
8	341171.342	13454136.769	178.48	CP #8
9	340623.305	13454164.411	175.57	CP #9
11	346932.165	13453884.623	174.77	CP #11
12	346302.760	13453908.556	174.75	CP #12
13	345826.312	13453932.542	173.76	CP #13
14	345491.203	13453944.165	174.11	CP #14
15	344877.923	13453983.439	175.00	CP #15

SCALE 1" = 20'

0 20 40



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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARGARETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER: S.PALAZZOLA	DATE: 01-15-18
CHECKED: M.DEDECKER	DATE: 01-15-18
FIELD LEADER: D.SCHUETZ	PROJECT SURVEYOR: D.SCHUETZ
PROJECT MANAGER: M.DEDECKER	DEPARTMENT MANAGER: G.PLATZ

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SCALE: 1"=20'	SHEET NO.: 1 OF 15

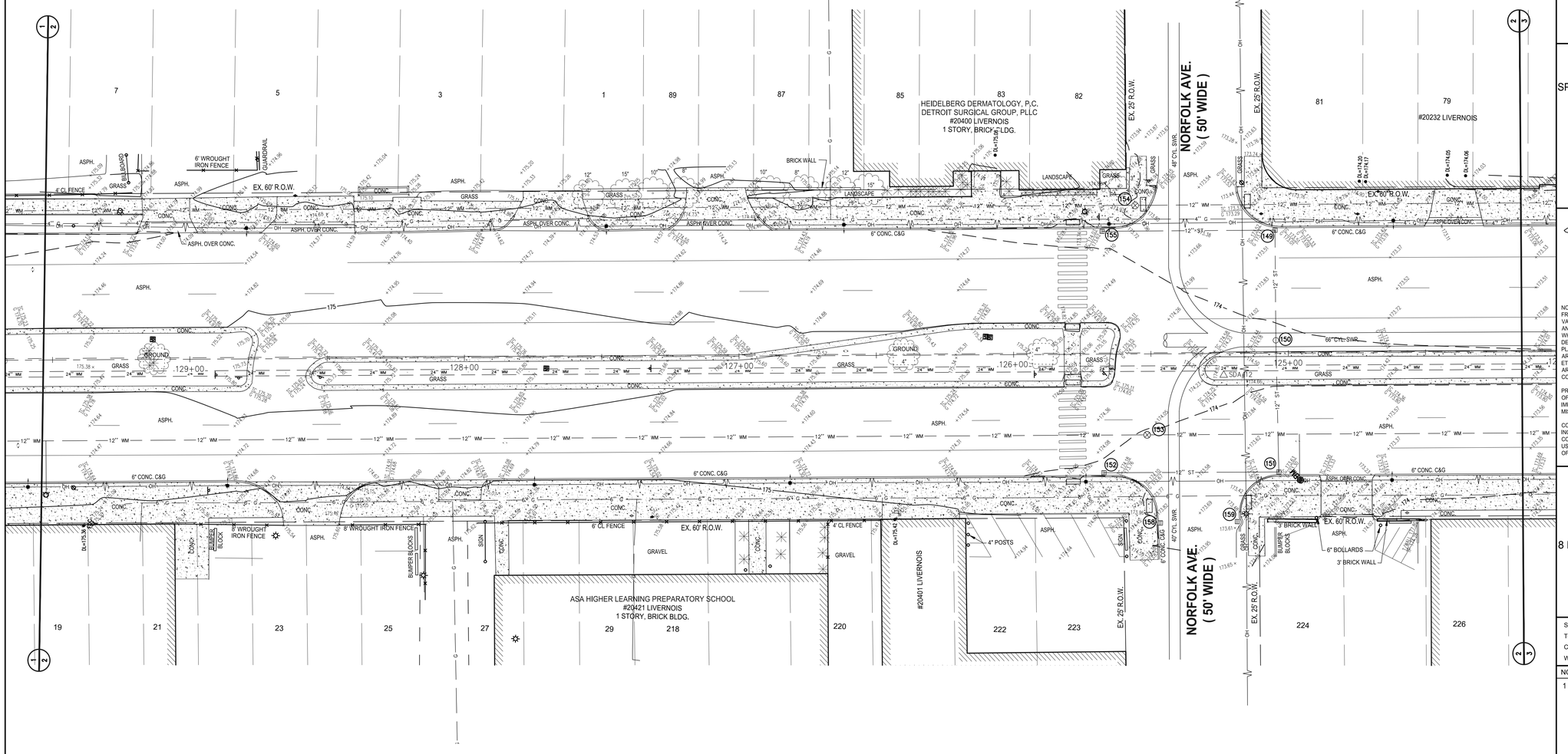
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- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 455.30 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
GR	GROUND ELEVATION
U.G.	UNDERGROUND
F.O.	FIBER OPTIC
CONC.	CONCRETE
ASPH.	ASPHALT
L.S.	LANDSCAPED
F.F.	FINISH FLOOR ELEVATION
D.L.	DOOR LEDGE ELEVATION
• F.I.	FOUND IRON
• F.M.	FOUND MONUMENT
• F.P.K.	FOUND P.K. NAIL
• S.I.	SET IRON W/SDA CAP
• S.P.K.	SET P.K. NAIL
• S.P.K./TAG	SET P.K. NAIL W/SDA TAG
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• MAG/TAG	SET MAGNETIC NAIL W/SDA TAG
M	MEASURED
R	RECORD
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SCALE 1" = 20'
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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE
8 MILE RD. TO MARAGETA AVE.

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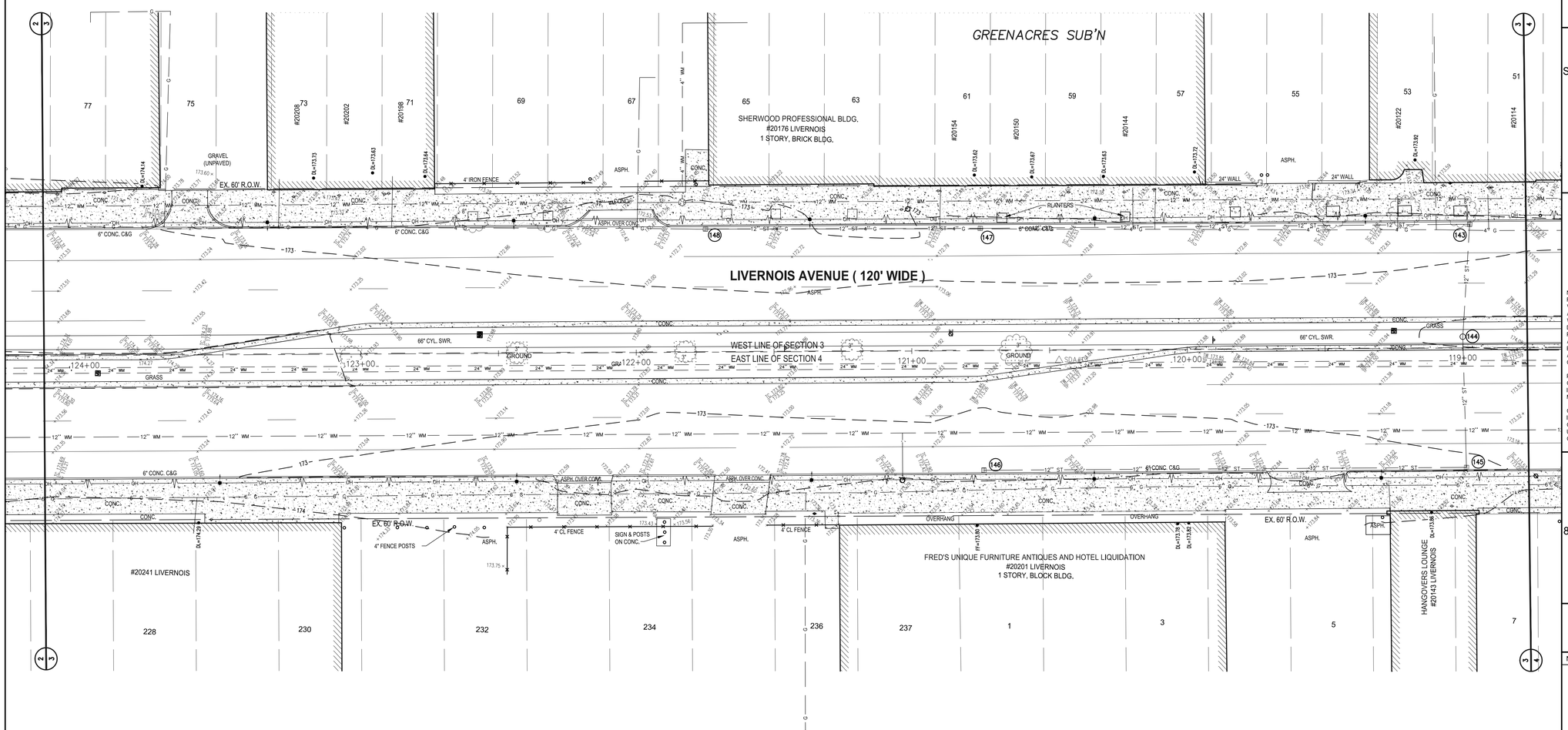
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LEGEND

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- STORM SEWER (STM)
- WATERMAIN (WM)
- OVERHEAD WIRE
- COMBINED SEWER
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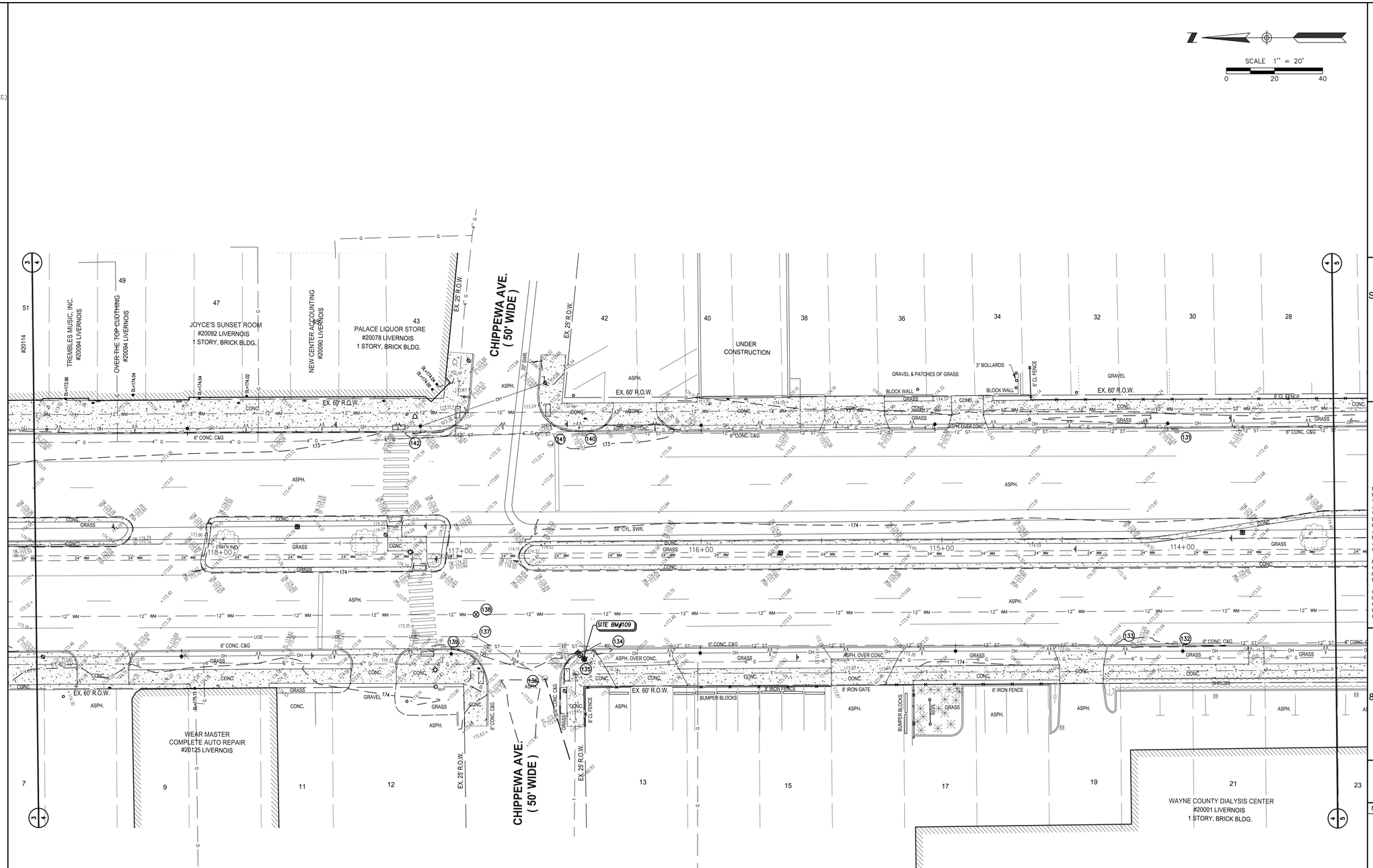
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SM17122	SM17122TPG
SCALE: 1" = 20'	SHEET NO. 3 OF 15

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LEGEND

- G — GAS
- SN — SANITARY SEWER (SAN)
- ST — STORM SEWER (STM)
- WM — WATERMAIN (WM)
- OH — OVERHEAD WIRE
- CS — COMBINED SEWER
- STE — STEAM LINE
- O — OIL LINE
- E — UNDERGROUND ELECTRIC (ELEC.)
- T — UNDERGROUND PHONE (PH)
- C — UNDERGROUND CABLE (CBL)
- MANHOLE
- CATCH BASIN
- SEWER CLEAN OUT
- GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE & WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
- LAWN SPRINKLER HEAD
- HAND HOLE
- ELECTRIC RISER OR METER
- TELEPHONE RISER
- CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GUY POLE
- GROUND LEVEL OR DECORATIVE LIGHTING
- FLAG POLE
- PHONE OR PHONE BOOTH
- CHAIN LINK FENCE (C.L.)
- WOOD FENCE
- WOVEN WIRE FENCE (W.W.)
- GUARD RAIL
- METAL OR CONC. POST
- MAILBOX
- SIGN
- WATER FOUNTAIN
- PARKING METER
- BILLBOARD OR LARGE SIGN
- BASKETBALL HOOP
- BOULDER
- STATUE OR SCULPTURE
- BENCH
- INV. INVERT ELEVATION
- CMP CORRUGATED METAL PIPE
- CENTERLINE OF DITCH
- CULVERT
- DITCH BANK/TOP OF SLOPE
- PROPERTY LINES
- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
GR	GROUND ELEVATION
U.G.	UNDERGROUND
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• S.P.K./TAG	SET P.K. NAIL W/SDA TAG
• MAG	SET MAGNETIC NAIL
• MAG/TAG	SET MAGNETIC NAIL W/SDA TAG
M	MEASURED
R	RECORD
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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER	S.PALAZZOLA	DATE	01-15-18
CHECKED	M.DEDECKER	DATE	01-15-18
FIELD LEADER	D.SCHUETZ	PROJECT SURVEYOR	D.SCHUETZ
PROJECT MANAGER	M.DEDECKER	DEPARTMENT MANAGER	G.PLATZ

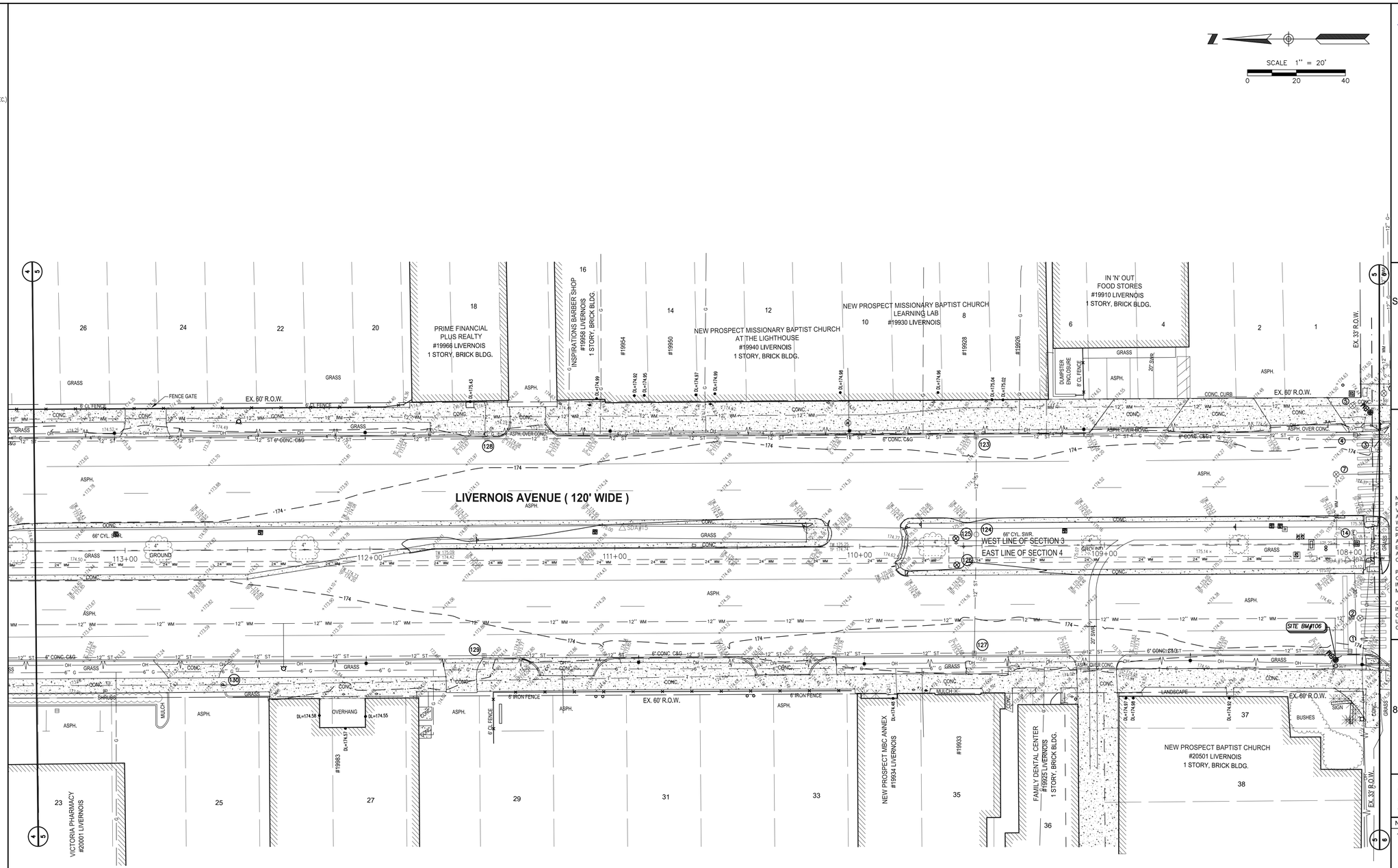
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DRAWING NO.	SM17122TPG
SCALE:	1" = 20'
SHEET NO.	4 OF 15

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- UTILITY POLE WITH TRANSFORMER
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- CMP CORRUGATED METAL PIPE
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- CULVERT
- DITCH BANK/TOP OF SLOPE
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- STUMP
- CONIFEROUS TREE
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- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- ×650.00 SPOT ELEVATION
- TC TOP OF CURB ELEVATION
- G GUTTER ELEVATION
- TP TOP OF PAVEMENT ELEVATION
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- TW TOP OF WALK ELEVATION
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- CONC. CONCRETE
- ASPH. ASPHALT
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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

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1	10-24-18	ADDITIONAL TOPO AND UTILITIES

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CHECKED: M.DEDECKER		DATE: 01-15-18
FIELD LEADER: D.SCHUETZ	PROJECT SURVEYOR: D.SCHUETZ	
PROJECT MANAGER: M.DEDECKER	DEPARTMENT MANAGER: G.PLATZ	

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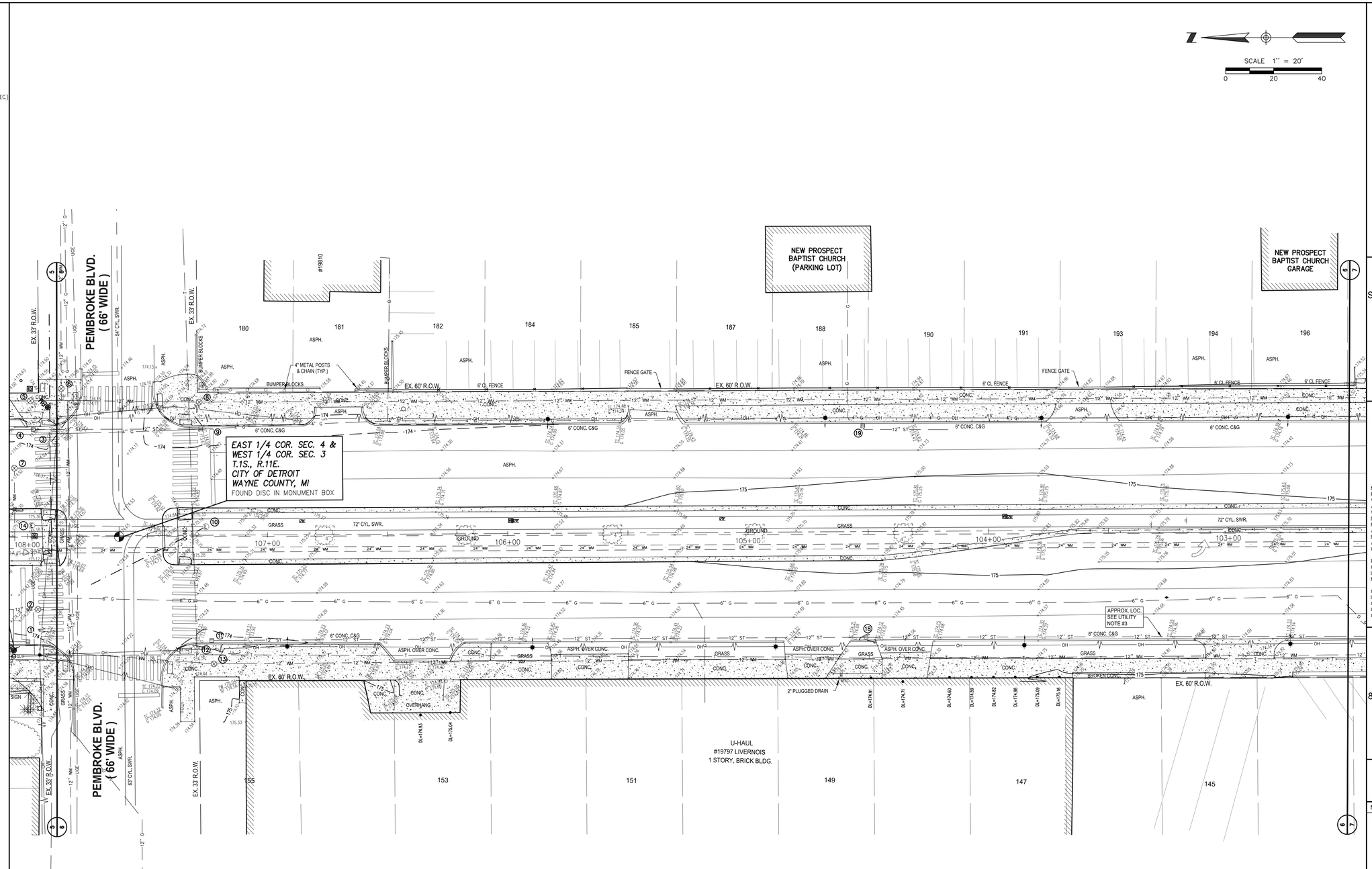
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- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- +555.55 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
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8 MILE RD. TO MARAGETA AVE.

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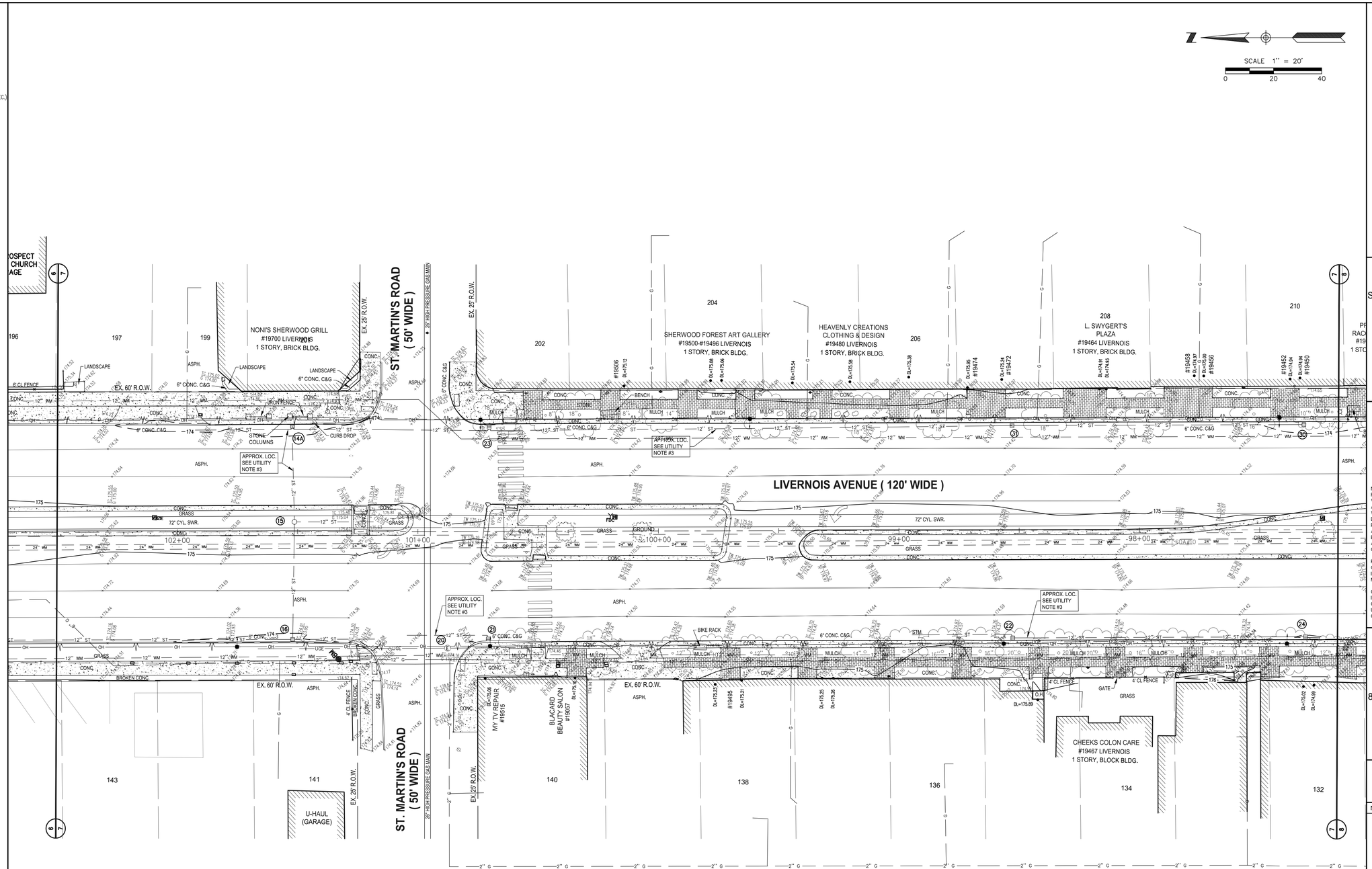
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- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
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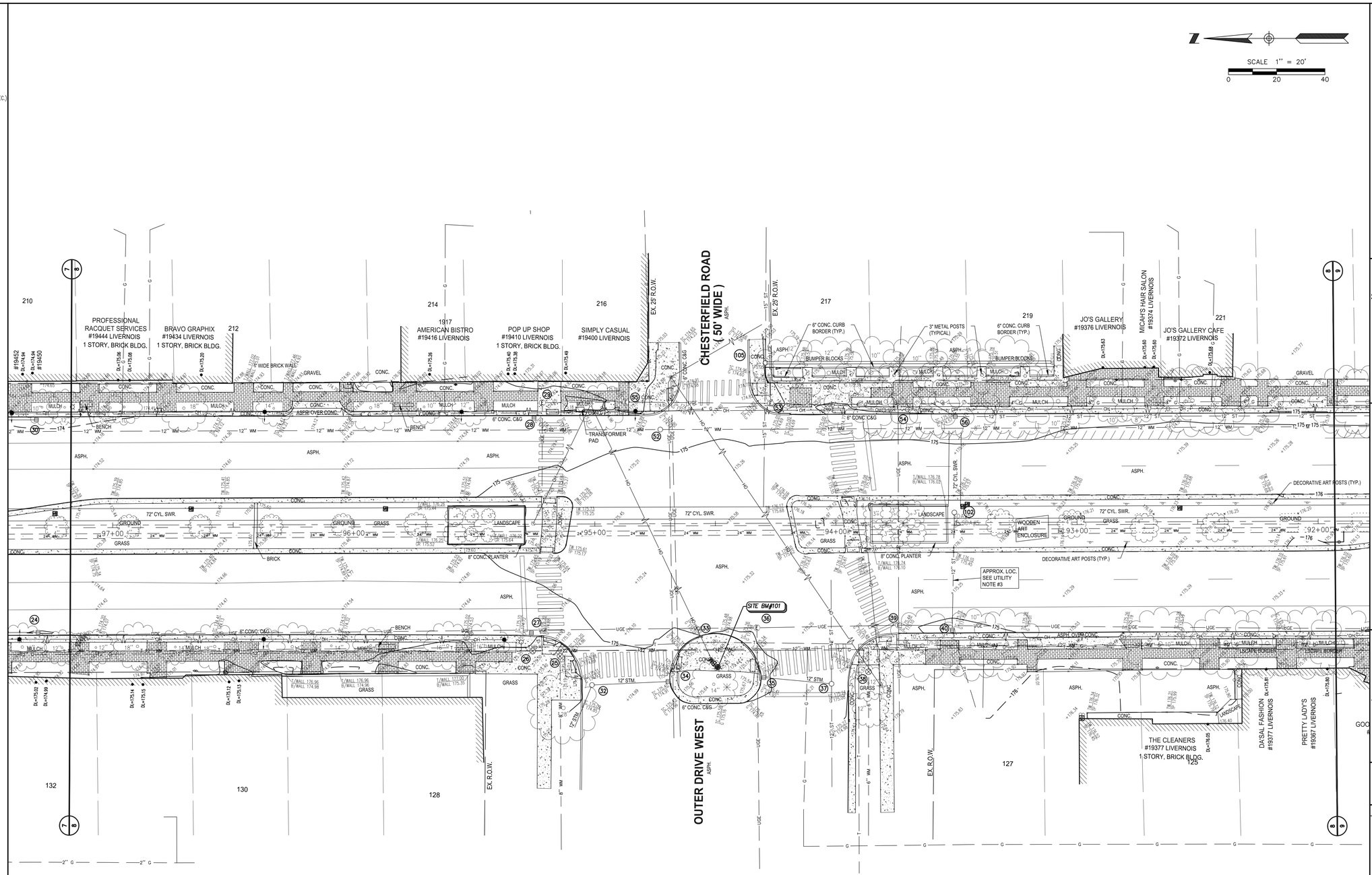
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SCALE: 1" = 20'	SHEET NO.: 7 OF 15

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LEGEND

- G — GAS
- SN — SANITARY SEWER (SAN)
- ST — STORM SEWER (STM)
- WM — WATERMAIN (WM)
- OH — OVERHEAD WIRE
- CS — COMBINED SEWER
- STE — STEAM LINE
- O — OIL LINE
- E — UNDERGROUND ELECTRIC (ELEC.)
- T — UNDERGROUND PHONE (PH)
- C — UNDERGROUND CABLE (CBL)
- MANHOLE
- CATCH BASIN
- SEWER CLEAN OUT
- G GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE & WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
- LAWN SPRINKLER HEAD
- HAND HOLE
- E ELECTRIC RISER OR METER
- T TELEPHONE RISER
- C CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GP GUY POLE
- GROUND LEVEL OR DECORATIVE LIGHTING
- FLAG POLE
- PHONE OR PHONE BOOTH
- CHAIN LINK FENCE (C.L.)
- WOOD FENCE
- WOVEN WIRE FENCE (W.W.)
- GUARD RAIL
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- MAILBOX
- SIGN
- WATER FOUNTAIN
- PARKING METER
- BILLBOARD OR LARGE SIGN
- BASKETBALL HOOP
- BOULDER
- STATUE OR SCULPTURE
- BENCH BENCH
- INV. INVERT ELEVATION
- CMP CORRUGATED METAL PIPE
- CENTERLINE OF DITCH
- CULVERT
- DITCH BANK/TOP OF SLOPE
- PROPERTY LINES
- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 650.00 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
GR	GROUND ELEVATION
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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER	S.PALAZZOLA		DATE 01-15-18
CHECKED	M.DEDECKER		DATE 01-15-18
FIELD LEADER	D.SCHUETZ	PROJECT SURVEYOR	D.SCHUETZ
PROJECT MANAGER	M.DEDECKER	DEPARTMENT MANAGER	G.PLATZ

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JOB NO. SM17122	DRAWING NO. SM17122TPG
SCALE: 1" = 20'	SHEET NO. 8 OF 15

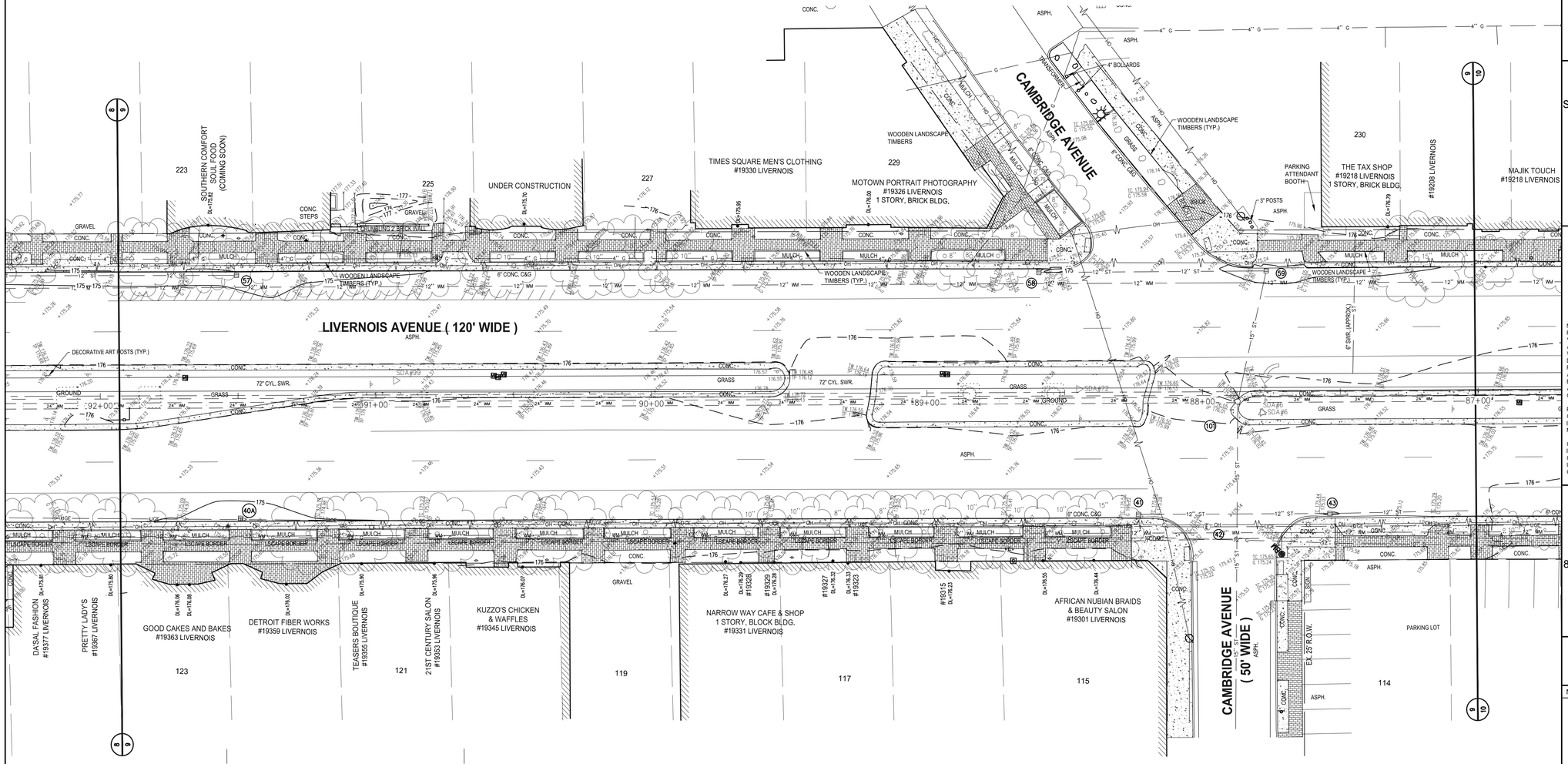
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- C CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
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- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
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- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 955.00 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

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CHECKED M.DEDECKER		DATE 01-15-18	
FIELD LEADER D.SCHUETZ		PROJECT SURVEYOR D.SCHUETZ	
PROJECT MANAGER M.DEDECKER		DEPARTMENT MANAGER G.PLATZ	

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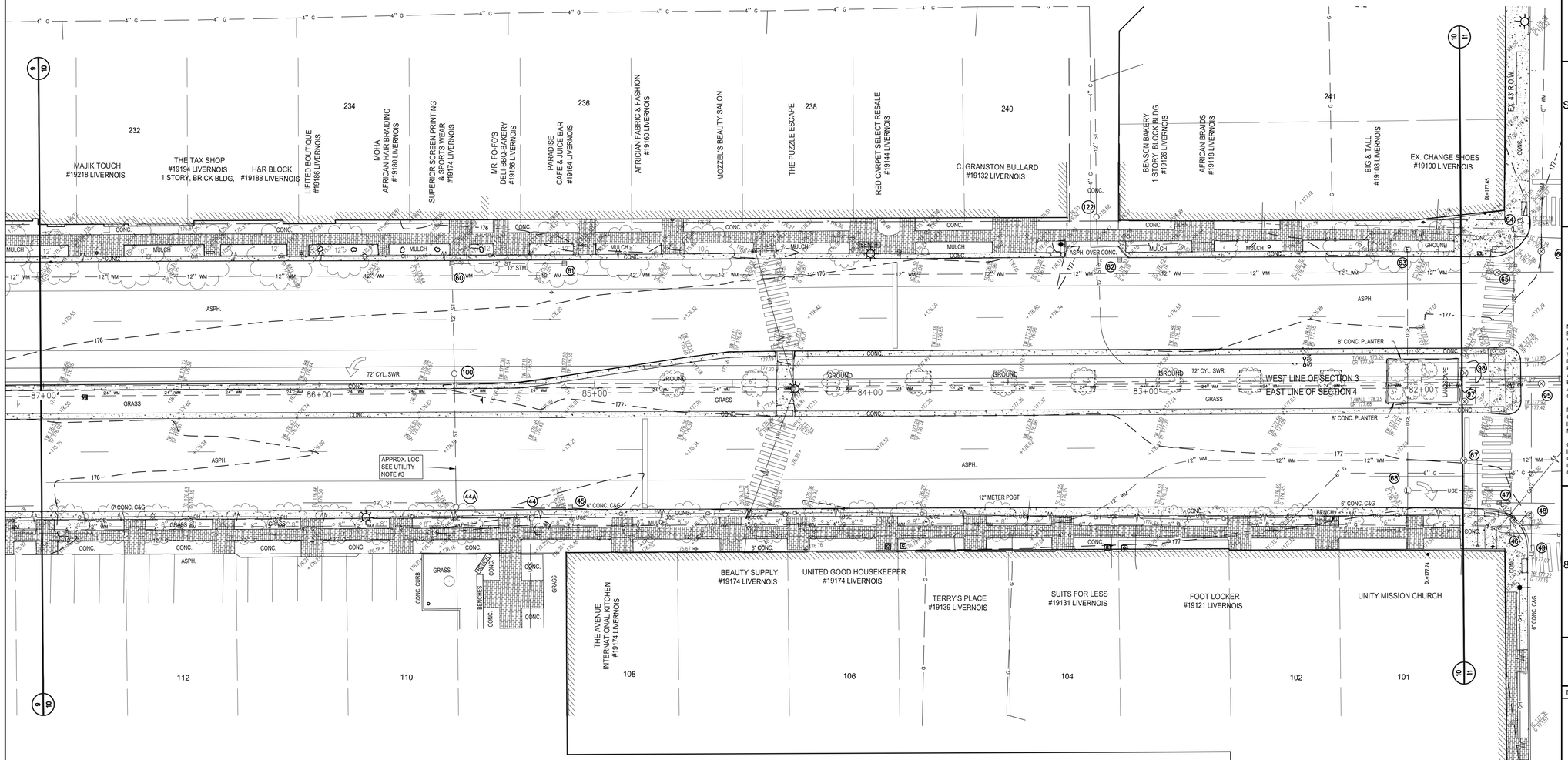
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- PROPERTY LINES
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- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 455.55 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
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SCALE 1" = 20'
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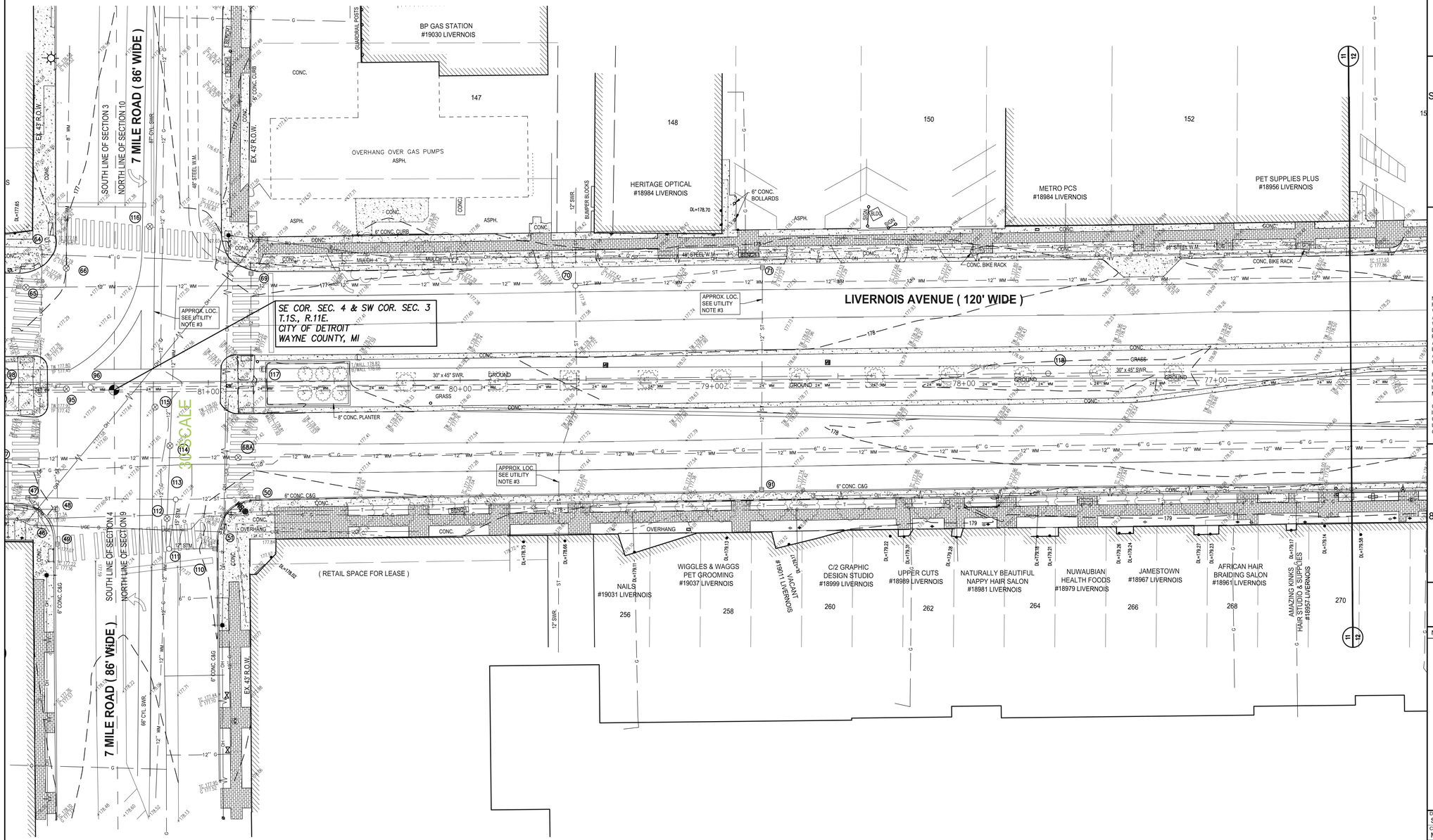
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- (10) SDA Point No.
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WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER	S.PALAZZOLA	DATE	01-15-18
CHECKED	M.DEDECKER	DATE	01-15-18
FIELD LEADER	D.SCHUETZ	PROJECT SURVEYOR	D.SCHUETZ
PROJECT MANAGER	M.DEDECKER	DEPARTMENT MANAGER	G.PLATZ

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DRAWING NO.	SM17122TPG
SCALE:	1" = 20'
SHEET NO.	11 OF 15

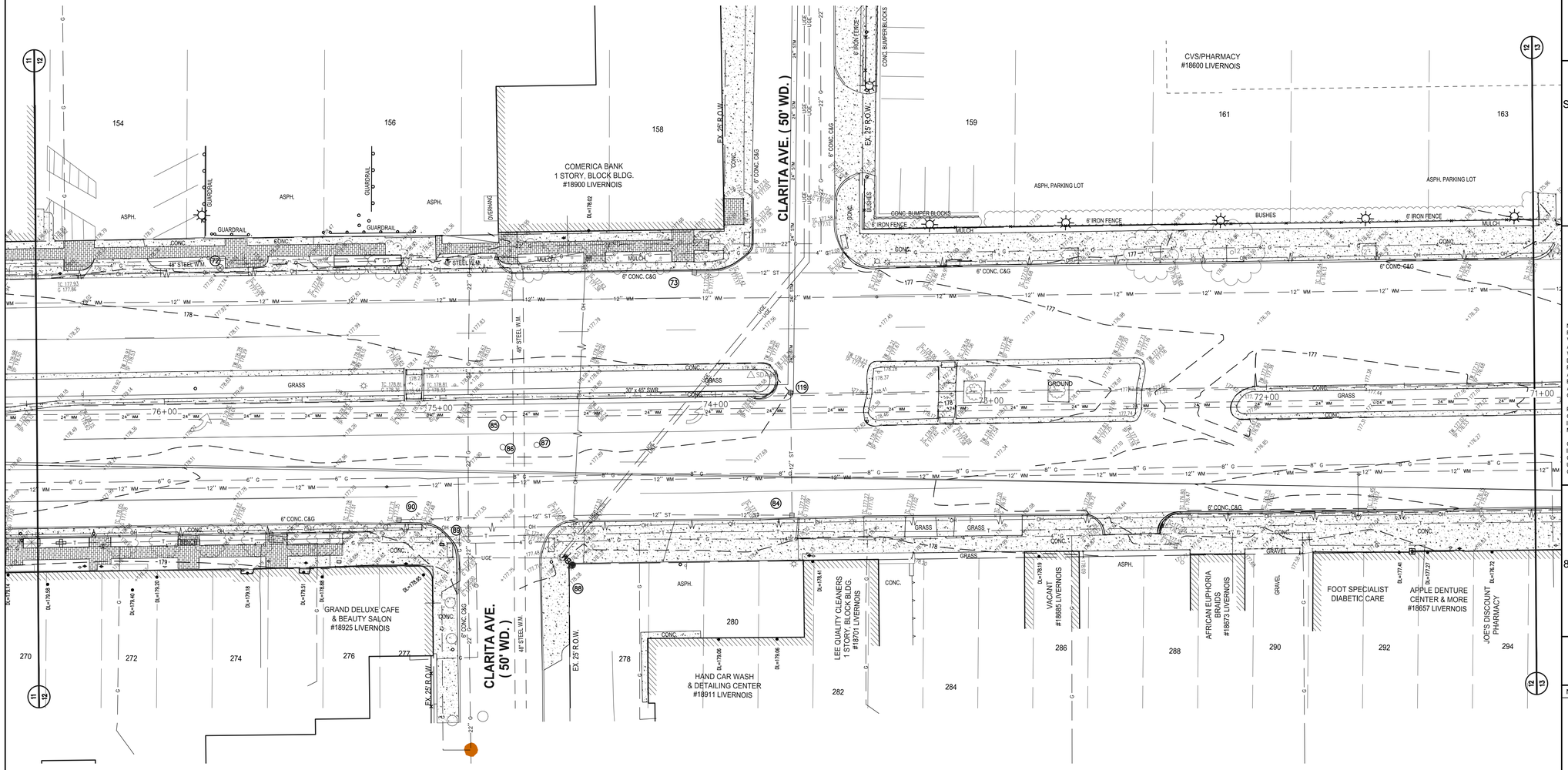
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LEGEND

- G — GAS
- SN — SANITARY SEWER (SAN)
- ST — STORM SEWER (STM)
- WM — WATERMAIN (WM)
- OH — OVERHEAD WIRE
- CS — COMBINED SEWER
- STE — STEAM LINE
- O — OIL LINE
- E — UNDERGROUND ELECTRIC (ELEC.)
- T — UNDERGROUND PHONE (PH)
- C — UNDERGROUND CABLE (CBL)
- MANHOLE
- CATCH BASIN
- SEWER CLEAN OUT
- GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE & WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
- LAWN SPRINKLER HEAD
- HAND HOLE
- ELECTRIC RISER OR METER
- TELEPHONE RISER
- CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GP GUY POLE
- GROUND LEVEL OR DECORATIVE LIGHTING
- FLAG POLE
- PB PHONE OR PHONE BOOTH
- CHAIN LINK FENCE (C.L.)
- WOOD FENCE
- WOVEN WIRE FENCE (W.W.)
- GUARD RAIL
- METAL OR CONC. POST
- MAILBOX
- SIGN
- WATER FOUNTAIN
- PARKING METER
- BILLBOARD OR LARGE SIGN
- BASKETBALL HOOP
- BOULDER
- STATUE OR SCULPTURE
- BENCH BENCH
- INV. INVERT ELEVATION
- CMP CORRUGATED METAL PIPE
- CENTERLINE OF DITCH
- CULVERT
- DITCH BANK/TOP OF SLOPE
- PROPERTY LINES
- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- ×455.00 SPOT ELEVATION
- TC TOP OF CURB ELEVATION
- G GUTTER ELEVATION
- TP TOP OF PAVEMENT ELEVATION
- EM EDGE OF METAL ELEVATION
- TW TOP OF WALK ELEVATION
- T/WALL TOP OF WALL ELEVATION
- GR GROUND ELEVATION
- U.G. UNDERGROUND
- F.O. FIBER OPTIC
- CONC. CONCRETE
- ASPH. ASPHALT
- L.S. LANDSCAPED
- F.F. FINISH FLOOR ELEVATION
- D.E. DOOR LEDGE ELEVATION
- • F.I. FOUND IRON
- • F.M. FOUND MONUMENT
- • F.P.K. FOUND P.K. NAIL
- • S.I. SET IRON W/SDA CAP
- • S.P.K. SET P.K. NAIL
- • S.P.K./TAG SET P.K. NAIL W/SDA TAG
- • MAG SET MAGNETIC NAIL
- • MAG/TAG SET MAGNETIC NAIL W/SDA TAG
- M MEASURED
- R RECORD
- C CALCULATED

SCALE 1" = 20'

0 20 40



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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER: S.PALAZZOLA	DATE: 01-15-18
CHECKED: M.DEDECKER	DATE: 01-15-18
FIELD LEADER: D.SCHUETZ	PROJECT SURVEYOR: D.SCHUETZ
PROJECT MANAGER: M.DEDECKER	DEPARTMENT MANAGER: G.PLATZ

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SCALE: 1" = 20'	SHEET NO.: 12 OF 15

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LEGEND

- GAS
- SANITARY SEWER (SAN)
- STORM SEWER (STM)
- WATERMAIN (WM)
- OVERHEAD WIRE
- COMBINED SEWER
- STEAM LINE
- OIL LINE
- UNDERGROUND ELECTRIC (ELEC.)
- UNDERGROUND PHONE (PH)
- UNDERGROUND CABLE (CBL)
- MANHOLE
- CATCH BASIN
- SEWER CLEAN OUT
- GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE & WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
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- DECIDUOUS SHRUB
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- SECTION CORNER
- △SDA#10 TRAVERSE POINT
- (1) STRUCTURE NUMBER
- (10) SDA POINT No.
- 955.00 SPOT ELEVATION

TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
GR	GROUND ELEVATION
U.G.	UNDERGROUND
F.O.	FIBER OPTIC
CONC.	CONCRETE
ASPH.	ASPHALT
L.S.	LANDSCAPED
F.F.	FINISH FLOOR ELEVATION
D.L.	DOOR LEDGE ELEVATION
• F.I.	FOUND IRON
• F.M.	FOUND MONUMENT
• F.P.K.	FOUND P.K. NAIL
• S.I.	SET IRON W/SDA CAP
• S.P.K.	SET P.K. NAIL
• S.P.K./TAG	SET P.K. NAIL W/SDA TAG
• MAG	SET MAGNETIC NAIL
• MAG/TAG	SET MAGNETIC NAIL W/SDA TAG
M	MEASURED
R	RECORD
C	CALCULATED

SCALE 1" = 20'
0 20 40

CVS/PHARMACY #18600 LIVERNOIS
PRO SPA NAILS #18680 LIVERNOIS
CHINA WOK CHINESE FOOD #18670 LIVERNOIS
INSTANT TAX SERVICE #18650 LIVERNOIS
CHECK N GO #18640 LIVERNOIS
NAVY CAREER CENTER #18620 LIVERNOIS
BOSTON MARKET #18610 LIVERNOIS

LIVERNOIS AVENUE (120' WIDE)
MARGARETA AVE. (50' WIDE)
EX. 25' R.O.W.

VACANT #18685 LIVERNOIS
AFRICAN EUPHORIA BRAIDS #18673 LIVERNOIS
FOOT SPECIALIST DIABETIC CARE
APPLE DENTURE CENTER & MORE #18657 LIVERNOIS
JOE'S DISCOUNT PHARMACY
DOLLAR SUPER STORE 1 STORY, BLOCK BLDG. #18647 LIVERNOIS
LIVERNOIS MARKET 1 STORY, BRICK BLDG. #18615 LIVERNOIS

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STRUCTURE TABLE

THE STRUCTURE TABLE ON THIS DRAWING IDENTIFIES THE AS-SURVEYED UNDERGROUND UTILITY MANHOLES THAT WERE FIELD MEASURED USING REASONABLE AND TRADITIONAL SURVEYING PRACTICES. PIPE SIZES, DIRECTIONS AND ELEVATIONS ARE INDICATED BY A COMBINATION OF FIELD EVIDENCE AND AVAILABLE RECORD INFORMATION. UNDERGROUND UTILITY PIPE SIZES AND CONNECTIONS ARE MANY TIMES AMBIGUOUS. SOME STRUCTURES MAY HAVE PIPES WITH UNKNOWN CONNECTIONS, SUMPS AND / OR PIPES THAT ARE FILLED WITH DEBRIS. IT WILL BE UP TO THE DESIGN ENGINEER TO LOOK AT THE PRESENTED SURVEY RESULTS AND DECIDE IF FURTHER INVESTIGATION BY OTHER METHODS SUCH AS VACUUM CLEAN OUT, UNDERGROUND RADAR, SMOKE TESTING AND PHYSICAL EXCAVATION IS REQUIRED AS AN ADDITIONAL SERVICE.

#	TYPE	RIM	SIZE	INVERT	TO	STRUCTURE/ BEARING	NOTES
1	SQUARE CATCH BASIN	173.89	4"	169.04	TO	NORTH	
				168.64	TO	BOTTOM OF MANHOLE	
				169.19	TO	TOP OF DEBRIS	
2	GATE VALVE & WELL	174.35	12"	169.00	TO	TOP OF PIPE	FLOWS N & S
				168.55	TO	BOTTOM OF MANHOLE	
3	PUBLIC LIGHTING MANHOLE	174.00		168.40	TO	BOTTOM OF MANHOLE	
				169.60	TO	TOP OF WATER	
			4"	169.45	TO	EAST	
			4"	169.45	TO	WEST	
4	SQUARE CATCH BASIN	173.73	12"	169.13	TO	STR #9	
			12"	169.03	TO	NORTH	
5	GATE VALVE & WELL	174.42		169.15	TO	TOP OF PIPE	RUNS NORTH & SOUTH
6	GATE VALVE & WELL	174.32		169.04	TO	TOP OF PIPE	RUNS EAST & WEST
7	GATE VALVE & WELL	174.38	12"	170.29	TO	TOP OF PIPE	RUNS NORTH & SOUTH
				169.78	TO	BOTTOM OF MANHOLE	
8	GATE VALVE & WELL	174.27		169.14	TO	TOP OF PIPE	RUNS NORTH & SOUTH
9	SQUARE CATCH BASIN	173.66		169.50	TO	TOP OF WATER	
			12"	169.50	TO	STR #4	
10	PUBLIC LIGHTING MANHOLE	175.21		170.88	TO	BOTTOM OF MANHOLE	
				171.51	TO	TOP OF WATER	
			4"	171.24	TO	NORTH	
			4"	171.24	TO	NW	
11	SQUARE CATCH BASIN	173.71	12"	169.11	TO	SOUTH	
				169.61	TO	TOP OF WATER	
				168.91	TO	TOP OF DEBRIS	
12	PHONE MANHOLE	174.32		166.22	TO	BOTTOM OF MANHOLE	
				173.72	TO	TOP OF WIRES	
13	GATE VALVE & WELL	174.44		169.64	TO	TOP OF DEBRIS	
				170.16	TO	TOP OF PIPE	
14	PUBLIC LIGHTING MANHOLE	175.17	4"	171.57	TO	SOUTH	
			4"	171.57	TO	WEST	
14A	SQUARE CATCH BASIN	173.83		169.63	TO	TOP OF DEBRIS	
			12"	168.28		SW	
			12"	168.23		NW	
15	STORM MANHOLE	175.56	12"	169.25	TO	SOUTH	
			12"	166.06	TO	EAST	
			12"	164.76	TO	WEST	
				150.52	TO	NORTH	(CONNECTS TO STR. #102)
				150.41	TO	SOUTH	FLOWS SOUTH
16	SQUARE CATCH BASIN	173.87	12"	168.57	TO	SOUTH	(POSSIBLE CONNECT TO STR. #21)
			12"	167.47	TO	NORTH	
			12"	166.82	TO	EAST	
18	SQUARE CATCH BASIN	173.94	12"	167.89	TO	SOUTH	
			12"	168.19	TO	NORTH	
19	SQAURE CATCH BASIN	174.29	12"	169.79	TO	SW	
20	EDISON MANHOLE	174.15		171.35	TO	TOP OF WIRES	
				168.65	TO	TOP OF CONDUIT	
21	SQUARE CATCH BASIN	174.07	12"	169.02	TO	SE	
			12"	168.97	TO	NE	(POSSIBLE CONNECT TO STR. #16)
22	SQUARE CATCH BASIN	174.34		169.04	TO	NE	
				168.79	TO	SOUTH	(POSSIBLE CONNECT STR. #22)
23	SQUARE CATCH BASIN	174.01		168.81	TO	SW	
				168.76	TO	NW	
24	SQUARE CATCH BASIN	173.97	12"	169.57	TO	NORTH	(POSSIBLE CONNECT STR. #22)
25	GATE VALVE & WELL	175.24	12"	169.54	TO	NORTH & SOUTH	
			8"	169.34	TO	WEST	
26	GATE VALVE & WELL	175.30		170.30	TO	TOP OF DEBRIS	
				169.70	TO	TOP OF PIPE	
27	SQUARE CATCH BASIN	174.79		171.89	TO	TOP OF DEBRIS	(FULL OF DEBRIS)
				170.29	TO	BOTTOM OF MANHOLE	
28	SQUARE CATCH BASIN	174.44		174.04	TO		(FULL OF DEBRIS)
29	EDISON MANHOLE	174.83		170.83	TO	BOTTOM OF MANHOLE	
				171.83	TO	WEST	
				173.83	TO	SOUTH	
30	SQUARE CATCH BASIN	173.89	12"	169.94	TO	NORTH	(POSSIBLE CONNECT STR #31)
31	SQUARE CATCH BASIN	174.10	12"	169.45	TO	NORTH	
			12"	169.65	TO	SOUTH	(POSSIBLE CONNECT STR #30)
32	ROUND CATCH BASIN	174.92	12"	169.37	TO	STR #34	
			12"	169.37	TO	NORTHWEST	
					TO	TOP OF DEBRIS	
33	PUBLIC LIGHTING MANHOLE	175.86		171.49	TO	TOP OF WIRES	RUNS NORTH & SOUTH
				167.96	TO	TOP OF WATER	
				167.86	TO	BOTTOM OF MANHOLE	
34	SQUARE CATCH BASIN	174.86	12"	170.28	TO	STR #32	
				169.86	TO	TOP OF DEBRIS	
35	SQUARE CATCH BASIN	174.87		171.09	TO	TOP OF DEBRIS	
			12"	170.23	TO	STR #37	
36	EDISON MANHOLE	175.05		169.95	TO	TOP OF WIRES	RUNS NORTH & SOUTH
				170.15	TO	WEST	
37	ROUND CATCH BASIN	175.14	12"	169.24	TO	WEST	
			12"	169.34	TO	STR #35	
			12"	169.39	TO	EAST	
38	GATE VALVE & WELL	175.77		169.23	TO	TOP OF PIPE	EAST & WEST
				169.07	TO	TOP OF DEBRIS	
39	PUBLIC LIGHTING MANHOLE	175.07		172.87	TO	TOP OF CONDUIT	NORTH
				173.82	TO	TOP OF WIRES	EAST & WEST
40	SQUARE CATCH BASIN	174.88	12"	169.20	TO	SW	(STRUCTURE IN PARKING LOT)
			12"	170.05	TO	STR# 102	TOP OF TRAP
				169.28	TO	TOP OF WATER	
				168.88	TO	BOTTOM OF MANHOLE	
41	SQUARE CATCH BASIN	175.24	12"	170.94	TO	SOUTH	(POSSIBLE CONNECT STR. #43)
42	PUBLIC LIGHTING MANHOLE	175.00		173.00	TO	NORTH & SOUTH	(LOTS OF WIRES)
				170.00	TO	NORTH & SOUTH	
43	SQUARE CATCH BASIN	174.98	12"	170.86	TO	STR #41	
			12"	170.81	TO	SOUTH	
				170.68	TO	TOP OF WATER	
				170.08	TO	TOP OF DEBRIS	
44	PUBLIC LIGHTING MANHOLE	175.90		174.25	TO	TOP OF WIRES	RUNS SOUTH & WEST
				172.70	TO	BOTTOM OF MANHOLE	
				172.90	TO	TOP OF WATER	
44A	STORM MANHOLE	176.53		171.53	TO	EAST	TOP OF PIPE
			12"	170.63	TO	NE	
45	SQUARE CATCH BASIN	175.42		170.52	TO	BOTTOM OF MANHOLE	NO INVERTS VISIBLE
				171.92	TO	TOP OF WATER	FILLED WITH DEBRIS
46	PUBLIC LIGHTING MANHOLE	177.38		173.88	TO	TOP OF DEBRIS	
				174.48	TO	TOP OF WIRES	RUNS EAST & SOUTH
47	SQUARE CATCH BASIN	176.77		171.87	TO	TOP OF DEBRIS	
			12"	171.84	TO	SOUTH	
			12"	172.87		SW	
48	PUBLIC LIGHTING MANHOLE	177.03					
49	SQUARE CATCH BASIN	177.02		174.02	TO	TOP OF DEBRIS	
				174.12	TO	TOP OF WATER	
			12"	174.38	TO	EAST	TOP OF PIPE
50	SQUARE CATCH BASIN	176.31		174.11	TO	TOP OF WATER	
			12"	173.91	TO	NORTH	(POSSIBLE CONNECT STR. #47)
				173.71	TO	TOP OF DEBRIS	
51	PUBLIC LIGHTING MANHOLE	177.02		173.92	TO	TOP OF DEBRIS	
				174.91	TO	TOP OF WIRES	
52	ROUND CATCH BASIN	174.81				LID BOLTED SHUT	(5 STAR LUG NUTS)
53	PUBLIC LIGHTING MANHOLE	174.89		170.99	TO	TOP OF WATER	
				170.99	TO	TOP OF DEBRIS	
				171.95	TO	TOP OF WIRES	RUNS EAST & SOUTH
54	PUBLIC LIGHTING MANHOLE	175.13		170.93	TO	TOP OF DEBRIS	
				173.23	TO	TOP OF WIRES	RUNS NORTH, EAST & WEST
55	PUBLIC LIGHTING MANHOLE	175.02		170.62	TO	TOP OF DEBRIS	
				173.34	TO	TOP OF WIRES	RUNS NORTH & SOUTH
56	SQUARE CATCH BASIN	174.52		168.72	TO	TOP OF WATER	
				168.12	TO	TOP OF DEBRIS	
			12"	168.85	TO	NORTHEAST	
			12"	168.28	TO	STR #57	
			12"	169.78	TO	STR #102	
57	SQUARE CATCH BASIN	174.67		170.07	TO	TOP OF WATER	
				168.97	TO	TOP OF DEBRIS	FILLED WITH DEBRIS
58	SQUARE CATCH BASIN	175.02		170.62	TO	TOP OF DEBRIS	
			12"	170.72	TO	STR #59	
59	SQUARE CATCH BASIN	174.82		170.22	TO	TOP OF WATER	
				169.42	TO	TOP OF DEBRIS	
			12"	170.44	TO	STR #101	
			12"	170.17	TO	STR #58	
60	SQUARE CATCH BASIN	175.33		169.83	TO	TOP OF WATER	
				168.93	TO	TOP OF DEBRIS	
			12"	170.68	TO	STR #61	TOP OF TRAP
			12"	171.71	TO	STR #100	
61	SQUARE CATCH BASIN	175.48		171.78	TO	TOP OF WATER	
				171.08	TO	TOP OF DEBRIS	NO PIPES VISIBLE
62	SQUARE CATCH BASIN	176.03		171.43	TO	TOP OF WATER	
				170.73	TO	TOP OF DEBRIS	NO PIPES VISIBLE
63	PUBLIC LIGHTING MANHOLE	177.21		169.61	TO	BOTTOM OF MANHOLE	NO WIRES VISIBLE
64	PUBLIC LIGHTING MANHOLE	177.25		174.35	TO	TOP OF DEBRIS	
				175.45	TO	TOP OF WIRES	
65	GATE VALVE & WELL	176.69		171.59	TO	NORTH	
				171.59	TO	SOUTH	
66	GATE VALVE & WELL	177.00					
67	GATE VALVE & WELL	177.02					
68	PUBLIC LIGHTING MANHOLE	176.80		172.63	TO	TOP OF WIRES	RUNS SOUTH, WEST & EAST
				169.80	TO	BOTTOM OF MANHOLE	
69	SQUARE CATCH BASIN	176.69		171.99	TO	TOP OF WATER	
				171.79	TO	TOP OF DEBRIS	
			12"	171.84	TO	WEST	
70	MANHOLE	177.33		169.92	TO	WEST	
				168.98	TO	SOUTH	
				166.58	TO	EAST	
71	SQUARE CATCH BASIN	177.23		168.93	TO	TOP OF DEBRIS	
				169.58	TO	WEST	
				169.31	TO	NORTH	
72	GATE VALVE & WELL	178.14		171.54	TO	BOTTOM OF MANHOLE	NO PIPE VISIBLE
73	SQUARE CATCH BASIN	177.05		171.85	TO	TOP OF DEBRIS	
			12"	173.20	TO	SOUTH	TOP OF TRAP
74	SQUARE CATCH BASIN	174.18		171.38	TO	TOP OF DEBRIS	
			12"	171.50	TO	STR #83	
75	GATE VALVE & WELL	174.56		169.46	TO	TOP OF PIPE	RUNS NORTH & SOUTH
76	PUBLIC LIGHTING MANHOLE	174.63		170.83	TO	TOP OF DEBRIS	
				172.71	TO	TOP OF WIRES	RUNS EAST & WEST
77	PUBLIC LIGHTING MANHOLE	174.43		170.93	TO	TOP OF DEBRIS	
				172.05	TO	TOP OF WIRES	RUNS SOUTHWEST & NORTH
78	PHONE MANHOLE	174.22		171.22	TO	NORTH & SOUTH	
79	PUBLIC LIGHTING MANHOLE	174.36		169.96	TO	TOP OF DEBRIS	
				171.58	TO	TOP OF WIRES	RUNS N, S & E
80	STORM MANHOLE	174.12		170.12	TO	NORTH	
				168.62	TO	WEST	TOP OF PIPE
81	ROUND CATCH BASIN	174.31		170.01	TO	WEST	FILLED WITH DEBRIS
82	PUBLIC LIGHTING MANHOLE	174.36		170.96	TO	TOP OF DEBRIS	
				172.40	TO	TOP OF WIRES	RUNS SOUTH & WEST
83	SQUARE CATCH BASIN	174.23		170.63	TO	TOP OF WATER	
				170.43	TO	TOP OF DEBRIS	NO INVERTS VISIBLE
84	SQUARE CATCH BASIN	177.09		172.19	TO	TOP OF WATER	
				171.69	TO	TOP OF DEBRIS	
			12"	171.97	TO	STR #300	
			12"	172.15	TO	STR #90	
85	STORM MANHOLE	178.30					DID NOT OPEN (CAR WASH TRAFFIC)
86	STORM MANHOLE	178.16					DID NOT OPEN (CAR WASH TRAFFIC)
87	STORM MANHOLE	178.17					DID NOT OPEN (CAR WASH TRAFFIC)
88	PUBLIC LIGHTING MANHOLE	177.98		168.68	TO	BOTTOM OF MANHOLE	
				169.08	TO	TOP OF WATER	
			6"	170.96	TO	TOP OF PIPE	RUNS NORTH & EAST
			6"	170.38	TO	TOP OF PIPE	RUNS NORTH & EAST
89	PHONE MANHOLE	177.72		169.92	TO	BOTTOM OF MANHOLE	
				174.28	TO	TOP OF WIRES	
90	SQUARE CATCH BASIN	177.31		172.81	TO	TOP OF WATER	
				172.51	TO	TOP OF DEBRIS	
			12"	172.71	TO	STR #84	
91	SQUARE CATCH BASIN	177.38		172.78	TO	TOP OF WATER	
				172.18	TO	TOP OF DEBRIS	
			12"	172.61	TO	EAST	(POSSIBLE CONNECT STR. #71)
95	GATE VALVE & WELL	177.51					(TOO MUCH TRAFFIC IN ROAD)
96	ROUND CATCH BASIN	177.51					(TOO MUCH TRAFFIC IN ROAD)
97	STORM MANHOLE	177.80		169.10	TO	BOTTOM OF MANHOLE	
				170.50	TO	TOP OF WATER	NO INVERTS VISIBLE
98	STORM MANHOLE	178.42		170.22	TO	BOTTOM OF MANHOLE	
				171.02	TO	TOP OF WATER	NO INVERTS VISIBLE
100	STORM MANHOLE	176.59					
101	STORM MANHOLE	175.97	15"	155.39	TO	WEST	
			15"	152.81	TO	EAST	
102	STORM MANHOLE	176.25		150.05	TO	NORTH	
				150.07	TO	SOUTH	
				149.70	TO	EAST	
				151.66	TO	TOP OF PIPE	
			12"	167.20	TO	STR #56	
			12"	165.23	TO	STR #40	
105	STORM MANHOLE	175.02		153.52	TO	BOTTOM OF MANHOLE	
				154.72	TO	TOP OF WATER	
			15"	162.69	TO	EAST	
			15"	153.52	TO	WEST	
110	SQUARE CATCH BASIN	176.84	12"	173.69	TO	111	
111	STORM MANHOLE	177.32	12"	173.44	TO	110	
			15"	173.44	TO	113	
112	GATE VALVE & WELL	177.40		174.50	TO	TOP OF NUT	
				173.10	TO	TOP OF DIRT	
113	STORM MANHOLE	177.47	15"	173.87	TO	111	
				173.47	TO	TOP OF PIPES	
				173.07	TO	TOP OF TRAP	
114	GATE VALVE & WELL	177.78		174.48	TO	TOP OF NUT	
				172.78	TO	TOP OF DIRT	
115	GATE VALVE & WELL	177.86		172.66	TO	TOP OF NUT	
				171.66	TO	TOP OF DIRT	
116	GATE VALVE & WELL	177.64		172.04	TO	TOP OF DEBRIS	(NO VISIBLE PIPES)
117	PUBLIC LIGHTING MANHOLE	177.96		174.16	TO	NORTH	(TOP OF WIRE)
118	STORM MANHOLE	179.24		156.00	TO	NORTH	(TOP OF WIRE)
				156.24	TO	SOUTH	
119	ROUND CATCH BASIN	177.92				(DID NOT OPEN)	
120	GATE VALVE & WELL	177.64		172.44	TO	NORTH & SOUTH	
121	PHONE MANHOLE	174.07		171.07	TO	NORTH & SOUTH	
122	STORM MANHOLE	176.54				COULD NOT OPEN	
123	SANITARY MANHOLE	173.65	12"	165.95	TO	124	
			12"	168.28	TO	4	
			12"	166.32	TO	128	
124	STORM MANHOLE	175.23	12"	165.93	TO	123	
			72"	151.49	TO	NORTH	
			72"	151.56	TO	SOUTH	
			12"	165.18	TO	NORTHEAST	
			12"	163.66	TO	127	
125	GATE VALVE AND WELL	175.15		166.15	TO	NORTH / SOUTH	VAULT
126	GATE VALVE AND WELL	175.09		166.64	TO	NORTH / SOUTH	VAULT
127	SQUARE CATCH BASIN	173.54	12"	166.66	TO	124	
			12"	166.82	TO	129	
			12"	168.57	TO	1	
128	SQUARE CATCH BASIN	173.45	12"	167.21	TO	123	
			12"	167.25	TO	131	
129	SQUARE CATCH BASIN	173.60	12"	167.40	TO	127	
			12"	167.45	TO	132	
130	PHONE MANHOLE	173.86		169.26	TO	NORTH / SOUTH	
131	SQUARE CATCH BASIN	173.01	12"	166.91	TO	128	
			12"	167.41	TO	140	
132	SQUARE CATCH BASIN	173.01	12"	168.11	TO	133	
			12"	168.01	TO	129	
133	SQAURE CATCH BASIN	172.86		172.86	TO		FULL OF DIRT
134	SQUARE CATCH BASIN	173.02	12"	168.47	TO	139	
			12"	168.37	TO	133	
135	PHONE MANHOLE	173.24		171.34	TO	NORTH / SOUTH	
136	PUBLIC LIGHTING MANHOLE	172.92		168.97	TO	NORTH / SOUTH	
137	PUBLIC LIGHTING MANHOLE	173.26		169.36	TO	NORTH / SOUTHWEST	
138	GATE VALVE AND WELL	173.57		168.72	TO	NORTH / SOUTH	TOP OF PIPE
139	SQUARE CATCH BASIN	172.97	12"	168.51	TO	134	
140	SQUARE CATCH BASIN	172.76	12"	168.26	TO	142	
			12"	168.16	TO	131	
141	PUBLIC LIGHTING MANHOLE	173.06		168.76	TO		FULL OF WATER
142	SQUARE CATCH BASIN	172.95	12"	168.19	TO	140	
				169.07	TO		TOP OF DEBRIS
143	SQUARE CATCH BASIN	172.65	12"	167.35	TO	147	
			12"	165.90	TO	144	
				167.09	TO		TOP OF WATER
				166.00	TO		TOP OF DEBRIS
144	STORM MANHOLE	174.06	12"	164.76	TO	143	
			48"	152.36	TO	SOUTH	
			48"	152.38	TO	NORTH	
			12"	164.16	TO	145	
145	SQUARE CATCH BASIN	172.91	12"	167.36	TO	146	
			12"	166.21	TO	144	
				166.76	TO		TOP OF WATER
				165.86	TO		TOP OD DEBRIS
146	SQUARE CATCH BASIN	172.37	12"	172.37	TO	145	
				167.81	TO		TOP OF WATER
				166.24	TO		TOP OF DEBRIS
147	SQUARE CATCH BASIN	172.44	12"	167.64	TO	143	
			12"	167.69	TO	148	
				167.69	TO		TOP OF WATER
				167.24	TO		TOP OF DEBRIS
148	SQUARE CATCH BASIN	172.20	12"	167.82	TO	147	
				167.90	TO		TOP OF DEBRIS
149	SQUARE CATCH BASIN	173.10	12"	168.10	TO	155	
			12"	168.15	TO	150	
				168.02	TO		TOP OF WATER
				167.30	TO		TOP OF DEBRIS
150	STORM MANHOLE	174.11	12"	165.81	TO	149	
			12"	164.06	TO	151	
				154.11	TO	NORTH	
				154.05	TO	SOUTH	
151	SQUARE CATCH BASIN	173.29	12"	167.89	TO	152	
			12"	167.94	TO	150	
				167.89	TO		TOP OF DEBRIS
152	SQUARE CATCH BASIN	173.81	12"	169.06	TO	151	
				169.21	TO		TOP OF WATER
				169.11	TO		TOP OF DEBRIS
153	GATE VALVE AND WELL	173.93		168.68	TO		TOP OF PIPE
154	GATE VALVE AND WELL	173.96	12"	169.01	TO	NORTH / SOUTH	TOP OF PIPE
				171.28	TO		TOP OF VALVE
155	SQUARE CATCH BASIN	173.66	12"	169.02	TO	149	
				168.98	TO		TOP OF DEBRIS
156	SQUARE CATCH BASIN	173.53	12"	168.21	TO	157	
				168.71	TO		TOP OF WATER
157	SQUARE CATCH BASIN	174.06	12"	169.29	TO	156	
				169.96	TO		TOP OF DEBRIS
158	SQUARE CATCH BASIN	173.66		169.16	TO		TOP OF WATER
				167.36	TO		TOP OF DEBRIS
159	SQUARE CATCH BASIN	173.45		168.82	TO		TOP OF WATER
				168.05	TO		TOP OF DEBRIS
160	ELECTRIC MANHOLE	172.80	3"	170.95	TO	SOUTH	TOP OF WIRES
			3"	170.95	TO	WEST	TOP OF WIRES
			3"	170.65	TO	SOUTH	TOP OF WIRES
161	SQUARE CATCH BASIN	172.48	12"	168.18	TO	SOUTH	
				168.16	TO		TOP OF WATER
				167.93	TO		TOP OF DEBRIS
162	PLD MANHOLE	172.85		N/A	TO		DID NOT OPEN
163	GATE VALVE AND WELL	173.05		N/A	TO		DID NOT OPEN
164	GATE VALVE AND WELL	173.57		N/A	TO		DID NOT OPEN
165	GATE VALVE AD WELL	173.70		N/A	TO		DID NOT OPEN
166	STORM MANHOLE	173.34		N/A	TO		DID NOT OPEN
167	ELECTRIC MANHOLE	173.67	3"	171.47	TO	WEST	
			3"	171.47	TO	NORTH	
168	SQUARE CATCH BASIN	173.12	12"	170.00	TO	NORTHWEST	
				169.97	TO		TOP OF WATER
				169.67	TO		TOP OF DEBRIS
169	ELECTRIC MANHOLE	173.58		N/A	TO		DID NOT OPEN
170	STORM MANHOLE	173.47		N/A	TO		DID NOT OPEN
171	GATE VALVE AND WELL	173.51		N/A	TO		DID NOT OPEN
172	SANITARY MANHOLE	173.98		167.46	TO		TOP OF WATER
				162.98	TO		TOP OF DEBRIS

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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER: S.PALAZZOLA	DATE: 01-15-18
CHECKED: M.DEDECKER	DATE: 01-15-18
FIELD LEADER: D.SCHUETZ	PROJECT SURVEYOR: D.SCHUETZ
PROJECT MANAGER: M.DEDECKER	DEPARTMENT MANAGER: G.PLATZ

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO.: SM17122	DRAWING NO.: SM17122TPG
SCALE: 1" = 20'	SHEET NO.: 14 OF 15

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UTILITY PROVIDERS

UTILITY PROVIDER	MISS-DIG RESULTS	DATE	CONTACT	CONTACT #	CONTACT EMAIL
123.NET, INC.	NOT YET RECEIVED		CHUCK IRVIN	248-228-8223	MISSDIG@123.NET
360 NETWORKS	NOT YET RECEIVED		ROGER BILODEAU	866-213-1756	gt.cbyd@BELL.CA
BP-AMOCO PIPELINE CO	NOT YET RECEIVED		BOBBY ROYE	800-548-6482	MITICKETS@DIGTRACK.COM
ATT (FORMERLY SBC)	PLANS	11/27/2017	LINDA DENNISUK	248-456-8256	ld2154@att.com
BUCKEYE PARTNERS L.P.	CLEAR	11/6/2017	TRACI MCCLERNON	610-904-4475	TMCCLERNON@BUCKEYE.COM
COMCAST	CLEAR	11/15/2017	CRAIG PUDAS	248-809-2715	CRAIG_PUDAS@CABLE.COMCAST.COM
CTLCL-CENTURYLINK	NOT YET RECEIVED		TOM TROMBLEY	734-777-1910	thomas.sturmer@centurylink.com
DETROIT EDISON	PLANS	12/1/2017	NOT PROVIDED	313-235-5632	Design_MissDig@DTEenergy.com
DETROIT PUBLIC LIGHTING	NOT YET RECEIVED		AMY O'ROURKE/URG	586-803-3516	AOROURKE@URGLLC.NET
DETROIT THERMAL LLC	NOT YET RECEIVED		WADE WOODS	313-921-1922	WWOODS@DETROITRENEWABLE.COM
DETROIT WATER & SEWER	NOT YET RECEIVED		DALE ECHOLS	313-267-4857	DALE.ECHOLS@GLWATER.ORG
DETROIT MEDICAL CENTER	CLEAR	11/6/2017	JUDITH GARLAND	313-578-2448	missdig@dmc.org
DETROIT PEOPLE MOVER SYSTEM	NOT YET RECEIVED		ROBERT A CANTALINI	313-224-2212	RCANTALINI@THEPEOPLEMOVER.COM
EVERSTREAM	NOT YET RECEIVED		BRIAN KUNTER	616-608-8945	BKUNTER@EVERSTREAM.NET
FONOROLA FIBER/GABES CONSTR	CLEAR	11/6/2017	VICKIE MORAN	877-459-2690	NOT PROVIDED
FORD MOTOR COMPANY, TELECOMMUNICATIONS	NOT YET RECEIVED		JOE FORSYTHE	269-208-0671	jforsythe@tkns.net
INTERNATIONAL TRANSMISSION COMPANY	CLEAR	11/13/2017	BRIANNA KOTELES	248-946-3322	bkoteles@itctransco.com
KEPS TECHNOLOGIES INC. DBA ACD-NET	NOT YET RECEIVED		TYLER LENSING	517-999-3247	LENSING.TYLER@ACD.NET
KINDER MORGAN COCHIN, LLC.	NOT YET RECEIVED		CLAY POPE	713-369-8319	onecall_liq@kindermorgan.com
LEVEL 3 COMMUNICATIONS	NOT YET RECEIVED		JUDY HENRY	720-888-2061	RELO@LEVEL3.COM
LIGHTOWER FIBER NETWORKS	CLEAR	11/6/2017	STEVEN HERALD	585-568-8449	SHERALD@LIGHTOWER.COM
M-1 RAIL	NOT YET RECEIVED		RYAN EPSTEIN	313-924-4373	RYAN.EPSTEIN@M1RAIL.ORG
MARATHON PIPELINE	NOT YET RECEIVED		CHRISTINA BODINE	419-672-4888	clbodine@MARATHONPETROLEUM.COM
MARATHON PETROLEUM CO. LP: MI REFINING	NOT YET RECEIVED		PAUL FRASER	419-429-5696	MISSDIGDesign@mgrouproot.com
DTE GAS DISTRIBUTION DESIGN CODE	PLANS	11/20/2017	BARBARA SAUNDERS	313-235-5111	SAUNDERSB@DTEENERGY.COM
MCI/VERIZON BUSINESS	PLANS	11/10/2017	OSP / INVESTIGATIONS	972-729-6016	investigations@verizon.com
MERIT NETWORK INC.	NOT YET RECEIVED		KEN LOPEZ	616-393-0132	KENL@WESTERNTEL-COM.COM
ENERGY TRANSFER	CLEAR	11/6/2017	MOLLY CARRIERE	713-989-7079	MISDIG_TICKETS@IRTH.COM
PUBLIC LIGHTING AUTHORITY	PLANS	3/19/2018	MUKESH PATEL	313-558-0191	mpatel@pladetroit.org
PLAINS MARKETING L.P.	NOT YET RECEIVED		BRENT SMITH	713-993-5098	tbsmith@paalp.com
PRAXAIR, INC.	NOT YET RECEIVED		ANDREW BAKER	219-313-2692	ANDREW_BAKER@PRAXAIR.COM
QWEST COMMUNICATIONS	NOT YET RECEIVED		GEORGE MCELVAIN	303-992-9931	THOMAS.STURMER@CENTURYLINK.COM
ROCKET FIBER LLC	NOT YET RECEIVED		SCOTT CERNY	989-277-3149	scottcerny@rocketfiber.com
ROYAL OAK CHARTER TOWNSHIP	NOT YET RECEIVED		SHERRY LEWIS	248-547-9800	SLEWIS@ROYALOAKTWP.COM
SPECTRUM BROADBAND, LLC	NOT YET RECEIVED		EDWARD REIMANN	517-899-2506	EDWARD@GOLIGHTSPEED.COM
SPRINT/NEXTEL	NOT YET RECEIVED		GERRY A. CRAIN/ERICSSON	847-445-1869	gerry.a.crain@sprint.com
SUNOCO PIPELINE LP	PLANS	11/6/2017	TRACY L HOFFMAN	610-670-3256	tlhoffman@sunocologistics.com
TERRADEX	CLEAR	11/6/2017	RIN TRAN	650-227-3254	RIN@TERRADEX.COM
U.S. SIGNAL CORP.	NOT YET RECEIVED		KEITH, VANDER PLOEG	616-295-0868	MISSDIG@TKNS.NET
WINDSTREAM COMMUNICATONS	CLEAR	11/9/2017	JOE GREEN	319-790-7510	JOSEPH.GREEN@WINDSTREAM.COM
WOLVERINE PIPELINE CO	CLEAR	11/6/2017	LOUIS KRAUS	269-323-2491	LOUIS_KRAUS@WPLCO.COM
WIDE OPEN WEST	CLEAR	11/20/2017	JOHN HAJEC	734-237-4319	JOHN.HAJEC@WOWINC.COM
WAYNE STATE UNIVERSITY	NOT YET RECEIVED		KEN LOPEZ	616-393-0138	KENL@WESTERNTEL-COM.COM
XO COMMUNICATIONS	NOT YET RECEIVED		ANTHONY KOWALESKI	248-784-4427	ANTHONY.KOWALESKI@XO.COM
ZAYO BANDWIDTH MIDWEST, LLC	NOT YET RECEIVED		GEORGE HUSS	443-403-2023	GEORGE.HUSS@ZAYO.COM

UTILITY NOTES:

1. SDA HAS MADE A REASONABLE AND PRUDENT ATTEMPT TO IDENTIFY THE OUTLETS FOR STORM WATER DRAINAGE AND SANITARY SEWER. THE OUTLETS FOR THIS SITE MAY BE MASKED BY TRAPS IN THE STRUCTURES AND/OR BLIND TAPS DIRECTLY INTO THE TRUNK LINES.

2. THE SEWERS IN THE CITY OF DETROIT ARE PART OF A COMBINED STORM/SANITARY SYSTEM. WHERE SDA HAS NOT BEEN ABLE TO PROPERLY DETERMINE WHETHER A PARTICULAR LINE IS "STORM" OR "SANITARY", WE HAVE LABELED THE UTILITY AS SEWER (SWR).

3. THE DWSD SEWER MAPS WERE CONSULTED AS REFERENCE FOR THE SEWER SYSTEM. THESE MAPS SHOWED THE MAIN SEWER RUNS WHICH WERE GENERALLY CONSIDERED TO BE THE COMBINED PORTION OF THE SYSTEM. IN MOST CASES, THE CONNECTIONS BETWEEN THE CATCH BASINS AND THE MAIN SEWER RUNS ARE NOT SHOWN ON THESE MAPS. IT APPEARS THAT THERE ARE SMALLER RUNS OF STORM SEWER THAT MAY INTERCONNECT A NUMBER OF CATCH BASINS THAT FEED INTO THE LARGER INTERCEPTORS. WE DO NOT HAVE ANY RECORDS FOR THE LOCATION AND CONFIGURATION OF THESE STORM SEWER RUNS. ADDING TO THE UNCERTAINTY IN THEIR LOCATION IS THAT WE BELIEVE THERE MAY BE HORIZONTAL BENDS IN THESE SEWER RUNS BASED ON THE DIRECTION OF THE PIPES THAT WE VIEWED LEAVING THE ACTUAL CATCH BASINS. WE HAVE PLOTTED THESE STORM SEWER CONNECTIONS BASED ON A POSSIBLE CONFIGURATION, BUT THIS SHOULD BE CONSIDERED TO BE APPROXIMATE IN NATURE ONLY AND NOT VERIFIED BY PRIOR RECORDS. THE POSSIBLE PRESENCE OF THE HORIZONTAL BENDS/ELBOWS BETWEEN STRUCTURES INCREASES THE UNCERTAINTY IN THE LOCATIONS FOR THESE RUNS OF PIPES.

SURVEYOR'S COMMENTS:

1. SPALDING DeDECKER HAS PERFORMED THIS TOPOGRAPHICAL SURVEY FOR THE DESIGN AND EVALUATION OF STREETSCAPE IMPROVEMENTS INCLUDING THE EVALUATION OF THE ROAD ALIGNMENT AND CONFIGURATION.

2. THE SCOPE OF SERVICES FOR THE AREA FROM MARGARETA AVENUE NORTHERLY TO PEMBROKE AVENUE INCLUDES A COMPLETE TOPOGRAPHICAL SURVEY INCLUDING SHOWING PRECISE GRADES USING CONVENTIONAL SURVEYING METHODS, MAPPING UNDERGROUND UTILITIES BASED ON A COMBINATION OF AVAILABLE UTILITY RECORDS ALONG WITH ACTUAL FIELD-MEASUREMENTS, AND RETRACING THE RIGHT OF WAY LINES BASED ON ACTUAL FIELD MEASUREMENTS. INDIVIDUAL LOT LINES ARE SHOWN FOR REFERENCE IN AN APPROXIMATE LOCATION. PARCEL LINES ARE SHOWN ACCORDING TO THE CITY OF DETROIT CARTOGRAPHIC MAPS, WHICH WERE USED FOR REFERENCE.

3. THE HORIZONTAL COORDINATE SYSTEM FOR THIS PROJECT IS THE STATE PLANE COORDINATE GRID, MICHIGAN SOUTH ZONE (2113), BASED ON NAD83 (2011). THE UNITS ARE INTERNATIONAL FEET.

4. THE VERTICAL DATUM FOR THE SURVEY IS THE LOCAL CITY OF DETROIT DATUM.

5. THE FIELD-WORK FOR THE SURVEY WAS COMPLETED IN DECEMBER, 2017. THERE WAS A SIGNIFICANT AMOUNT OF SNOW ON SITE DURING THE FINAL COMPLETION OF THE SURVEY, WHICH OBSTRUCTED FEATURES PRIMARILY NEAR THE SOUTH END OF THE MAPPING.

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SUITE 696
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(313) 720-1055
emily@smm.studio

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NOTE: UTILITY INFORMATION ON THIS DRAWING MAY BE FROM INFORMATION DISCLOSED TO THIS FIRM BY THE VARIOUS UTILITY COMPANIES, CITY/COUNTY AGENCIES AND OTHER VARIOUS SOURCES. UNDERGROUND UTILITIES WHICH ARE ON PRIVATE PROPERTY ARE USUALLY NOT DELINEATED UPON A UTILITY COMPANY'S PUBLISHED PLANS, THEIR LOCATION, IF SHOWN UPON THIS SURVEY, ARE APPROXIMATED FROM FOUND PAINT MARKS/STAKES, ETC. AS LOCATED BY THIS FIRM FROM SOURCES WHICH ARE UNKNOWN. NO GUARANTEE IS GIVEN AS TO THE COMPLETENESS OR ACCURACY THEREOF.

PRIOR TO CONSTRUCTION, ALL LOCATIONS AND DEPTHS OF EXISTING UTILITIES (IN CONFLICT WITH PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD. CALL MISS DIG 3 WORKING DAYS PRIOR TO CONSTRUCTION.

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DETROIT LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE

8 MILE RD. TO MARAGETA AVE.

TOPOGRAPHICAL SURVEY

SECTION 3
TOWN 1 SOUTH RANGE 11 EAST
CITY OF DETROIT
WAYNE COUNTY, MI.

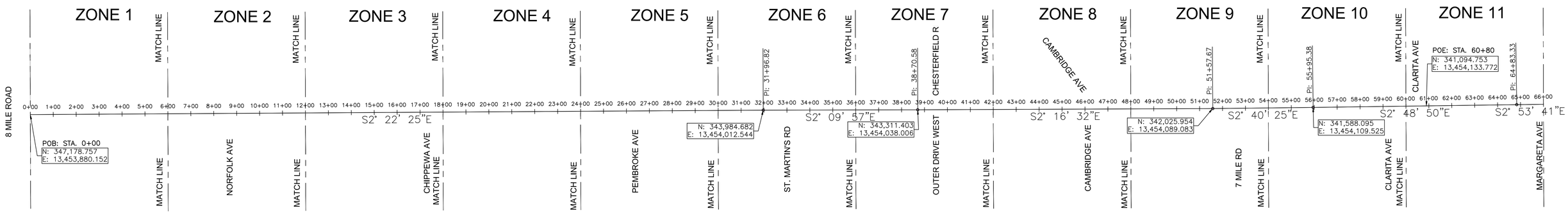
NO.	DATE	REVISION
1	10-24-18	ADDITIONAL TOPO AND UTILITIES

DRAFTER S.PALAZZOLA		DATE 01-15-18	
CHECKED M.DEDECKER		DATE 01-15-18	
FIELD LEADER D.SCHUETZ		PROJECT SURVEYOR D.SCHUETZ	
PROJECT MANAGER M.DEDECKER		DEPARTMENT MANAGER G.PLATZ	

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. SM17122	DRAWING NO. SM17122TPG
SCALE: 1" = 20'	SHEET NO. 15 OF 15

Plotted: Nov 6, 2018, 2:12 PM by user: 922 — Saved: 11/6/2018 by user: 922
J:\SM\SM17122 Livernois Streetscape Detroit\DWG\SM17122TPG.dwg



NOTES

1. ROADWAY CENTER LINE PROVIDED BY SPALDING DEDECKER (SDA) BASED ON A BEST–FIT ALIGNMENT OF THE CENTERLINE OF PREVIOUS LIVERNOIS AVENUE MEDIAN CONSTRUCTION PROJECT FROM 2005 (SHEET 9 OF 71, ALIGNMENT SHEET).
   - 1.1. FOR REFERENCE, SEE CITY OF DETROIT PLANS ENTITLED "LIVERNOIS AVE MEDIAN IMPROVEMENTS FROM SOUTH OF McNICHOLS RD TO EIGHT MILE RD" FROM 2005, PREPARED BY HNTB.
   - 1.2. CONTROL SECTION NUMBER: EDCF 82544
   - 1.3. JOB NUMBER: 84857A
   - 1.4. FEDERAL PROJECT NUMBER: MG 0582(127)
   - 1.5. FEDERAL ITEM NUMBER: RR4714

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

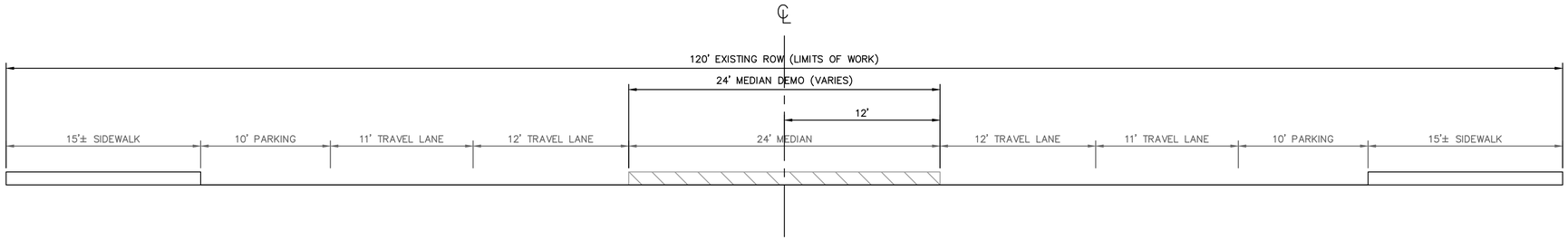
Sheet Title: OVERALL ALIGNMENT AND KEY MAP

Sheet No: C001

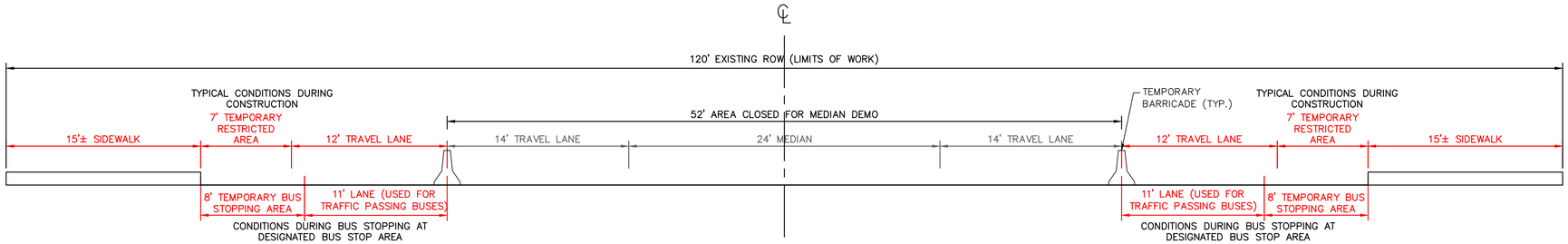
J:\2017\61\17018\production sets\livernois streetscape\17018-stationing.dwg Plotted: 12/20/2018 12:59 PM by bbosack

NOTES

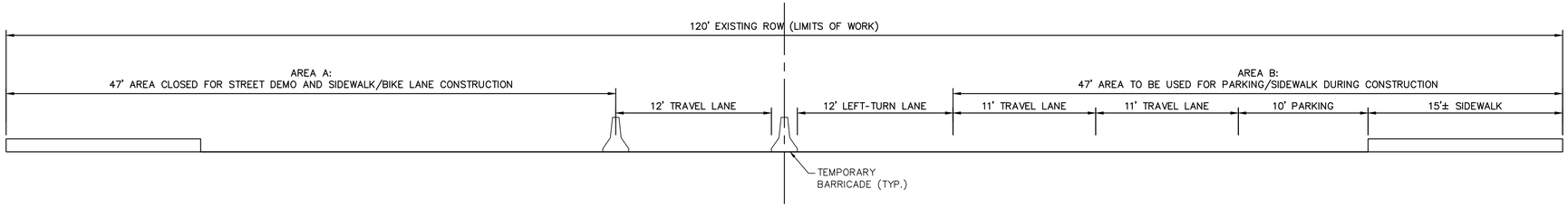
1. ALL ROADWAY SECTIONS ARE TO BE SYMMETRICAL UNLESS OTHERWISE NOTED
2. EXISTING RIGHT-OF-WAY (ROW) WIDTH ACROSS LIVERNOIS AVENUE IS 120' THROUGHOUT AREA OF PROJECT SCOPE
3. MEDIAN IS 24' WIDE ACROSS FULL SECTION, BUT WHERE TURN LANES AND MICHIGAN LEFTS ARE PRESENT, THE LENGTH VARIES. ALL PARTS OF MEDIAN, INCLUDING AREAS WITH VARIABLE WIDTHS, ARE TO BE DEMOLISHED
4. CONTRACTOR IS TO ENSURE THAT PARKING IS MAINTAINED AS MUCH AS POSSIBLE DURING OUTER LANE REMOVAL AND SIDEWALK CONSTRUCTION. ONE SIDE OF LIVERNOIS AVE IS TO BE KEPT OPEN AT ALL TIMES DURING THIS PHASE IN ORDER TO PROVIDE TEMPORARY ON-STREET PARKING. SEE CROSS-SECTION 3, AREAS A AND B. AREAS A AND B ARE TO ALTERNATE ONE SIDE AT A TIME TO ALLOW FOR LANE DEMOLITION AND SIDEWALK CONSTRUCTION WORK IN THESE AREAS.



1 EX. NORMAL SECTION (FULL MEDIAN)
SCALE: 1" = 5'

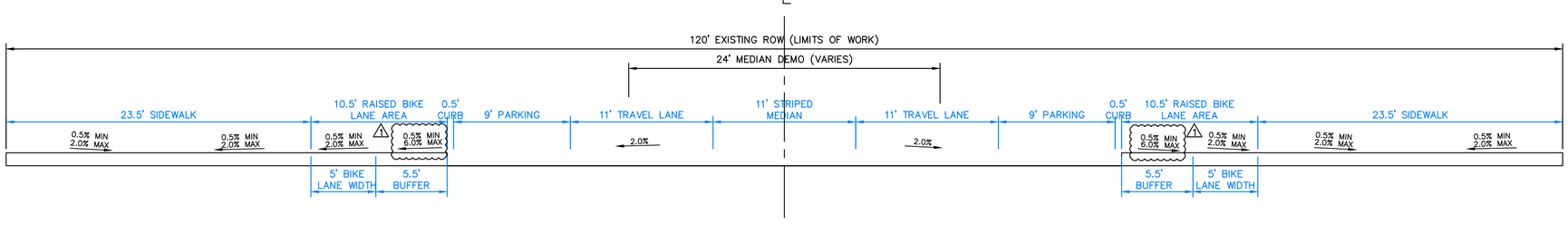


2 EX. NORMAL SECTION DURING CONSTRUCTION (FULL MEDIAN REMOVAL)
SCALE: 1" = 5'



3 EX. ROADWAY SECTION DURING CONSTRUCTION (REMOVAL OF NB AND SB LANES)
SCALE: 1" = 5'

*AREA A AND B: SEE NOTE 4, THIS SHEET



4 PR. FUTURE ROADWAY SECTION (FULL MEDIAN REMOVED)
SCALE: 1" = 5'

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: TYPICAL CROSS-SECTIONS

Sheet No: C002

J:\2017\61\17018\production sets\livernois streetscape\17018-rockey_sections.dwg Plotted: 2/7/2019 1:00 PM by bbosack

NOTES

1. AREAS SHOWN ON THIS SHEET ARE TO SERVE AS CONCEPTUAL CONSTRUCTION STAGING PHASE AREAS ONLY. SEE MAINTENANCE OF TRAFFIC (MOT) SHEETS FOR MORE DETAILED TRANSITIONS.
2. FOR PROPOSED AND EXISTING CROSS–SECTIONS, SEE SHEET C002 – TYPICAL CROSS–SECTIONS.

STAGING PLAN LEGEND

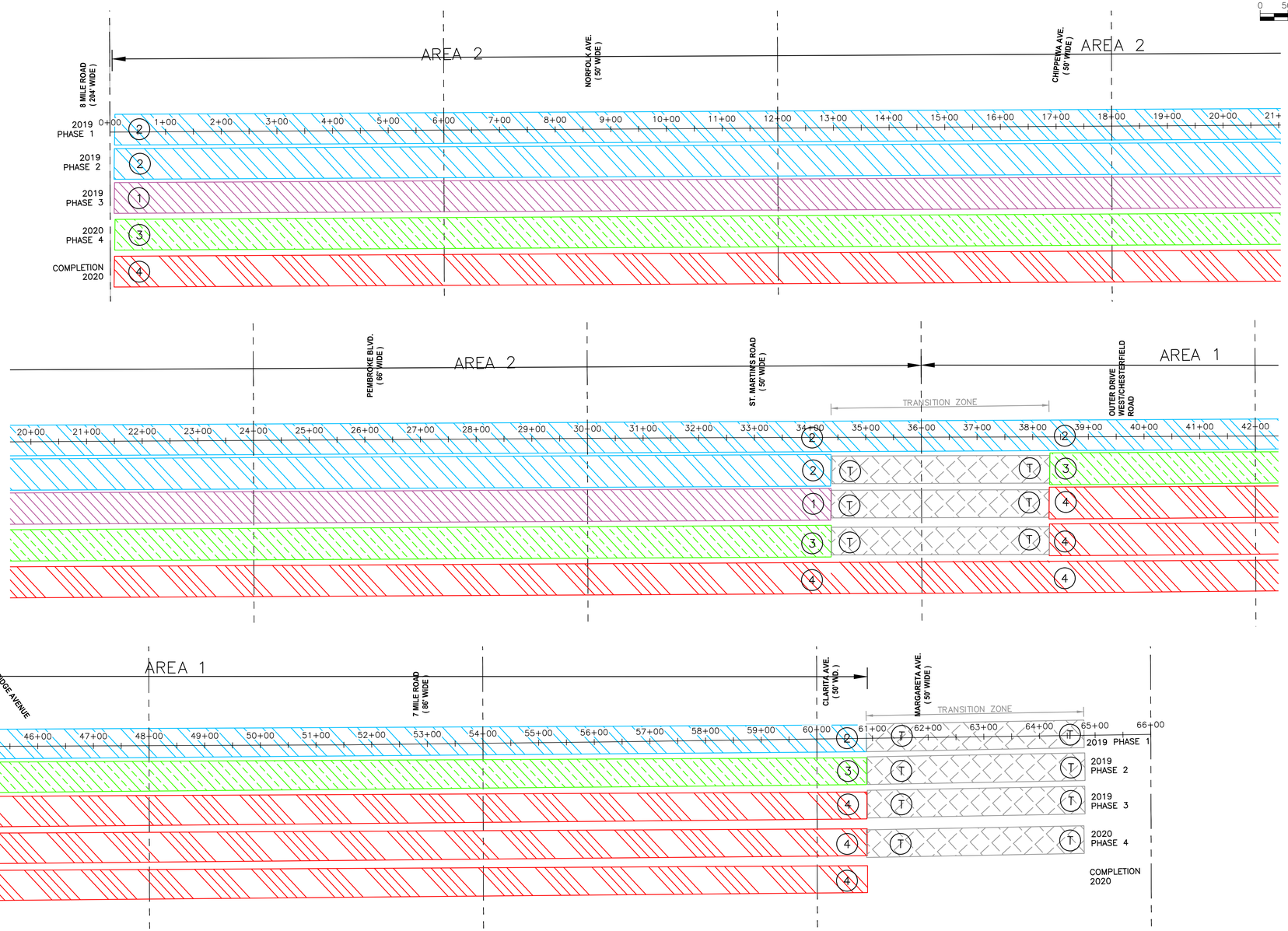
- MAINTENANCE OF TRAFFIC CROSS–SECTION (1)
- MAINTENANCE OF TRAFFIC CROSS–SECTION (2)
- MAINTENANCE OF TRAFFIC CROSS–SECTION (3)
- MAINTENANCE OF TRAFFIC CROSS–SECTION (4)
- TRANSITION ZONE: CHANNELIZATION OF TRAFFIC AND PEDESTRIANS NEAR CONSTRUCTION ZONES (T)

PHASE 1 (2019)
1. CHANNELIZE TRAFFIC TO ESTABLISH LIVERNOIS MAINTENANCE OF TRAFFIC (MOT) CROSS–SECTION 2 FOR ENTIRE PROJECT AREA.
2. PERFORM MEDIAN REMOVAL AND REPLACEMENT FOR ENTIRE PROJECT AREA, WORKING FROM SOUTH TO NORTH.
3. DIVIDE PROJECT AREA INTO TWO AREAS:
   – AREA 1: MARGARETA AVE TO OUTER DRIVE
   – AREA 2: ST. MARTINS TO 8 MILE ROAD

PHASE 2 (2019)
1. AREA 1
   1.1. TRANSITION TRAFFIC ONTO NEW PAVEMENT WHERE MEDIAN WAS REMOVED, PER MOT CROSS–SECTION 3.
   1.2. PERFORM STREETSCAPE ENHANCEMENTS ON BOTH SIDES OF LIVERNOIS AVE, ONE SIDE AT A TIME.
2. AREA 2
   2.1. MAINTAIN TRAFFIC PER MOT CROSS–SECTION 2 UNTIL STREETSCAPE IMPROVEMENTS ARE COMPLETED ON BOTH SIDES OF LIVERNOIS AVE IN AREA 1.

PHASE 3 (2019)
AT THE COMPLETION OF 2019 CONSTRUCTION, AREA 1 STREETSCAPE ENHANCEMENTS ARE TO BE COMPLETED AND MEDIAN AND TURNAROUNDS ARE TO BE REMOVED AND REPLACED WITH PAVEMENT.
1. AREA 1
   1.1. OPEN ALL LANES AND SIDEWALKS FOR THEIR INTENDED USES, PER MOT CROSS–SECTION 4.
2. AREA 2
   2.1. TRANSITION TRAFFIC FROM CROSS–SECTION 4 TO CROSS–SECTION 1 IN AREA 2.
   2.2. MAINTAIN TRAFFIC PER MOT CROSS–SECTION 1. RESTRIPE/BARRICADE TEMPORARY MEDIAN AND TURNAROUNDS UNTIL 2020 CONSTRUCTION.

PHASE 4 (2020)
1. AREA 1
   1.1. AREA 1 WAS COMPLETED IN 2019.
2. AREA 2
   2.1. TRANSITION TO MOT CROSS–SECTION 3.
   2.2. PERFORM STREETSCAPE ENHANCEMENTS ON BOTH SIDES OF LIVERNOIS AVE, ONE SIDE AT A TIME.
   2.3. WHEN COMPLETE, REMOVE MAINTENANCE OF TRAFFIC ITEMS. CROSS–SECTION 4 NOW APPLIES ACROSS LIVERNOIS AVE FOR ENTIRE PROJECT AREA.



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PROJECT

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STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

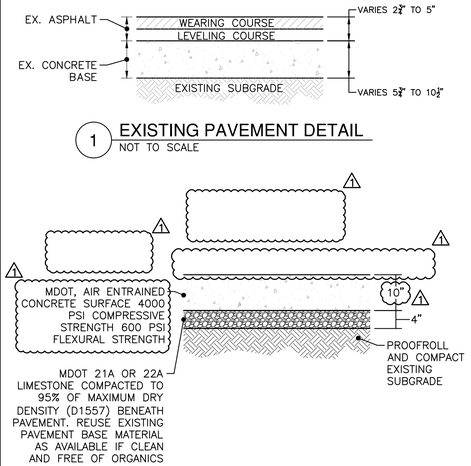
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: STAGING PLAN

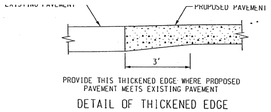
Sheet No: C003

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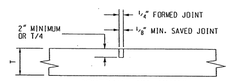


1 EXISTING PAVEMENT DETAIL
NOT TO SCALE

2 PROPOSED PAVEMENT DETAIL
NOT TO SCALE



DETAIL OF THICKENED EDGE



CONTRACTION JOINT

BASEMENT WALL REMOVAL

	CITY CRITERIA	M.D.O.T. CRITERIA
1	REMOVE WALLS 1'-0" BELOW BOTTOM OF PROPOSED PAVEMENT AND 2'-0" BEHIND FACE OF CURB.	REMOVE WALLS 3'-0" BELOW LOWEST POINT OF PROPOSED PAVEMENT SURFACE AND 2'-0" BEYOND FACE OF CURB.
2	REMOVE WALLS 1'-0" MINIMUM BELOW BOTTOM OF PROPOSED SIDEWALK.	REMOVE WALLS TO BOTTOM OF PROPOSED PAVEMENT SLAB IN BERM AREA.
3	SAME AS 2. (OR 1'-0" BELOW GROUND SURFACE WHICHEVER IS DEEPER).	REMOVE WALLS TO 1'-0" BELOW PROPOSED SURFACE ELEVATIONS.

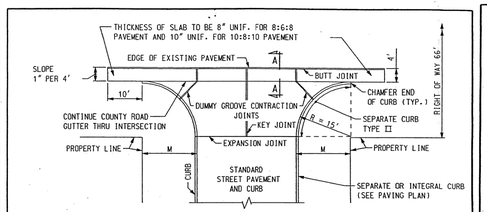
NOTES:

1. VARIABLE WIDTHS:
   W_1 = PROPOSED RIGHT-OF-WAY
   W_2 = PROPOSED ROADWAY
   X_1 = PROPOSED MARGIN
   X_2 = PARKING LANE
   X_3 = MOVING LANE
2. NOMENCLATURE ON THE TYPICAL SECTION IS FOR CITY OF DETROIT (CITY) FUNDED PROJECTS. FOR MICHIGAN DEPARTMENT OF TRANSPORTATION (M.D.O.T.) FUNDED PROJECTS, USE M.D.O.T. NOMENCLATURE (SEE LEGENDS).
3. THE PAVEMENT CROWN IS TO BE PARABOLIC IN SHAPE CONSTRUCTED ACCORDING TO AN ELEWENTS TABLE SHOWN ON THE PLANS OR TO CITY ENGINEERING DIVISION CROWN TABLES.
4. THIS TYPICAL SECTION IS INTENDED AS A GUIDELINE ONLY. CERTAIN PARAMETERS SUCH AS PAVEMENT THICKNESS AND SIDEWALK LOCATION MAY VARY.
5. FOR LOCAL STREETS THE CONCRETE PAVEMENT MAY BE NON-REINFORCED. EXCEPT THE TYPE D LANE TIE JOINTS MUST STILL BE USED.
6. THE MINIMUM PAVEMENT THICKNESS IS 9".

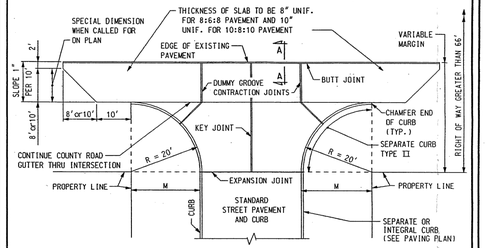
CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
TYPICAL PAVEMENT CROSS SECTION FOR STREET CONSTRUCTION

03/07/18 PLAN DATE	DRAWING NO. A	DETAIL STANDARD NO. C-4304	SHEET

METRIC TO ENGLISH UNIT SYSTEM:DEC.2002



USE THIS TYPE ONLY WHEN
LIMITED TO A 66' RIGHT OF WAY



USE THIS TYPE WHEN
RIGHT OF WAY IS MORE THAN 66'

NOTE:
WHERE 'M' EXCEEDS 'R', EXTEND CURB TO THE PROPERTY LINE.

WHERE 'M' IS LESS THAN 'R', CONSTRUCT COMPLETE CURB CIRCLE.

REVISED DATE:METRIC TO ENGLISH UNIT SYSTEM:DEC.2002

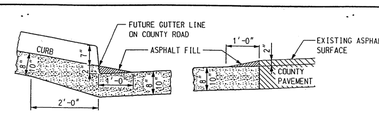
PREPARED BY BUREAU OF STREETS AND HIGHWAYS

rev. K.S.M. DRAWN BY:
M.F.S. CHECKED BY:

APPROVED
Jacqui Hall
PLANNER & STREETS
CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
DETAIL OF APPROACH TO EXISTING COUNTY HIGHWAY PAVEMENTS

03/07/18 PLAN DATE	DRAWING NO. 6	DETAIL STANDARD NO. C-4383	SHEET 1 OF 2

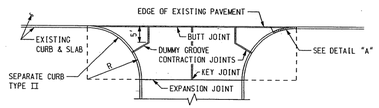


USE THIS SECTION WHEN
COUNTY ROAD IS ASPHALT

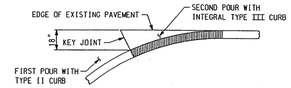


USE THIS SECTION WHEN
COUNTY ROAD IS CONCRETE

SECTION A-A



USE THIS TYPE FOR
JUNCTION WITHOUT WIDENING



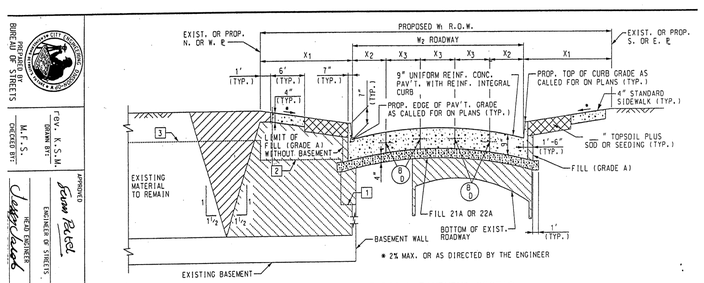
DETAIL - "A"

REVISED DATE:METRIC TO ENGLISH UNIT SYSTEM:DEC.2002

NOTE:
ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
DETAIL OF APPROACH TO EXISTING COUNTY HIGHWAY PAVEMENTS

03/07/18 PLAN DATE	DRAWING NO. 6	DETAIL STANDARD NO. C-4383	SHEET 2 OF 2



TYPICAL PAVEMENT SECTION

PAVEMENT SECTION LEGEND

CITY DESIGNATION	M.D.O.T. DESIGNATION
FILL 21A OR 22A	Aggregate Base.— "
FILL (GRADE A)	Granular Material, Cl II
" TOPSOIL PLUS SOD OR SEEDING	Topsoil Surface, Furn.-LM Plus Seeding, Or Seeding, Mixture Tuf
FILL - SELECTED EXCAVATED MATERIAL	Embankment, CIP
PROPOSED CONCRETE * #(4" Standard Sidewalk)	Proposed Concrete * #(Sidewalk, Concrete, 4")

JOINT LEGEND

- (B) LONGITUDINAL BULKHEAD JOINT, ACCORDING TO DETAIL STANDARD NO. C-4943 (M.D.O.T. STANDARD DRAWING R-41-E)
- (D) LONGITUDINAL LANE TIE JOINT WITH TIE BAR, ACCORDING TO DETAIL STANDARD NO. C-4943 (M.D.O.T. STANDARD DRAWING R-41-E)
- (B or D) OPTIONAL, B OR D JOINT

NOTE: PAVEMENT SECTION TO BE 10" NON-REINFORCED CONCRETE ⚠

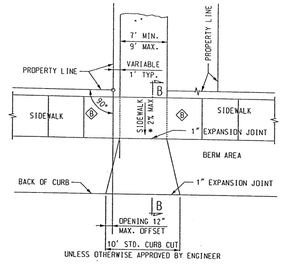
D				
C				
B	* SIDEWALK CROSS SLOPE	KSM	K.S.	7/7/07
A	UNITS SHOWN	KSM	M.F.	7/7/07
	DESCRIPTION	Drwn.	Chkd	Appd Date

REVISED to

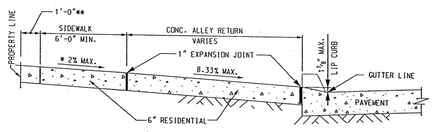
CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
TYPICAL PAVEMENT CROSS SECTION FOR STREET CONSTRUCTION

03/07/18 PLAN DATE	DRAWING NO. A	DETAIL STANDARD NO. C-4304	SHEET

BUREAU OF STREETS
M.F.S. CHECKED BY:
rev. K.S.M. DRAWN BY:
APPROVED Jacqui Hall ENGINEER OF STREETS
RICHT SPEIKERS CITY ENGINEER



DETAIL OF CURB CUT OPENINGS
FOR RESIDENTIAL DRIVEWAY



SECTION B-B

NOTES:

IF ALLEY IS PAVED, CONSTRUCT RETURN WITH 1" EXPANSION JOINT ON PROPERTY LINE.

(A) RADIUS TO BE 10' UNLESS OTHERWISE SHOWN ON PAVING PLAN.

(B) SIDEWALK FLAGS ABUTTING ALLEY SHALL BE 6" THICK. SIDEWALK SHALL BE REPLACED FOR A SMOOTH TRANSITION AND TO ATTAIN A CROSS SLOPE OF 2% MAX. OR AS DIRECTED BY THE ENGINEER.

(C) KEY JOINT OR "B" JOINT IF REINFORCED PAVEMENT.

ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

* SIDEWALK CROSS SLOPE SHALL BE 2% MAX. OR AS DIRECTED BY THE ENGINEER.

** THE SLOPE OF THE DRIVEWAY IN THE 1 FT. SPACE ADJACENT TO THE PROPERTY LINE MAY BE ALTERED UP TO 10% TO MEET EXISTING CONDITIONS.

REVISED DATE:METRIC TO ENGLISH UNIT SYSTEM:DEC.2002

C				
B	* SIDEWALK CROSS SLOPE	KSM	J.J.	7/7/07
A	Chgd. THICKNESS NOTE	KSM	W.H.	W.T. 10/06
	DESCRIPTION	Drwn.	Chkd	Appd Date

REVISED to

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
DETAIL OF ALLEY RETURN AND DRIVE APPROACH

03/07/18 PLAN DATE	DRAWING NO. 7	DETAIL STANDARD NO. C-4384	SHEET 1 OF 2

\\2017\01\170118\production sets\livernois streetscape\170118-details 2.dwg Plotted: 2/1/2019 1:01 PM by bbosack

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41780 Six Mile Road
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Northville | MI| 48168
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NTH Project No.
61-170118

PROJECT
LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

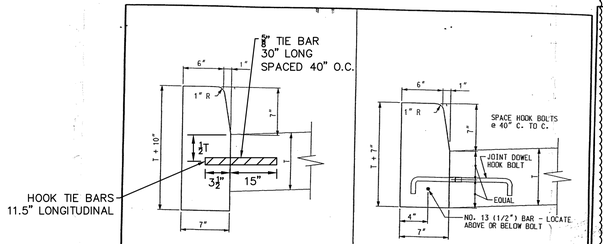
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

Sheet Title
PAVEMENT AND DRIVEWAY DETAILS

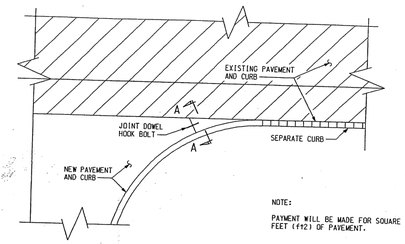
Sheet No:
C004



REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

PREPARED BY BUREAU OF STREETS AND HIGHWAYS	$C\theta x_s$ K.S.M. DRAWN BY:	APPROVED Dadiw Haidar ENGINEER OF STREETS; Wm Talley CITY ENGINEER	CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___STANDARD CURB DETAILS___
	$M_x E_x S_x$ CHECKED BY:		03/07/08 PLAN DATE | DRAWING NO. 3 | DETAIL STANDARD NO. C-4380 | SHEET 1 OF 4.

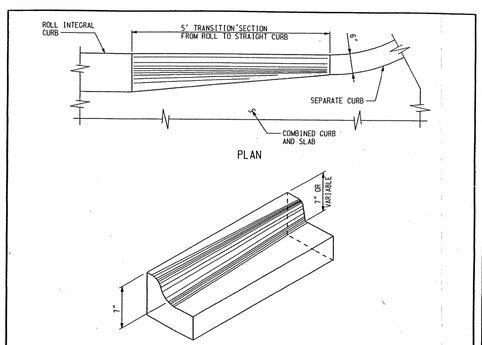
NOTE: TYPE II CURB DETAIL SHALL BE MODIFIED TO INCLUDE STRAIGHT BAR LANE-TIE



DETAIL SHOWING TREATMENT AT CURB RETURNS

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

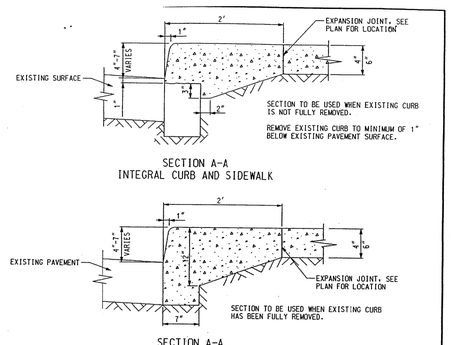
CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___STANDARD CURB DETAILS___			
03/07/08 PLAN DATE	DRAWING NO. 3	DETAIL STANDARD NO. C-4380	SHEET 3 OF 4.



NOTE:
ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___STANDARD CURB DETAILS___			
03/07/08 PLAN DATE	DRAWING NO. 3	DETAIL STANDARD NO. C-4380	SHEET 4 OF 4.

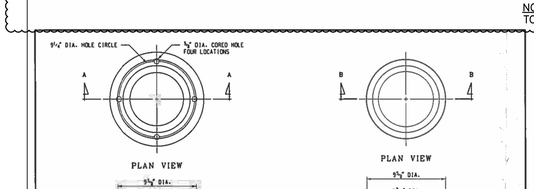


NOTES:

1. WHEN MARGIN DIMENSIONS ARE 20' OR LESS, CONSTRUCT SIDEWALK INTERSECTION AS SHOWN.
2. WHEN MARGIN DIMENSIONS EXCEED 20', CONSTRUCT INTERSECTION OF SEPARATE TYPE CURB AND SIDEWALK AS DIRECTED BY ENGINEER.
3. CONSTRUCT SIDEWALK RAMPS AS SHOWN ON THE PLAN OR AS DIRECTED BY ENGINEER.
4. GRADE "A" CONCRETE TO BE USED FOR CURBS AND INTEGRAL CURB AND SIDEWALK.
5. ALL EXPANSION JOINT PAPER SHALL EXTEND 1" BELOW THE BOTTOM OF THINNEST ADJOINING SECTION.
6. ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___INTEGRAL CURB AND WALK___ ___MODIFIED SEPARATE TYPE CURB___			
03/07/08 PLAN DATE	DRAWING NO. 33	DETAIL STANDARD NO. C-4550	SHEET 2 OF 2.



NOTES:

ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

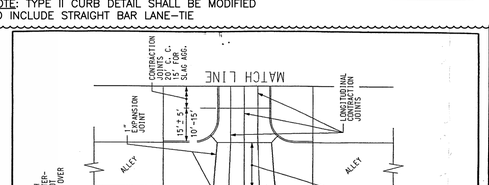
THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATIONS FOR GRAY IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

ALL CASTINGS AND THEIR MATCHING SEATS SHALL BE GROUND OR MACHINED SO THAT AN EVEN BEARING IS ATTAINED. THUS PREVENTING ROCKING OR TILTING.

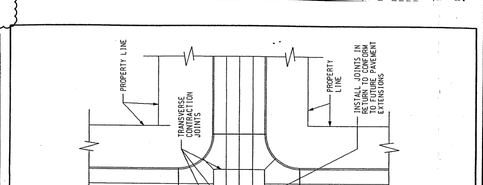
THE CASTING SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS, AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

MDOT	DEPARTMENT DIRECTION Kirk T. Steudle	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR MONUMENT BOXES	
PREPARED BY DESIGN DIVISION	APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES		
DRAWN BY: B.L.T.	APPROVED BY: DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT		
CHECKED BY: B.L.T.	9-30-2014 F.H.W.A. APPROVAL	4-16-2014 PLAN DATE	R-11-E | SHEET 1 OF 1



REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

PREPARED BY BUREAU OF STREETS AND HIGHWAYS	rev. K.S.M. DRAWN BY:	APPROVED Dadiw Haidar ENGINEER OF STREETS; Wm Talley CITY ENGINEER	CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___TYPICAL JOINT LAYOUT FOR___ ___NON-REINFORCED CONCRETE PAVEMENT___
	$M_x E_x S_x$ CHECKED BY:		03/07/08 PLAN DATE | DRAWING NO. 2 | DETAIL STANDARD NO. C-4379 | SHEET 1 OF 2.



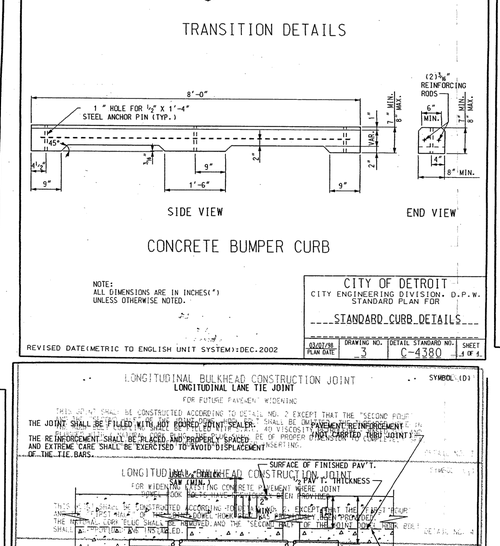
REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___TYPICAL JOINT LAYOUT FOR___ ___NONREINFORCED CONCRETE PAVEMENT___			
03/07/08 PLAN DATE	DRAWING NO. 2	DETAIL STANDARD NO. C-4379	SHEET 2 OF 2.

LONGITUDINAL BULKHEAD CONSTRUCTION JOINT — SYMBOL (D)

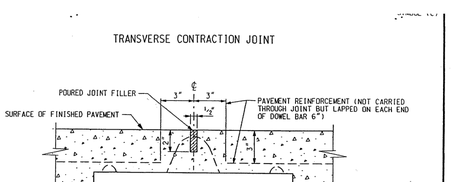
LONGITUDINAL LANE TIE JOINT
FOR FUTURE PAVEMENT WIDENING

THIS "D" JOINT SHALL BE CONSTRUCTED ACCORDING TO DETAIL NO. 2 EXCEPT THAT THE "SECOND POUR" THE JOINT SHALL BE FILLED WITH HOT POURED JOINT SEALER. SHALL BE UNFORMED AND PAVEMENT REINFORCEMENT
THE REINFORCEMENT SHALL BE PLACED AND PROPERLY SPACED AND CARRIED THRU JOINT.)
AND EXTREME CARE SHALL BE EXERCISED TO AVOID DISPLACEMENT OF THE TIE BARS.



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	$M_x E_x S_x$ CHECKED BY:		03/07/08 PLAN DATE | DRAWING NO. 25 | DETAIL STANDARD NO. C-4943 | SHEET 1 OF 4.

TRANSVERSE CONTRACTION JOINT

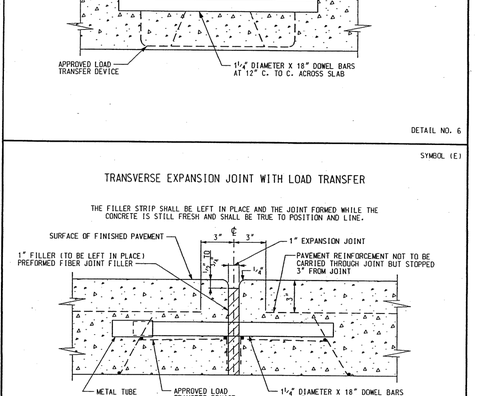


DETAIL NO. 6

SYMBOL (E)

TRANSVERSE EXPANSION JOINT WITH LOAD TRANSFER

THE FILLER STRIP SHALL BE LEFT IN PLACE AND THE JOINT FORMED WHILE THE CONCRETE IS STILL FRESH AND SHALL BE TRUE TO POSITION AND LINE.



DETAIL NO. 7

CITY OF DETROIT CITY ENGINEERING DIVISION. D.P.W. STANDARD PLAN FOR ___REINFORCED CONCRETE___ ___PAVEMENT JOINTS___			
03/07/08 PLAN DATE	DRAWING NO. 25	DETAIL STANDARD NO. C-4943	SHEET 3 OF 4.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

NOTE: JOINT DETAILS APPLY WITHOUT PAVEMENT REINFORCEMENT

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

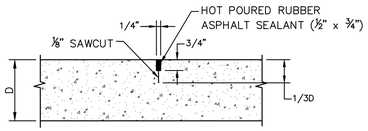
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

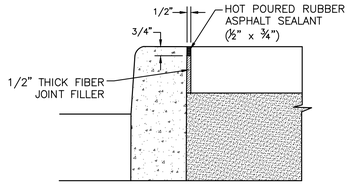
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Sheet No: C005

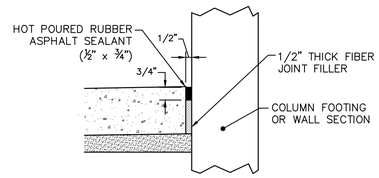
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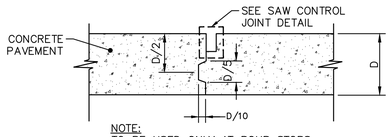
1 SAWCUT CONTROL JOINT
NOT TO SCALE



4 ISOLATION JOINT
NOT TO SCALE

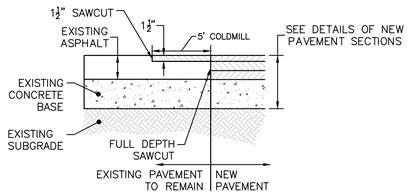


5 ISOLATION JOINT-STRUCTURE
NOT TO SCALE

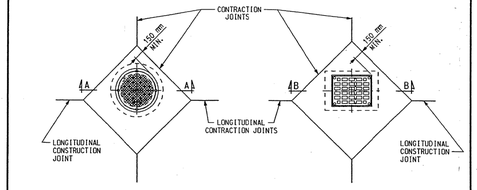


NOTE:
TO BE USED ONLY AT POUR STOPS.

2 CONSTRUCTION JOINT
NOT TO SCALE



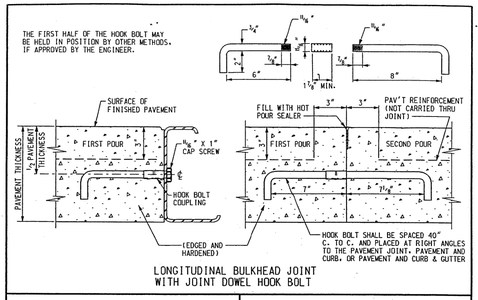
3 BUTT JOINT
NOT TO SCALE



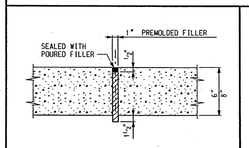
MANHOLE AND CATCH BASIN JOINT DETAILS

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

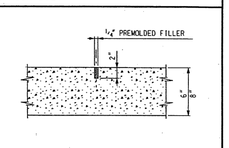
PREPARED BY BUREAU OF STREETS AND HIGHWAYS	rev. K.S.M. DRAWN BY: W.F.S. CHECKED BY:	APPROVED ENGINEER OF STREETS HEAD ENGINEER CITY ENGINEER	CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR DETAIL AND STANDARD JOINTS	03/07/98 PLAN DATE	DRAWING NO. 2	DETAIL STANDARD NO. C-4397	SHEET 1 OF 2



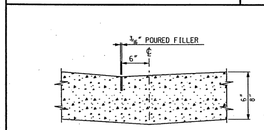
LONGITUDINAL BULKHEAD JOINT
WITH JOINT DOWEL HOOK BOLT



EXPANSION JOINT



TRANSVERSE CONTRACTION JOINT



LONGITUDINAL CONTRACTION JOINT

NOTE:
ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR DETAIL AND STANDARD JOINTS				
03/07/98 PLAN DATE	DRAWING NO. 2	DETAIL STANDARD NO. C-4397	SHEET 2 OF 2	

NOTE: JOINT DETAILS APPLY WITHOUT PAVEMENT REINFORCEMENT

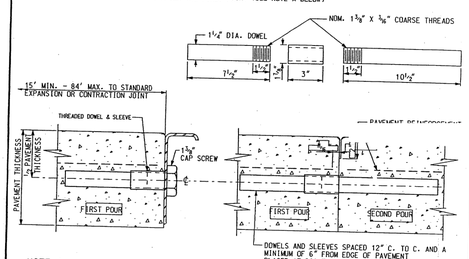
TRANSVERSE END OF POUR CONSTRUCTION JOINT

PRIOR TO PLACING CONCRETE IN FIRST POUR, THE SLEEVED DOWELS AND BULKHEAD SHALL BE SECURELY ASSEMBLED AND FIRMLY SECURED TO THE SUBGRADE, TRUE TO POSITION AND LINE.

THE BULKHEAD SHALL BE METAL SUFFICIENTLY RIGID TO PREVENT DEFORMATION WHEN CONCRETE IS PLACED AND SHALL CONFORM TO THE CROWN OF THE FINISHED PAVEMENT.

PRIOR TO PLACING CONCRETE IN SECOND POUR, THE CAP - SCREWS AND BULKHEAD SHALL BE CAREFULLY REMOVED TO AVOID RUPTURING THE FRESH CONCRETE. THE DOWELS TO THE SECOND POUR SHALL BE SCREWED INTO THE SLEEVES AND COATED.

AFTER THE SECOND POUR, THE JOINT SHALL BE FINISHED ACCORDING TO SPECIFICATIONS FOR CONTRACTION JOINTS. THIS SHALL BE USED IF IT IS ANTICIPATED THAT THE SECOND POUR WILL BE PLACED MORE THAN (7) DAYS AFTER THE FIRST POUR. (SEE NOTE A BELOW)



NOTE A

WHEN THE CONSTRUCTION (SECOND POUR) OF THE PAVEMENT WILL CONTINUE WITHIN (7) DAYS, THE 2 - PIECE DOWELS WILL NOT BE REQUIRED AND THE JOINT WILL BE TREATED AS A STANDARD CONTRACTION OR EXPANSION JOINT.

IF EXPANSION JOINT IS USED, ALL CAPS WILL BE ON ONE SIDE OF THE JOINT.

IF CONTRACTION JOINT IS USED, COAT ALL THE DOWELS ON THE SAME SIDE.

DETAIL NO. 8

NOTES:

1. ALL STEEL BARS, BOLT, AND FILLER USED IN PAVEMENT JOINTS WILL BE CONSIDERED INCIDENTAL TO THE CONSTRUCTION OF PAVEMENT OR BASE COURSE. TIE BARS SHALL BE DEFORMED.
2. ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR REINFORCED CONCRETE PAVEMENT JOINTS				
03/07/98 PLAN DATE	DRAWING NO. 25	DETAIL STANDARD NO. C-4943	SHEET 4 OF 4	

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

JOINT LEGEND

E — 1" TRANSVERSE EXPANSION JOINT WITH LOAD TRANSFER DEVICE ACCORDING TO THE CURRENT STANDARD PLAN.

E1 — 1" TRANSVERSE EXPANSION JOINT WITHOUT LOAD TRANSFER DEVICE.

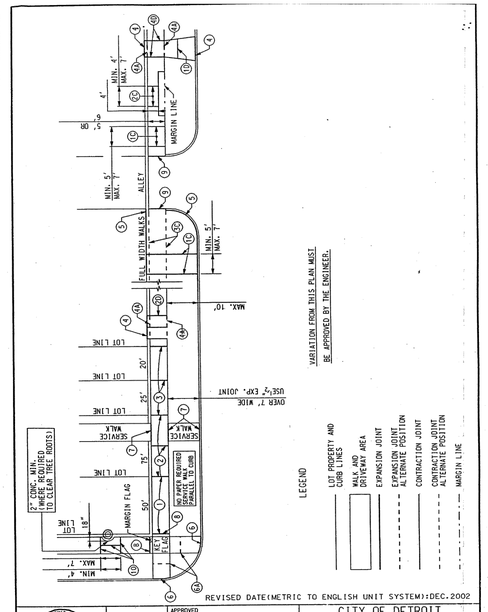
C — TRANSVERSE CONTRACTION JOINT ACCORDING TO THE CURRENT STANDARD.

NOTES:

1. UNLESS OTHERWISE SHOWN ON PLANS OR DIRECTED BY THE ENGINEER, TRANSVERSE JOINTS SHALL BE PLACED AS SHOWN ON THIS STANDARD PLAN AND ON THE CURRENT STANDARD PLANS.
2. WHERE NECESSARY TO RELIEVE HORIZONTAL PRESSURES AT SHARP VERTICAL CURVES 1" EXPANSION JOINTS WITH LOAD TRANSFER DEVICE SHALL ALSO BE PLACED AS SHOWN ON PLANS OR WHERE DIRECTED BY THE ENGINEER.
3. DURING THE PERIOD FROM APRIL 15TH TO SEPTEMBER 15TH, EXPANSION JOINTS SHALL NOT BE PLACED EXCEPT AT STRUCTURES. INTERSECTIONS AND LOCATIONS SPECIFIED.
4. DURING THE PERIOD FROM SEPTEMBER 15TH TO APRIL 15TH, EXPANSION JOINTS SHALL BE SPACED AT INTERVALS OF 315', OR AS SHOWN ON THIS STANDARD PLAN.
5. EXPANSION RELIEF JOINTS SHALL BE PLACED AT STRUCTURES AND RAILROAD TRACKS AS INDICATED.
6. TRANSVERSE CONTRACTION JOINTS WITH LOAD TRANSFER DEVICE SHALL BE PLACED AT INTERVALS OF 26'-3" BETWEEN EXPANSION JOINTS.

CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR LOCATION OF TRANSVERSE EXPANSION AND CONTRACTION JOINTS IN REINFORCED CONCRETE PAVEMENT				
03/07/98 PLAN DATE	DRAWING NO. 29	DETAIL STANDARD NO. C-4992	SHEET 3 OF 3	

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002



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EXPANSION JOINTS

ALL EXPANSION JOINT PAPER SHALL EXTEND 1" BELOW THE BOTTOM OF THE THINNER OF ADJOINING PAVEMENT SECTIONS.

(1) PLACE ½" PAPER EXPANSION JOINTS AT LOT LINES WHEN LOT LINES ARE BETWEEN 25' AND 50' APART.

(2) PLACE ADDITIONAL ½" PAPER EXPANSION JOINTS SO THAT THE DISTANCE BETWEEN JOINTS DOES NOT EXCEED 15.2 m WHEN LOT LINES ARE OVER 15.240 m APART.

(3) PLACE ½" PAPER EXPANSION JOINTS AT EVERY SECOND LOT LINE AND CONTRACTION JOINT AT INTERVENING LOT LINE WHEN LOT LINES ARE LESS THAN 25' APART.

(4) PLACE 1" PAPER EXPANSION JOINTS AT CURB AND BUILDING OR PROPERTY LINE OR AT ALTERNATE POSITION (4A) AS SHOWN FOR DRIVEWAY.

(5) PLACE 1" PAPER EXPANSION JOINTS AT CURB AND BUILDING OR PROPERTY LINE FOR FULL WIDTH SIDEWALK EXCEEDING 7' IN WIDTH.

(6) PLACE 1" PAPER EXPANSION JOINTS AT CURB CIRCLES OR AT ALTERNATE POSITION (6A) AS SHOWN.

(7) PLACE 1" PAPER EXPANSION JOINTS AT INTERSECTIONS OF SERVICE WALKS AND SIDEWALKS AND SERVICE WALKS AND CURBS.

(8) PLACE 1" PAPER EXPANSION JOINTS AT MARGIN FLAGS AT CROSSWALKS.

(9) PLACE 1" PAPER EXPANSION JOINTS AT ALLEY APRONS.

(10) PLACE ½" PAPER EXPANSION JOINT BOTH SIDES OF SIDEWALK FLAG ABUTTING TREE AND ON CENTERLINE JOINT.

CONTRACTION JOINTS

(1C) PLACE CONTRACTION JOINTS AT INTERVALS OF NOT LESS THAN 5' NOR MORE THAN 7' ON WALKS 5' WIDE OR WIDER, INCLUDING FULL WIDTH WALKS.

(2C) PLACE CONTRACTION JOINTS AT INTERVALS OF NOT LESS THAN 4' NOR MORE THAN 7' ON WALKS 4' WIDE.

(3C) PLACE CONTRACTION JOINTS AT THE MARGIN LINE ON FULL WIDTH WALKS (OPTIONAL).

DRIVEWAYS

(1D) PLACE CONTRACTION JOINTS IN DRIVEWAYS SO THAT NO SLAB WILL EXCEED THE DIMENSIONS OF 15' BY 15'.

(2D) PLACE 1" PAPER EXPANSION JOINTS ON ALL SIDES OF COMMERCIAL DRIVES.

(3D) PLACE CONSTRUCTION OR CONTRACTION JOINT ON CENTERLINE WHEN WIDTH OF DRIVEWAY EXCEEDS 15'

(4D) PLACE ½" PAPER EXPANSION JOINTS ON BOTH SIDES OF RESIDENTIAL DRIVEWAYS. IF DRIVEWAY EDGE IS WITHIN 2' OF LOT LINE, PLACE THIS EXPANSION PAPER AT PROPERTY LINE.

CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR SIDEWALK JOINTING STANDARD				
03/07/98 PLAN DATE	DRAWING NO. 9	DETAIL STANDARD NO. C-4462	SHEET 2 OF 2	

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

PRIME CONSULTANT

spackman mossop michaels

440 Burroughs Street
Suite 696
Detroit | MI | 48202
T: 313.720.1055

NTH Consultants
41780 Six Mile Road
Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

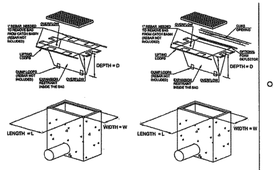
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CURB AND JOINT DETAILS (2 OF 2)

Sheet No: C006

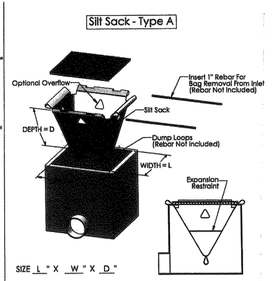
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INSTALLATION AND USE GUIDELINES

- FOR INSTALLATION OF THE SILT SACK IN A CATCH BASIN:
  - REMOVE THE GRATE AND PLACE THE SILT SACK OVER THE INLET OPENING.
  - ADD A SECOND SILT SACK AS NEEDED FOR PHASE OF THE WORK.
  - REPLACE THE GRATE OVER THE SILT SACK AND CLOSE THE DOOR.
- IF NECESSARY TO OVERRIDE THE CHOKE WITH MANY CURB INLETS IN THE AREA, ADD ADDITIONAL SILT SACKS AS NEEDED.
- INSPECT SILT SACKS AT LEAST ONCE EACH WEEK AND AFTER EACH RAINFALL.
- REMOVE SEDIMENT WHEN IT REACHES ONE-HALF THE HEIGHT OF THE OPENING IN THE CURB INLET.
- REMOVE AND DISPOSE OF DEBRIS AS NEEDED.
- REMOVE THE SILT SACK AFTER THE CONTRIBUTING DRAINAGE AREA IS STABILIZED.
- DO NOT REMOVE SEDIMENT FROM THE SILT SACK WHILE IT IS IN THE CURB INLET.
- CAREFULLY REMOVE THE SILT SACK FROM THE CURB INLET.
- EMPTY THE SILT SACK ON THE GROUND, SHAKE AND RINSE IT OVER THE GRASS AND PLACE BACK IN THE CURB INLET.
- REPEAT AS NEEDED.
- INSPECT THE SILT SACK AFTER EACH RAINFALL AND REPAIR IT IF NECESSARY.
- REMOVE SEDIMENT AND DEBRIS FROM THE SILT SACK AND DISPOSE OF IT IN A MANNER THAT DOES NOT CONTAMINATE WATERWAYS OR WETLANDS.
- REMOVE THE SILT SACK AFTER THE CONTRIBUTING DRAINAGE AREA IS STABILIZED. DISTRIBUTE THE SILT SACK FROM THE DITCH.

HANES GEO COMPONENTS	3-17-2014	HGC IPSB
1335 Carlisle Road, Jamestown, NC 27282	HANES GEO COMPONENTS	SHEET 1 OF 1
800-232-4643 FAX 336-454-3545	INLET PRO SEDIMENT BAG	



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Geoturf® Filter Bag

Whenever accumulated water on a construction site must be pumped, utilize filter bags to ensure the water is properly filtered of silt and sediment prior to discharge into receiving bodies. Filter bags are constructed of strong, high quality nonwoven geotextile filter fabric with a fill port to accommodate a pump discharge hose. The filter bags permit a controlled outflow of water, while retaining harmful pollutants.

Size	15' x 20' x 8"
Snout Size	8"
Holding Capacity	15 Cubic Yds.

Meets the requirements of MDOT Item 208 Erosion Control Filter Bag

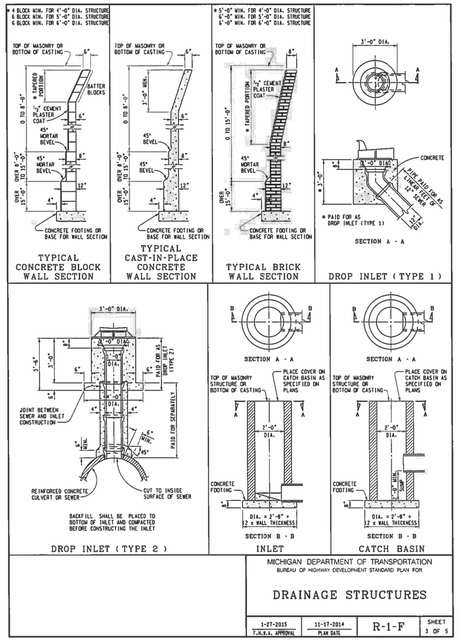


GENERAL NOTES

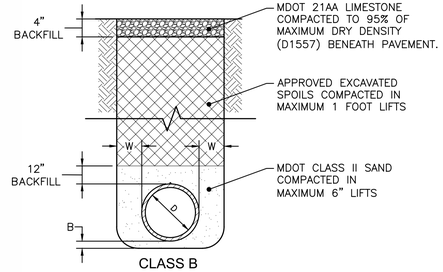
1. CENTER OF CATCH BASIN SHALL BE 20 INCHES FROM BACK OF CURB.
2. ALL SIZES AND FLOW LINES OF PIPES, AND ELEVATIONS FOR TOP AND BOTTOM OF STRUCTURES SHALL BE DETERMINED FROM THE PLANS OR CONSTRUCTION REQUIREMENTS. THE BELL SHALL BE REMOVED FROM THE FIRST LENGTH OF OUTLET PIPE PROJECTING THROUGH THE WALL OF THE STRUCTURES WHEN ANY STRUCTURE IS CONSTRUCTED OF PRECAST CONCRETE OR CONCRETE BLOCK. THE TOP OF THE MASONRY SHALL BE LEFT SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF THE COVER TO GRADE BY THE USE OF MORTAR OR BRICKS AS DIRECTED BY THE ENGINEER.
3. A TRAP, AS DETAILED ON SHEET 3 OF 7, SHALL BE PLACED WHERE CALLED FOR IN THE OUTLET SEWER LINE OF CATCH BASINS "B". THIS TRAP SHALL BE SET INTO THE MASONRY WALL AS SHOWN ON THE DETAIL. THE SPACE BETWEEN THE FACES OF THE WALL AND THE TRAP SHALL BE COMPLETELY FILLED WITH CEMENT MORTAR OR CONCRETE, SO AS TO HOLD TRAP SECURELY IN PLACE.
4. THE MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT STANDARD SPECIFICATIONS FOR PAVING AND RELATED CONSTRUCTION EXCEPT AS NOTED ON THIS SHEET AND ON THE PLANS.
5. A PLASTER COAT OF MORTAR 1/2" IN THICKNESS SHALL BE APPLIED TO THE OUTER SURFACE OF THE STRUCTURE AS SHOWN. A 1/2" CEMENT PLASTER COAT SHALL BE PLACED ON THE INSIDE OF ALL SUMPS.
6. CONTRACTOR SHALL VERIFY ELEVATIONS OF EXISTING UTILITIES TO ENABLE CONSTRUCTION TO INDICATED ELEVATIONS SHOWN ON DRAWINGS. IF NECESSARY, INVERT ELEVATIONS SHOWN ON THE DRAWINGS MAY BE ALTERED IN THE FIELD TO CLEAR EXISTING UTILITIES. SUCH ALTERATIONS, UPWARD OR DOWNWARD, SHALL BE AT NO CHANGE IN CONTRACT PRICE.
7. WHEN PRECAST CONCRETE PIPE SECTIONS ARE USED FOR CATCH BASINS, EITHER A SECTION OF THE INLET AND OUTLET PIPES OR AN OPENING OR EYE FOR THE INLET AND OUTLET PIPES SHALL BE CAST INTO THE WALL OF THE CATCH BASIN PIPE WHEN IT IS BEING MANUFACTURED. EYES IN PRECAST PIPE SECTIONS SHALL BE FURNISHED TO ACCOMODATE A FLEXIBLE JOINT CONNECTION SUCH AS PRESS-WEDGE BY PRESS SEAL GASKET CORP. OR RES-SEAL BY SCALES MFG. CORP.
8. PAY LIMIT FOR SEWERS SHALL BE INSIDE FACES OF STRUCTURES UNLESS OTHERWISE NOTED.
9. ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT CITY ENGINEERING DIVISION- D.P.W. STANDARD PLAN FOR CATCH BASINS "A" AND "B" AND FLAT GRATE AND FRAME			
03/07/58 PLAN DATE	DRAWING NO. 35	DETAIL STANDARD NO. C-5028	SHEET 7 OF 7



MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR DRAINAGE STRUCTURES			
1-27-2015 F.H.W.A. APPROVAL	11-17-2014 PLAN DATE	R-1-F	SHEET 3 OF 5

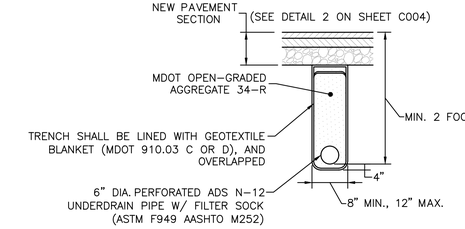


CLASS B
FIRST CLASS BEDDING

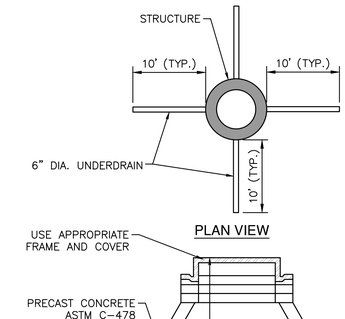
NOTES:
1. MINIMUM TRENCH WIDTH (SEE TABLE).
2. ALL PIPE TO BE PLACED AND JOINTED IN A DRY TRENCH AND LAID ACCURATELY TO LINE AND GRADE WITH BELLS UPHILL.
3. ALL CONCRETE ENCASEMENT AND CRADLING, IF REQUIRED, TO BE CLASS "A" CONCRETE. CONTRACTOR SHALL PROVIDE A UNIT PRICE FOR THIS ITEM AT TIME OF BIDDING THAT WILL BE UTILIZED DURING CONSTRUCTION, IF REQUIRED.
4. CLASS "A" CONCRETE SHALL CONSIST OF 3,000 PSI CONCRETE WITH A 0.45 W/C AND MAX. 4" SLUMP.
5. FOR ALL FORCEMAIN PIPE, INSTALL BROWN MARKER TAPE WHICH STATES "CAUTION-BURIED FORCEMAIN" AS MANUFACTURED BY USA BLUEBOOK, OF ENGINEER APPROVED EQUAL.

PIPE	D	W	B
PVC/HDPE	0"-12"	12" MIN. 18" MAX.	4"
CONC.	ALL	6" MIN. 12" MAX.	4"
DIP	ALL	8" MIN.	4"

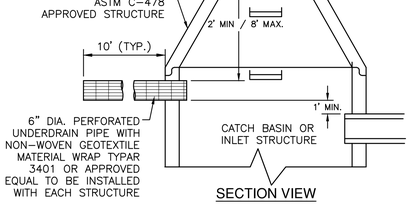
1 PIPE TRENCH BEDDING
NOT TO SCALE



4 OPEN-GRADED UNDERDRAIN
NOT TO SCALE



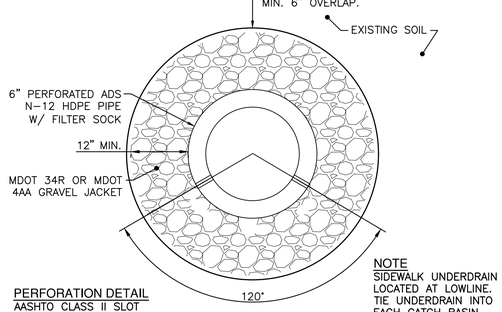
PLAN VIEW



SECTION VIEW

NOTES:
1. UNDERDRAIN BACKFILL SHALL MEET MDOT REQUIREMENTS FOR 34R OPEN GRADED DRAINAGE COURSE AGGREGATES. THIS BACKFILL SHALL EXTEND 4" BELOW PIPE TO LEVEL OF 21AA LIMESTONE, AND FOR FULL WIDTH OF TRENCH
2. WHERE EACH BASIN STRUCTURE IS PROPOSED, IN CURB LINE, INSTALL UNDERDRAIN LEADS 10' OUT FROM STRUCTURE IN ALL DIRECTIONS (4 TYP.)

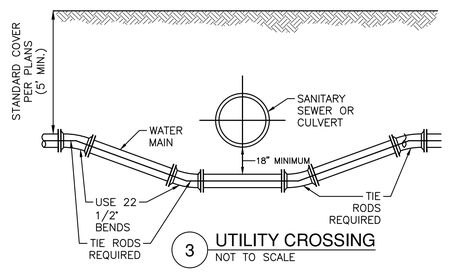
5 UNDERDRAIN
NOT TO SCALE



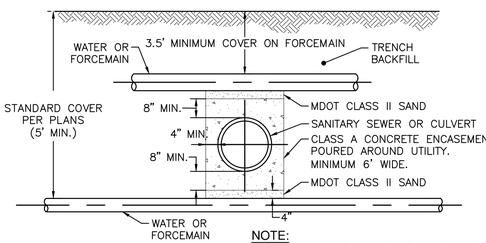
PERFORATION DETAIL
AASHTO CLASS II SLOT PATTERN, 120 DEGREE ROTATED PERFORATIONS.

NOTE
SIDEWALK UNDERDRAIN LOCATED AT LOWLINE. TIE UNDERDRAIN INTO EACH CATCH BASIN STRUCTURE IN SIDEWALK.

2 PERFORATED DRAIN PIPE (BENEATH SIDEWALK)
NOT TO SCALE



3 UTILITY CROSSING
NOT TO SCALE



NOTE:
WHERE A LESS THAN 18 INCHES OF VERTICAL CLEARANCE OR 10 FEET OF HORIZONTAL CLEARANCE EXISTS BETWEEN SANITARY SEWER/FORCEMAIN AND WATER MAIN, ENCASE CROSSING/UTILITY IN CONCRETE.

PRIME CONSULTANT

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SUB CONSULTANT

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T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

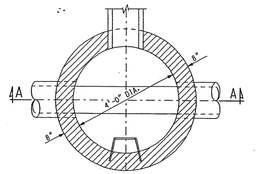
Sheet Title

UTILITY DETAILS (1 OF 4)

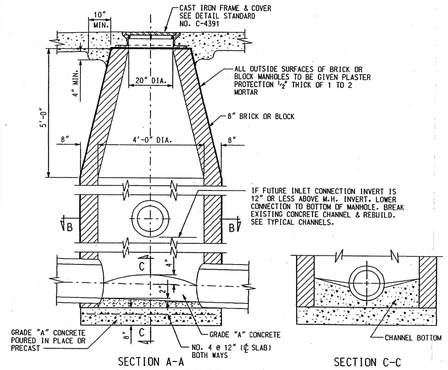
Sheet No:

C007

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PLAN VIEW AT B-B



SECTION A-A

SECTION C-C

SEWER MANHOLE

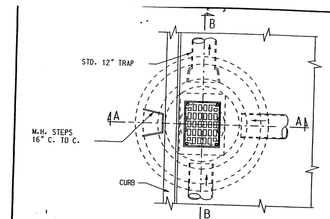
REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

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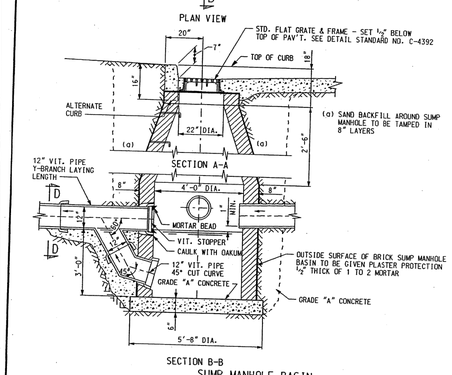
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M.F.S. CHECKED BY:
APPROVED
ENGINEER OF STREETS
CHIEF ENGINEER
CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
STANDARD SEWER AND DROP MANHOLES

03/07/98 PLAN DATE	DRAWING NO. 10	DETAIL STANDARD NO. C-4387	SHEET 1 OF 3



PLAN VIEW



SECTION B-B

SUMP MANHOLE BASIN

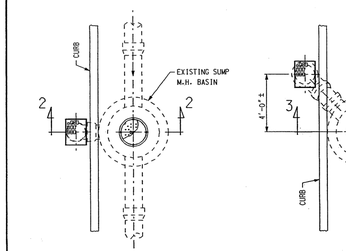
REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

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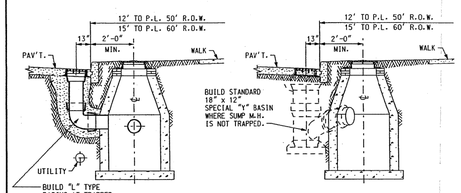
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CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
TYPICAL SUMP MANHOLE AND "L" TYPE CATCH BASIN

03/07/98 PLAN DATE	DRAWING NO. 12	DETAIL STANDARD NO. C-4389	SHEET 1 OF 3



CAST IRON M.H. FRAMES



SECTION 2-2

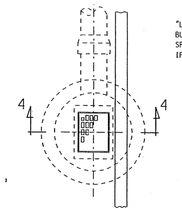
SECTION 3-3

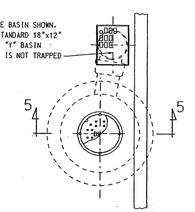
DETAIL Ⓑ
(SEE NOTE Ⓑ)

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
RECONSTRUCTION OF EXISTING SUMP MANHOLES AND NEW CATCH BASIN INSTALLATIONS

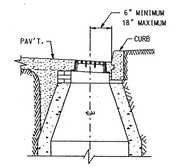
03/07/98 PLAN DATE	DRAWING NO. 13	DETAIL STANDARD NO. C-4390	SHEET 3 OF 6

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002



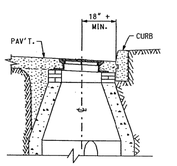


CAST IRON M.H. FRAMES



SECTION 4-4

DETAIL Ⓒ
(SEE NOTE Ⓒ)



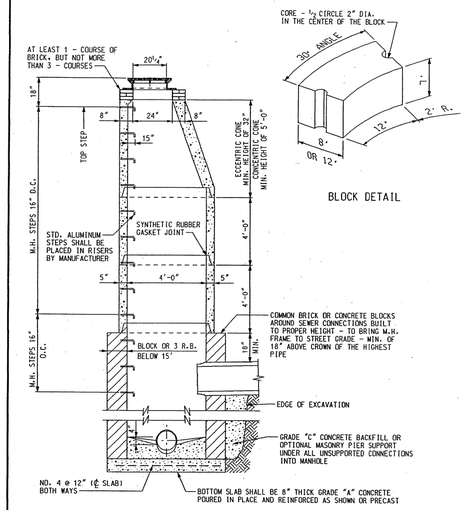
SECTION 5-5

DETAIL Ⓓ
(SEE NOTE Ⓑ)

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
RECONSTRUCTION OF EXISTING SUMP MANHOLES AND NEW CATCH BASIN INSTALLATIONS

03/07/98 PLAN DATE	DRAWING NO. 13	DETAIL STANDARD NO. C-4390	SHEET 4 OF 6

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002



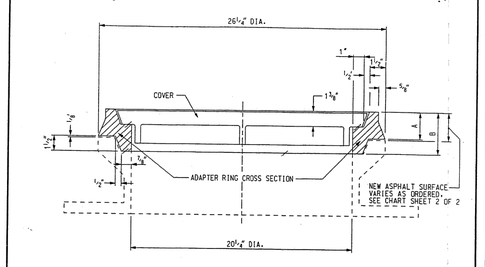
BLOCK DETAIL

PRECAST CONCRETE PIPE OPTION

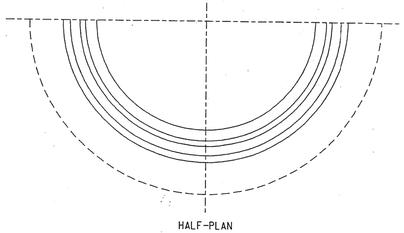
CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
STANDARD SEWER MANHOLES CONSTRUCTION ALTERNATES

03/07/98 PLAN DATE	DRAWING NO. 18	DETAIL STANDARD NO. C-4395A	SHEET 2 OF 2

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002



CROSS-SECTION



HALF-PLAN

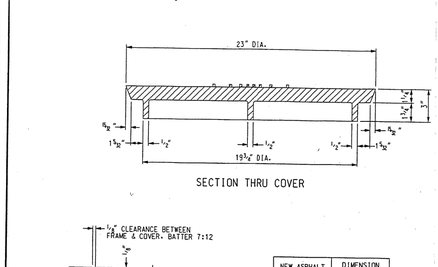
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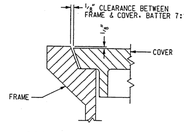
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APPROVED
ENGINEER OF STREETS
CHIEF ENGINEER
CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
MANHOLE ADAPTER RING

03/07/98 PLAN DATE	DRAWING NO. 31	DETAIL STANDARD NO. C-4125A	SHEET 1 OF 2



SECTION THRU COVER



DETAIL OF EXISTING FRAME & COVER

NEW ASPHALT THICKNESS	DIMENSION A	DIMENSION B
2"	1⅞"	3⅜"
2½"	2⅜"	3⅞"
3"	2⅞"	4⅜"

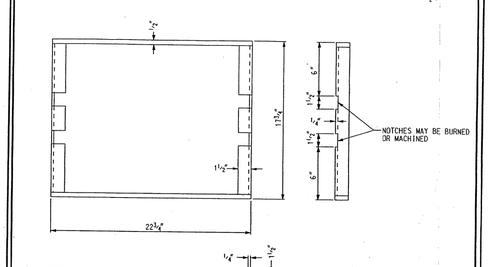
NOTES:

1. THE SEATING FACE OF THE ADAPTER RING SHALL BE MACHINE FINISHED SO THAT THE COVER SHALL HAVE AN EVEN BEARING ON ITS SEAT.
2. ADAPTER RING TO BE GRAY IRON CASTING A.S.T.M. A-48-62 CLASS No. 30.
3. STANDARD SHALL BE EAST JORDAN IRON WORKS ADAPTER RING OR EQUIVALENT.
4. ALL DIMESIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

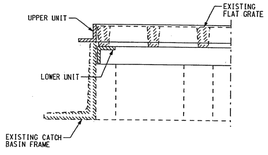
REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
MANHOLE ADAPTER RING

03/07/98 PLAN DATE	DRAWING NO. 31	DETAIL STANDARD NO. C-4125A	SHEET 2 OF 2



LOWER UNIT



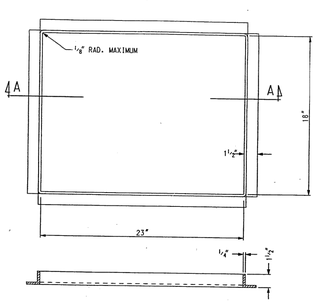
REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

PREPARED BY BUREAU OF STREETS AND HIGHWAYS

rev. K.S.M. DRAWN BY:
M.F.S. CHECKED BY:
APPROVED
ENGINEER OF STREETS
CHIEF ENGINEER
CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
CATCH BASIN ADAPTER

03/07/98 PLAN DATE	DRAWING NO. 32	DETAIL STANDARD NO. C-4285	SHEET 1 OF 2



SECTION A-A

UPPER UNIT

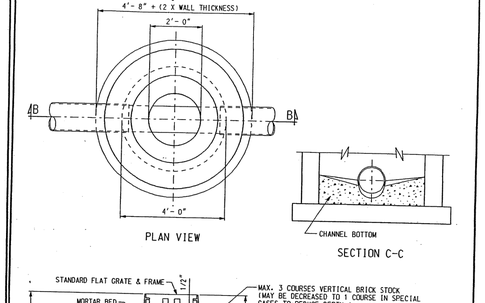
NOTES:

1. UPPER UNIT: TO BE MADE OF 1½"x 1½" x½" ROLLED STRUCTURAL STEEL ANGLE.
2. LOWER UNIT: TO BE MADE OF 1½" x ½" HOT ROLLED WILD STEEL BARS AND 1½" x 1½" x ¼" ROLLED STRUCTURAL STEEL ANGLE.
3. CONTRACTOR TO FABRICATE OR TO HAVE FABRICATED THE ADAPTER AS PER THIS DRAWING.
4. ALL DIMENSIONS ARE IN INCHES(") UNLESS OTHERWISE NOTED.

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

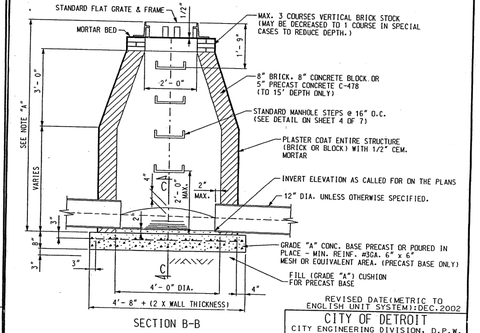
CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
CATCH BASIN ADAPTER

03/07/98 PLAN DATE	DRAWING NO. 32	DETAIL STANDARD NO. C-4285	SHEET 2 OF 2



PLAN VIEW

SECTION C-C



SECTION B-B

CATCH BASIN "B"

NOTE "A":
WALL THICKNESS SHALL BE 8" FROM THE TOP OF STRUCTURE TO A DEPTH OF 15' - BELOW 15' THE THICKNESS OF THE WALL SHALL BE 12"

REVISED DATE(METRIC TO ENGLISH UNIT SYSTEM):DEC.2002

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
CATCH BASINS "A" AND "B" AND FLAT GRATE AND FRAME

03/07/98 PLAN DATE	DRAWING NO. 35	DETAIL STANDARD NO. C-5028	SHEET 2 OF 7

J:\2017\d01\170118\production sets\livernois streetscape\170118-details 2.dwg Plotted: 1/10/2019 10:53 AM by bbosack

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

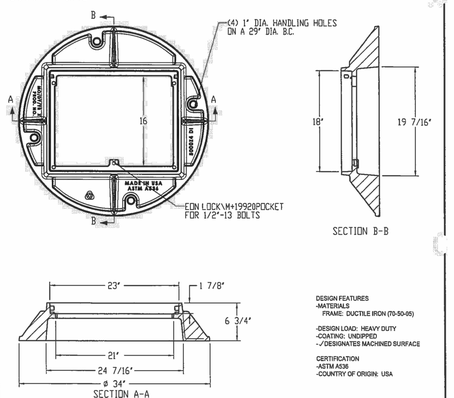
Sheet Title

UTILITY DETAILS (2 OF 4)

Sheet No:

C008

5000 Frame



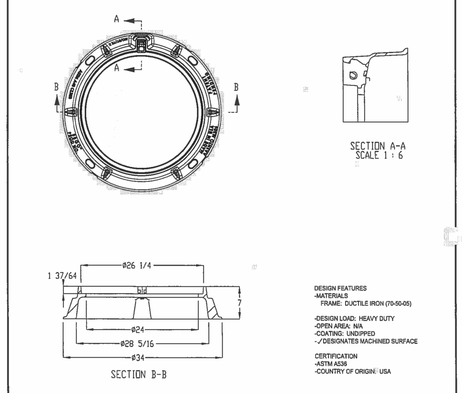
DESIGN FEATURES
-MATERIALS
FRAME: DUCTILE IRON (70-50-05)

-DESIGN LOAD: HEAVY DUTY
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	DWSD MANHOLE 5000 FRAME	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 103; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014



DESIGN FEATURES
-MATERIALS
FRAME: DUCTILE IRON (70-50-05)

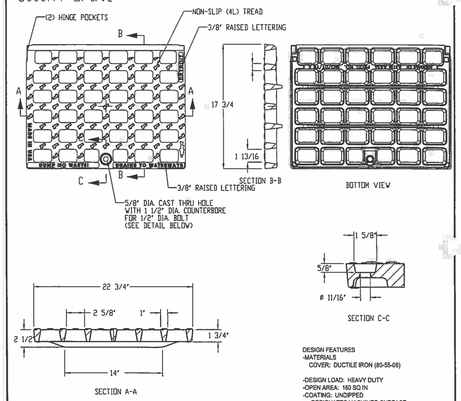
-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: N/A
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	DWSD MANHOLE FRAME	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 113; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000M4 Grate



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)

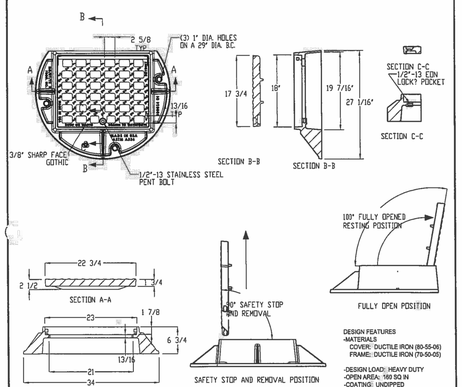
-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: 160 SQ IN
-COATING: UNDIPPED
- DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	CATCH BASIN 5000 M4 GRATE	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 105; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000Z4 5000M4 Assembly



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)
FRAME: DUCTILE IRON (70-50-05)

-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: 160 SQ IN
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

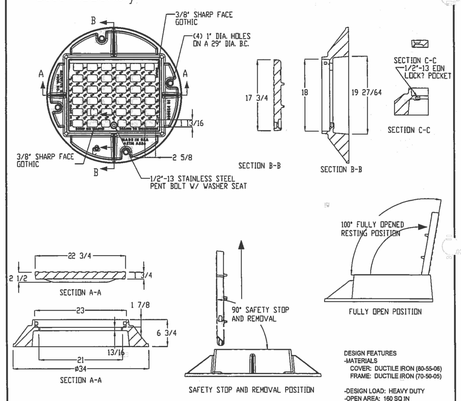
CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	CATCH BASIN 5000Z4 5000M4 ASSEMBLY	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 108; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000 Assembly



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)
FRAME: DUCTILE IRON (70-50-05)

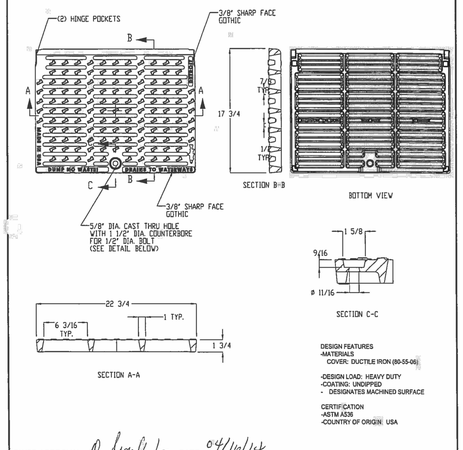
-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: N/A
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	CATCH BASIN 5000 ASSEMBLY	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 107; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000M5 Grate



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)

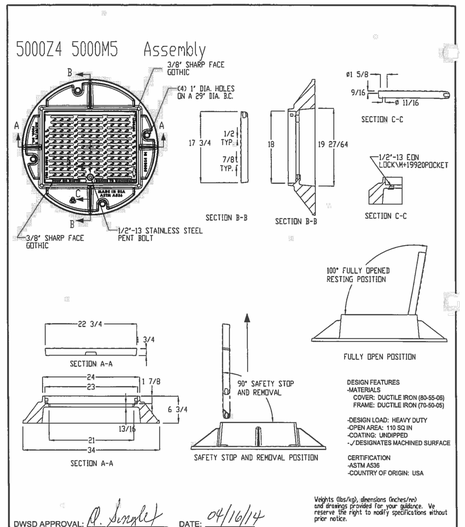
-DESIGN LOAD: HEAVY DUTY
-COATING: UNDIPPED
- DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	A.D.A. CATCH BASIN 5000M5 GRATE	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 109; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000Z4 5000M5 Assembly



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)
FRAME: DUCTILE IRON (70-50-05)

-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: 110 SQ IN
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

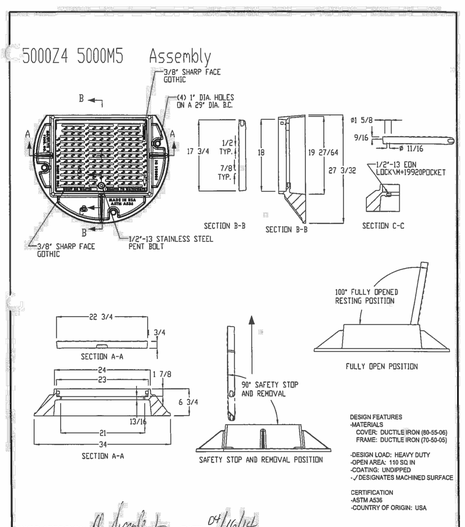
CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	A.D.A. CATCH BASIN 5000Z4 5000M5 ASSEMBLY	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 110; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

5000Z4 5000M5 Assembly



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)
FRAME: DUCTILE IRON (70-50-05)

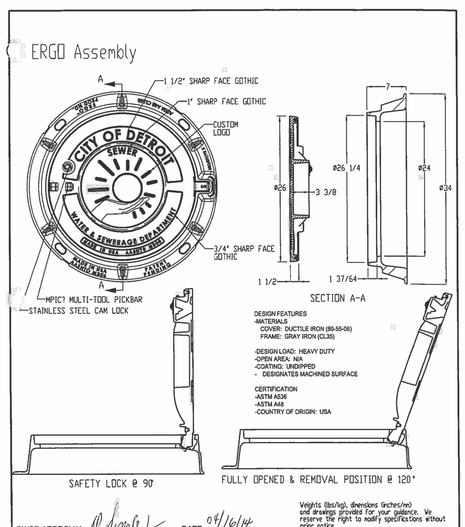
-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: 110 SQ IN
-COATING: UNDIPPED
- / DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	A.D.A. CATCH BASIN 5000Z4 5000M5 ASSEMBLY	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 110; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

ERGO Assembly



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)
FRAME: GRAY IRON (CL35)

-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: N/A
-COATING: UNDIPPED
- DESIGNATES MACHINED SURFACE

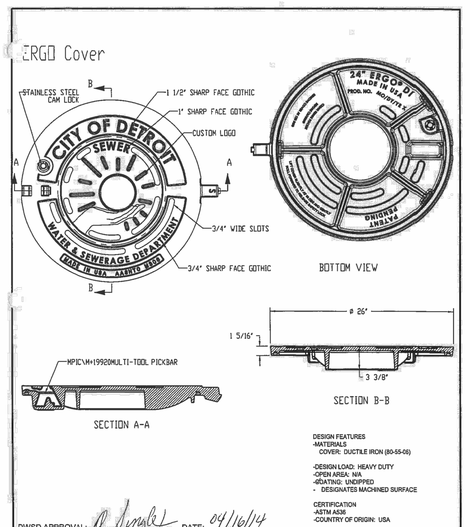
CERTIFICATION
-ASTM A536
-ASTM A48
-COUNTRY OF ORIGIN: USA

Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	DWSD MANHOLE ERGO ASSEMBLY	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 102; DRAWN BY: K.K. BAKER; DATE: 9/19/2014

ERGO Cover



DESIGN FEATURES
-MATERIALS
COVER: DUCTILE IRON (80-55-06)

-DESIGN LOAD: HEAVY DUTY
-OPEN AREA: N/A
-ROTATING: UNDIPPED
- DESIGNATES MACHINED SURFACE

CERTIFICATION
-ASTM A536
-COUNTRY OF ORIGIN: USA

DWSD APPROVAL: D. Singleton DATE: 04/16/14

CITY OF DETROIT CITY ENGINEERING DIVISION DPW	DWSD MANHOLE ERGO COVER	APPROVED: DEPUTY DIRECTOR, ENGINEERING & WATER SUPPLY 4/16/14; CITY ENGINEER 4/16/14	SHEET 1 OF 1; DETAIL STD. No.; DRAWING No. 112; DRAWN BY: N.Y. SANTOS; DATE: 9/19/2014

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

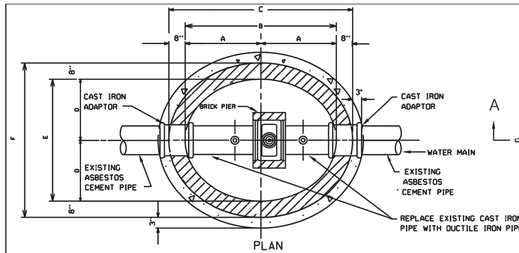
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Sheet Title

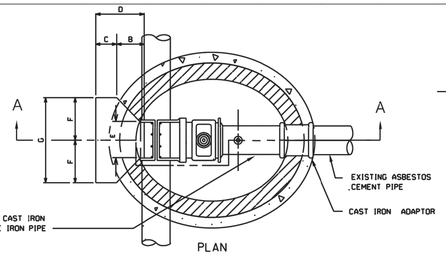
UTILITY DETAILS (3 OF 4)

Sheet No:

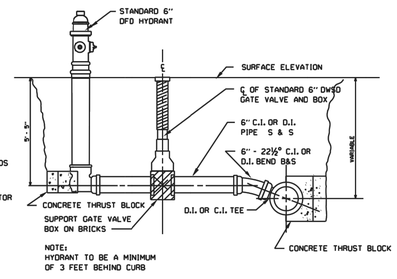
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PLAN

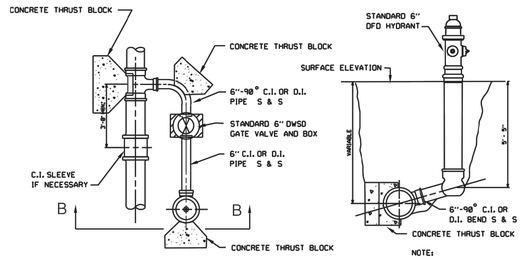


PLAN



NOTE:
HYDRANT TO BE A MINIMUM OF 3 FEET BEHIND CURB

DETAIL OF 6" HYDRANT INSTALLATION
STRAIGHT AWAY

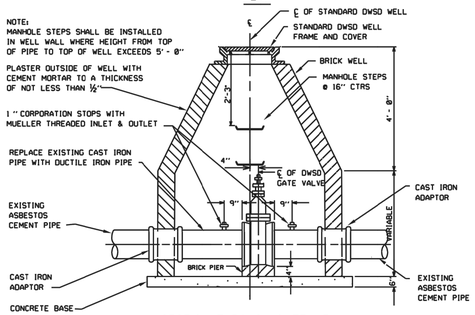


PLAN

NOTE:
HYDRANT TO BE A MINIMUM OF 3 FEET BEHIND CURB

SECTION B-B

DETAIL OF 6" HYDRANT INSTALLATION
OFF SET

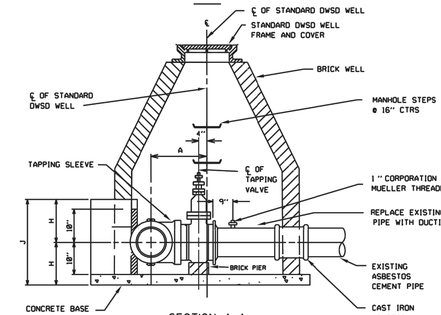


SECTION THROUGH GATE WELL

NOTE:
WHERE A REDUCER/OMNI COUPLING IS CALLED FOR ON THE DRAWINGS, THE FACE OF THE NEAREST JOINT ON THE REDUCER/OMNI COUPLING SHALL BE APPROX. 2FT. OR AS SHOWN ON THE DRAWINGS FROM THE OUTSIDE FACE OF THE WELL WALL.

SCHEDULE OF GATE WELL DIMENSIONS						
SIZE	A	B	C	D	E	F
6"	2' - 6"	5' - 8"	6' - 4"	2' - 8"	4' - 8"	5' - 4"
8"	2' - 6"	5' - 8"	6' - 4"	2' - 8"	4' - 8"	5' - 4"
12"	2' - 9"	5' - 6"	6' - 10"	2' - 3"	4' - 6"	5' - 10"
16"	3' - 8"	6' - 8"	7' - 4"	2' - 9"	5' - 6"	6' - 10"

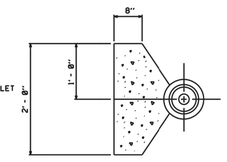
DETAIL OF STANDARD GATE WELLS



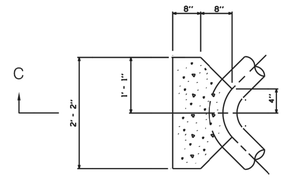
SECTION A-A

SCHEDULE OF THRUST BLOCK DIMENSIONS FOR TAPPING VALVE										
SIZE	A	B	C	D	E	F	G	H	J	
8" x 8"	1' - 6¾"				@ - 7"					
12" x 8"	1' - 9"				@ - 7"					
16" x 8"	1' - 11¼"				@ - 7½"					
12" x 12"	1' - 6¾"	1' - 6"	8' - 9"	2' - 3"	@ - 7"	1' - 9"	3' - 6"	1' - 6"	3' - 8"	
16" x 12"	1' - 11¾"	1' - 6"	8' - 9"	2' - 3"	@ - 10½"	1' - 9"	3' - 6"	1' - 6"	3' - 8"	
16" x 16"	2' - 2"	2' - 7"	1' - 8"	3' - 7"	@ - 10½"	2' - 11"	5' - 10"	1' - 8"	3' - 4"	

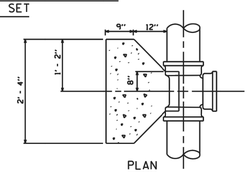
DETAIL OF STANDARD THRUST BLOCKS
FOR TAPPING VALVES



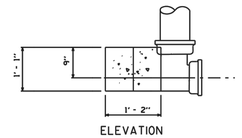
PLAN



PLAN

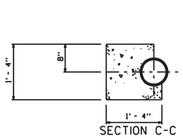


PLAN



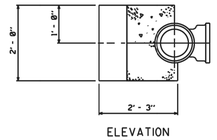
ELEVATION

THRUST BLOCK
FOR 6" HYDRANT



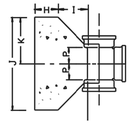
SECTION C-C

THRUST BLOCK
FOR 6" HYDRANT BEND



ELEVATION

THRUST BLOCK
FOR HYDRANT TEE

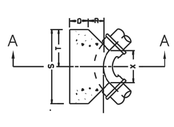


PLAN

ELEVATION

DETAIL OF STANDARD THRUST BLOCKS
FOR TEES

SCHEDULE OF THRUST BLOCK DIMENSIONS								
TEE SIZE	H	I	J	K	L	M	N	P
6" x 6"	0' - 9"	1' - 8"	2' - 6"	1' - 3"	1' - 6"	8' - 9"	2' - 3"	8' - 6"
8" x 8"	0' - 9"	1' - 8"	3' - 0"	1' - 6"	2' - 0"	1' - 8"	2' - 3"	8' - 6"
12" x 8"	0' - 9"	1' - 8"	3' - 8"	1' - 6"	2' - 0"	1' - 8"	2' - 5"	8' - 6"
12" x 12"	0' - 9"	1' - 4"	4' - 8"	2' - 0"	3' - 0"	1' - 6"	2' - 9"	8' - 8"
16" x 8"	0' - 9"	1' - 8"	3' - 8"	1' - 6"	2' - 0"	1' - 8"	2' - 9"	8' - 6"
16" x 12"	0' - 9"	1' - 4"	4' - 8"	2' - 0"	3' - 0"	1' - 6"	3' - 11"	8' - 8"
16" x 16"	1' - 0"	1' - 8"	5' - 8"	2' - 6"	4' - 0"	2' - 0"	3' - 8"	8' - 11"

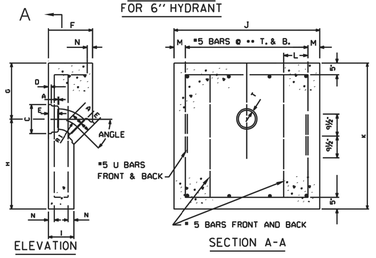


PLAN

SECTION A-A

DETAIL OF STANDARD THRUST BLOCKS
FOR BENDS

SCHEDULE OF THRUST BLOCK DIMENSIONS									
BEND SIZE	D	R	S	T	U	V	W	X	
6" - 45	8' - 9"	1' - 8"	2' - 8"	1' - 8"	1' - 6"	8' - 9"	1' - 11"	1' - 4"	
6" - 90	8' - 9"	1' - 8"	3' - 8"	1' - 6"	2' - 8"	1' - 8"	1' - 11"	1' - 2"	
8" - 45	8' - 9"	1' - 8"	2' - 4"	1' - 2"	2' - 8"	1' - 8"	1' - 11"	1' - 4"	
8" - 90	8' - 9"	1' - 8"	3' - 4"	1' - 8"	2' - 6"	1' - 3"	1' - 11"	1' - 2"	
12" - 22½	8' - 9"	1' - 8"	2' - 6"	1' - 3"	2' - 8"	1' - 8"	2' - 8"	1' - 4"	
12" - 45	8' - 9"	1' - 4"	3' - 6"	1' - 4"	2' - 6"	1' - 3"	2' - 4"	1' - 4"	
12" - 90	8' - 9"	1' - 8"	5' - 6"	2' - 4"	3' - 0"	1' - 6"	2' - 4"	1' - 8"	
16" - 22½	1' - 0"	1' - 8"	3' - 4"	1' - 8"	2' - 6"	1' - 3"	3' - 8"	1' - 2"	
16" - 45	1' - 0"	1' - 8"	5' - 4"	2' - 8"	3' - 0"	1' - 6"	3' - 8"	2' - 6"	
16" - 90	1' - 0"	1' - 8"	6' - 0"	3' - 0"	5' - 0"	2' - 6"	3' - 8"	2' - 8"	

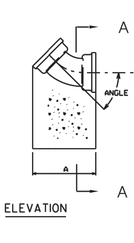


A

DETAIL OF THRUST BLOCK FOR VERTICAL TOP BEND

SCHEDULE OF THRUST BLOCK DIMENSIONS										DIMENSIONS - INCHES					
BEND SIZE	F	G	H	I	J	K	L	M	N	**	A	C	E	R	D	T
6" - 22½	1' - 7"	1' - 4"	1' - 8"	1' - 4"	2' - 8"	3' - 8"	8		8' - 4"	8' - 3"	3 @ 8"	5.8	18.6	4.8	15.86	1.50	0.55
6" - 45	1' - 7"	1' - 4"	1' - 8"	1' - 4"	2' - 8"	3' - 8"	8		8' - 4"	8' - 3"	3 @ 8"	5.8	18.6	4.8	87.25	1.50	0.55
8" - 22½	1' - 7"	1' - 4"	1' - 8"	1' - 4"	2' - 8"	3' - 8"	8" - 4"		8' - 4"	8' - 3"	4 @ 8"	5.5	13.8	4.8	17.62	1.50	0.68
8" - 45	1' - 8"	1' - 6"	2' - 6"	1' - 4"	2' - 8"	3' - 8"	8" - 4"		8' - 4"	8' - 3"	4 @ 12"	5.5	13.8	4.8	88.44	1.50	0.68
12" - 22½	1' - 10"	1' - 6"	2' - 6"	1' - 5"	3' - 6"	4' - 8"	8" - 6"		8' - 6"	8' - 3"	4 @ 18"	6.5	15.3	4.8	22.62	1.50	0.68
12" - 45	1' - 11"	1' - 8"	2' - 10"	1' - 8"	4' - 8"	4' - 6"	8" - 8"		8' - 8"	8' - 3"	4 @ 12"	6.5	15.3	4.8	18.88	1.50	0.68
12" - 22½	2' - 8"	1' - 6"	2' - 6"	1' - 7"	4' - 8"	4' - 8"	8" - 8"		8' - 6"	8' - 4"	4 @ 12"	7.5	17.6	4.8	27.62	1.50	0.75
12" - 45	2' - 1"	1' - 6"	3' - 0"	1' - 2"	5' - 8"	4' - 6"	8" - 11"		8' - 6"	8' - 3"	4 @ 14"	7.5	17.6	4.8	13.25	1.58	0.75
16" - 22½	2' - 2"	1' - 8"	2' - 10"	1' - 7"	5' - 8"	4' - 6"	8" - 10"		8' - 9"	8' - 4"	4 @ 14"	8.8	22.2	4.8	27.62	1.75	0.85

DETAIL OF THRUST BLOCK FOR VERTICAL BOTTOM BEND



ELEVATION

SECTION A-A

BEND SIZE	A	B	C	BEND SIZE	A	B	C
6" - 22½°	1' - 8"	1' - 8"	1' - 8"	6" - 45°	1' - 8"	1' - 8"	1' - 8"
8" - 22½°	1' - 9"	1' - 8"	1' - 8"	8" - 45°	1' - 9"	1' - 8"	1' - 8"
18" - 22½°	1' - 11"	1' - 8"	1' - 8"	18" - 45°	1' - 11"	1' - 8"	1' - 8"
12" - 22½°	2' - 2"	1' - 8"	1' - 8"	12" - 45°	2' - 2"	1' - 8"	1' - 8"
16" - 22½°	2' - 3"	1' - 8"	1' - 3"	16" - 45°	2' - 3"	1' - 8"	1' - 3"

* A.S.A. DIMENSIONS FROM CAST IRON PIPE HANDBOOK
** NUMBERS AND SPACING FOR * 5 BARS

F					DESIGNED BY	APPROVED
E						R.BURLETT
D					DRAWN BY THOMAS WINFREY	ENGINEER-WATER SYSTEMS
C					CHECKED BY	
B						HEAD ENGINEER WATER SYSTEMS
A						
	DESCRIPTION	CHECKED	APPROVED	DATE	ENGINEER OF WATER SYSTEMS	ENG. MANAGER
	REVISIONS					

WATER SYSTEM IMPROVEMENTS
VARIOUS STREETS THROUGHOUT THE CITY

DWSD STANDARD DETAILS-2

SCALE: NONE DATE:

CITY OF DETROIT
WATER AND SEWERAGE DEPARTMENT
ENGINEERING DIVISION

SECTION MAP	TOWN	RANGE	SECTION	PORTION CODE	FAMIS NO.	(DESIGN) (CONST)

M.D.P.H./D.N.R PERMIT NO.
FED. REF. NO.
CONTRACT NO.
FILE NO.
DRAWING NO.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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spackman
mossop
michaels

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Suite 696
Detroit | MI | 48202
T: 313.720.1055

SUB CONSULTANT

NTH Consultants
41780 Six Mile Road
Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

REVISION

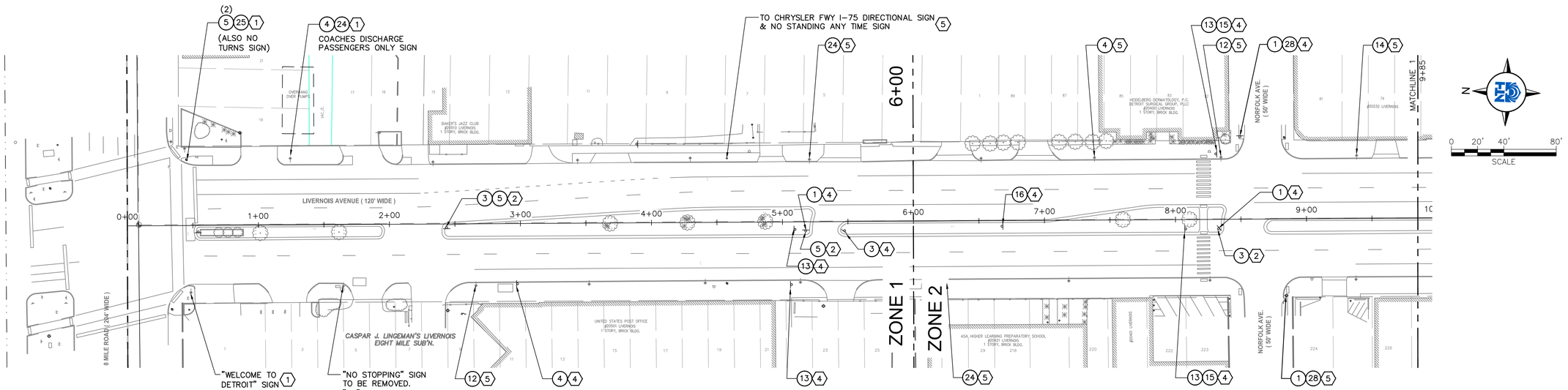
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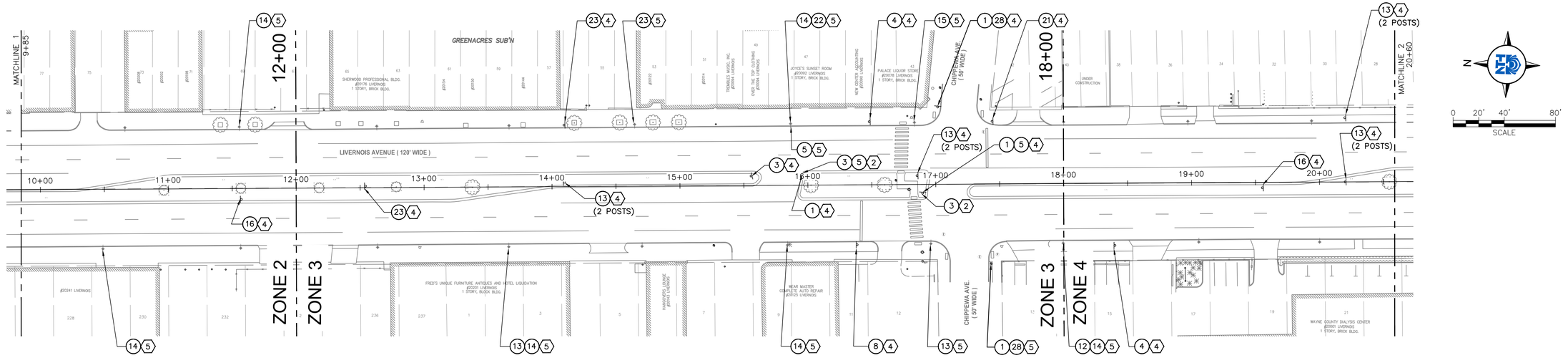
UTILITY DETAILS (4 OF 4)

Sheet No:

C010



EXISTING SIGNAGE PLAN: STA. 0+00 TO STA. 9+85
SCALE: 1" = 40'



EXISTING SIGNAGE PLAN: STA. 9+85 TO STA. 20+60
SCALE: 1" = 40'

SIGN KEY

1. STOP
2. PARKING ZONE SIGNS (2 EACH LOCATION) (ELECTRONIC PARKING TOLL SYSTEM)
3. DO NOT ENTER
4. DDOT BUS STOP / NO STANDING
5. ONE WAY ARROW
6. SURFACE MOUNTED ELECTRONIC PARKING TOLL KIOSK
7. LEFT TURN ONLY THIS LANE
8. NO STANDING HERE TO CORNER
9. RIGHT LANE MUST TURN RIGHT
10. NO LEFT TURN ARROW EXCEPT BUSES
11. BUSINESS WATCH
12. SPEED LIMIT 30
13. PEDESTRIAN CROSSING
14. NO PARKING / SNOW EMERGENCY ROUTE
15. DIAGONAL DOWNWARD POINTING ARROW
16. THIS LANE MUST TURN LEFT
17. HANDICAPPED PARKING ZONE/ONLY
18. NO PARKING TIME LIMITED THIS SIDE OF SIGN
19. PARKING TWO HOURS
20. NO LEFT TURN ARROW
21. STOP HERE ON RED
22. PARKING ALLOWED
23. PARKING ALLOWED THIS SIDE OF SIGN
23. NO PARKING THIS SIDE OF SIGN
24. NO STANDING
25. NO TURN ON RED
26. RIGHT TURN ONLY THIS LANE
27. NO PARKING/STANDING HERE TO CORNER
28. RIGHT TURN ONLY WITH ARROW

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

NOTES

1. CONTRACTOR SHALL REMOVE ALL SIGNS AS SHOWN ON THE PLANS. RE-USE AND RE-INSTALL EXISTING SIGNS TO MEET THE FINAL DESIGN CONDITION AS SHOWN ON SHEET Nos. C505 THROUGH C508. ALL REMAINING SIGNS TO BE TURNED OVER TO THE CITY OF DETROIT.
2. SURFACE MOUNTED PARKING ZONE SIGNS AND ASSOCIATED ELECTRONIC TOLL KIOSKS MAY BE REUSED AT THE DISCRETION OF THE CITY OF DETROIT.

KEY NOTES

1. EXISTING SIGN/ELEMENT TO REMAIN
2. EXISTING SIGN/ELEMENT TO BE REMOVED
3. SURFACE MOUNTED POST & SIGN TO BE REMOVED
4. IN-GROUND U-CHANNEL POST & SIGN TO BE REMOVED
5. LIGHT OR UTILITY POLE MOUNTED SIGN TO BE REMOVED

PRIME CONSULTANT
spackman mossop michaels
440 Burroughs Street
Suite 696
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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

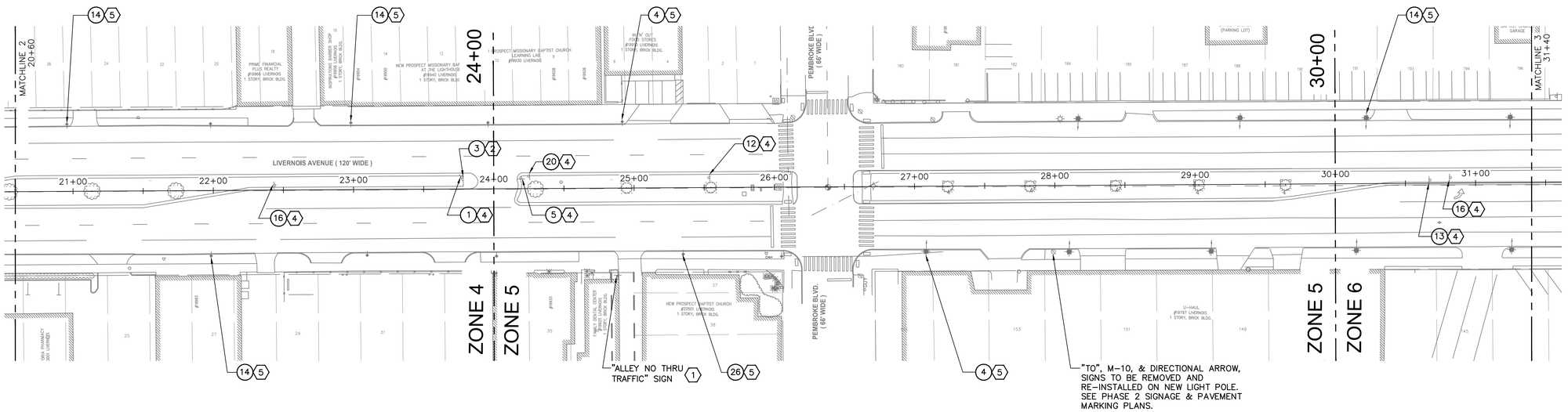
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Sheet Title: EXISTING SIGN INVENTORY (SHEET 1 OF 4)

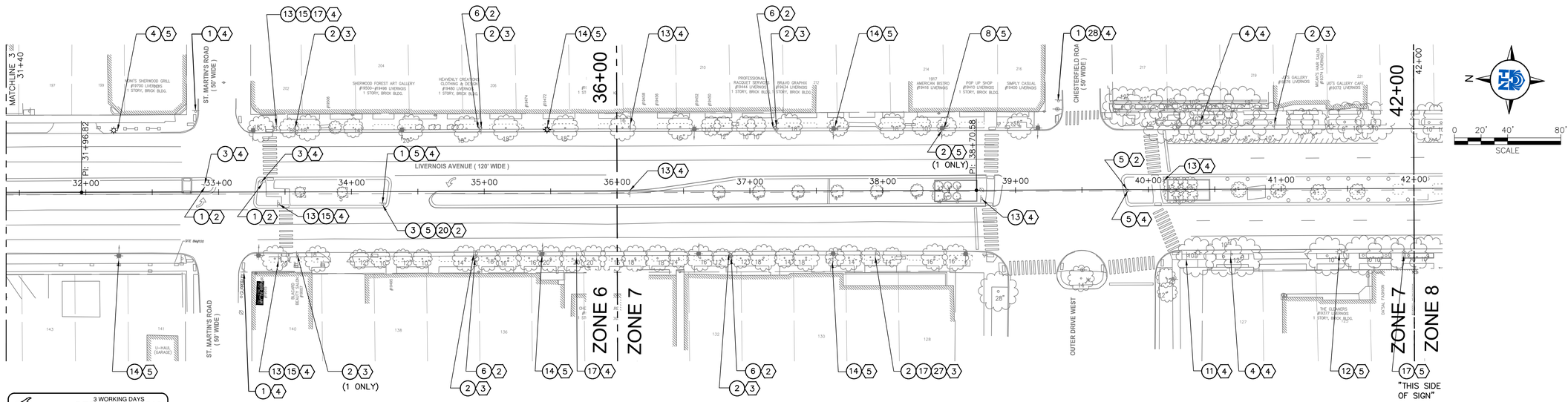
Sheet No: C101

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EXISTING SIGNAGE PLAN: STA. 20+60 TO STA. 31+40

SCALE: 1" = 40'



EXISTING SIGNAGE PLAN: STA. 31+40 TO STA. 42+00

SCALE: 1" = 40'

SIGN KEY

1. STOP
2. PARKING ZONE SIGNS (2 EACH LOCATION) (ELECTRONIC PARKING TOLL SYSTEM)
3. DO NOT ENTER
4. DDOT BUS STOP / NO STANDING
5. ONE WAY ARROW
6. SURFACE MOUNTED ELECTRONIC PARKING TOLL KIOSK
7. LEFT TURN ONLY THIS LANE
8. NO STANDING HERE TO CORNER
9. RIGHT LANE MUST TURN RIGHT
10. NO LEFT TURN ARROW EXCEPT BUSES
11. BUSINESS WATCH
12. SPEED LIMIT 30
13. PEDESTRIAN CROSSING
14. NO PARKING / SNOW EMERGENCY ROUTE
15. DIAGONAL DOWNWARD POINTING ARROW
16. THIS LANE MUST TURN LEFT
17. HANDICAPPED PARKING ZONE/ONLY
18. NO PARKING TIME LIMITED THIS SIDE OF SIGN
19. PARKING TWO HOURS
20. NO LEFT TURN ARROW
21. STOP HERE ON RED
22. PARKING ALLOWED
23. PARKING ALLOWED THIS SIDE OF SIGN
23. NO PARKING THIS SIDE OF SIGN
24. NO STANDING
25. NO TURN ON RED
26. RIGHT TURN ONLY THIS LANE
27. NO PARKING/STANDING HERE TO CORNER
28. RIGHT TURN ONLY WITH ARROW

KEY NOTES

1. EXISTING SIGN/ELEMENT TO REMAIN
2. EXISTING SIGN/ELEMENT TO BE REMOVED
3. SURFACE MOUNTED POST & SIGN TO BE REMOVED
4. IN-GROUND U-CHANNEL POST & SIGN TO BE REMOVED
5. LIGHT OR UTILITY POLE MOUNTED SIGN TO BE REMOVED

NOTES

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3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
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For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

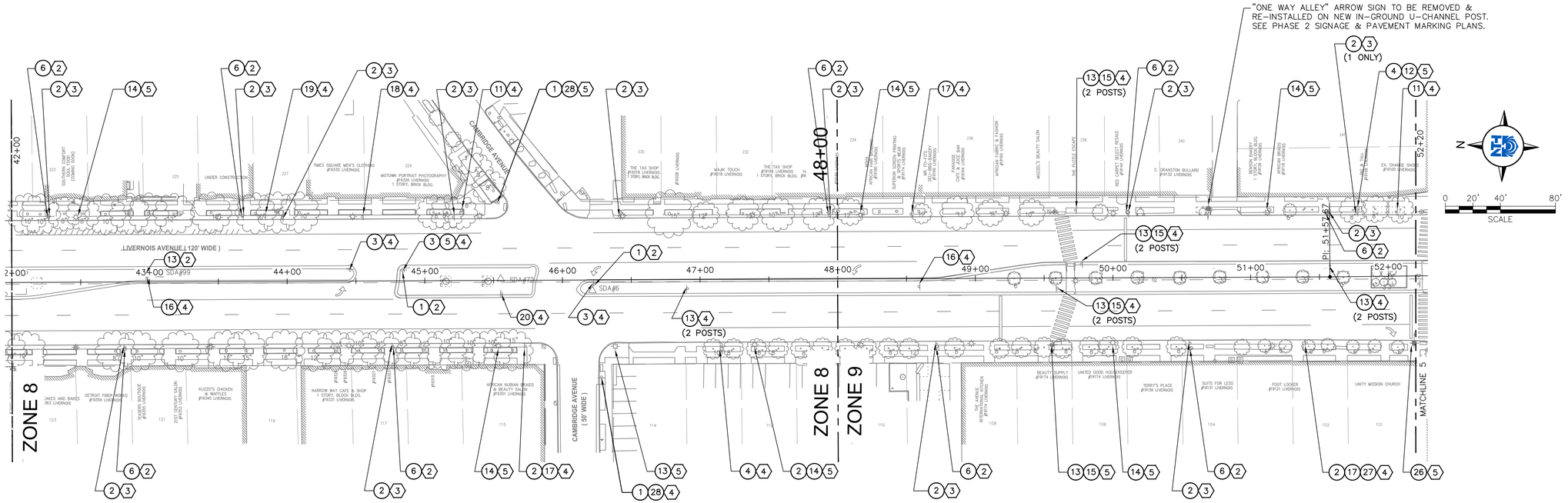
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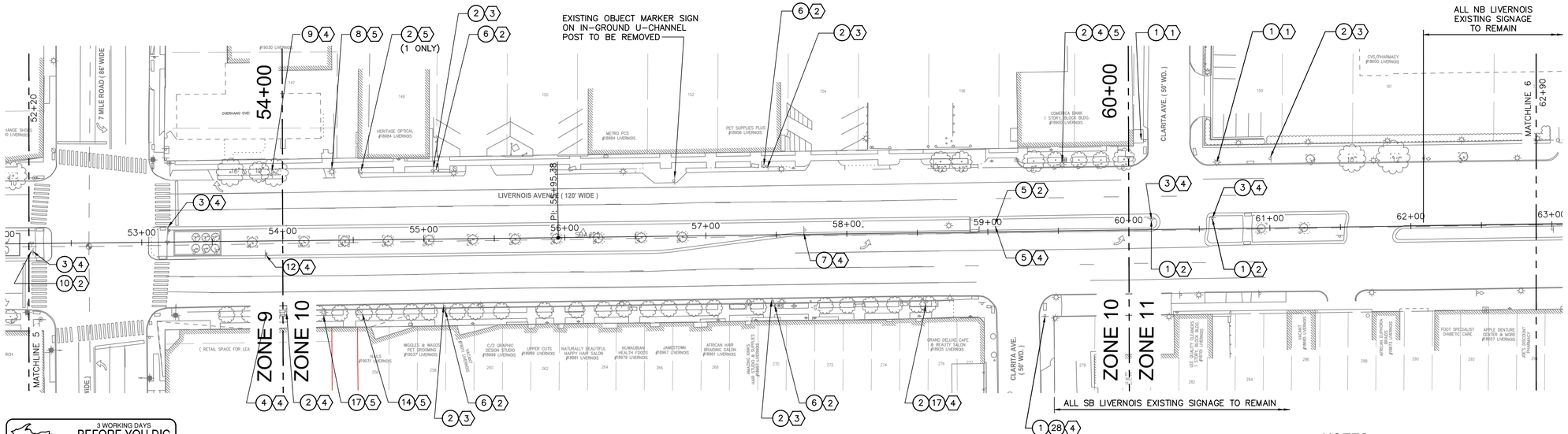
Sheet Title: EXISTING SIGN INVENTORY (SHEET 2 OF 4)

Sheet No: C102

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EXISTING SIGNAGE PLAN: STA. 42+00 TO STA. 52+20
SCALE: 1" = 40'



EXISTING SIGNAGE PLAN: STA. 52+20 TO STA. 62+90
SCALE: 1" = 40'

SIGN KEY

1. STOP
2. PARKING ZONE SIGNS (2 EACH LOCATION) (ELECTRONIC PARKING TOLL SYSTEM)
3. DO NOT ENTER
4. DDOT BUS STOP / NO STANDING
5. ONE WAY ARROW
6. SURFACE MOUNTED ELECTRONIC PARKING TOLL KIOSK
7. LEFT TURN ONLY THIS LANE
8. NO STANDING HERE TO CORNER
9. RIGHT LANE MUST TURN RIGHT
10. NO LEFT TURN ARROW EXCEPT BUSES
11. BUSINESS WATCH
12. SPEED LIMIT 30
13. PEDESTRIAN CROSSING
14. NO PARKING / SNOW EMERGENCY ROUTE
15. DIAGONAL DOWNWARD POINTING ARROW
16. THIS LANE MUST TURN LEFT
17. HANDICAPPED PARKING ZONE/ONLY
18. NO PARKING TIME LIMITED THIS SIDE OF SIGN
19. PARKING TWO HOURS
20. NO LEFT TURN ARROW
21. STOP HERE ON RED
22. PARKING ALLOWED
23. PARKING ALLOWED THIS SIDE OF SIGN
23. NO PARKING THIS SIDE OF SIGN
24. NO STANDING
25. NO TURN ON RED
26. RIGHT TURN ONLY THIS LANE
27. NO PARKING/STANDING HERE TO CORNER
28. RIGHT TURN ONLY WITH ARROW

NOTES

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5. LIGHT OR UTILITY POLE MOUNTED SIGN TO BE REMOVED

3 WORKING DAYS
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ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

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SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

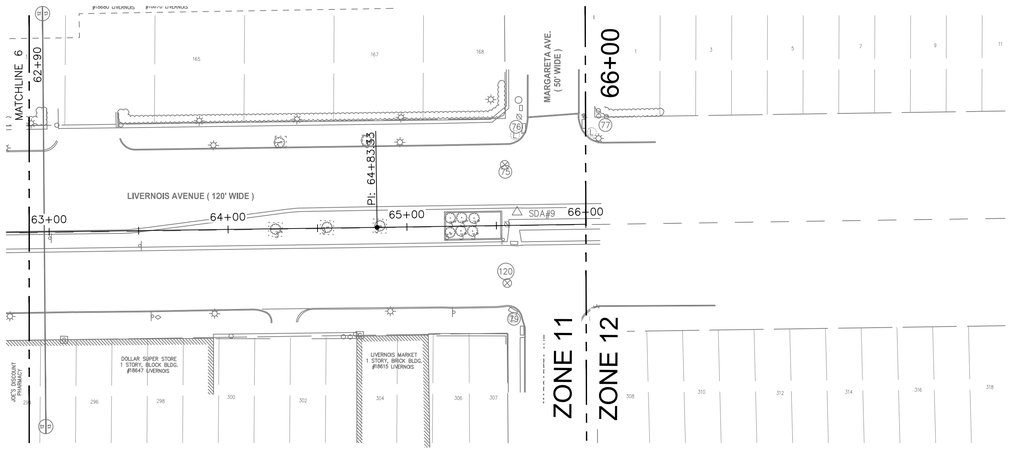
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Sheet Title: EXISTING SIGN INVENTORY (SHEET 3 OF 4)

Sheet No: C103

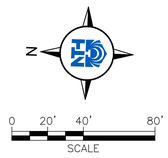
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NOTE: ALL EXISTING SIGNS TO REMAIN THIS SHEET.

EXISTING SIGNAGE PLAN: STA. 62+90 TO 66+00

SCALE: 1" = 40'



SIGN KEY

1. STOP
2. PARKING ZONE SIGNS (2 EACH LOCATION) (ELECTRONIC PARKING TOLL SYSTEM)
3. DO NOT ENTER
4. DDOT BUS STOP / NO STANDING
5. ONE WAY ARROW
6. SURFACE MOUNTED ELECTRONIC PARKING TOLL KIOSK
7. LEFT TURN ONLY THIS LANE
8. NO STANDING HERE TO CORNER
9. RIGHT LANE MUST TURN RIGHT
10. NO LEFT TURN ARROW EXCEPT BUSES
11. BUSINESS WATCH
12. SPEED LIMIT 30
13. PEDESTRIAN CROSSING
14. NO PARKING / SNOW EMERGENCY ROUTE
15. DIAGONAL DOWNWARD POINTING ARROW
16. THIS LANE MUST TURN LEFT
17. HANDICAPPED PARKING ZONE/ONLY
18. NO PARKING TIME LIMITED THIS SIDE OF SIGN
19. PARKING TWO HOURS
20. NO LEFT TURN ARROW
21. STOP HERE ON RED
22. PARKING ALLOWED
23. PARKING ALLOWED THIS SIDE OF SIGN
23. NO PARKING THIS SIDE OF SIGN
24. NO STANDING
25. NO TURN ON RED
26. RIGHT TURN ONLY THIS LANE
27. NO PARKING/STANDING HERE TO CORNER
28. RIGHT TURN ONLY WITH ARROW

KEY NOTES

1. EXISTING SIGN/ELEMENT TO REMAIN
2. EXISTING SIGN/ELEMENT TO BE REMOVED
3. SURFACE MOUNTED POST & SIGN TO BE REMOVED
4. IN-GROUND U-CHANNEL POST & SIGN TO BE REMOVED
5. LIGHT OR UTILITY POLE MOUNTED SIGN TO BE REMOVED

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

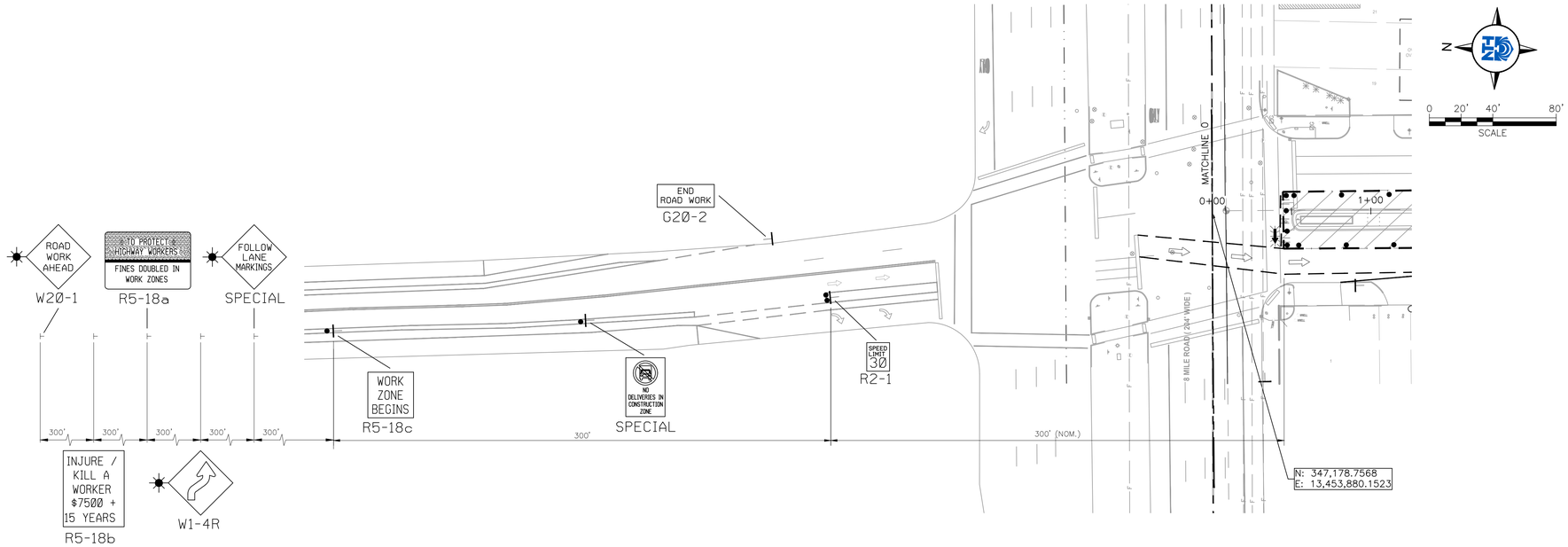
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: EXISTING SIGN INVENTORY (SHEET 4 OF 4)

Sheet No: C104

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MAINTENANCE OF TRAFFIC PLAN: POB TO STA. 0+00

SCALE: 1" = 40'

MAINTENANCE OF TRAFFIC NOTES

1. APPLICABLE WARNING, REGULATORY, AND GUIDE SIGNS SHALL NOT BE REMOVED BUT SHALL BE RETAINED DURING THE PROGRESS OF THE WORK IN THEIR EXISTING LOCATION UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT OR ITS INSPECTOR. ALL MDOT SIGNS REQUIRING RELOCATION DUE TO THE APPLICANT'S OPERATIONS SHALL BE SALVAGED, AS PER THE CURRENT VERSION OF THE MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, AND RE-INSTALLED AT THE ORIGINAL LOCATION UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT OR THEIR INSPECTING AGENCY. SALVAGED SIGNS SHALL BE RE-INSTALLED NO LATER THAN ONE (1) DAY AFTER THE COMPLETION OF THE WORK.

2. A SAFE AND ADEQUATE TRAVEL ROUTE FOR PEDESTRIANS SHALL BE MAINTAINED AT ALL TIMES. PEDESTRIANS SHALL NOT BE DIRECTED TO CROSS THE TRUNKLINE AT NON SIGNALIZED INTERSECTIONS.

3. CONSTRUCTION ZONE SIGNING SHALL CONFORM (EFFECTIVE APRIL 1, 2004) TO PUBLIC ACT 315 OF 2003.

4. ALL TRAFFIC CONTROL DEVICES INCLUDING SIGNS AND PAVEMENT MARKINGS (REMOVAL AND INSTALLATIONS) SHALL BE MAINTAINED AND/OR INSTALLED IN ACCORDANCE WITH CURRENT MDOT STANDARDS AND SPECIFICATIONS. CHARGES ARE THE SOLE RESPONSIBILITY OF THE PERMITTEE. ALL TRAFFIC CONTROL DEVICES SHALL MEET THE REQUIREMENTS OF THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES", (MMUTCD) 2011 EDITION, AS REVISED SEPTEMBER 2013, AND THE AMERICAN TRAFFIC SAFETY ASSOCIATION (ATSA) "QUALITY STANDARDS FOR WORK ZONE TRAFFIC CONTROL DEVICES"-1992. TRAFFIC CONTROL DEVICES ARE INCLUSIVE OF BUT NOT LIMITED TO SIGNS, BARRICADES, VERTICAL PANELS, DRUMS, WARNING LIGHTS, ARROW BOARDS, CHANGEABLE MESSAGE SIGNS, CONES, TUBULAR MARKERS, PAVEMENT TAPE, PAINT AND PAVEMENT MARKERS.

5. CONTRACTOR SHALL MAINTAIN ALL PEDESTRIAN CROSSWALKS IN AN OPERATIONAL STATE TO THE GREATEST EXTENT POSSIBLE. CONSTRUCT TEMPORARY WALKING SURFACE FOLLOWING DEMOLITION. DURING LIMITED PERIODS OF CROSSWALK INTERRUPTION, PROVIDE TEMPORARY PEDESTRIAN DETOUR SIGNAGE AS SHOWN HEREIN.

6. CONTRACTOR SHALL MAINTAIN SINGLE LANE "MICHIGAN" LEFT TURN LANES AS SHOWN ON PLANS. RESTRICT ACCESS DURING DEMOLITION OPERATIONS. PROVIDE AND INSTALL TEMPORARY PAVEMENT FOLLOWING DEMOLITION OF EXISTING MEDIAN.

7. THE CONTRACTOR SHALL ENDEAVOR TO MAINTAIN THE EXISTING TRAFFIC PATTERN TO THE NORTH OF THE WORK ZONE AS CONSTRUCTION PROGRESSES FROM SOUTH TO NORTH, TO THE GREATEST EXTENT PRACTICABLE. SEE "TYPICAL NORTH TRAFFIC RESTORATION DETAIL" ON SHEET NO. C105.

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

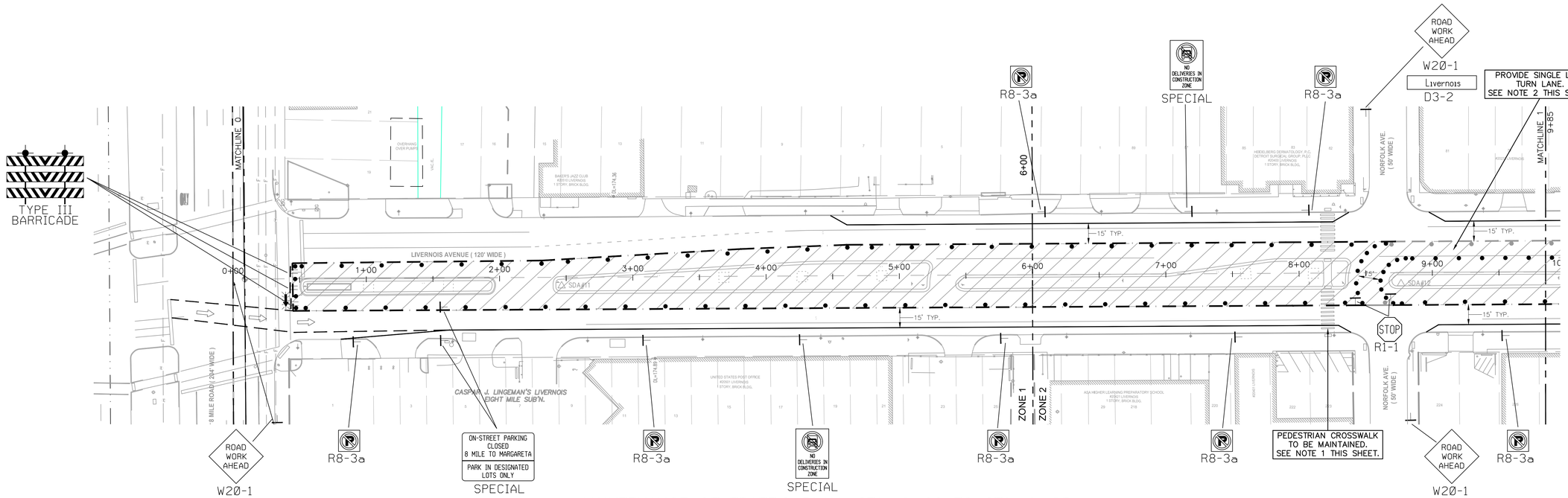
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - POB TO STA. 0+00

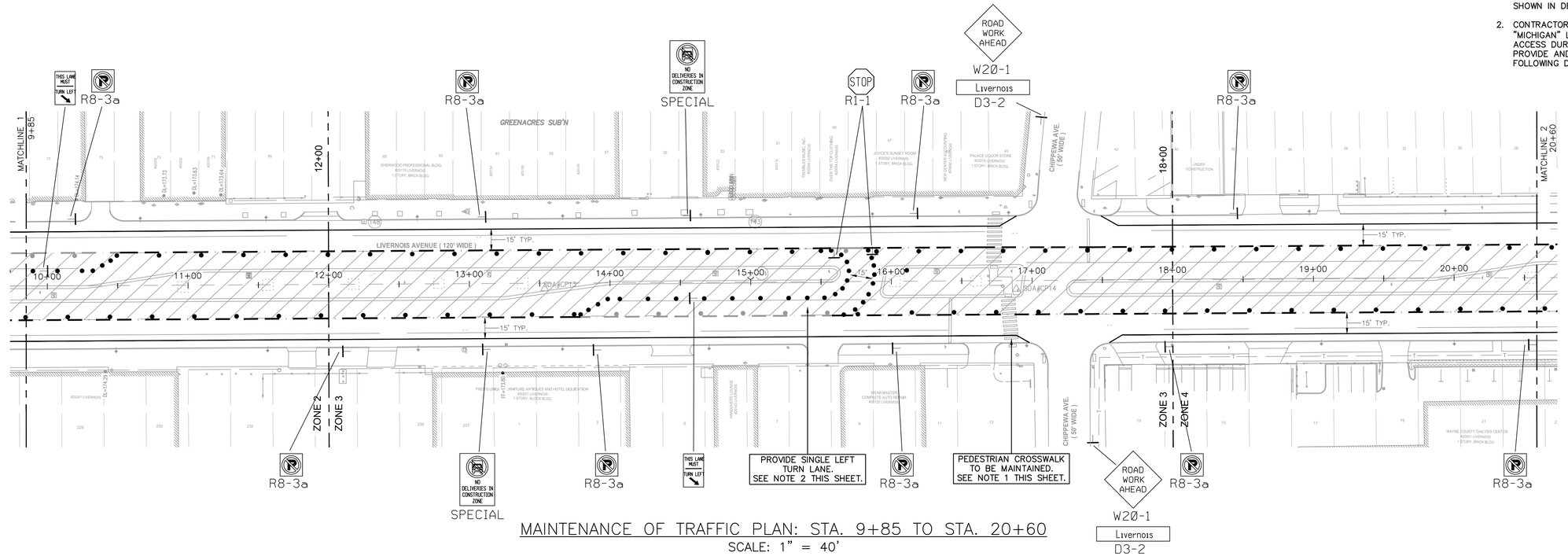
Sheet No: C201

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MAINTENANCE OF TRAFFIC PLAN: STA. 0+00 TO STA. 9+85

SCALE: 1" = 40'



MAINTENANCE OF TRAFFIC PLAN: STA. 9+85 TO STA. 20+60

SCALE: 1" = 40'

NOTES

1. CONTRACTOR SHALL MAINTAIN PEDESTRIAN CROSSWALK IN AN OPERATIONAL STATE TO THE GREATEST EXTENT POSSIBLE. CONSTRUCT TEMPORARY WALKING SURFACE FOLLOWING DEMOLITION. DURING LIMITED PERIODS OF CROSSWALK INTERRUPTION, PROVIDE TEMPORARY PEDESTRIAN DETOUR SIGNAGE AS SHOWN IN DETAIL ON SHEET No. C105.
2. CONTRACTOR SHALL MAINTAIN A SINGLE LANE "MICHIGAN" LEFT TURN LANE. RESTRICT ACCESS DURING DEMOLITION OPERATIONS. PROVIDE AND INSTALL TEMPORARY PAVEMENT FOLLOWING DEMOLITION OF EXISTING MEDIAN.

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

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Blue WATER
Green STORM DRAIN
Brown SEWER
Pink SURVEYING
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

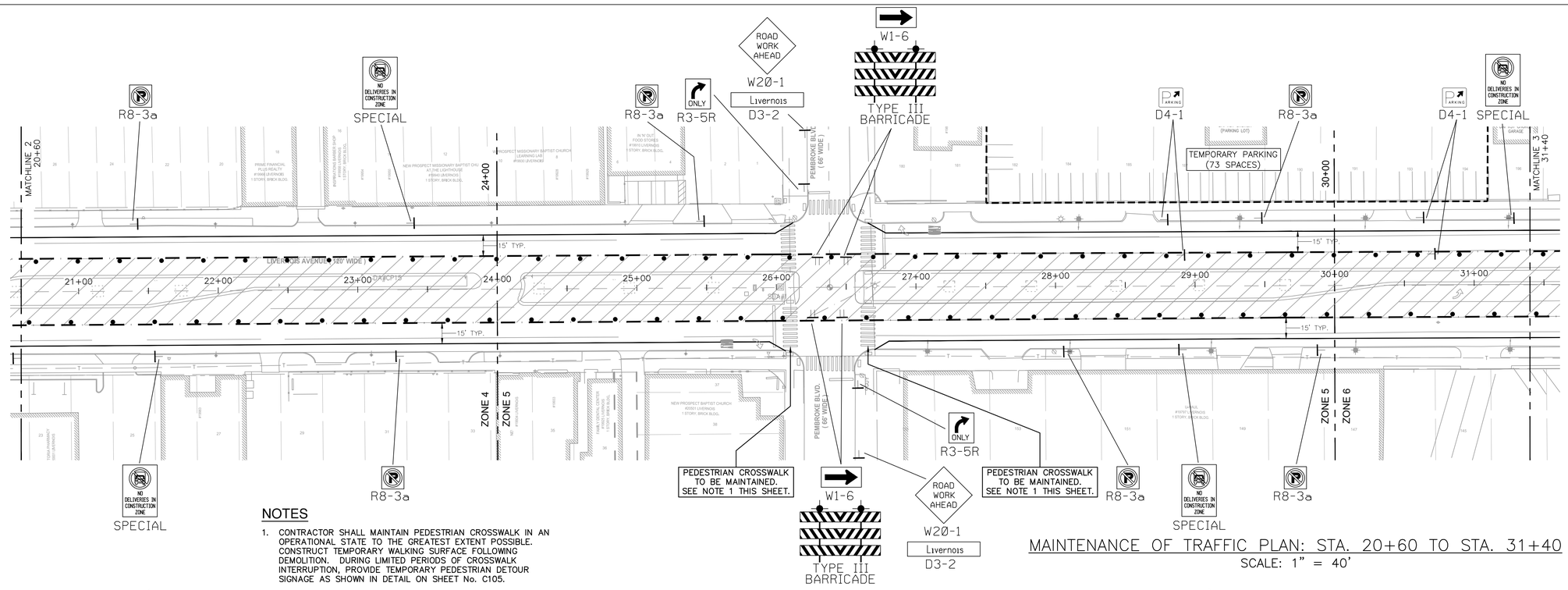
REVISION

NO.	DESCRIPTION	BY	APP'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - STA. 0+00 TO STA. 20+60

Sheet No: C202

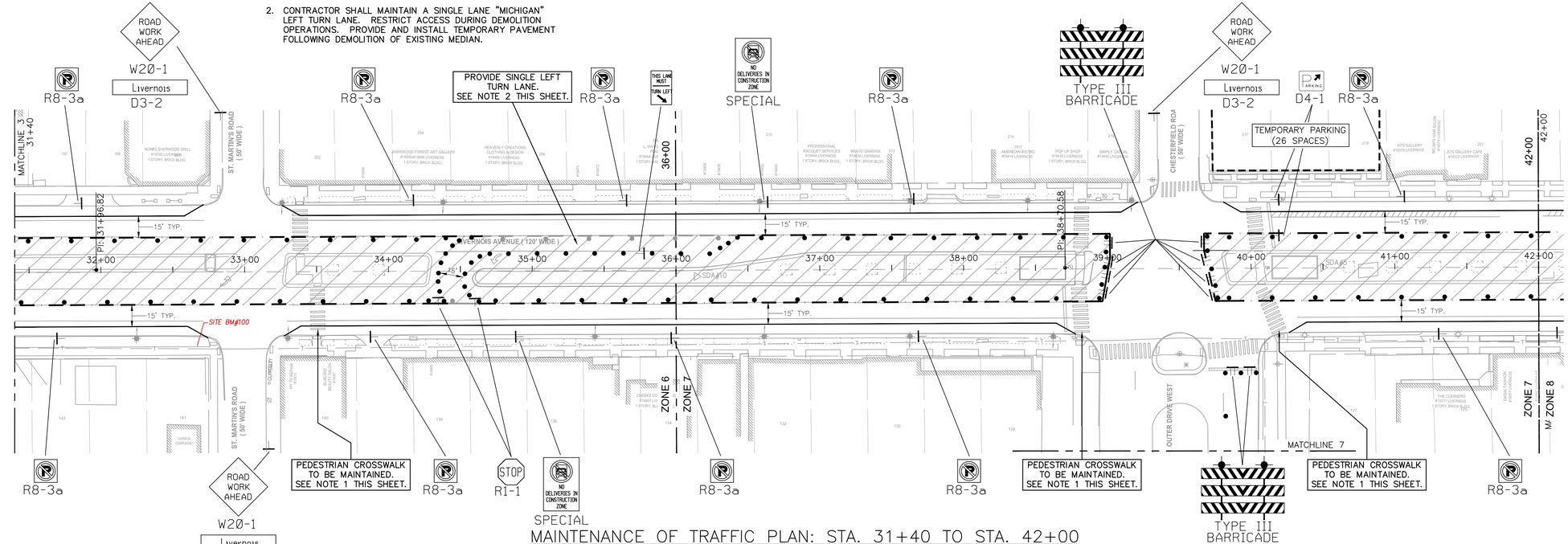
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NOTES

1. CONTRACTOR SHALL MAINTAIN PEDESTRIAN CROSSWALK IN AN OPERATIONAL STATE TO THE GREATEST EXTENT POSSIBLE. CONSTRUCT TEMPORARY WALKING SURFACE FOLLOWING DEMOLITION. DURING LIMITED PERIODS OF CROSSWALK INTERRUPTION, PROVIDE TEMPORARY PEDESTRIAN DETOUR SIGNAGE AS SHOWN IN DETAIL ON SHEET No. C105.
2. CONTRACTOR SHALL MAINTAIN A SINGLE LANE "MICHIGAN" LEFT TURN LANE. RESTRICT ACCESS DURING DEMOLITION OPERATIONS. PROVIDE AND INSTALL TEMPORARY PAVEMENT FOLLOWING DEMOLITION OF EXISTING MEDIAN.

MAINTENANCE OF TRAFFIC PLAN: STA. 20+60 TO STA. 31+40
SCALE: 1" = 40'



MAINTENANCE OF TRAFFIC PLAN: STA. 31+40 TO STA. 42+00
SCALE: 1" = 40'

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

3 WORKING DAYS
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Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: I7081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

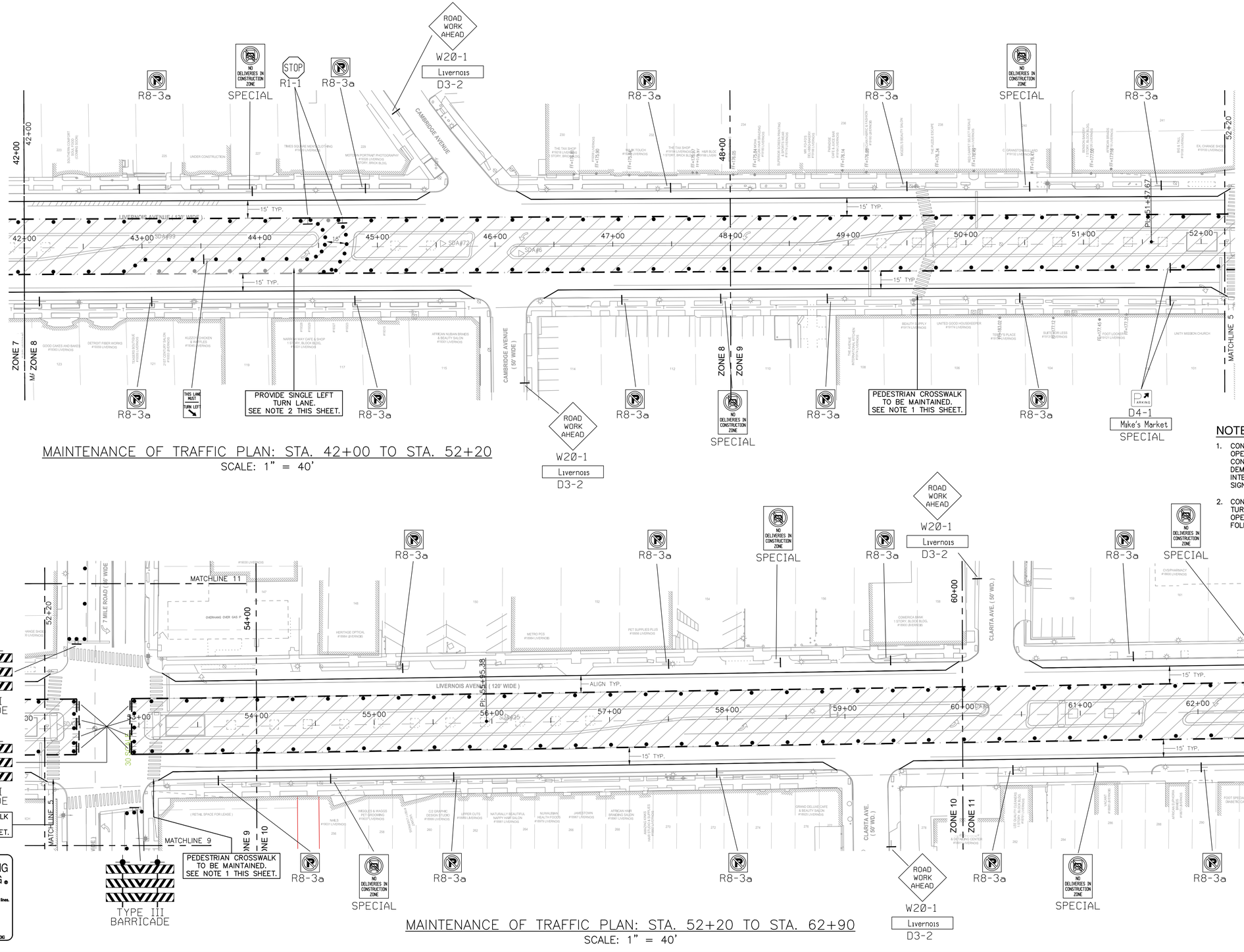
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - STA. 20+60 TO STA. 42+00

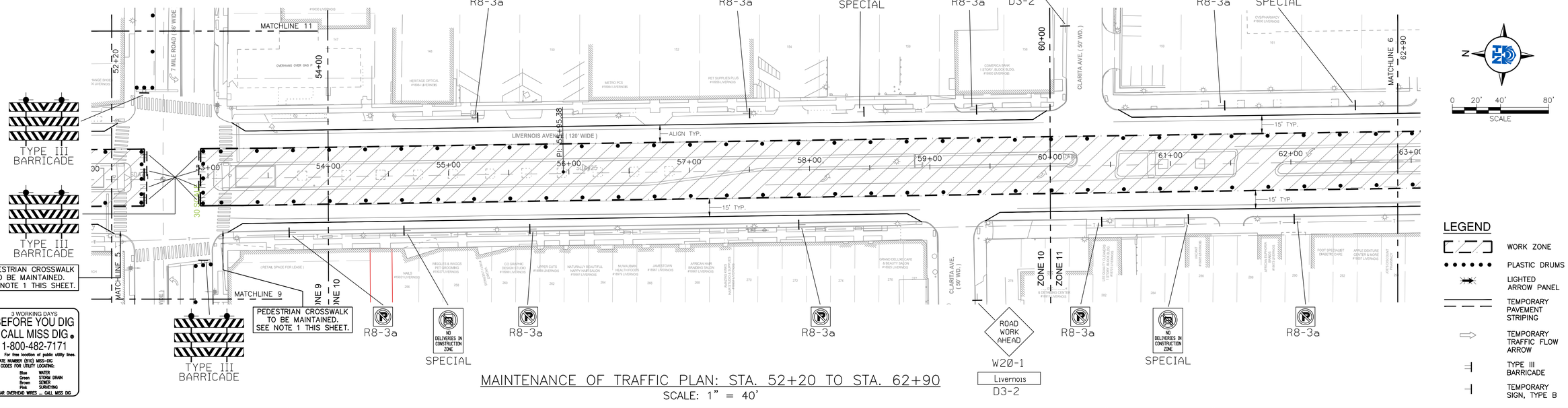
Sheet No: C203

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MAINTENANCE OF TRAFFIC PLAN: STA. 42+00 TO STA. 52+20

SCALE: 1" = 40'



MAINTENANCE OF TRAFFIC PLAN: STA. 52+20 TO STA. 62+90

SCALE: 1" = 40'

NOTES

1. CONTRACTOR SHALL MAINTAIN PEDESTRIAN CROSSWALK IN AN OPERATIONAL STATE TO THE GREATEST EXTENT POSSIBLE. CONSTRUCT TEMPORARY WALKING SURFACE FOLLOWING DEMOLITION. DURING LIMITED PERIODS OF CROSSWALK INTERRUPTION, PROVIDE TEMPORARY PEDESTRIAN DETOUR SIGNAGE AS SHOWN IN DETAIL ON SHEET No. C105.
2. CONTRACTOR SHALL MAINTAIN A SINGLE LANE "MICHIGAN" LEFT TURN LANE. RESTRICT ACCESS DURING DEMOLITION OPERATIONS. PROVIDE AND INSTALL TEMPORARY PAVEMENT FOLLOWING DEMOLITION OF EXISTING MEDIAN.

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

3 WORKING DAYS
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ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

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Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

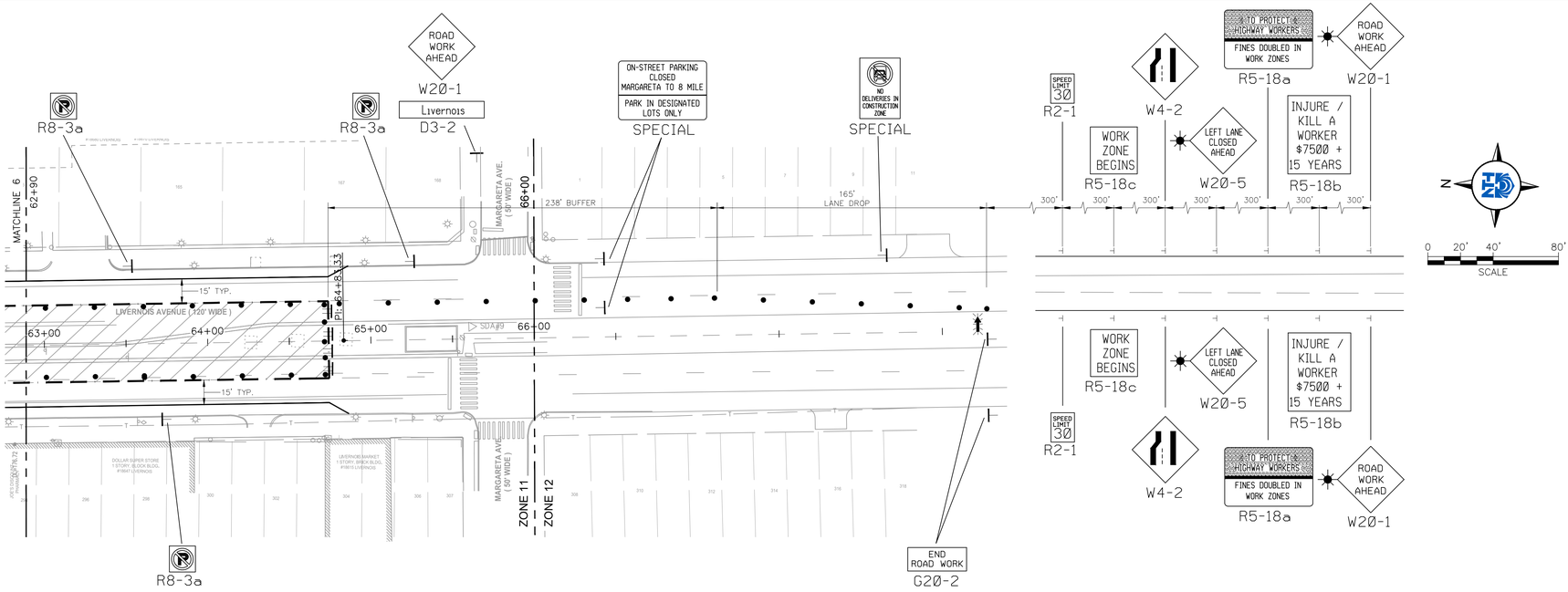
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - STA. 42+00 TO STA. 62+90

Sheet No: C204

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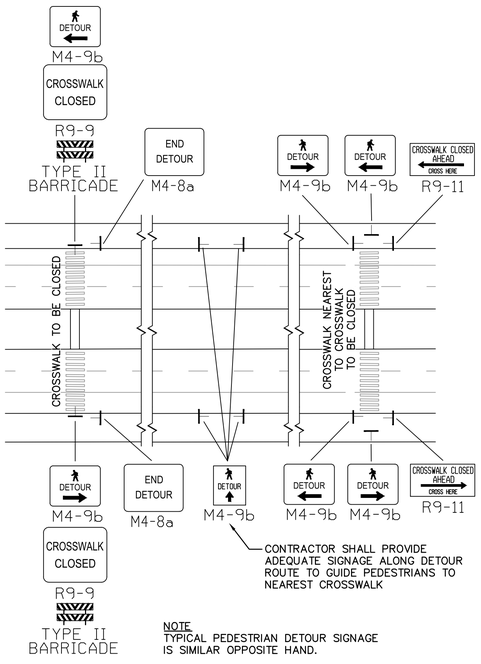


MAINTENANCE OF TRAFFIC PLAN: STA. 62+90 TO POE

SCALE: 1" = 40'

LEGEND

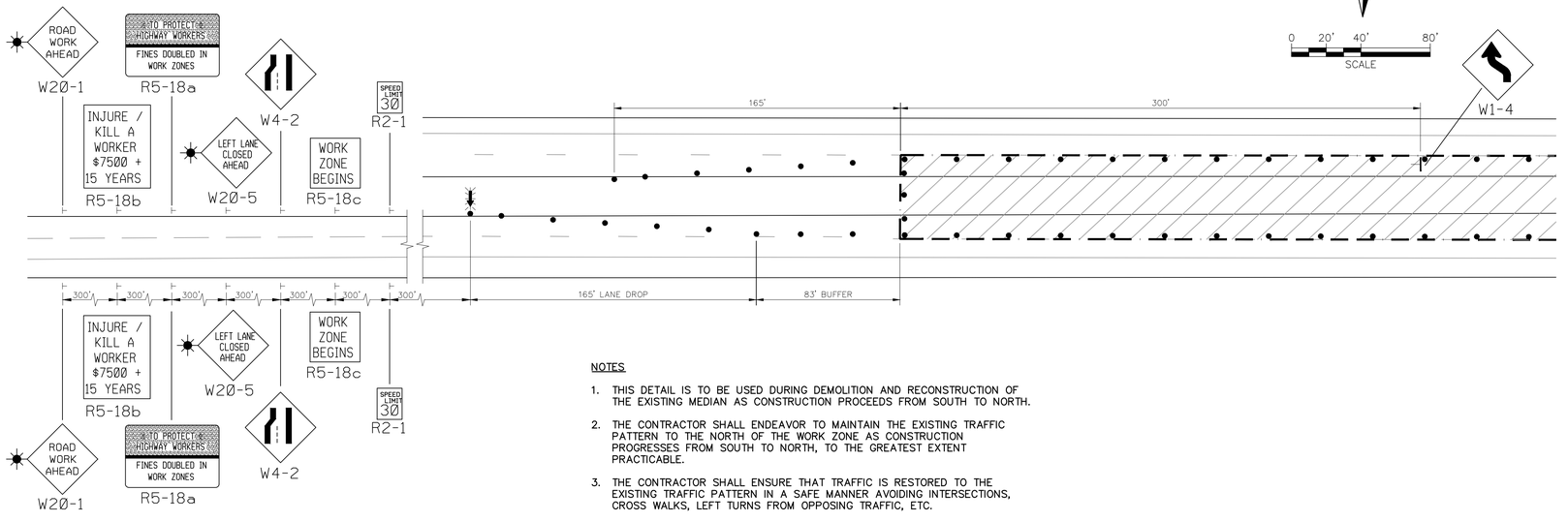
- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B



NOTE
TYPICAL PEDESTRIAN DETOUR SIGNAGE IS SIMILAR OPPOSITE HAND.

TYPICAL PEDESTRIAN DETOUR SIGNAGE

SCALE: NONE



NOTES

1. THIS DETAIL IS TO BE USED DURING DEMOLITION AND RECONSTRUCTION OF THE EXISTING MEDIAN AS CONSTRUCTION PROCEEDS FROM SOUTH TO NORTH.
2. THE CONTRACTOR SHALL ENDEAVOR TO MAINTAIN THE EXISTING TRAFFIC PATTERN TO THE NORTH OF THE WORK ZONE AS CONSTRUCTION PROGRESSES FROM SOUTH TO NORTH, TO THE GREATEST EXTENT PRACTICABLE.
3. THE CONTRACTOR SHALL ENSURE THAT TRAFFIC IS RESTORED TO THE EXISTING TRAFFIC PATTERN IN A SAFE MANNER AVOIDING INTERSECTIONS, CROSS WALKS, LEFT TURNS FROM OPPOSING TRAFFIC, ETC.

TYPICAL NORTH TRAFFIC RESTORATION DETAIL

SCALE: 1" = 40'

3 WORKING DAYS
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Pink SURVEYING
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

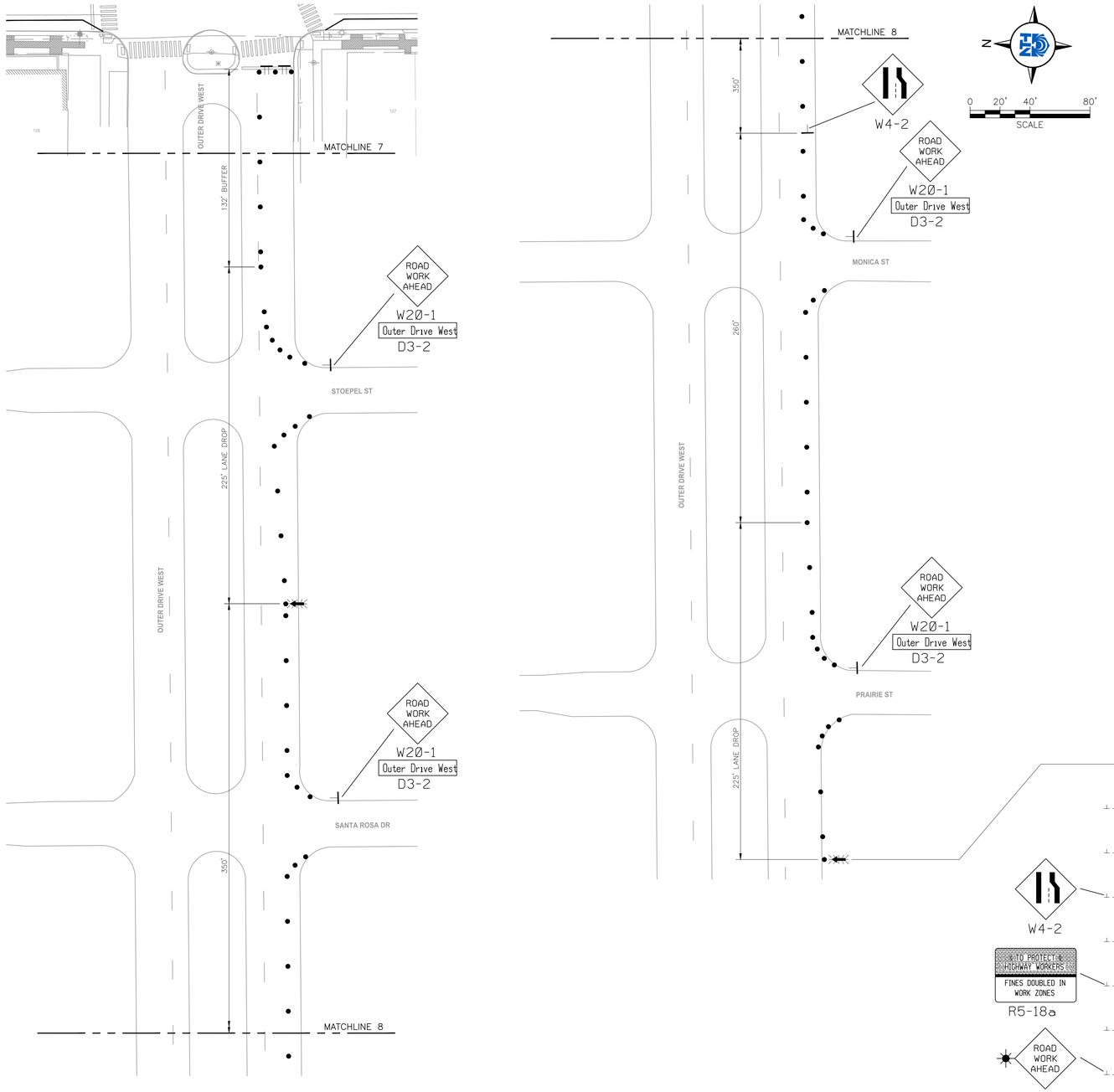
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - STA. 62+90 TO 66+00

Sheet No: C205

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MAINTENANCE OF TRAFFIC PLAN: EB OUTER DRIVE WEST

SCALE: 1" = 40'

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

3 WORKING DAYS
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

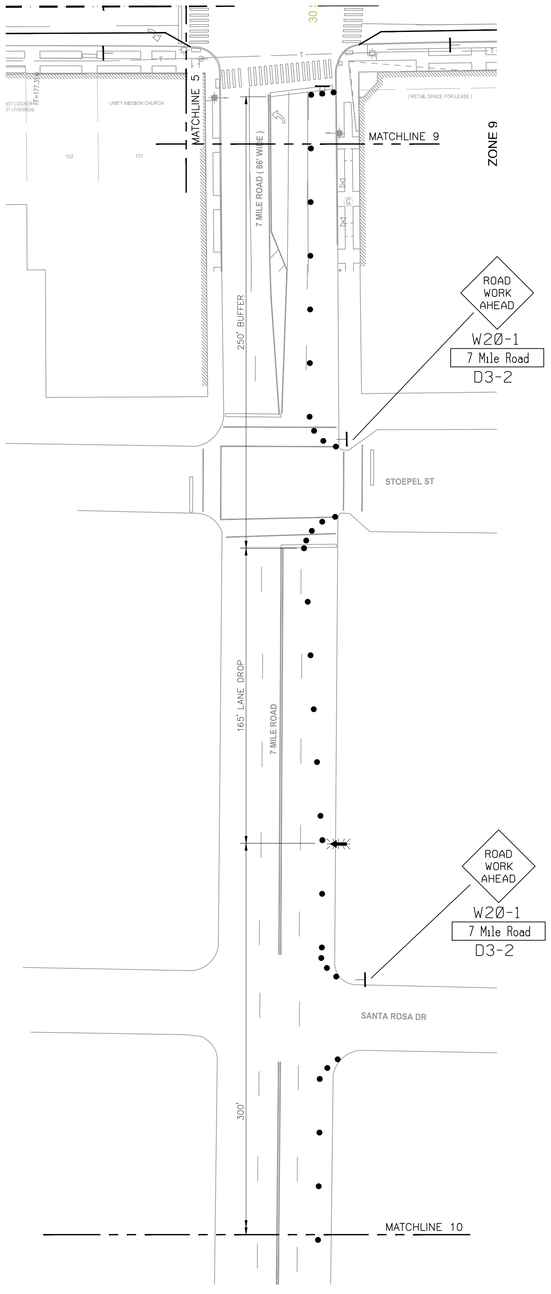
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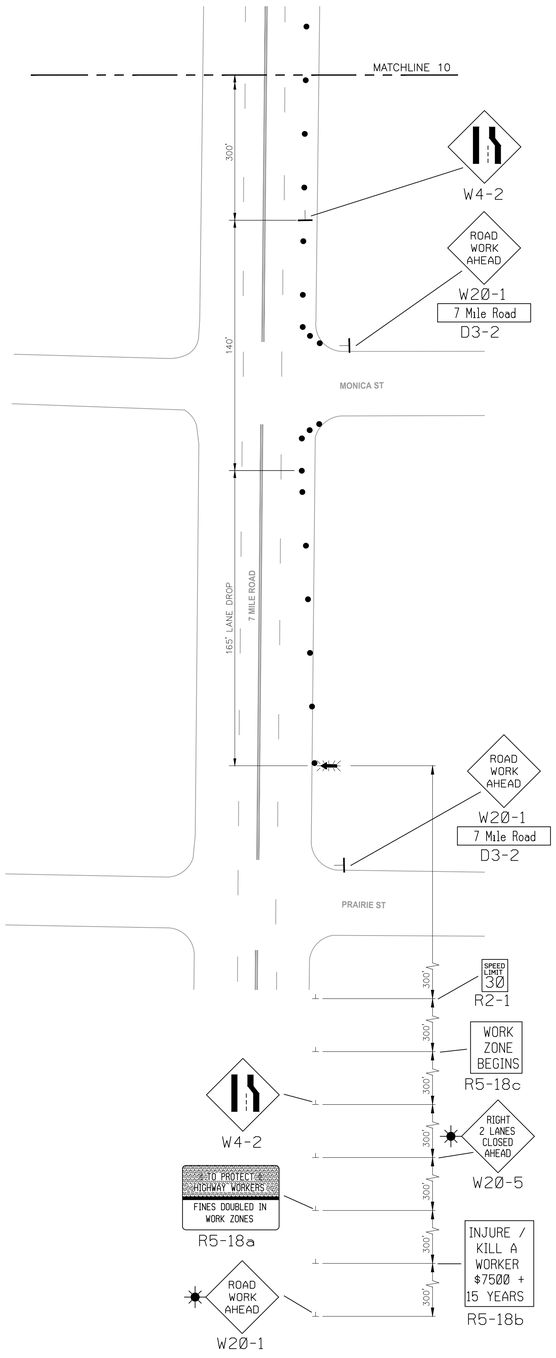
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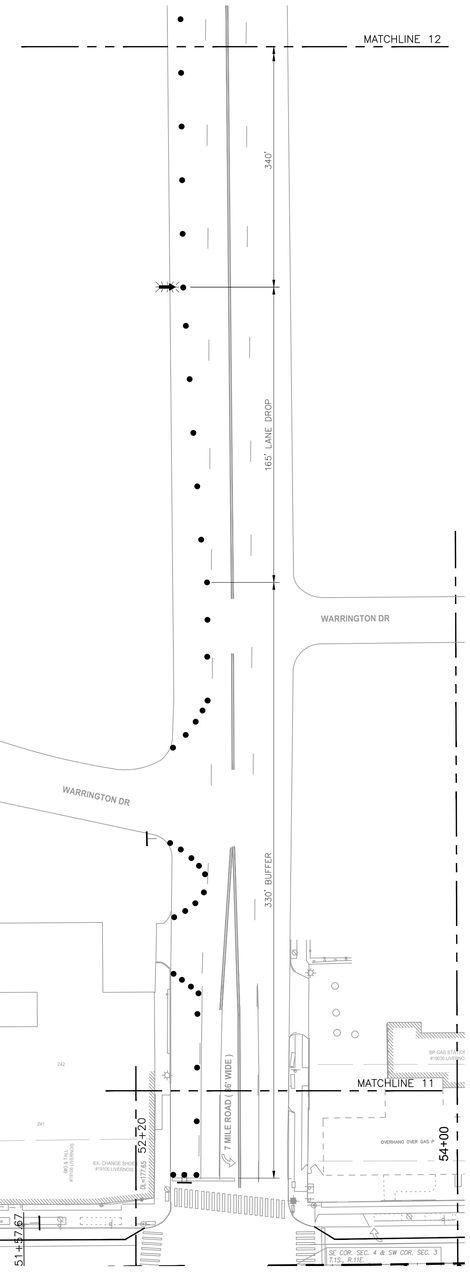
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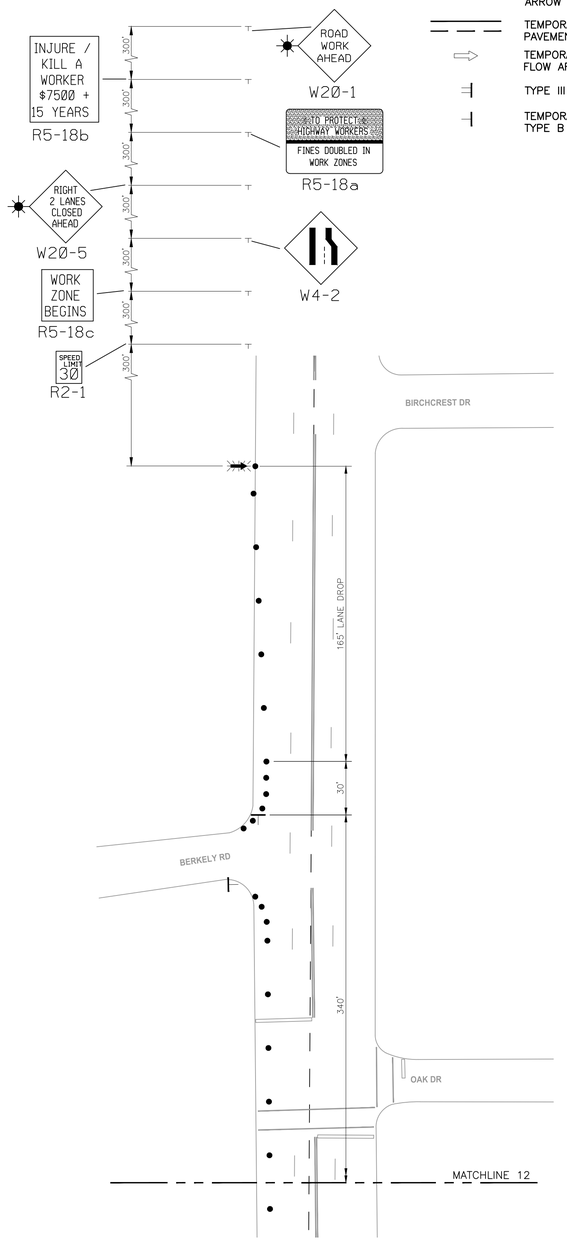
Sheet No: C206

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LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

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		Pink	SURVEYING

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MAINTENANCE OF TRAFFIC PLAN: EB 7 MILE ROAD
SCALE: 1" = 40'

MAINTENANCE OF TRAFFIC PLAN: WB 7 MILE ROAD
SCALE: 1" = 40'

PRIME CONSULTANT

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PROJECT

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LIVERNOIS AVENUE, DETROIT

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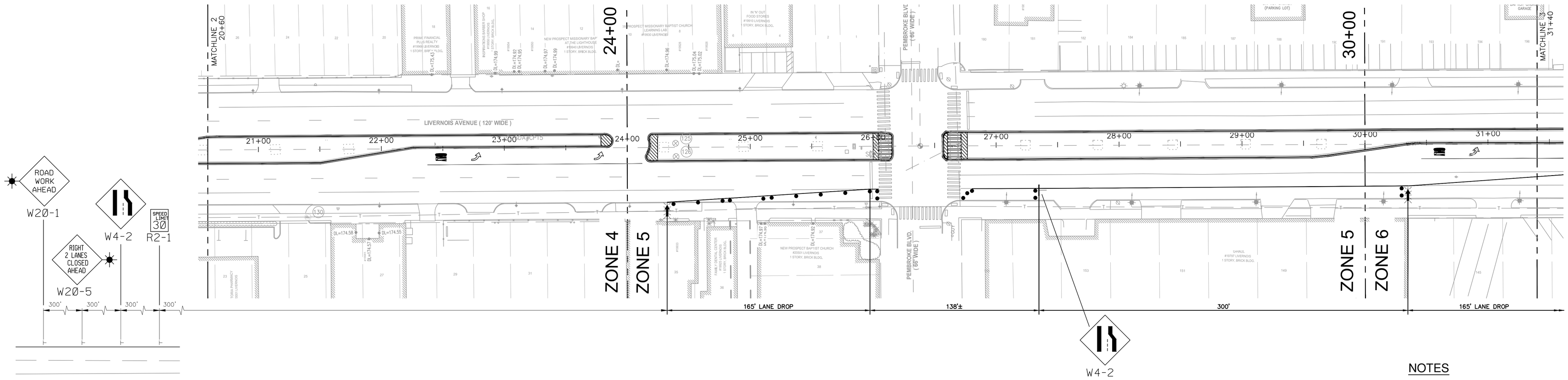
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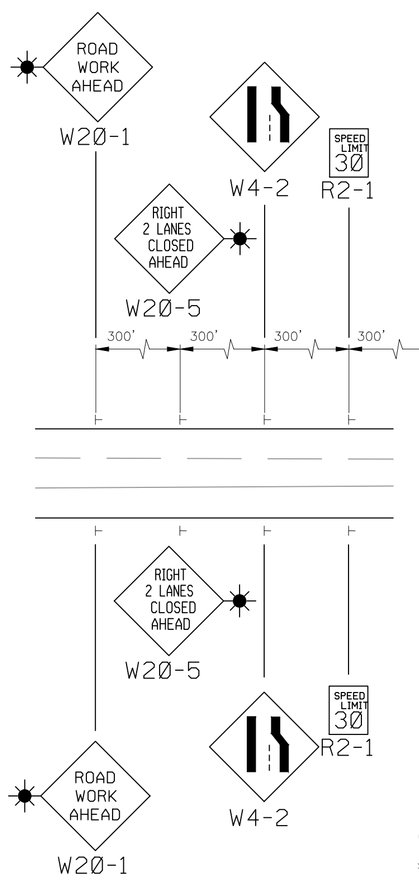
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC - 7 MILE ROAD

Sheet No: C207

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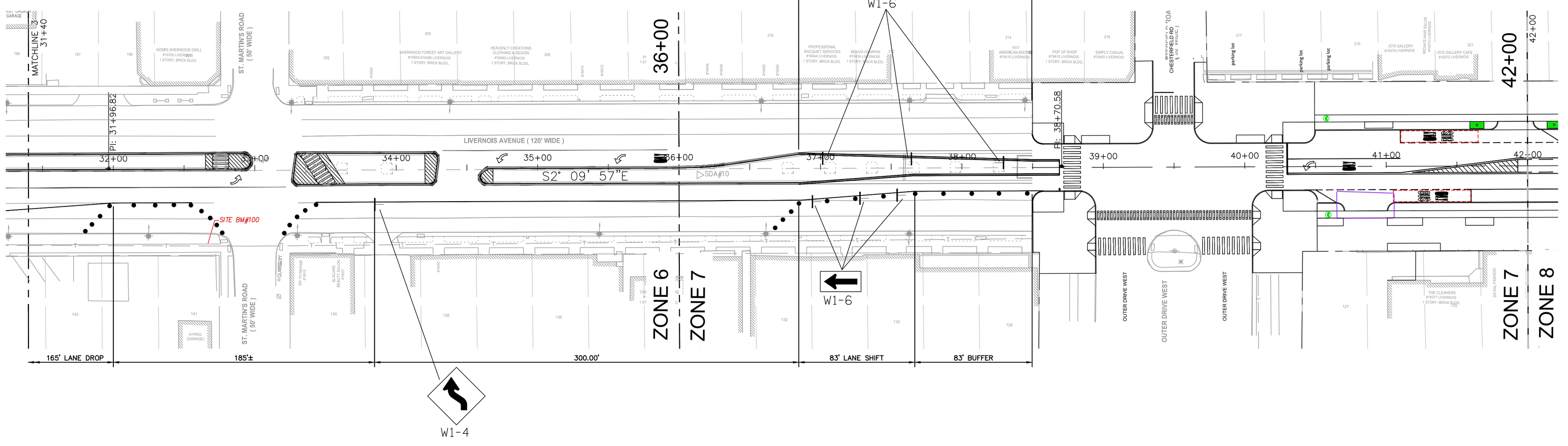




TEMPORARY MAINTENANCE OF TRAFFIC PLAN – TRANSITION: STA. 20+50 TO STA. 31+40
SCALE: 1" = 40'

NOTES

1. THE PURPOSE OF THESE PLANS IS TO PROVIDE TRAFFIC CONTROL FOLLOWING THE COMPLETION OF PHASE 1 RECONSTRUCTION AND PRIOR TO CONSTRUCTION OF THE NORTHERN PORTION OF THE PROJECT.
2. REFER TO SHEET No. C101 FOR MAINTENANCE OF TRAFFIC NOTES.
3. REFER TO MAINTENANCE OF TRAFFIC PLANS AND SIGNAGE AND PAVEMENT MARKING PLANS FOR ADDITIONAL INFORMATION.



TEMPORARY MAINTENANCE OF TRAFFIC PLAN – TRANSITION: STA. 31+40 TO STA. 42+00
SCALE: 1" = 40'

LEGEND

- WORK ZONE
- PLASTIC DRUMS
- LIGHTED ARROW PANEL
- TEMPORARY PAVEMENT STRIPING
- TEMPORARY TRAFFIC FLOW ARROW
- TYPE III BARRICADE
- TEMPORARY SIGN, TYPE B

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

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Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

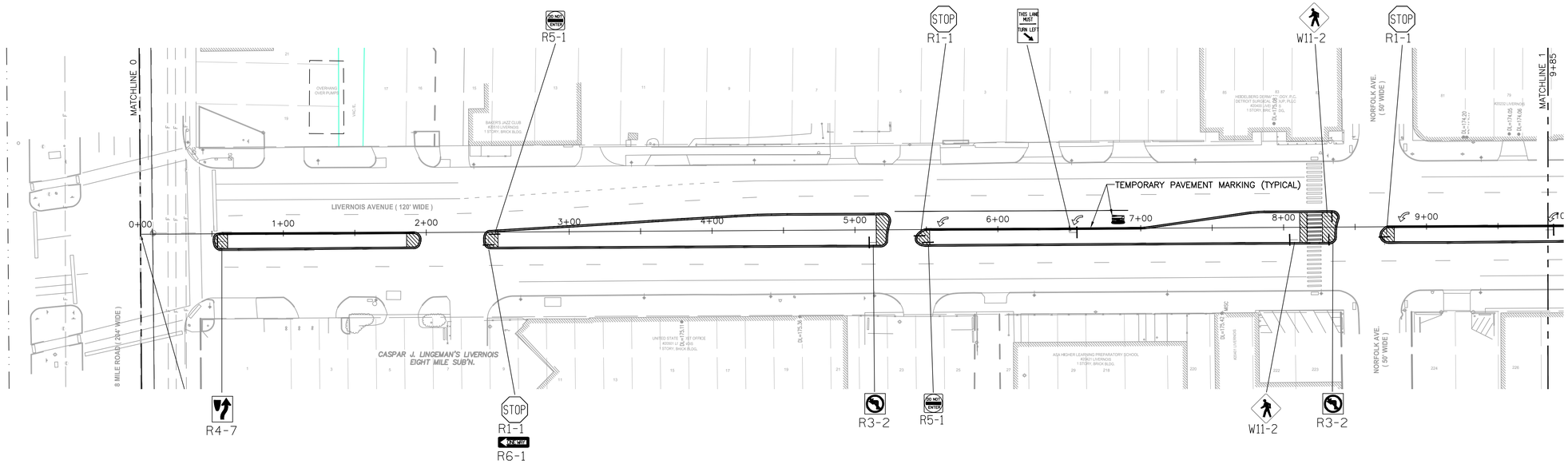
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: MAINTENANCE OF TRAFFIC TRANSITION

Sheet No: C208

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TEMPORARY SIGNAGE AND PAVEMENT MARKING PLAN: STA. 0+00 TO STA. 9+85

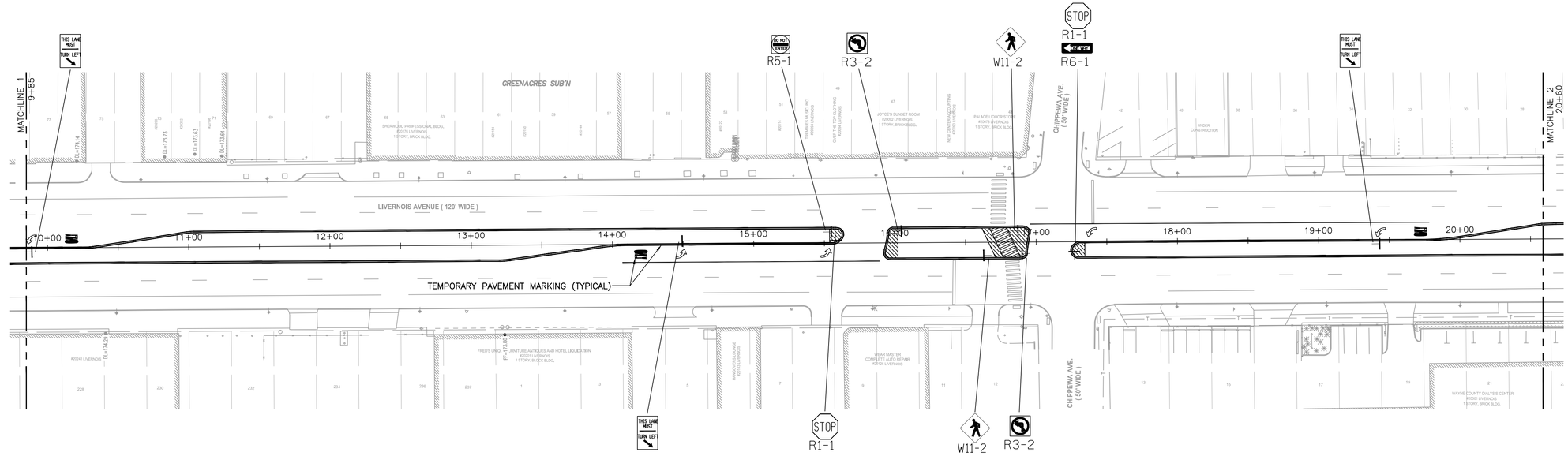
SCALE: 1" = 40'

LEGEND

- TEMPORARY DOUBLE YELLOW PAVEMENT MARKING (6" WIDE, EACH)
- TEMPORARY SINGLE WHITE PAVEMENT MARKING (4" WIDE)
- TEMPORARY TRAFIC FLOW ARROW
- TEMPORARY SIGN, TYPE B

NOTES

1. CONTRACTOR MAY COMBINE MULTIPLE SIGNS ON A COMMON POLE WHEREVER PRACTICAL.



TEMPORARY SIGNAGE AND PAVEMENT MARKING PLAN: STA. 9+85 TO STA. 20+60

SCALE: 1" = 40'

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1-800-482-7171
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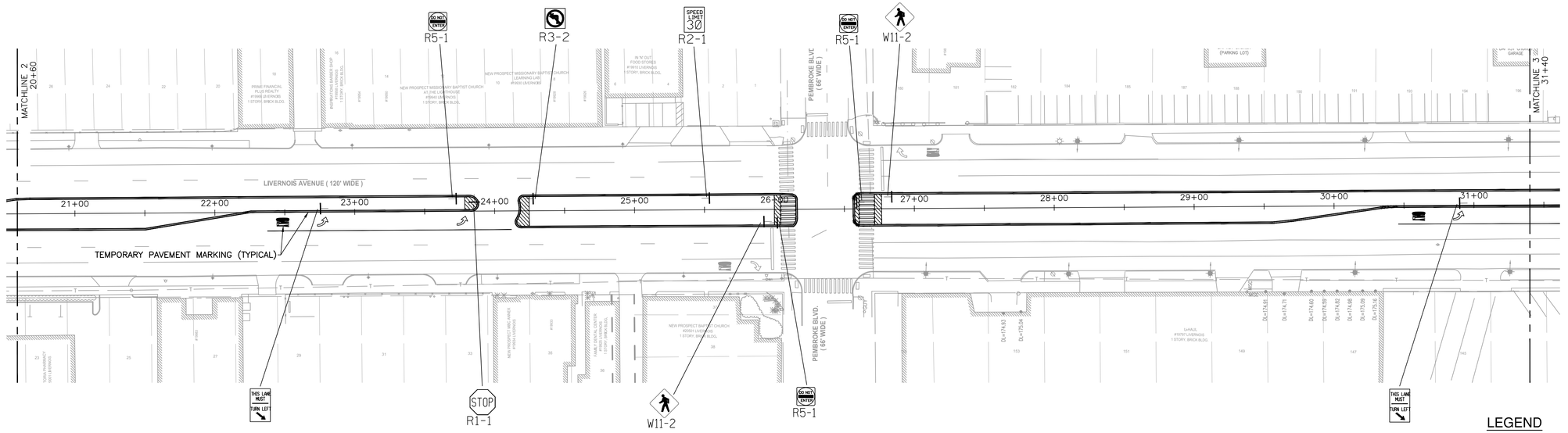
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: TEMPORARY SIGNAGE & PAVEMENT MARKING - STA. 0+00 TO STA. 20+60

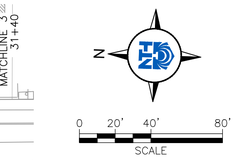
Sheet No: C251

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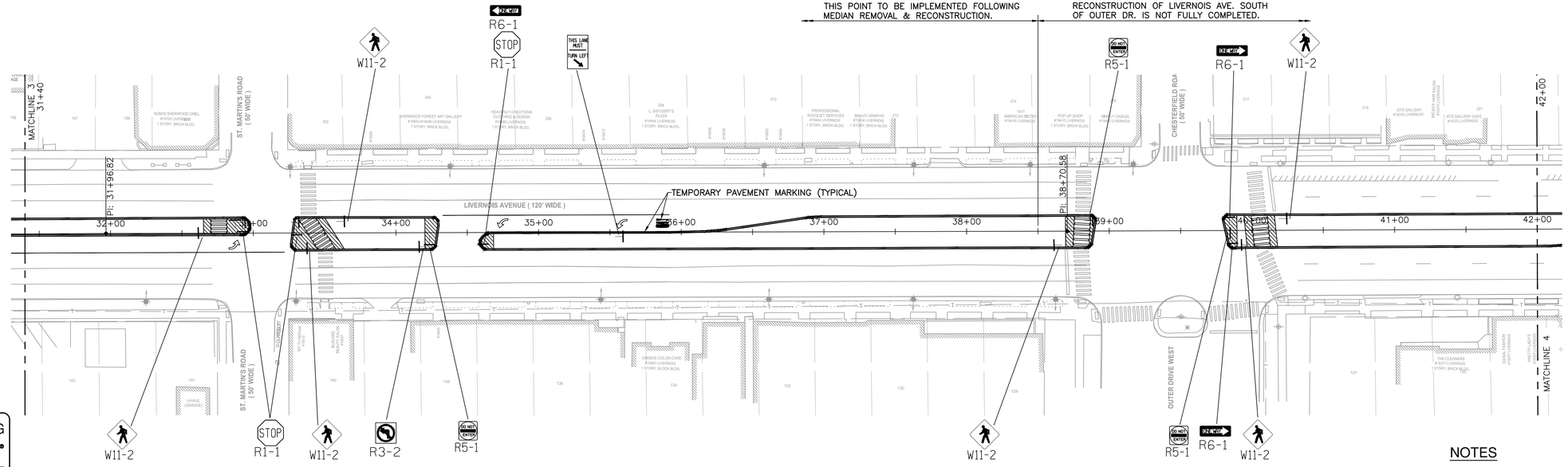
SIGNAGE AND PAVEMENT MARKING PLAN: STA. 20+60 TO STA. 31+40

SCALE: 1" = 40'



LEGEND

- TEMPORARY DOUBLE YELLOW PAVEMENT MARKING (6" WIDE, EACH)
- TEMPORARY SINGLE WHITE PAVEMENT MARKING (4" WIDE)
- TEMPORARY TRAFIC FLOW ARROW
- TEMPORARY SIGN, TYPE B



SIGNAGE AND PAVEMENT MARKING PLAN: STA. 31+40 TO STA. 42+00

SCALE: 1" = 40'



NOTES

1. CONTRACTOR MAY COMBINE MULTIPLE SIGNS ON A COMMON POLE WHEREVER PRACTICAL.

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Blue WATER
Green STORM DRAIN
Brown SEWER
Pink SURVEYING
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SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

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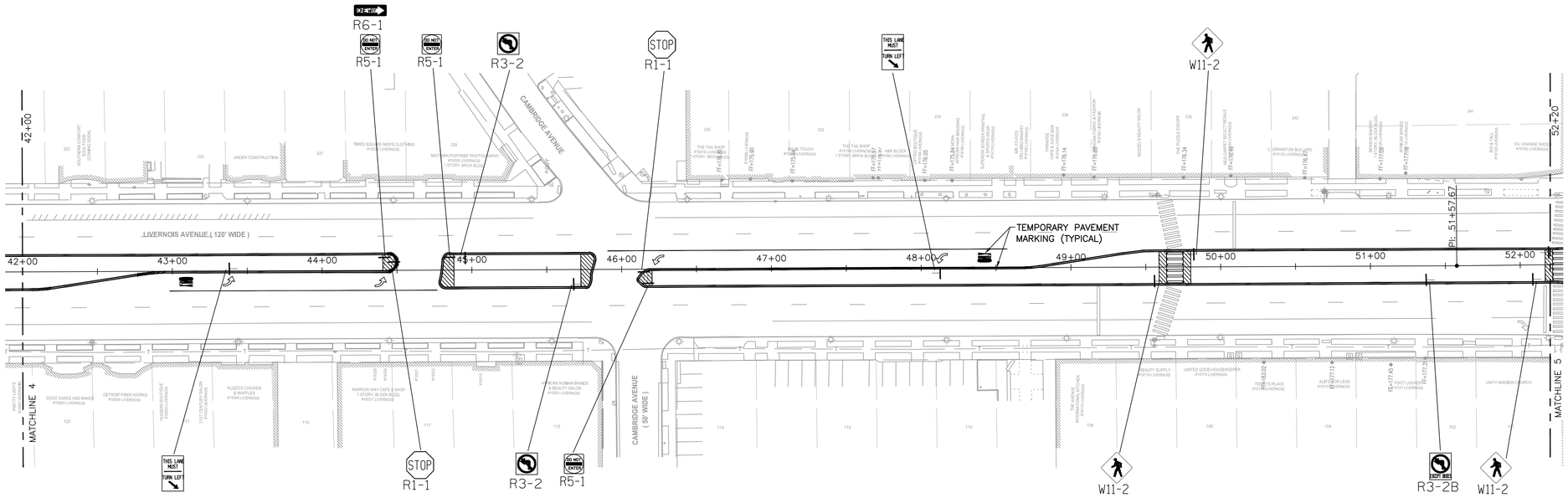
REVISION

NO.	DESCRIPTION	BY	APP'D	DATE

Sheet Title: TEMPORARY SIGNAGE & PAVEMENT MARKING - STA. 20+60 TO STA. 42+00

Sheet No: C252

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SIGNAGE AND PAVEMENT MARKING PLAN: STA. 42+00 TO STA. 52+20

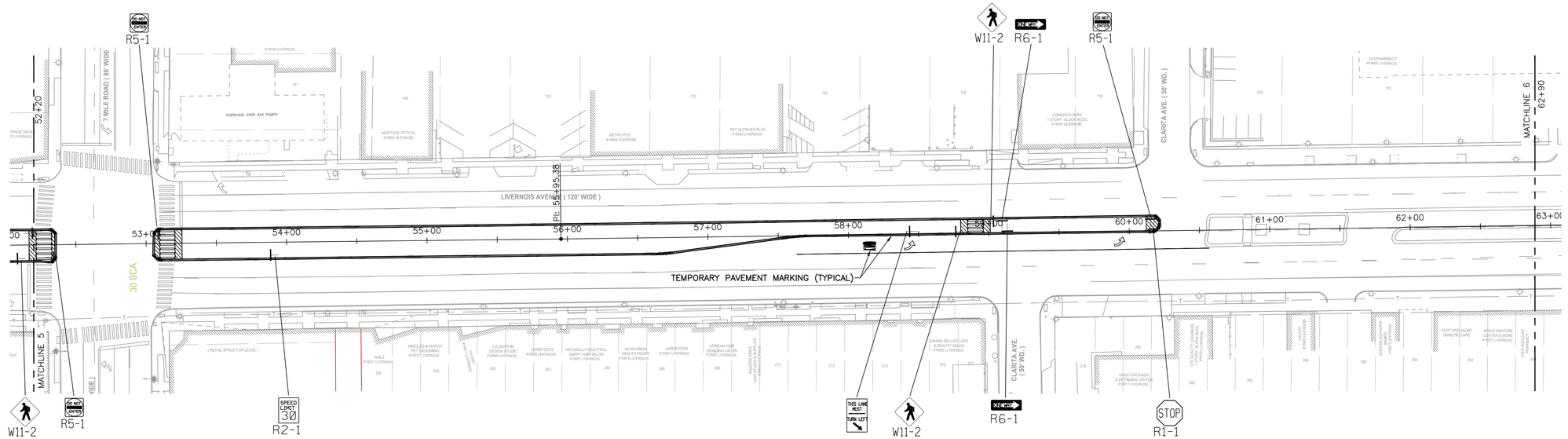
SCALE: 1" = 40'

LEGEND

- TEMPORARY DOUBLE YELLOW PAVEMENT MARKING (6" WIDE, EACH)
- TEMPORARY SINGLE WHITE PAVEMENT MARKING (4" WIDE)
- TEMPORARY TRAFIC FLOW ARROW
- TEMPORARY SIGN, TYPE B

NOTES

1. CONTRACTOR MAY COMBINE MULTIPLE SIGNS ON A COMMON POLE WHEREVER PRACTICAL.



SIGNAGE AND PAVEMENT MARKING PLAN: STA. 52+20 TO STA. 62+90

SCALE: 1" = 40'

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ALTERNATE NUMBER (810) MISS-DIG
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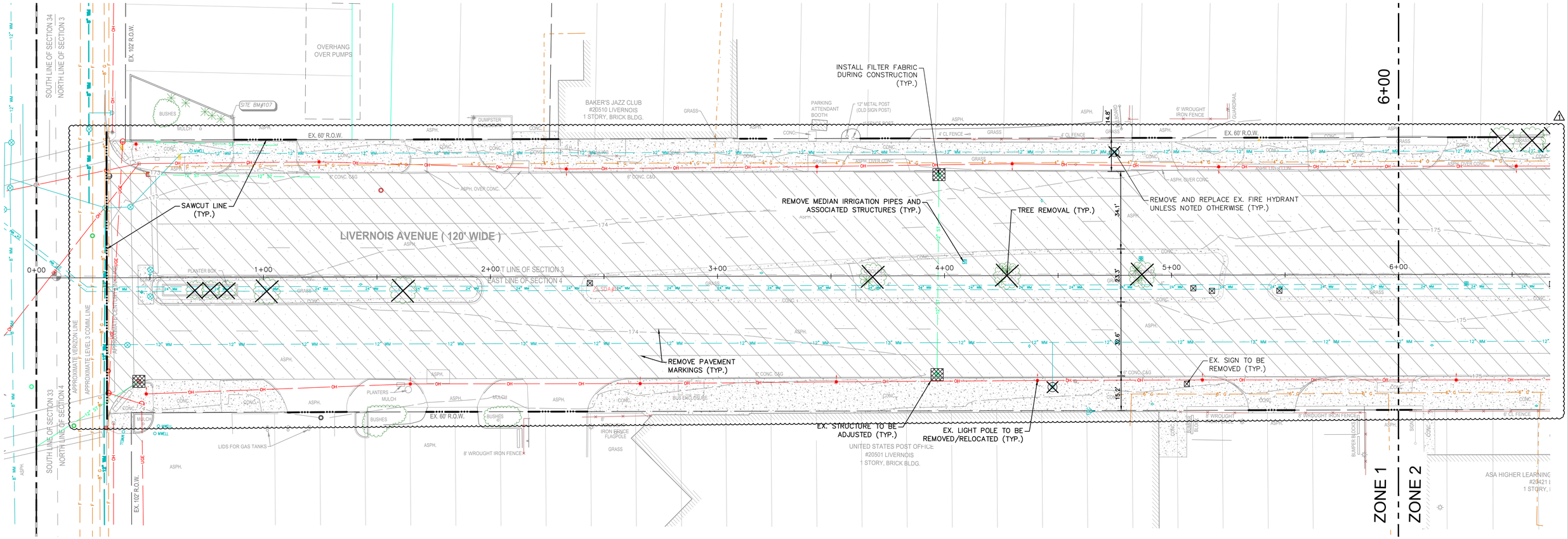
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: TEMPORARY SIGNAGE & PAVEMENT MARKING - STA. 42+00 TO STA. 62+90

Sheet No: C253

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

1. GENERAL
   - 1.1. DEMOLITION ACTIVITIES ARE TO BE COMPLETED ACROSS THE ENTIRE 120' WIDTH OF LIVERNOIS AVENUE RIGHT-OF-WAY. SEE SHEET C003 – STAGING PLAN FOR PROPOSED PHASING OF CONSTRUCTION.
   - 1.2. REPLACE ALL EX. STRUCTURES CURRENTLY WITHIN THE EX. MEDIAN AND/OR WITHIN THE LIMITS OF PR. ROADWAY THAT ARE TO REMAIN WITH TRAFFIC-RATED FRAME AND CASTING, AS REQUIRED. ADJUST RIM HEIGHT PER PLAN. SEE SHEETS C401-C411.
   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
5. IRRIGATION
   - 5.1. REMOVE AND DISPOSE OF ALL IRRIGATION STRUCTURES, SPRINKLERS, AND PIPING WITHIN MEDIAN.
6. STREET ART
   - 6.1. REMOVE AND RETURN ALL STREET ART TO OWNER.
7. PARKING METER EQUIPMENT
   - 7.1. PARKING METERS AND ASSOCIATED EQUIPMENT TO BE REMOVED BY CITY OF DETROIT AND REPLACED 2' FROM PR. FACE OF CURB. SEE LANDSCAPE DRAWINGS FOR MORE DETAIL.
8. LIGHTING AND SIGNAL DISPOSAL
   - 8.1. SEE LIGHTING AND TRAFFIC PLANS FOR MORE DETAIL.
9. PEDESTRIAN EQUIPMENT
   - 9.1. ALL PEDESTRIAN CROSSWALK AND TRAFFIC SIGNAL EQUIPMENT TO BE REMOVED. SEE TRAFFIC PLANS FOR MORE DETAIL.
10. BUS SHELTERS
    - 10.1. EXISTING BUS SHELTERS TO BE REMOVED BY DETROIT DEPARTMENT OF TRANSPORTATION (DDOT)
11. STREET LIGHTING
    - 11.1. STREET LIGHTS TO BE REMOVED/REPLACED BY CONTRACTOR PER CITY OF DETROIT PUBLIC LIGHTING DEPT. PLANS (TO BE PROVIDED)

N

0 10' 20' 40'
SCALE

3 WORKING DAYS
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CALL MISS DIG ®
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For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

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Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

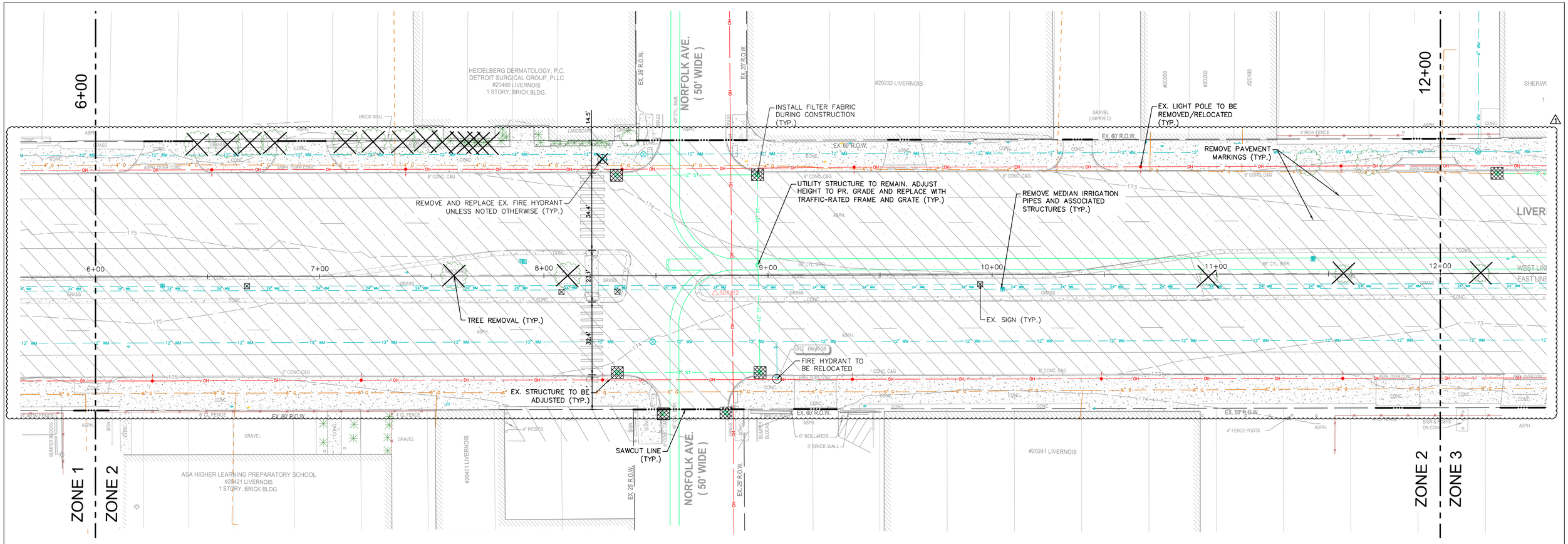
Sheet Title

DEMOLITION AND SESC - STA. 0+00 TO 6+00

Sheet No:

C301

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

1. GENERAL
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   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
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8. LIGHTING AND SIGNAL DISPOSAL
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N

0 10' 20' 40'
SCALE

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LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

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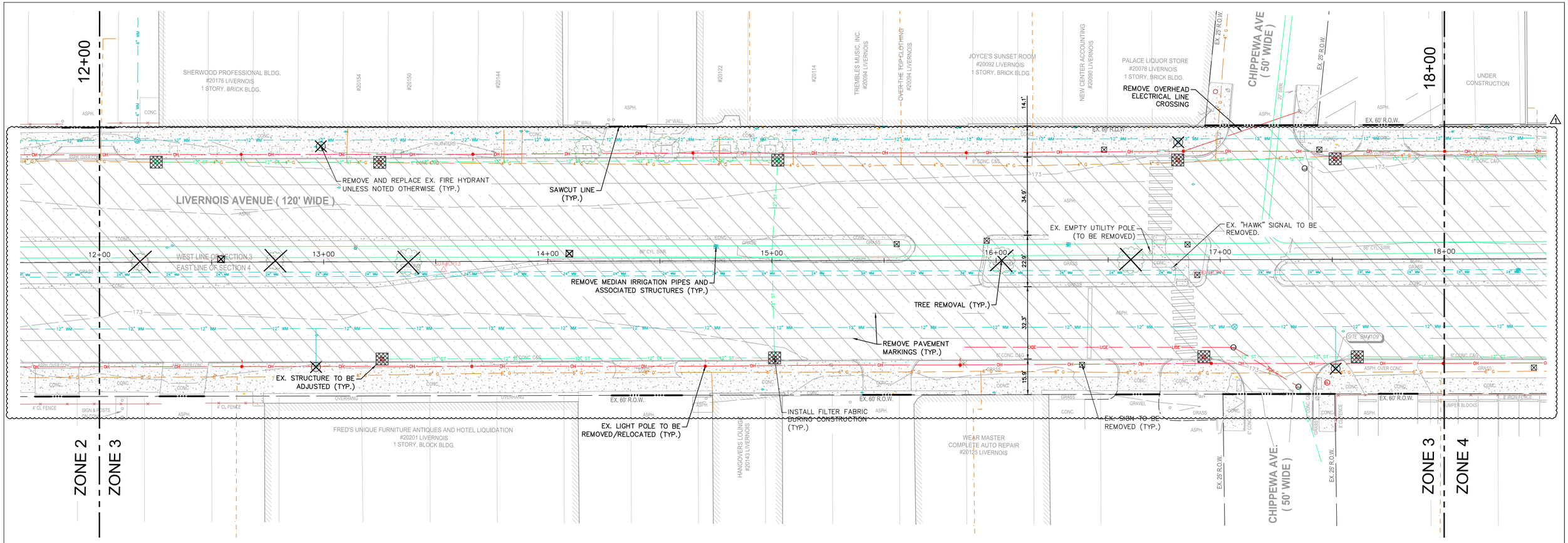
Sheet Title

DEMOLITION AND SESC - STA. 6+00 TO 12+00

Sheet No:

C302

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
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- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

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11. STREET LIGHTING
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N

0 10' 20' 40'
SCALE

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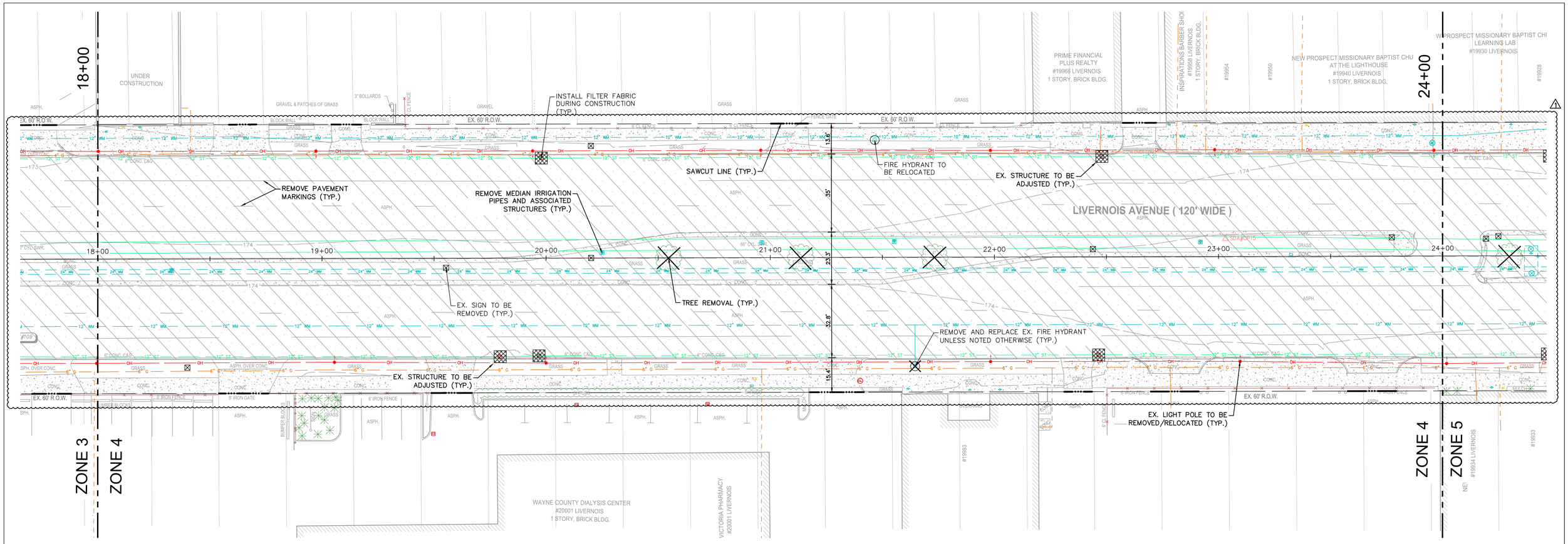
Sheet Title

DEMOLITION AND SESC - STA. 12+00 TO 18+00

Sheet No:

C303

A:\2017\61\170118\production sets\livernois streetscape\170118-demo sheet.dwg Plotted: 2/7/2019 1:02 PM by bbostock



LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

1. GENERAL
   - 1.1. DEMOLITION ACTIVITIES ARE TO BE COMPLETED ACROSS THE ENTIRE 120' WIDTH OF LIVERNOIS AVENUE RIGHT-OF-WAY. SEE SHEET C003 – STAGING PLAN FOR PROPOSED PHASING OF CONSTRUCTION.
   - 1.2. REPLACE ALL EX. STRUCTURES CURRENTLY WITHIN THE EX. MEDIAN AND/OR WITHIN THE LIMITS OF PR. ROADWAY THAT ARE TO REMAIN WITH TRAFFIC-RATED FRAME AND CASTING, AS REQUIRED. ADJUST RIM HEIGHT PER PLAN. SEE SHEETS C401-C411.
   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
5. IRRIGATION
   - 5.1. REMOVE AND DISPOSE OF ALL IRRIGATION STRUCTURES, SPRINKLERS, AND PIPING WITHIN MEDIAN.
6. STREET ART
   - 6.1. REMOVE AND RETURN ALL STREET ART TO OWNER.
7. PARKING METER EQUIPMENT
   - 7.1. PARKING METERS AND ASSOCIATED EQUIPMENT TO BE REMOVED BY CITY OF DETROIT AND REPLACED 2' FROM PR. FACE OF CURB. SEE LANDSCAPE DRAWINGS FOR MORE DETAIL.
8. LIGHTING AND SIGNAL DISPOSAL
   - 8.1. SEE LIGHTING AND TRAFFIC PLANS FOR MORE DETAIL.
9. PEDESTRIAN EQUIPMENT
   - 9.1. ALL PEDESTRIAN CROSSWALK AND TRAFFIC SIGNAL EQUIPMENT TO BE REMOVED. SEE TRAFFIC PLANS FOR MORE DETAIL.
10. BUS SHELTERS
    - 10.1. EXISTING BUS SHELTERS TO BE REMOVED BY DETROIT DEPARTMENT OF TRANSPORTATION (DDOT)
11. STREET LIGHTING
    - 11.1. STREET LIGHTS TO BE REMOVED/REPLACED BY CONTRACTOR PER CITY OF DETROIT PUBLIC LIGHTING DEPT. PLANS (TO BE PROVIDED)

N

0 10' 20' 40'
SCALE

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T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

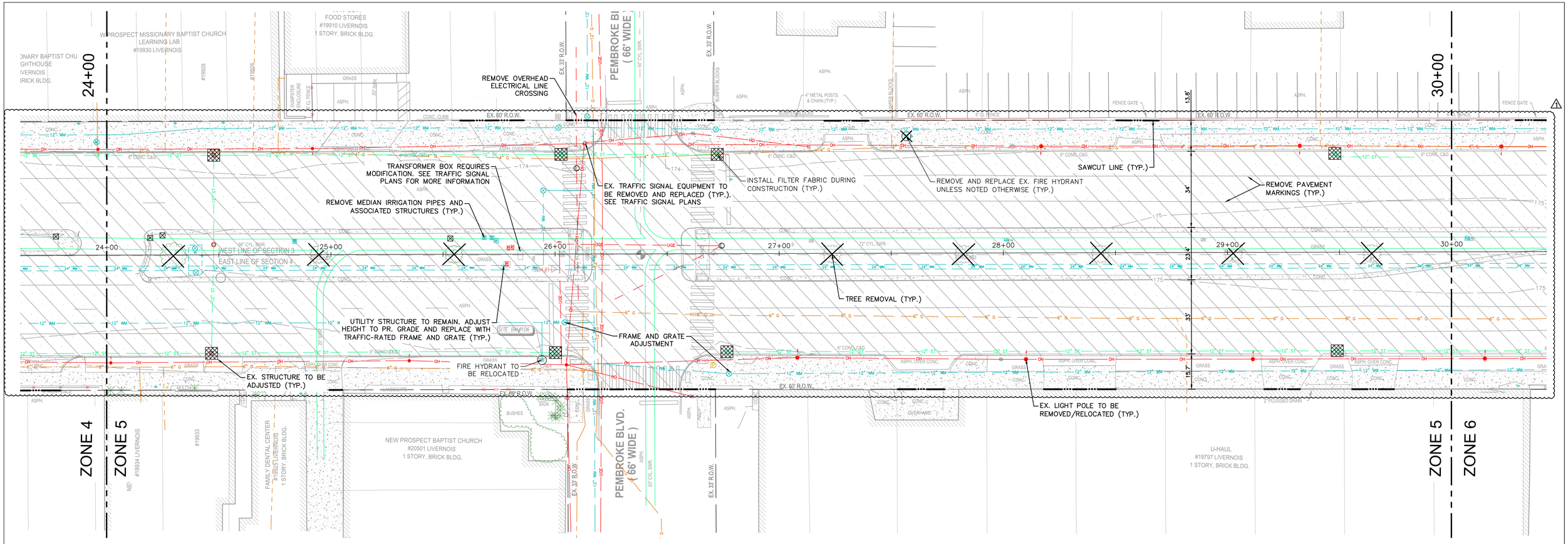
Sheet Title

DEMOLITION AND SESC - STA. 18+00 TO 24+00

Sheet No:

C304

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

1. GENERAL
   - 1.1. DEMOLITION ACTIVITIES ARE TO BE COMPLETED ACROSS THE ENTIRE 120' WIDTH OF LIVERNOIS AVENUE RIGHT-OF-WAY. SEE SHEET C003 – STAGING PLAN FOR PROPOSED PHASING OF CONSTRUCTION.
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   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
5. IRRIGATION
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6. STREET ART
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7. PARKING METER EQUIPMENT
   - 7.1. PARKING METERS AND ASSOCIATED EQUIPMENT TO BE REMOVED BY CITY OF DETROIT AND REPLACED 2' FROM PR. FACE OF CURB. SEE LANDSCAPE DRAWINGS FOR MORE DETAIL.
8. LIGHTING AND SIGNAL DISPOSAL
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9. PEDESTRIAN EQUIPMENT
   - 9.1. ALL PEDESTRIAN CROSSWALK AND TRAFFIC SIGNAL EQUIPMENT TO BE REMOVED. SEE TRAFFIC PLANS FOR MORE DETAIL.
10. BUS SHELTERS
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11. STREET LIGHTING
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N

0 10' 20' 40'
SCALE

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

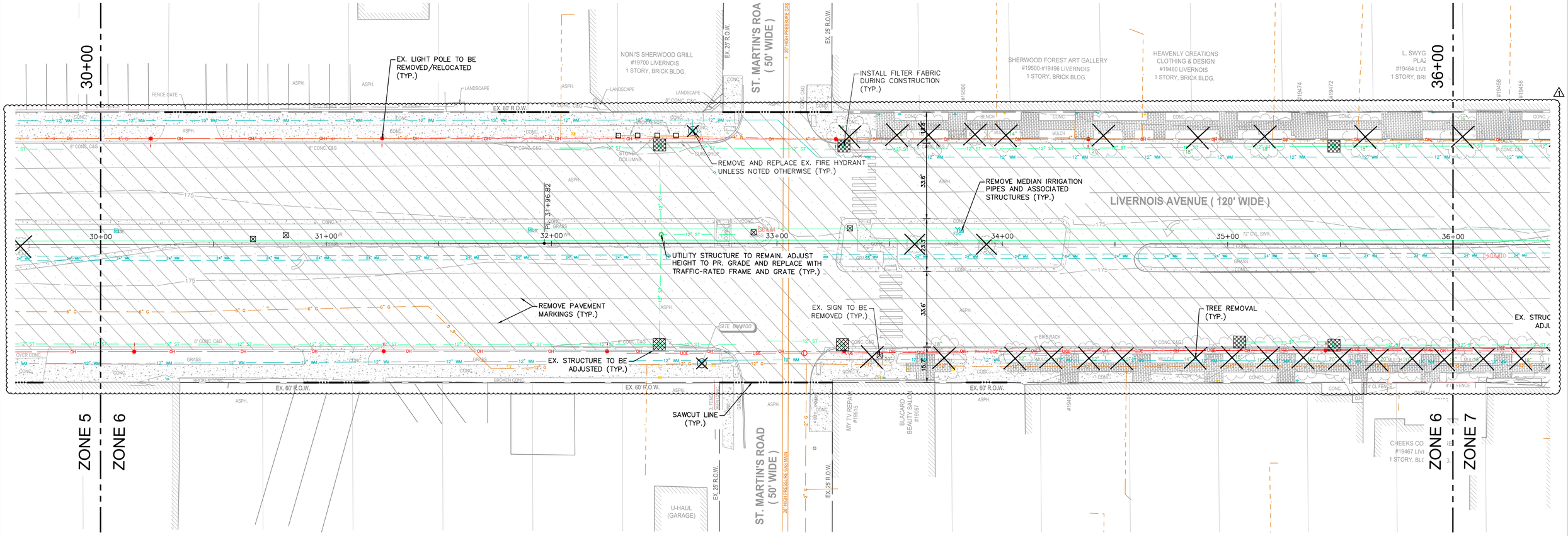
Sheet Title

DEMOLITION AND SESC - STA. 24+00 TO 30+00

Sheet No:

C305

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

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   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
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7. PARKING METER EQUIPMENT
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8. LIGHTING AND SIGNAL DISPOSAL
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9. PEDESTRIAN EQUIPMENT
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N

0 10' 20' 40'
SCALE

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

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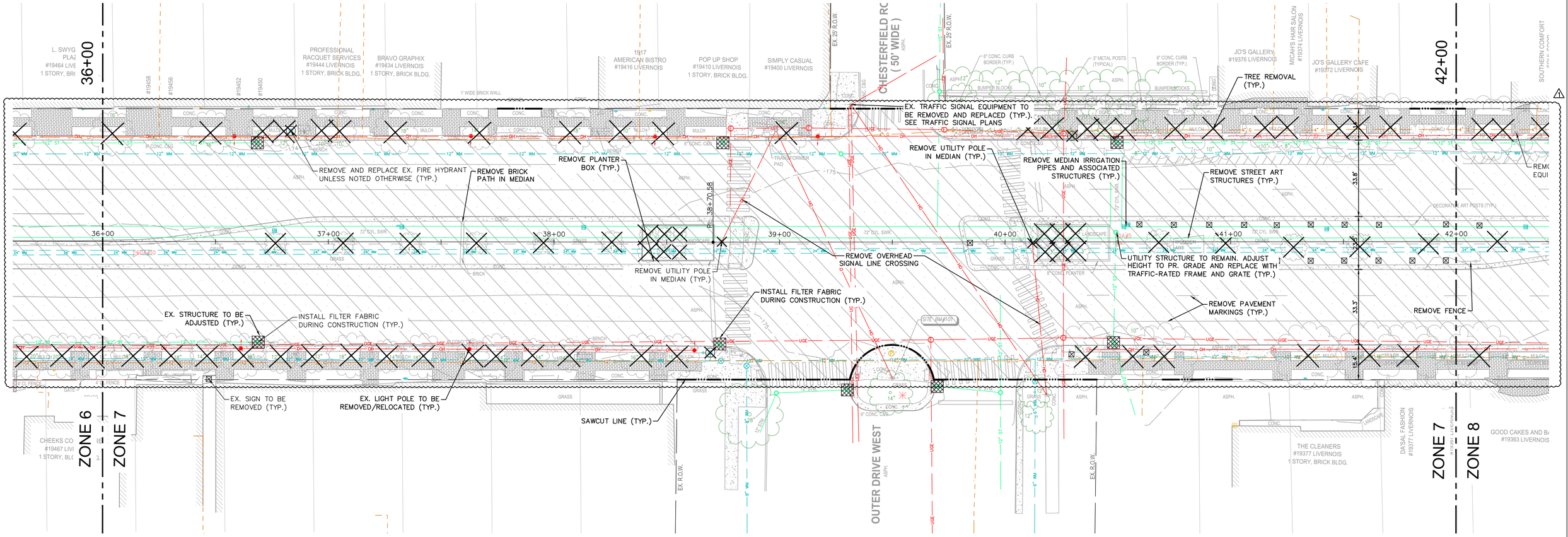
Sheet Title

DEMOLITION AND SESC - STA. 30+00 TO 36+00

Sheet No:

C306

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

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   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
5. IRRIGATION
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6. STREET ART
   - 6.1. REMOVE AND RETURN ALL STREET ART TO OWNER.
7. PARKING METER EQUIPMENT
   - 7.1. PARKING METERS AND ASSOCIATED EQUIPMENT TO BE REMOVED BY CITY OF DETROIT AND REPLACED 2' FROM PR. FACE OF CURB. SEE LANDSCAPE DRAWINGS FOR MORE DETAIL.
8. LIGHTING AND SIGNAL DISPOSAL
   - 8.1. SEE LIGHTING AND TRAFFIC PLANS FOR MORE DETAIL.
9. PEDESTRIAN EQUIPMENT
   - 9.1. ALL PEDESTRIAN CROSSWALK AND TRAFFIC SIGNAL EQUIPMENT TO BE REMOVED. SEE TRAFFIC PLANS FOR MORE DETAIL.
10. BUS SHELTERS
    - 10.1. EXISTING BUS SHELTERS TO BE REMOVED BY DETROIT DEPARTMENT OF TRANSPORTATION (DDOT)
11. STREET LIGHTING
    - 11.1. STREET LIGHTS TO BE REMOVED/REPLACED BY CONTRACTOR PER CITY OF DETROIT PUBLIC LIGHTING DEPT. PLANS (TO BE PROVIDED)

N

0 10' 20' 40'
SCALE

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

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1	ADDENDUM 1	2/8/19

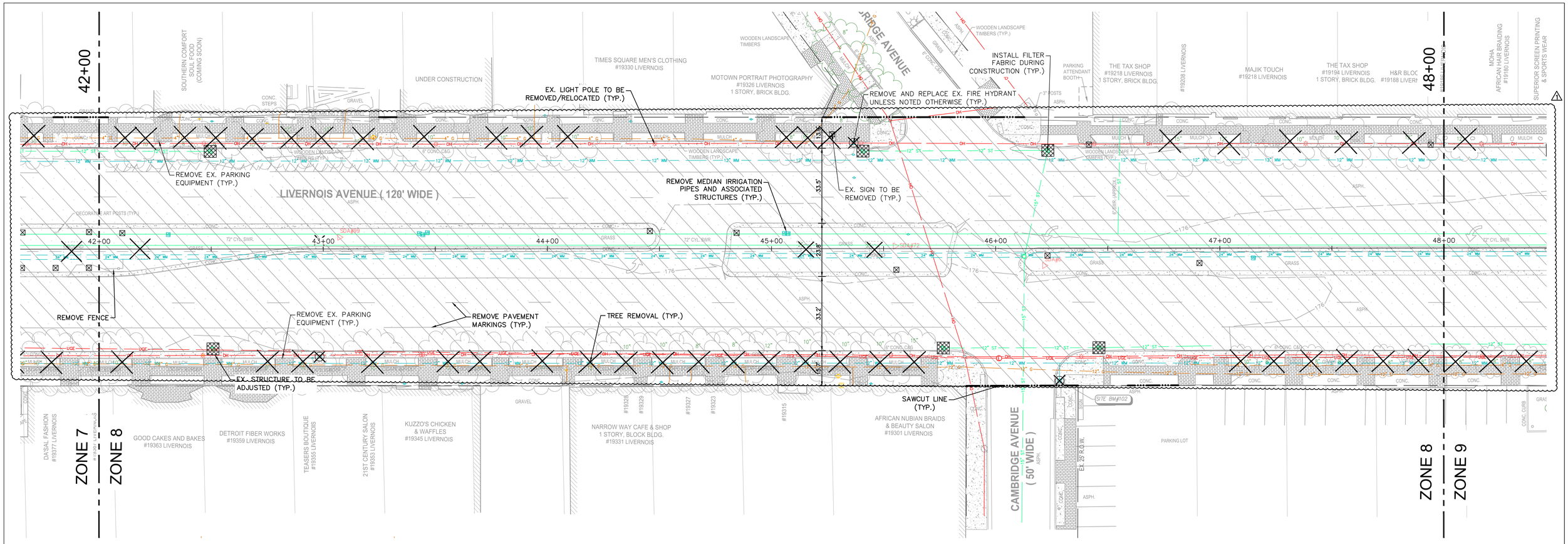
Sheet Title

DEMOLITION AND SESC - STA. 36+00 TO 42+00

Sheet No:

C307

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

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2. VEGETATION
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3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
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4. FIRE HYDRANTS
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5. IRRIGATION
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6. STREET ART
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7. PARKING METER EQUIPMENT
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8. LIGHTING AND SIGNAL DISPOSAL
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N

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SCALE

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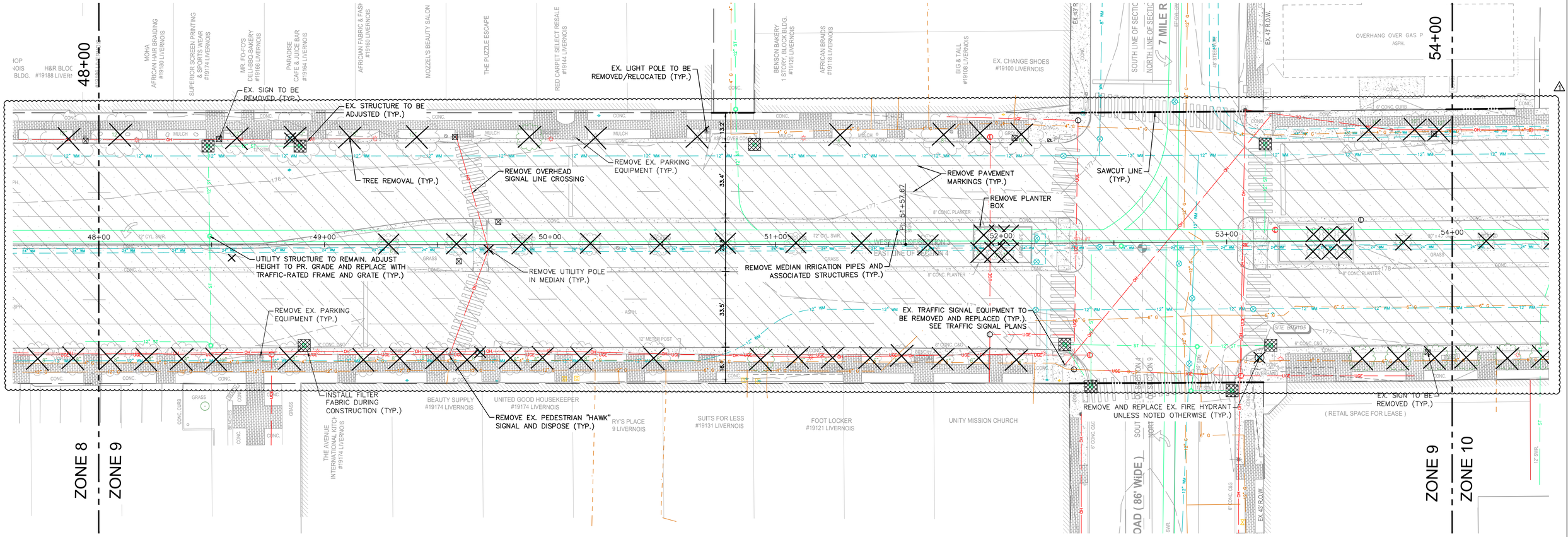
Sheet Title

DEMOLITION AND SESC - STA. 42+00 TO 48+00

Sheet No:

C308

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION
- ⚠1

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Red	ELECTRIC*	Brown	SEWER
		Pink	SURVEYING

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Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

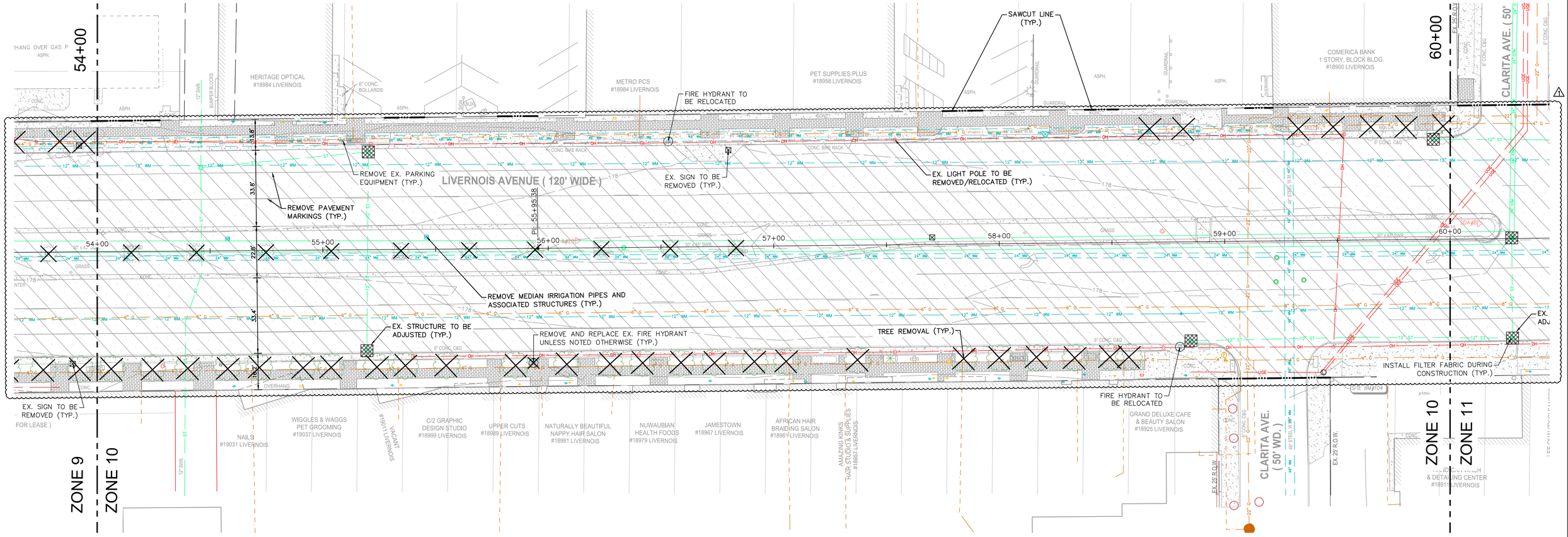
Sheet Title

DEMOLITION AND SESC - STA. 48+00 TO 54+00

Sheet No:

C309

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

DEMOLITION NOTES:

1. GENERAL
   - 1.1. DEMOLITION ACTIVITIES ARE TO BE COMPLETED ACROSS THE ENTIRE 120' WIDTH OF LIVERNOIS AVENUE RIGHT-OF-WAY. SEE SHEET C003 – STAGING PLAN FOR PROPOSED PHASING OF CONSTRUCTION.
   - 1.2. REPLACE ALL EX. STRUCTURES CURRENTLY WITHIN THE EX. MEDIAN AND/OR WITHIN THE LIMITS OF PR. ROADWAY THAT ARE TO REMAIN WITH TRAFFIC-RATED FRAME AND CASTING, AS REQUIRED. ADJUST RIM HEIGHT PER PLAN. SEE SHEETS C401-C411.
   - 1.3. SEE CONSTRUCTION PLAN AND PROFILE SHEETS (SHEETS C501-C520) FOR PROPOSED SPOT GRADES AND SLOPES.
2. VEGETATION
   - 2.1. REMOVE ALL TREES/VEGETATION WITHIN THE MEDIAN AND UP TO RIGHT-OF-WAY BOUNDARY AND/OR SAW CUT LINE.
3. SIGNAGE/STRIPING
   - 3.1. SALVAGE ALL REMOVED SIGNS FOR FUTURE REINSTALLATION OR PROVIDE TO OWNER.
   - 3.2. REMOVE ALL EXISTING PAVEMENT MARKING WITHIN PROJECT AREA.
4. FIRE HYDRANTS
   - 4.1. FIRE HYDRANTS ARE TO BE RELOCATED OR REPLACED BY CONTRACTOR. SEE THESE SHEETS AND SHEETS C401-C411 FOR MORE DETAIL.
5. IRRIGATION
   - 5.1. REMOVE AND DISPOSE OF ALL IRRIGATION STRUCTURES, SPRINKLERS, AND PIPING WITHIN MEDIAN.
6. STREET ART
   - 6.1. REMOVE AND RETURN ALL STREET ART TO OWNER.
7. PARKING METER EQUIPMENT
   - 7.1. PARKING METERS AND ASSOCIATED EQUIPMENT TO BE REMOVED BY CITY OF DETROIT AND REPLACED 2' FROM PR. FACE OF CURB. SEE LANDSCAPE DRAWINGS FOR MORE DETAIL.
8. LIGHTING AND SIGNAL DISPOSAL
   - 8.1. SEE LIGHTING AND TRAFFIC PLANS FOR MORE DETAIL.
9. PEDESTRIAN EQUIPMENT
   - 9.1. ALL PEDESTRIAN CROSSWALK AND TRAFFIC SIGNAL EQUIPMENT TO BE REMOVED. SEE TRAFFIC PLANS FOR MORE DETAIL.
10. BUS SHELTERS
    - 10.1. EXISTING BUS SHELTERS TO BE REMOVED BY DETROIT DEPARTMENT OF TRANSPORTATION (DDOT)
11. STREET LIGHTING
    - 11.1. STREET LIGHTS TO BE REMOVED/REPLACED BY CONTRACTOR PER CITY OF DETROIT PUBLIC LIGHTING DEPT. PLANS (TO BE PROVIDED)

N

0 10' 20' 40'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC*	Brown	SEWER
		Pink	SURVEYING

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

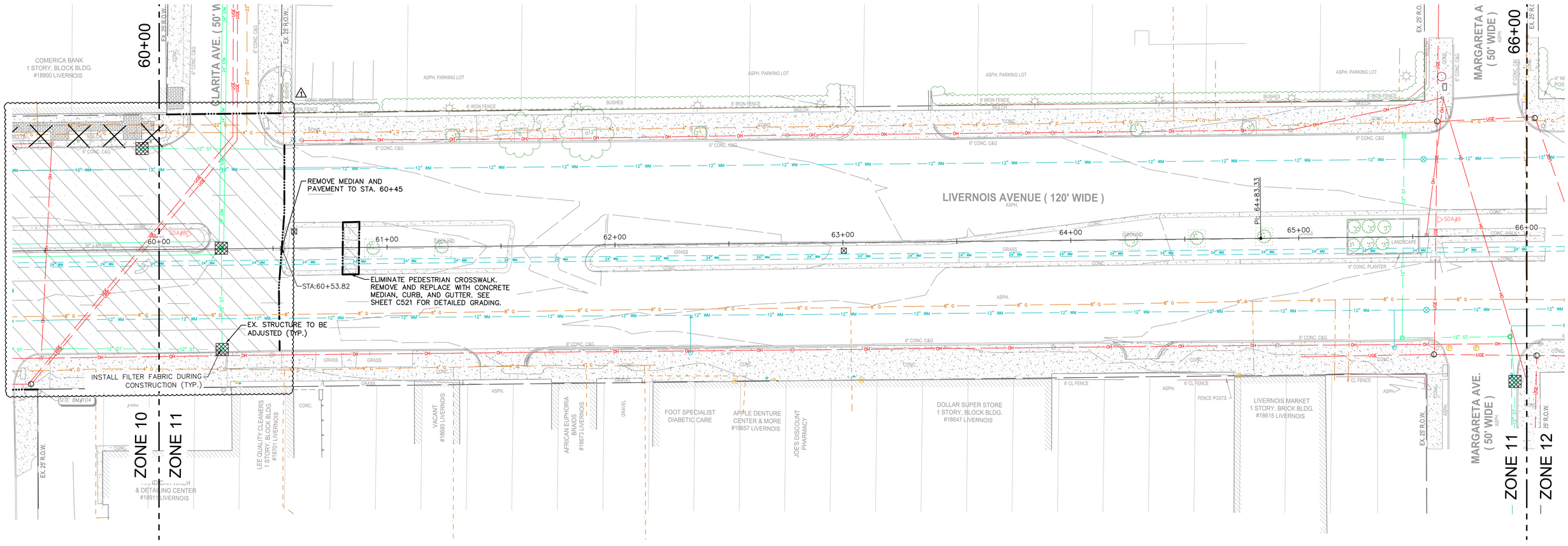
Sheet Title

DEMOLITION AND SESC - STA. 54+00 TO 60+00

Sheet No:

C310

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LEGEND

- PROPOSED SAW CUT LINE
- REMOVE EXISTING TREES AND PLANTS
- REMOVE EXISTING SIGNS
- REMOVE/REPLACE EXISTING FIRE HYDRANT, ASSOCIATED GATE VALVE AND WATERMAIN
- RELOCATE EXISTING FIRE HYDRANT
- PROPOSED FILTER FABRIC
- ROADWAY/MEDIAN DEMOLITION: FULL DEMOLITION

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N

0 10' 20' 40'
SCALE

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1-800-482-7171
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Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

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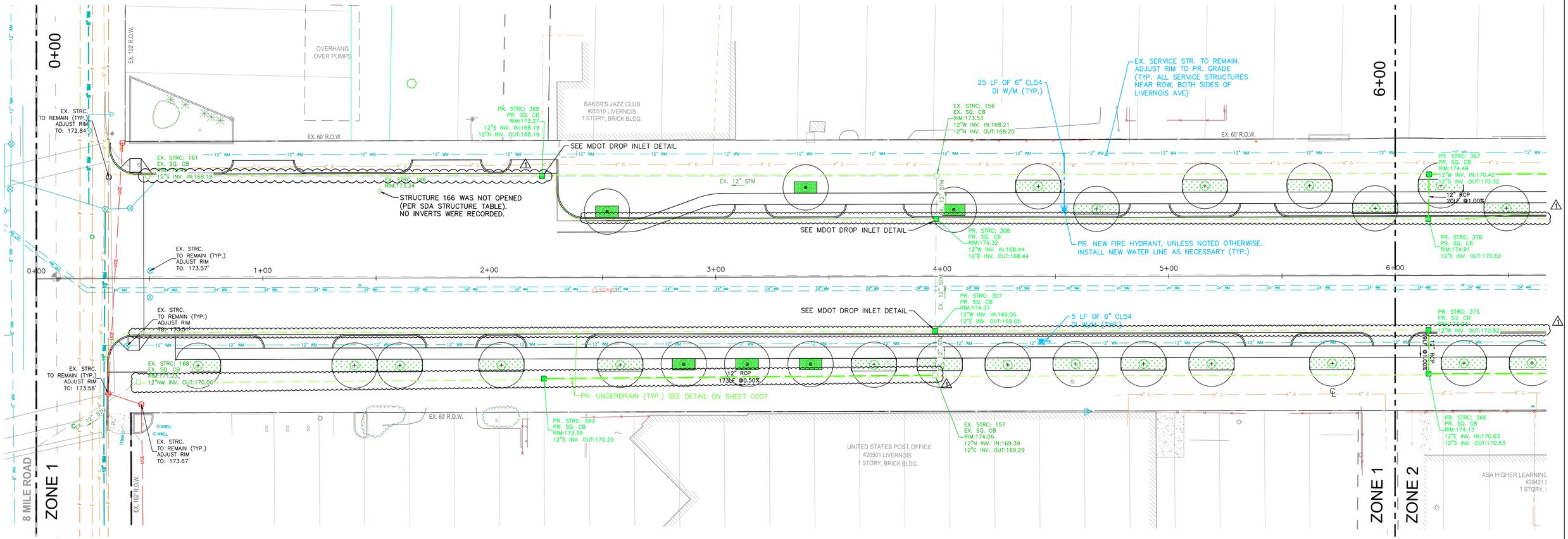
Sheet Title

DEMOLITION AND SESC - STA. 60+00 TO 66+00

Sheet No:

C311

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

NOTES:

1. LOCATION OF UTILITIES OR OTHER STRUCTURES SHOWN ON PLANS ARE TAKEN FROM SURVEY OF RECORD. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY OMISSIONS OR VARIATIONS. THE CONTRACTOR SHALL CONTACT MISS DIG A MINIMUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF WORK AND SHALL VERIFY ALL UNDERGROUND UTILITIES ON-SITE, PRIOR TO CONSTRUCTION.
2. FOR UTILITY DETAILS, SEE SHEETS C007-C010.
3. ALL PROPOSED CATCH BASINS SHALL HAVE FILTER FABRIC INSTALLED PER DETAIL ON SHEET C007 UNTIL CONSTRUCTION IS COMPLETED.
4. ALL PROPOSED STORM SEWER PIPES ARE TO BE CLASS IV REINFORCED CONCRETE PIPE UNLESS NOTED OTHERWISE.
5. EXISTING STORM SEWER GRATES IN PR. NEW SIDEWALK TO BE REPLACED WITH PEDESTRIAN-STYLE GRATE. EAST JORDAN IRON WORKS 1020MB, OR EQUIVALENT, WITH DWSD LOGO.
6. PROPOSED STORM WATER OVERFLOW STRUCTURES IN BIOSWALES TO BE BEEHIVE CATCH BASINS (EAST JORDAN IRON WORKS 29952 BEEHIVE GRATES, OR EQUIVALENT, WITH DWSD LOGO).
7. PROPOSED UNDERDRAIN IS TO RUN NORTH-SOUTH ON BOTH SIDES OF LIVERNOIS AVENUE AT LOW LINE IN SIDEWALK. SEE SHEET C007 FOR DETAIL.
8. ALL RIM ELEVATIONS FOR PROPOSED AND EXISTING STRUCTURES THAT ARE TO REMAIN WITHIN PAVEMENT AND/OR PROPOSED SIDEWALK MAY REQUIRE ADJUSTMENT DURING CONSTRUCTION. THE CONTRACTOR SHALL ADJUST ALL RIM ELEVATIONS AS NEEDED SUCH THAT CASTINGS ARE FLUSH WITH NEW PAVEMENT AND/OR SIDEWALK GRADES.
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11. FIRE HYDRANTS TO BE CONSTRUCTED PER DWSD STANDARD DETAILS. FIRE HYDRANTS TO BE INSTALLED A MINIMUM OF 3' FROM CURB. ALL FIRE HYDRANTS TO BE INSTALLED WITH A 6" LEAD LINE AND STANDARD DWSD 6" GATE VALVE AND BOX. SEE SHEET C010 FOR DETAIL.

N

0 10' 20' 40'
SCALE

3 WORKING DAYS
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		Pink	SURVEYING

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

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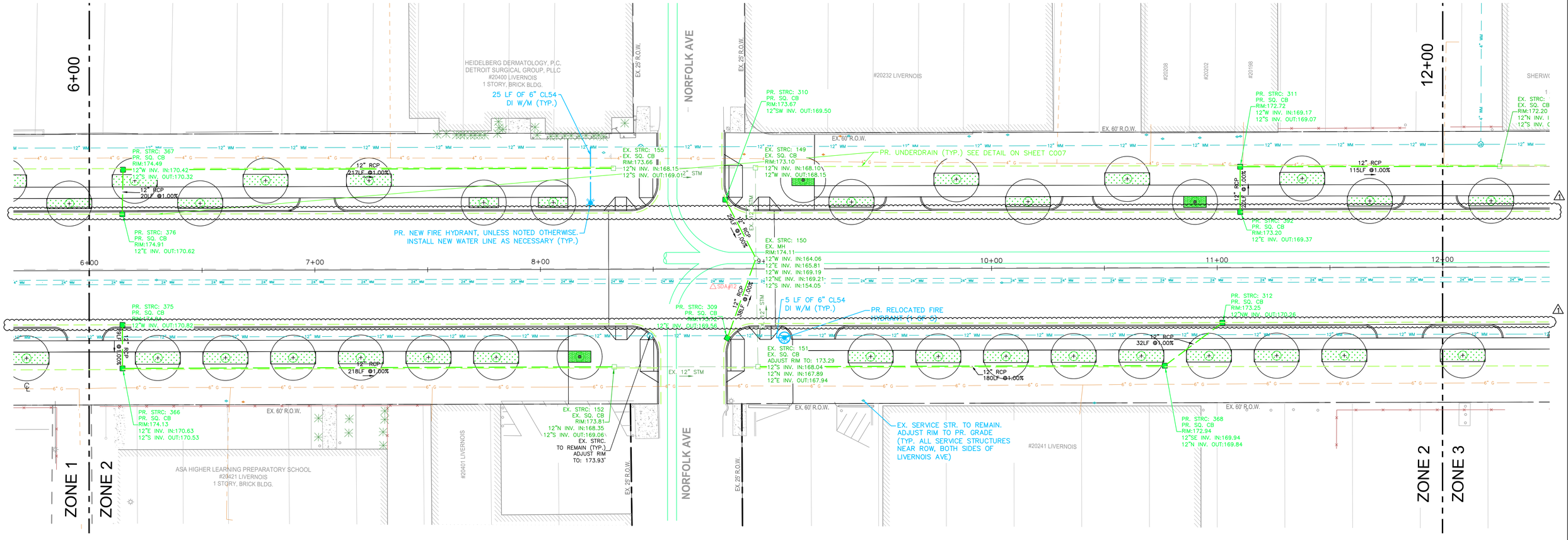
Sheet Title

UTILITY PLAN - STA. 0+00 TO 6+00

Sheet No:

C401

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

NOTES:

1. LOCATION OF UTILITIES OR OTHER STRUCTURES SHOWN ON PLANS ARE TAKEN FROM SURVEY OF RECORD. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY OMISSIONS OR VARIATIONS. THE CONTRACTOR SHALL CONTACT MISS DIG A MINIMUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF WORK AND SHALL VERIFY ALL UNDERGROUND UTILITIES ON-SITE, PRIOR TO CONSTRUCTION.
2. FOR UTILITY DETAILS, SEE SHEETS C007-C010.
3. ALL PROPOSED CATCH BASINS SHALL HAVE FILTER FABRIC INSTALLED PER DETAIL ON SHEET C007 UNTIL CONSTRUCTION IS COMPLETED.
4. ALL PROPOSED STORM SEWER PIPES ARE TO BE CLASS IV REINFORCED CONCRETE PIPE UNLESS NOTED OTHERWISE.
5. EXISTING STORM SEWER GRATES IN PR. NEW SIDEWALK TO BE REPLACED WITH PEDESTRIAN-STYLE GRATE. EAST JORDAN IRON WORKS 1020MB, OR EQUIVALENT, WITH DWSD LOGO.
6. PROPOSED STORM WATER OVERFLOW STRUCTURES IN BIOSWALES TO BE BEEHIVE CATCH BASINS (EAST JORDAN IRON WORKS 29952 BEEHIVE GRATES, OR EQUIVALENT, WITH DWSD LOGO).
7. PROPOSED UNDERDRAIN IS TO RUN NORTH-SOUTH ON BOTH SIDES OF LIVERNOIS AVENUE AT LOW LINE IN SIDEWALK. SEE SHEET C007 FOR DETAIL.
8. ALL RIM ELEVATIONS FOR PROPOSED AND EXISTING STRUCTURES THAT ARE TO REMAIN WITHIN PAVEMENT AND/OR PROPOSED SIDEWALK MAY REQUIRE ADJUSTMENT DURING CONSTRUCTION. THE CONTRACTOR SHALL ADJUST ALL RIM ELEVATIONS AS NEEDED SUCH THAT CASTINGS ARE FLUSH WITH NEW PAVEMENT AND/OR SIDEWALK GRADES.
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N

0 10' 20' 40'
SCALE

3 WORKING DAYS
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COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
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PROJECT

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LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

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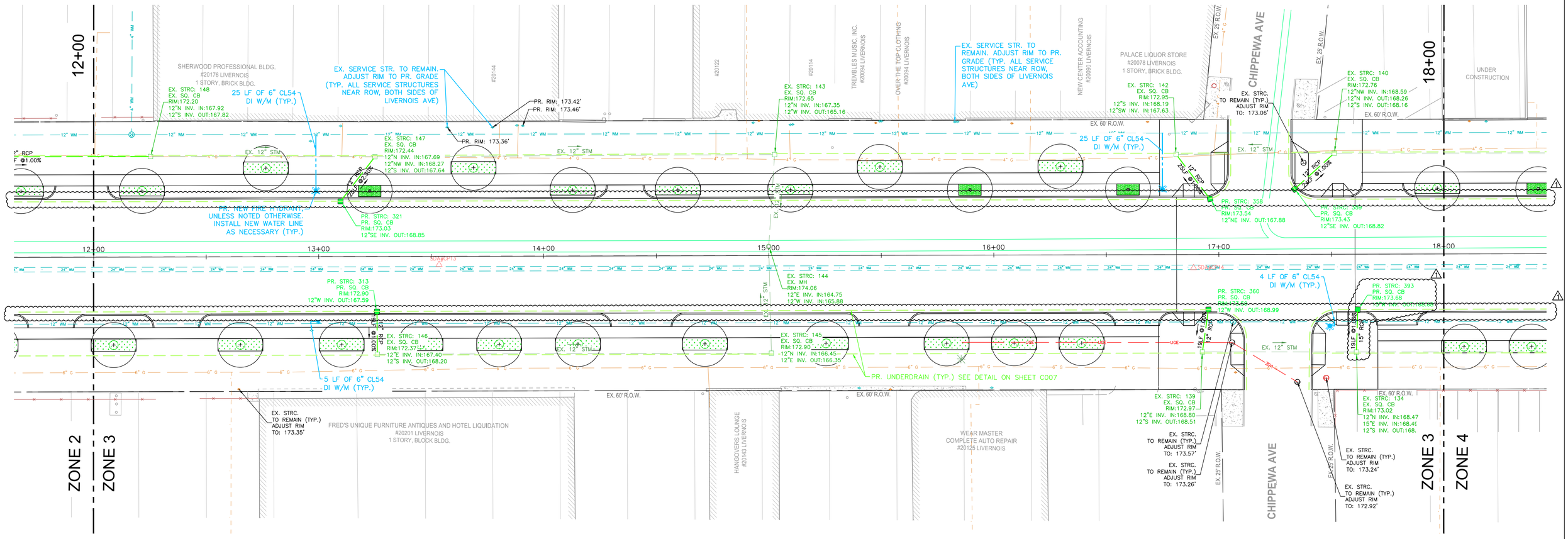
Sheet Title

UTILITY PLAN - STA. 6+00 TO 12+00

Sheet No:

C402

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

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N

0 10' 20' 40'
SCALE

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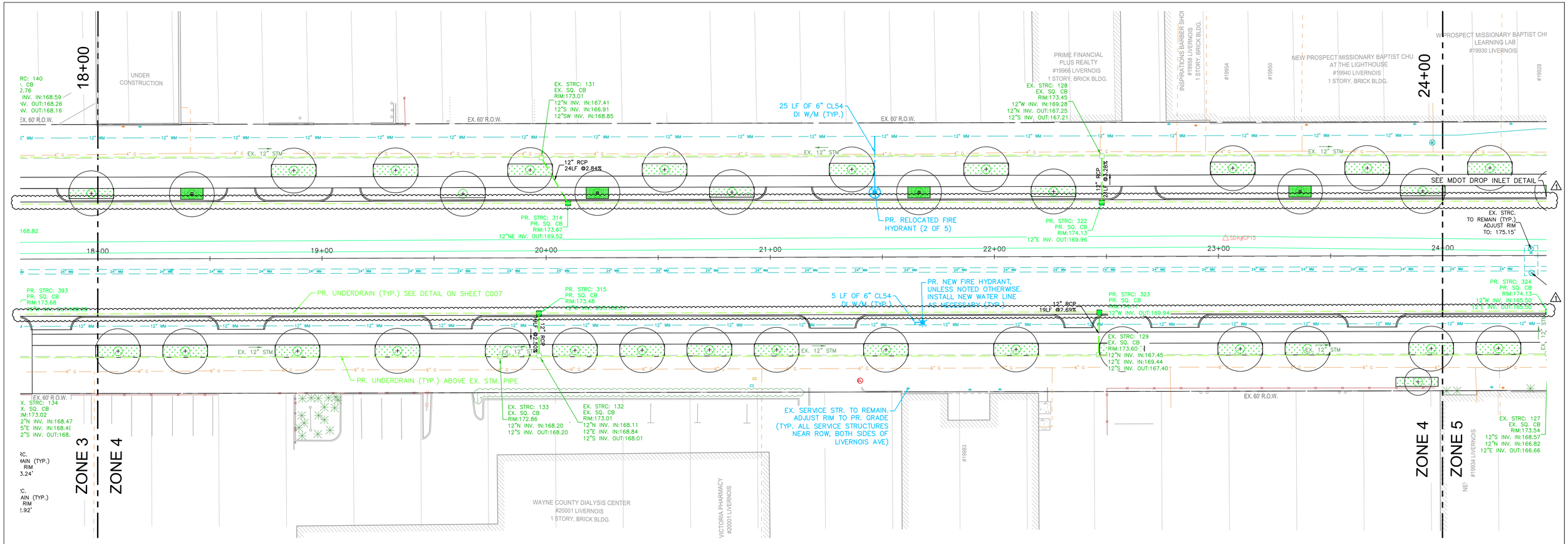
Sheet Title

UTILITY PLAN - STA. 12+00 TO 18+00

Sheet No:

C403

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

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N

0 10' 20' 40'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

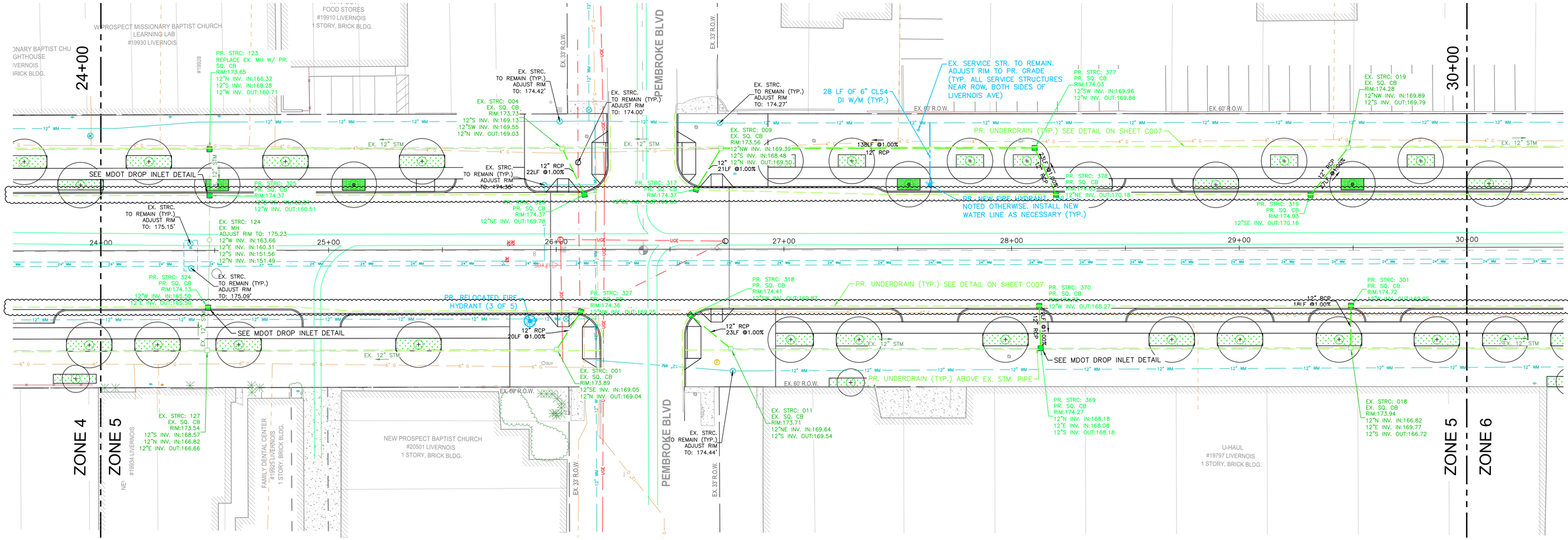
Sheet Title

UTILITY PLAN - STA. 18+00 TO 24+00

Sheet No:

C404

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

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SCALE

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NOT FOR CONSTRUCTION

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DATE: 21 December 2018

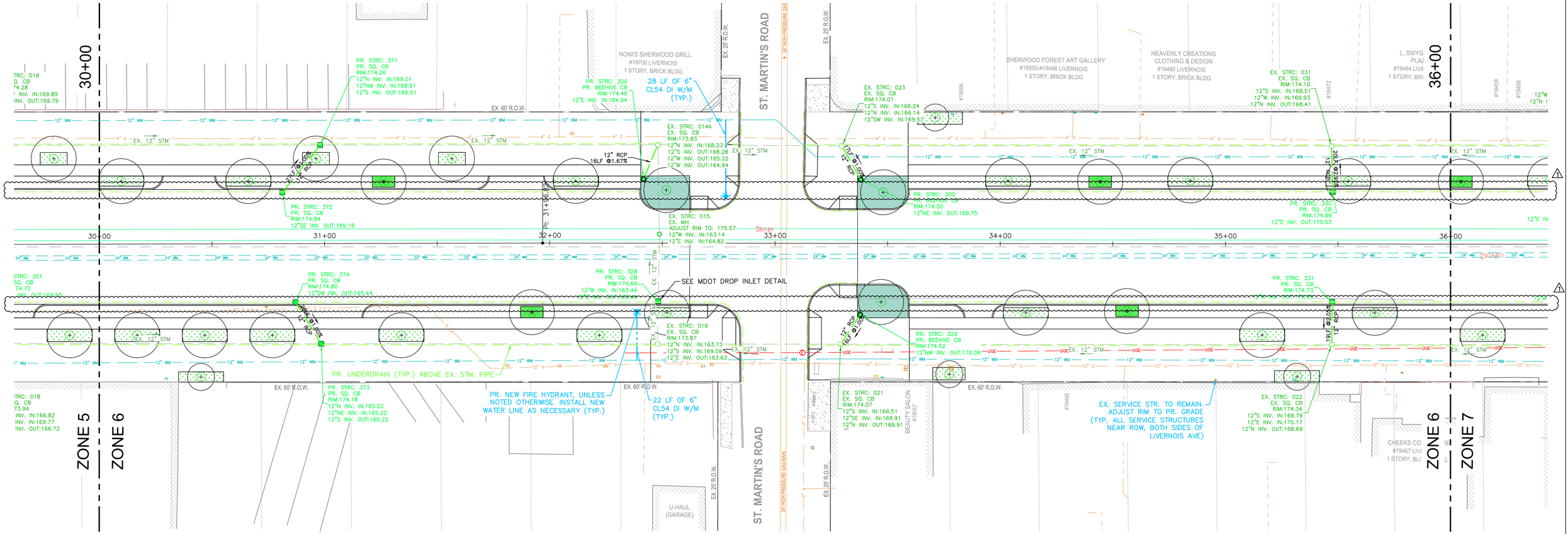
REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

Sheet Title: UTILITY PLAN - STA. 24+00 TO 30+00

Sheet No: C405

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LEGEND

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- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

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SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

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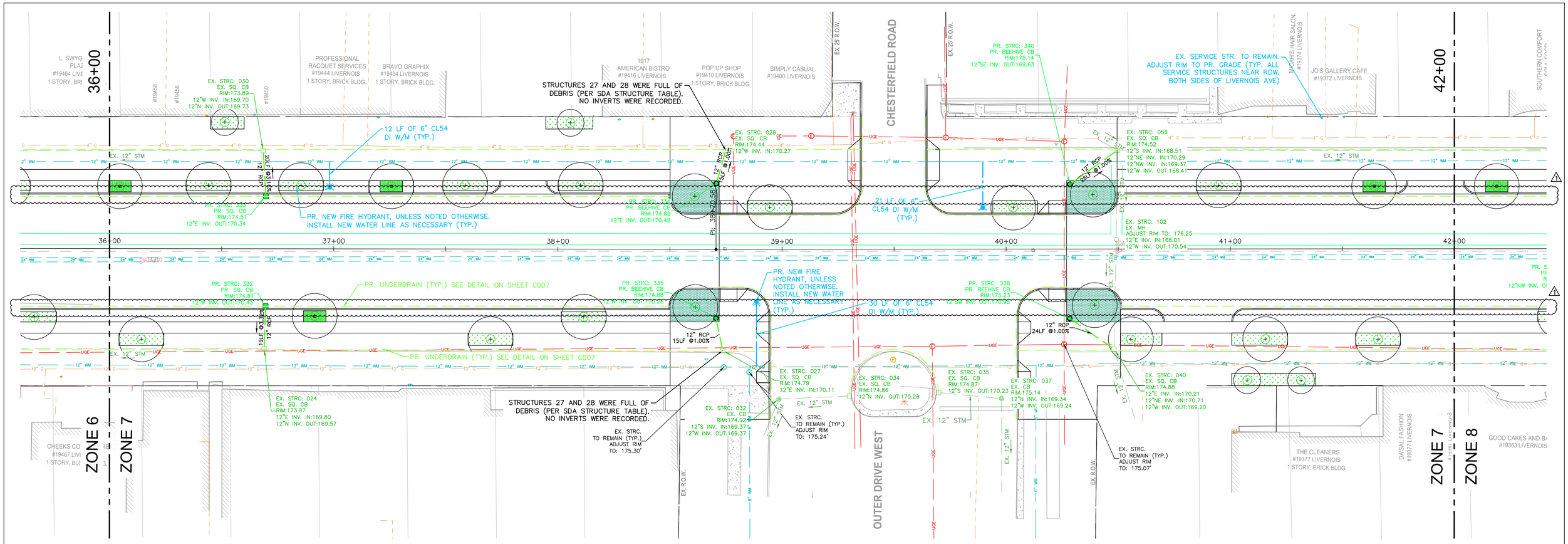
REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

Sheet Title: UTILITY PLAN - STA. 30+00 TO 36+00

Sheet No: C406

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
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N

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SCALE

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Yellow	OIL & GAS	Blue	WATER
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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

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REVISION

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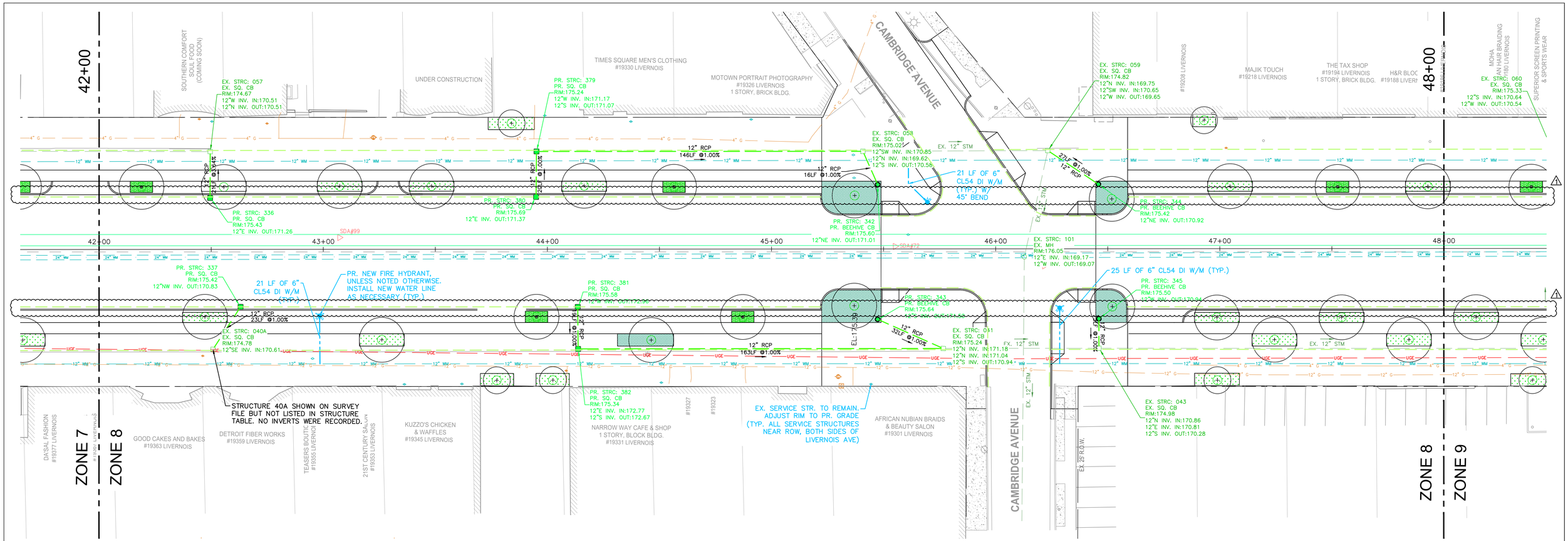
Sheet Title

UTILITY PLAN - STA. 36+00 TO 42+00

Sheet No:

C407

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
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SCALE

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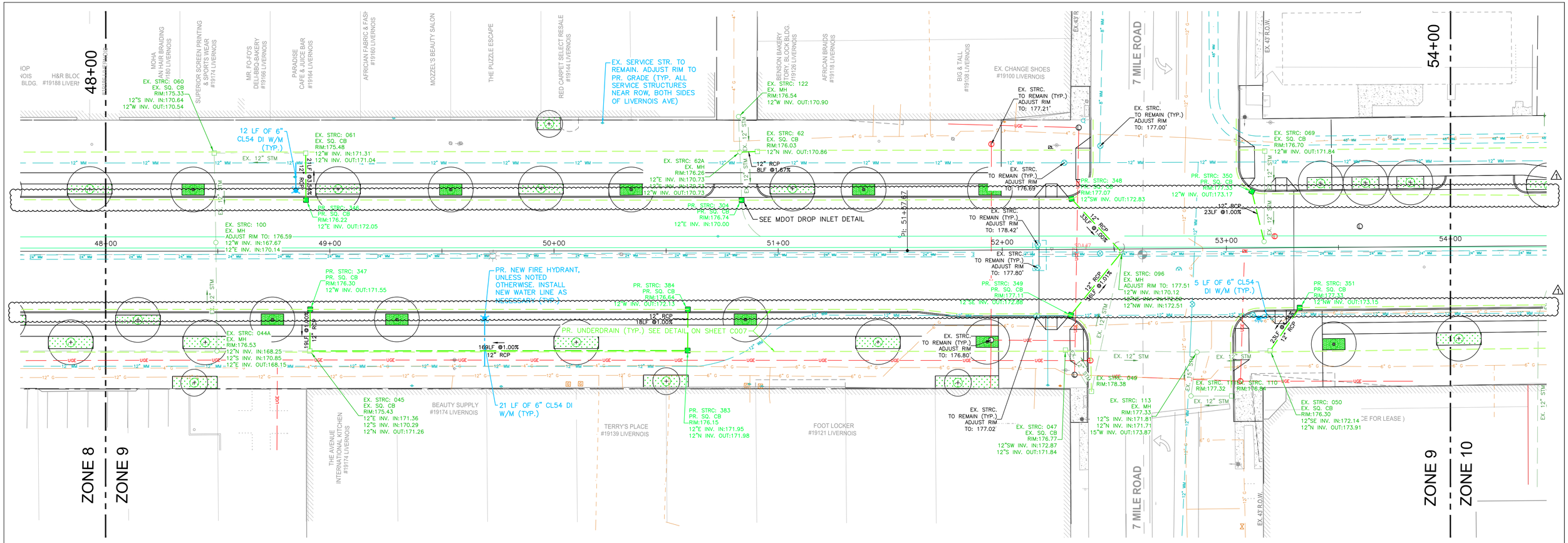
Sheet Title

UTILITY PLAN - STA. 42+00 TO 48+00

Sheet No:

C408

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LEGEND

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- EXISTING STORM SEWER MANHOLE
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- EXISTING WATER MANHOLE
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STATUS: 60% Design - For Bid

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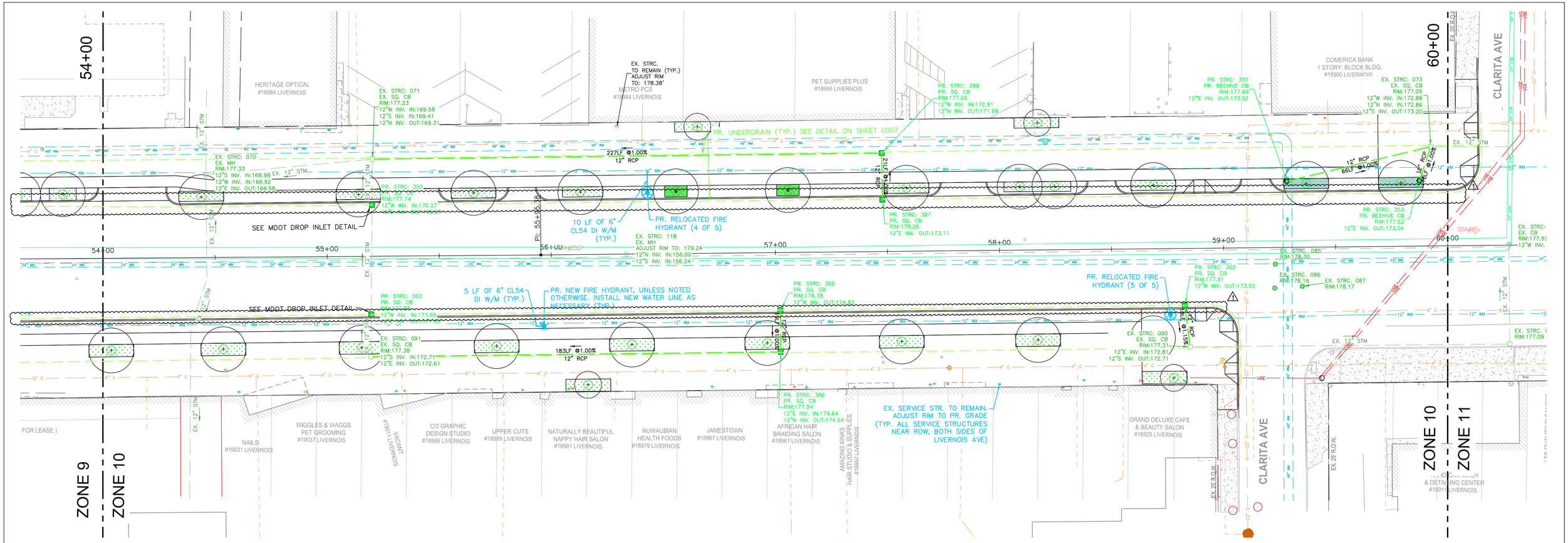
REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

Sheet Title: UTILITY PLAN - STA. 48+00 TO 54+00

Sheet No: C409

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
- PROPOSED STORM SEWER CATCH BASIN
- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠1
- PROPOSED WATERMAIN

NOTES:

1. LOCATION OF UTILITIES OR OTHER STRUCTURES SHOWN ON PLANS ARE TAKEN FROM SURVEY OF RECORD. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY OMISSIONS OR VARIATIONS. THE CONTRACTOR SHALL CONTACT MISS DIG A MINIMUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF WORK AND SHALL VERIFY ALL UNDERGROUND UTILITIES ON-SITE, PRIOR TO CONSTRUCTION.
2. FOR UTILITY DETAILS, SEE SHEETS C007-C010.
3. ALL PROPOSED CATCH BASINS SHALL HAVE FILTER FABRIC INSTALLED PER DETAIL ON SHEET C007 UNTIL CONSTRUCTION IS COMPLETED.
4. ALL PROPOSED STORM SEWER PIPES ARE TO BE CLASS IV REINFORCED CONCRETE PIPE UNLESS NOTED OTHERWISE.
5. EXISTING STORM SEWER GRATES IN PR. NEW SIDEWALK TO BE REPLACED WITH PEDESTRIAN-STYLE GRATE. EAST JORDAN IRON WORKS 1020MB, OR EQUIVALENT, WITH DWSD LOGO.
6. PROPOSED STORM WATER OVERFLOW STRUCTURES IN BIOSWALES TO BE BEEHIVE CATCH BASINS (EAST JORDAN IRON WORKS 29952 BEEHIVE GRATES, OR EQUIVALENT, WITH DWSD LOGO).
7. PROPOSED UNDERDRAIN IS TO RUN NORTH-SOUTH ON BOTH SIDES OF LIVERNOIS AVENUE AT LOW LINE IN SIDEWALK. SEE SHEET C007 FOR DETAIL.
8. ALL RIM ELEVATIONS FOR PROPOSED AND EXISTING STRUCTURES THAT ARE TO REMAIN WITHIN PAVEMENT AND/OR PROPOSED SIDEWALK MAY REQUIRE ADJUSTMENT DURING CONSTRUCTION. THE CONTRACTOR SHALL ADJUST ALL RIM ELEVATIONS AS NEEDED SUCH THAT CASTINGS ARE FLUSH WITH NEW PAVEMENT AND/OR SIDEWALK GRADES.
9. CONFIRM UTILITY STRUCTURE FRAME AND GRATE PRIOR TO INSTALLATION.
10. PROPOSED NEW FIRE HYDRANTS ARE TO SUPPLIED BY THE CITY OF DETROIT AND INSTALLED BY CONTRACTOR.
11. FIRE HYDRANTS TO BE CONSTRUCTED PER DWSD STANDARD DETAILS. FIRE HYDRANTS TO BE INSTALLED A MINIMUM OF 3' FROM CURB. ALL FIRE HYDRANTS TO BE INSTALLED WITH A 6" LEAD LINE AND STANDARD DWSD 6" GATE VALVE AND BOX. SEE SHEET C010 FOR DETAIL.

N

0 10' 20' 40'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

PRIME CONSULTANT

spackman mossop michaels

440 Burroughs Street
Suite 696
Detroit | MI | 48202
T: 313.720.1055

NTH Consultants
41780 Six Mile Road
Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
⚠1	ADDENDUM 1	2/8/19

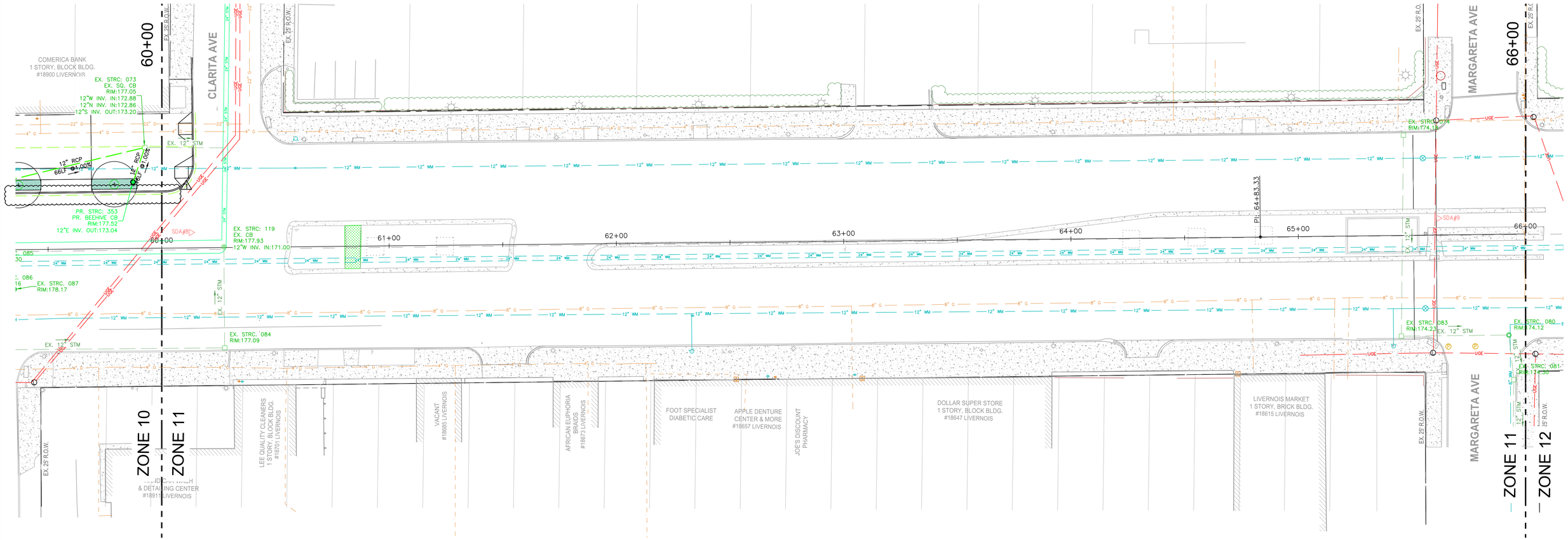
Sheet Title

UTILITY PLAN - STA. 54+00 TO 60+00

Sheet No:

C410

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LEGEND

- EXISTING STORM SEWER CATCH BASIN
- EXISTING STORM SEWER MANHOLE
- EXISTING UNDERGROUND PHONE MANHOLE
- EXISTING GATE WELL & VALVE
- EXISTING WATER MANHOLE
- EXISTING ELECTRICAL MANHOLE
- EXISTING ELECTRICAL HANDHOLE
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- PROPOSED STORM SEWER MANHOLE
- PROPOSED NEW FIRE HYDRANT
- PROPOSED RELOCATED FIRE HYDRANT
- EXISTING GAS LINE
- EXISTING UNDERGROUND PHONE LINE
- EXISTING STORM SEWER PIPE
- EXISTING WATERMAIN
- PROPOSED STORM SEWER PIPE
- PROPOSED UNDERDRAIN ⚠
- PROPOSED WATERMAIN

NOTES:

1. LOCATION OF UTILITIES OR OTHER STRUCTURES SHOWN ON PLANS ARE TAKEN FROM SURVEY OF RECORD. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY OMISSIONS OR VARIATIONS. THE CONTRACTOR SHALL CONTACT MISS DIG A MINIMUM OF THREE WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION IN THE AREA OF WORK AND SHALL VERIFY ALL UNDERGROUND UTILITIES ON-SITE, PRIOR TO CONSTRUCTION.
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N

0 10' 20' 40'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

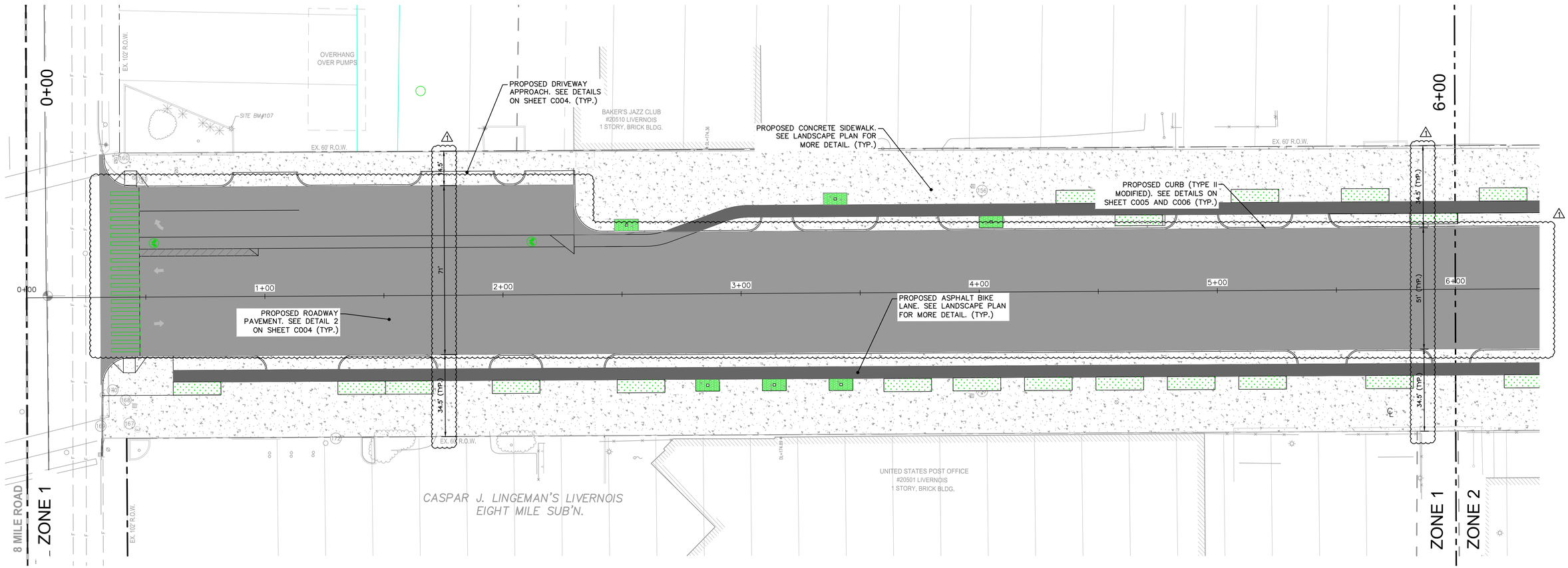
REVISION

NO.	DESCRIPTION	DATE
⚠	ADDENDUM 1	2/8/19

Sheet Title: UTILITY PLAN - STA. 60+00 TO 66+00

Sheet No: C411

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N

0 20' 40' 80'
SCALE

CONSTRUCTION PLAN: STA. 0+00 TO STA. 6+00
SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

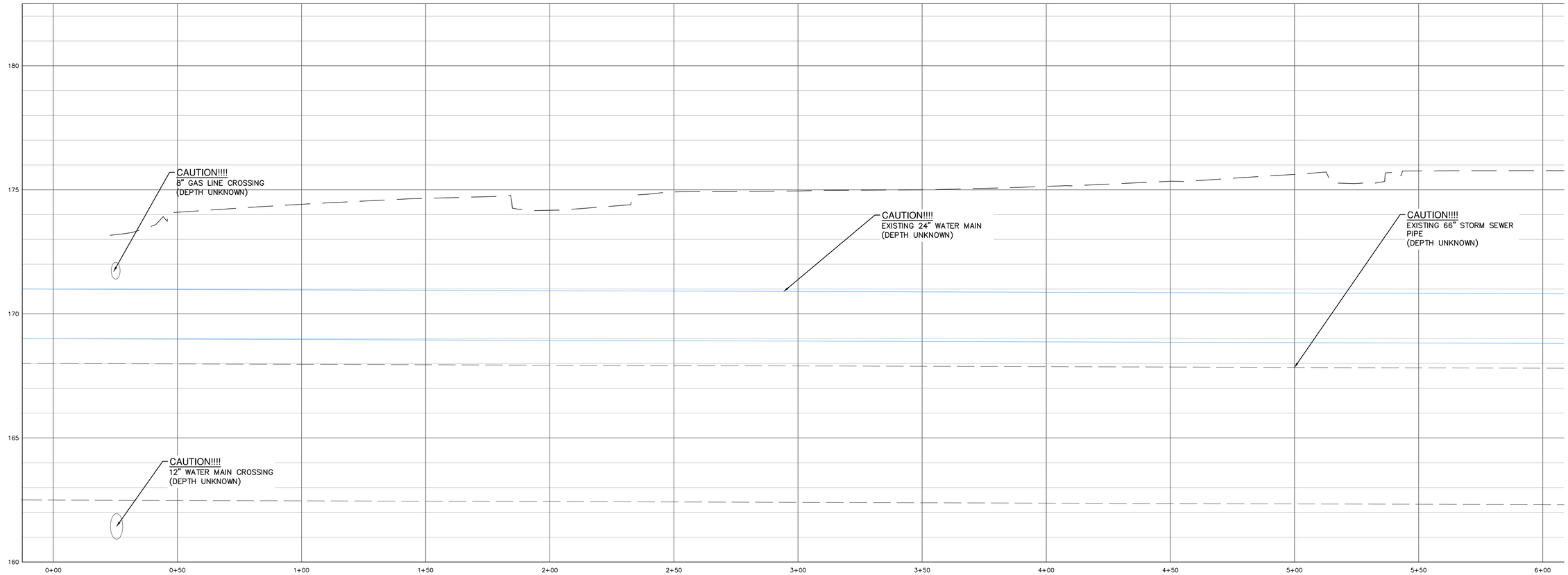
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 0+00 TO 6+00

Sheet No: C501

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CONSTRUCTION PROFILE: STA. 0+00 TO STA. 6+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

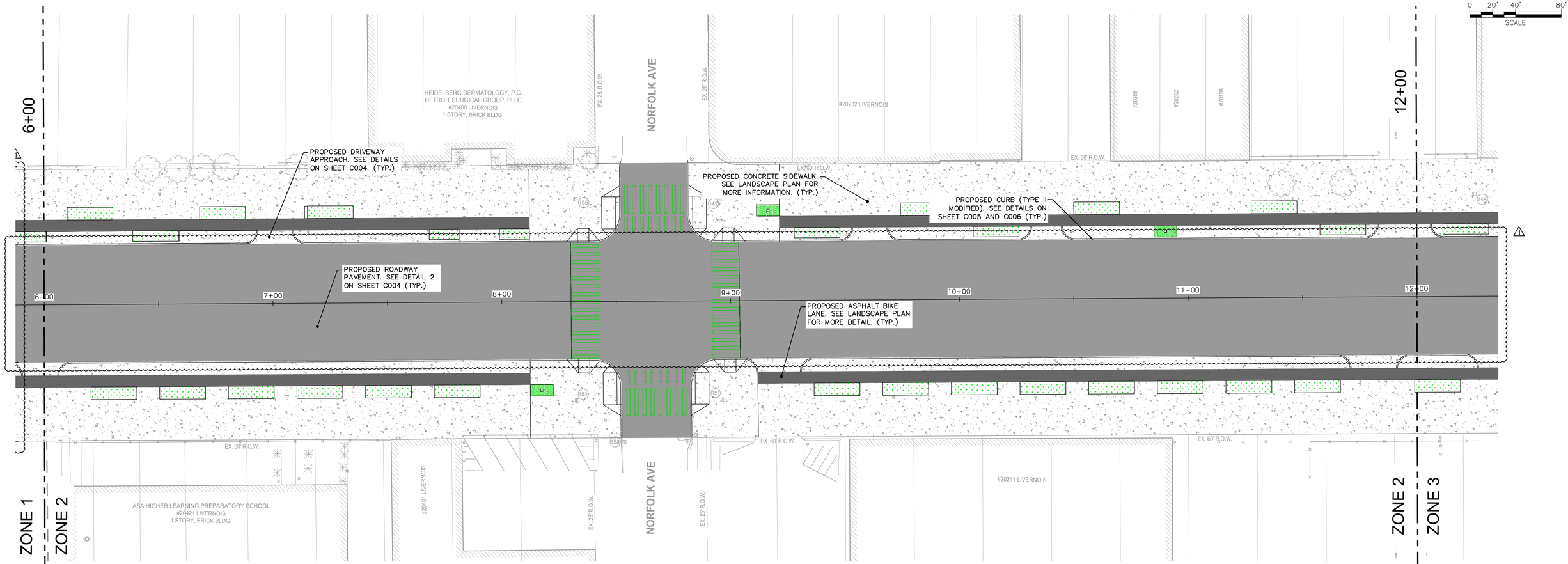
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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 0+00 TO 6+00

Sheet No: C502

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CONSTRUCTION PLAN: STA. 6+00 TO STA. 12+00

SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

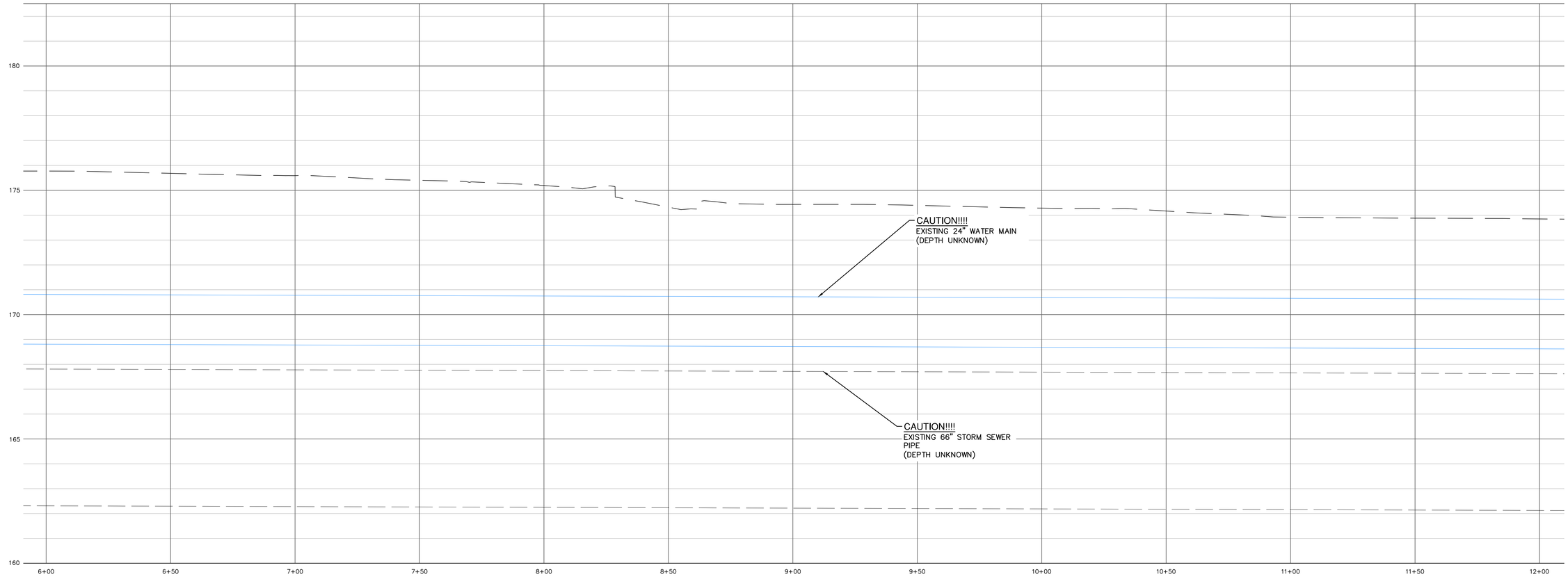
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 6+00 TO 12+00

Sheet No: C503

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CONSTRUCTION PROFILE: STA. 6+00 TO STA. 12+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

N

0 20' 40' 80'

SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

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PROJECT

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LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

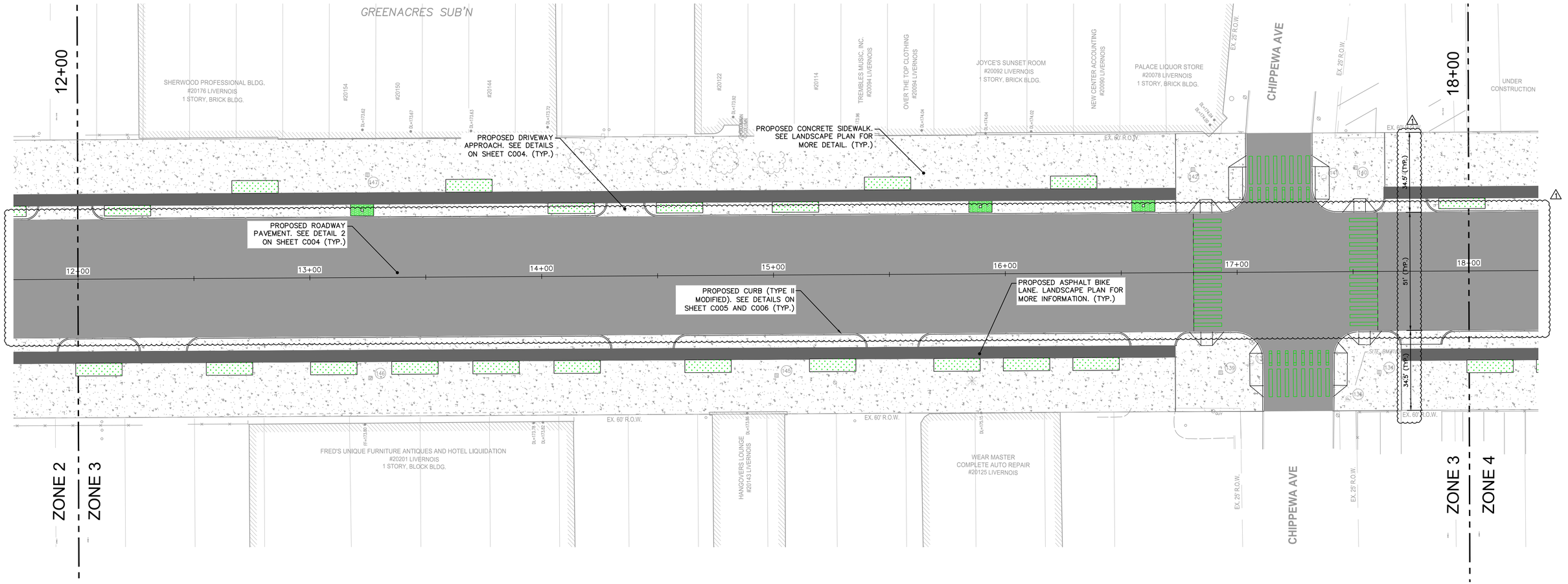
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 6+00 TO 12+00

Sheet No: C504

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0 20' 40' 80'
SCALE

CONSTRUCTION PLAN: STA. 12+00 TO STA. 18+00
SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

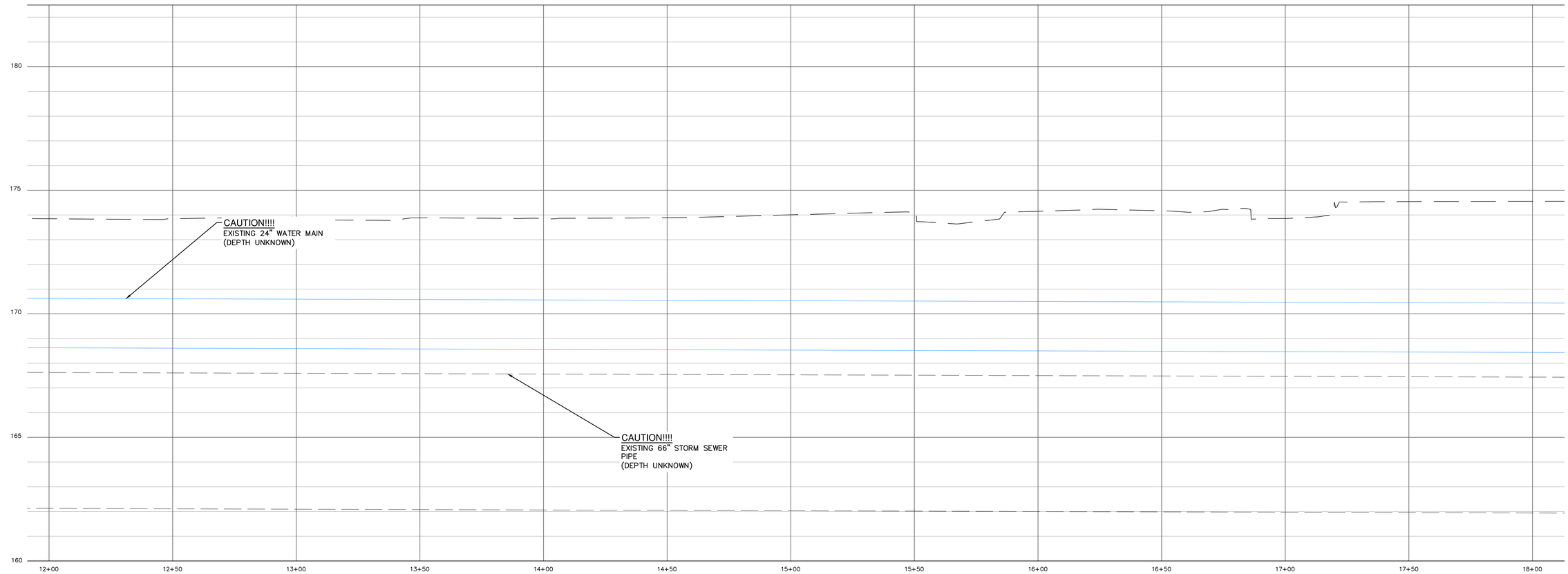
REVISION

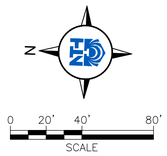
NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 12+00 TO 18+00

Sheet No: C505

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CONSTRUCTION PROFILE: STA. 12+00 TO STA. 18+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
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NTH Project No.
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PROJECT

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SMM PROJECT No: 17081

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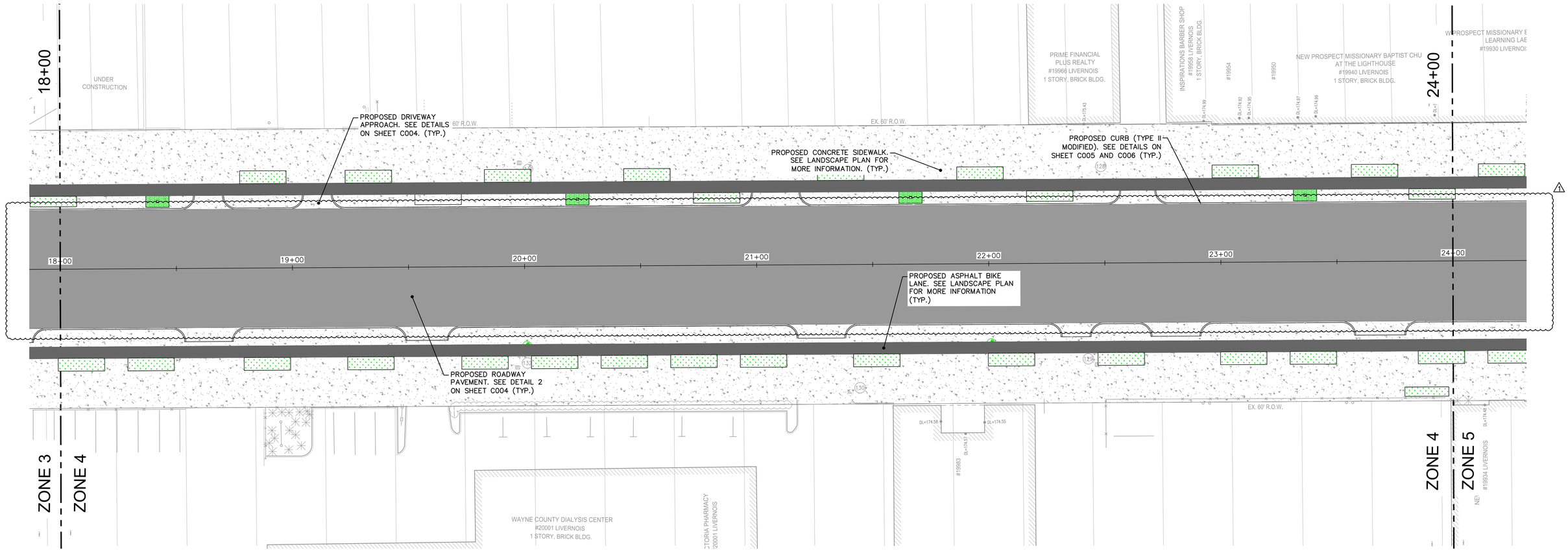
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 12+00 TO 18+00

Sheet No: C506

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CONSTRUCTION PLAN: STA. 18+00 TO STA. 24+00

SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
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1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

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Orange	PHONE & CATV	Green	STORM DRAIN
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IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

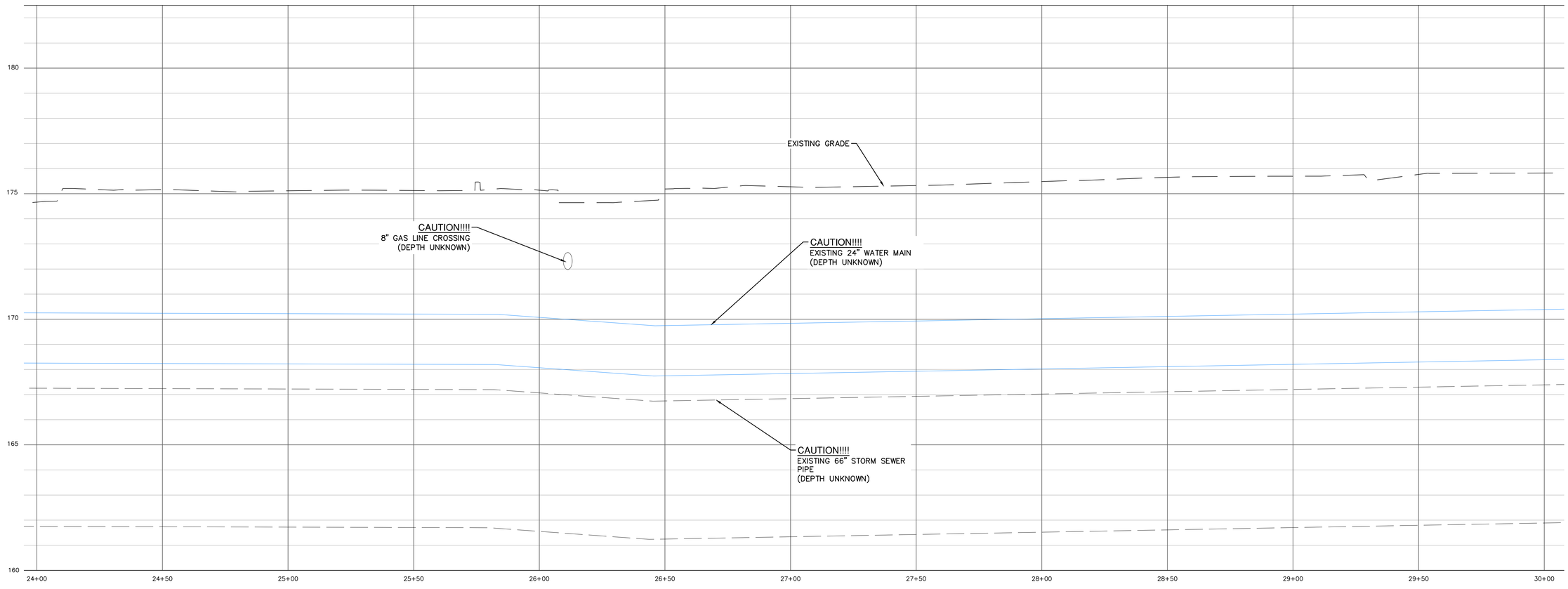
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 18+00 TO 24+00

Sheet No: C507

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CONSTRUCTION PROFILE: STA. 18+00 TO STA. 24+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
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		Pink	SURVEYING

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Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

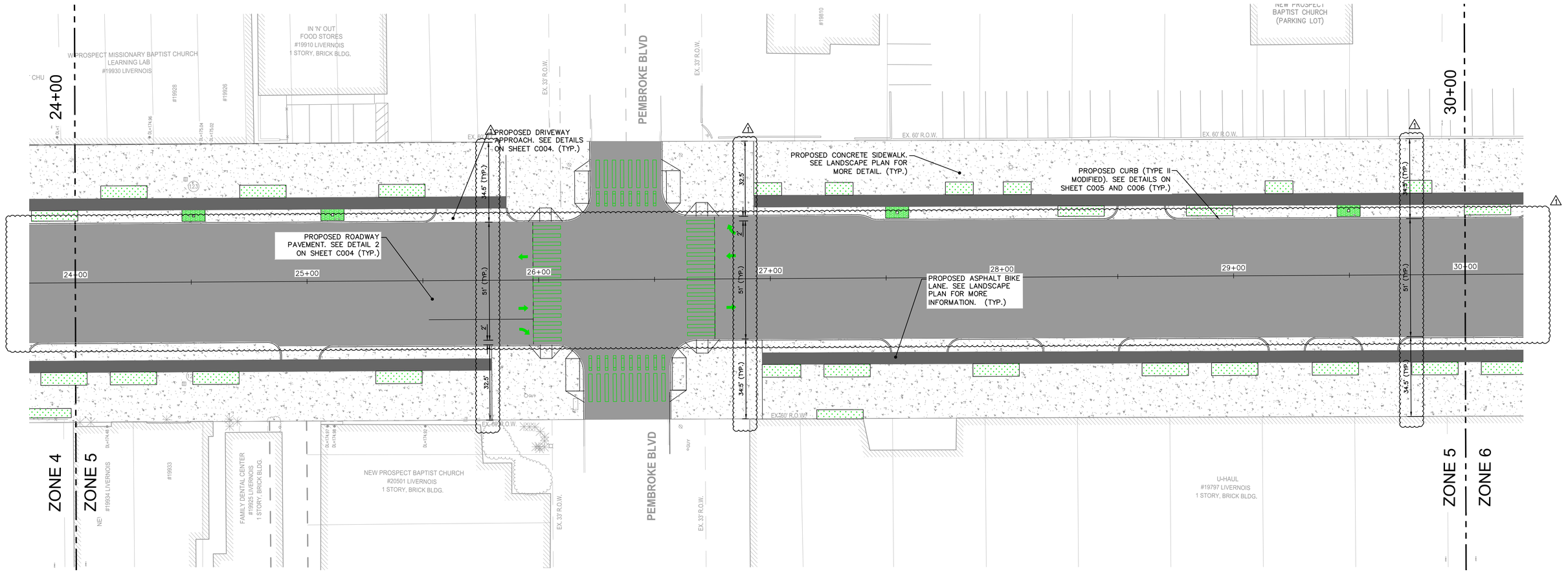
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 18+00 TO 24+00

Sheet No: C508

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0 20' 40' 80'
SCALE

CONSTRUCTION PLAN: STA. 24+00 TO STA. 30+00
SCALE: 1" = 20'

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

LEGEND
- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:
1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

PRIME CONSULTANT
spackman mossop michaels
440 Burroughs Street
Suite 696
Detroit | MI | 48202
T: 313.720.1055

NTH Consultants
41780 Six Mile Road
Suite 200
Northville | MI| 48168
T: 248.662.0000
NTH Project No.
61-170118

PROJECT
LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

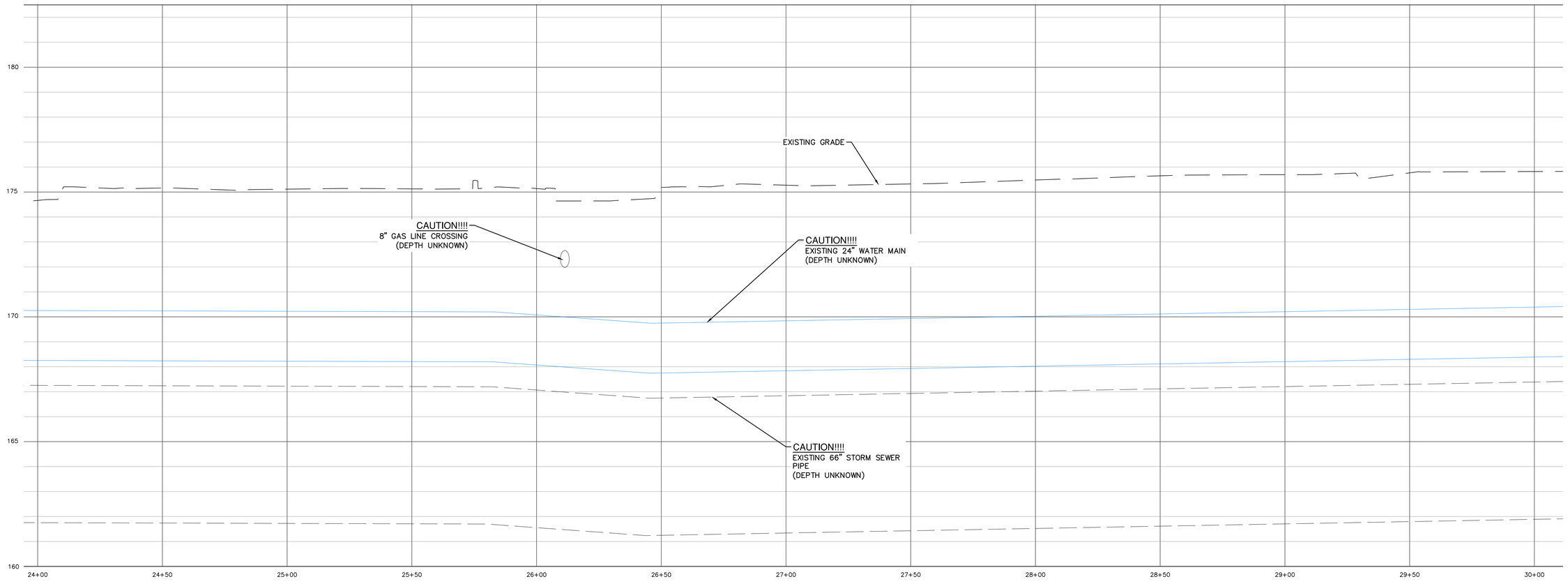
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 24+00 TO 30+00

Sheet No: C509

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CONSTRUCTION PROFILE: STA. 24+00 TO STA. 30+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

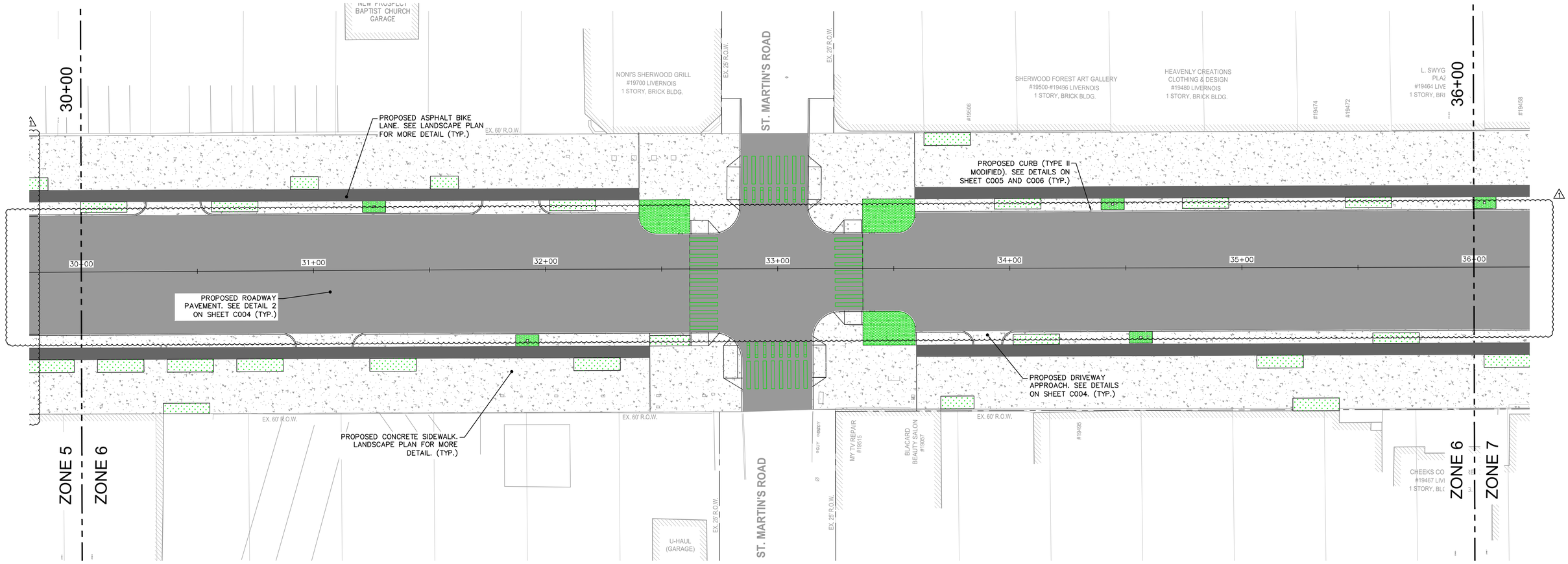
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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 24+00 TO 30+00

Sheet No: C510

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CONSTRUCTION PLAN: STA. 30+00 TO STA. 36+00

SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

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2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

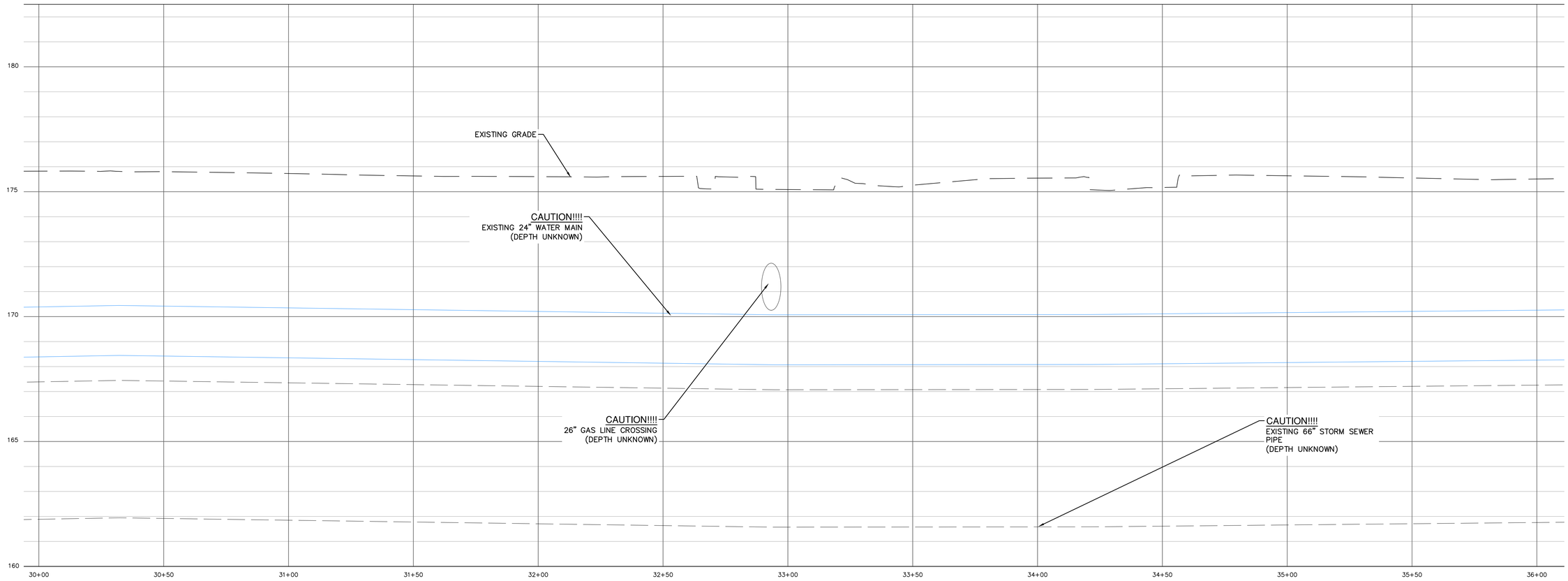
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 30+00 TO 36+00

Sheet No: C511

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CONSTRUCTION PROFILE: STA. 30+00 TO STA. 36+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

N

0 20' 40' 80'

SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

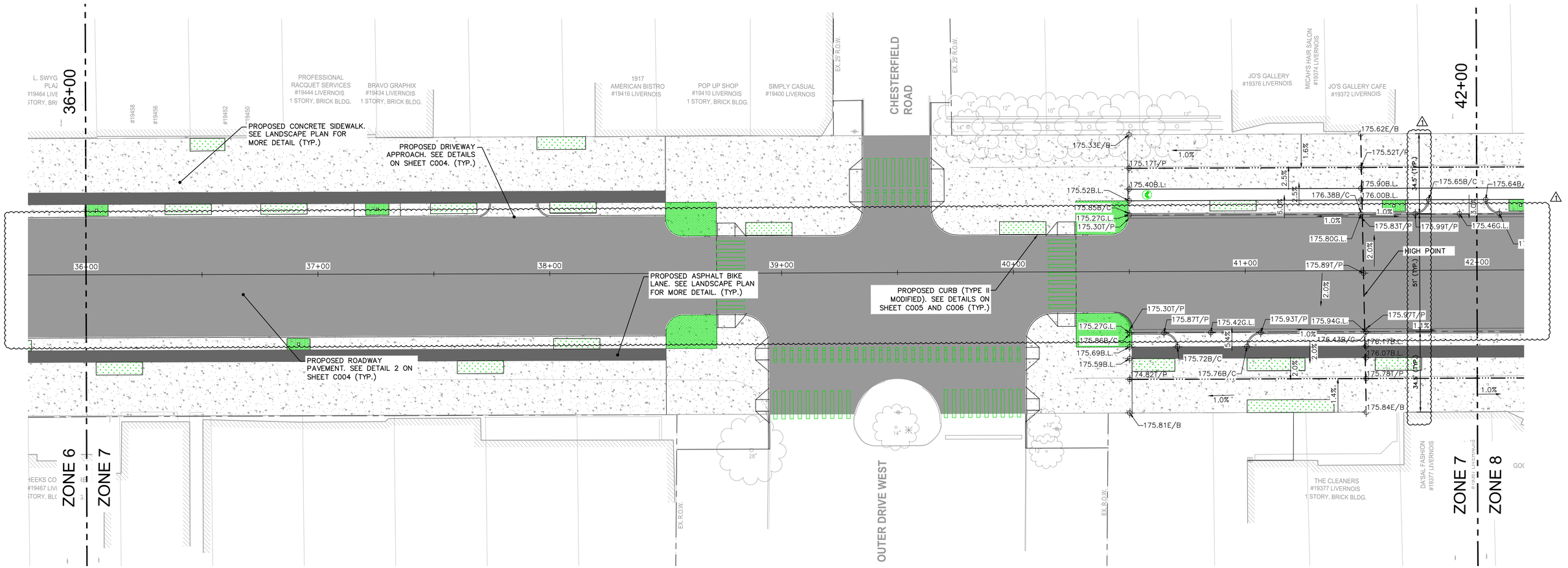
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 30+00 TO 36+00

Sheet No: C512

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CONSTRUCTION PLAN: STA. 36+00 TO STA. 42+00

SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

LABEL LEGEND

- 9.00T/P TOP OF PAVEMENT ELEVATION
- 9.00B/C BACK OF CURB ELEVATION
- 9.00G.L. GUTTER LINE ELEVATION
- 9.00E/B EDGE OF BUILDING ELEVATION
- 9.00B.L. BIKE LANE ELEVATION
- 9.00C.B. CATCH BASIN RIM ELEVATION
- LOW LINE
- HIGH POINT
- LOW POINT
- GUTTER LINE

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

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SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

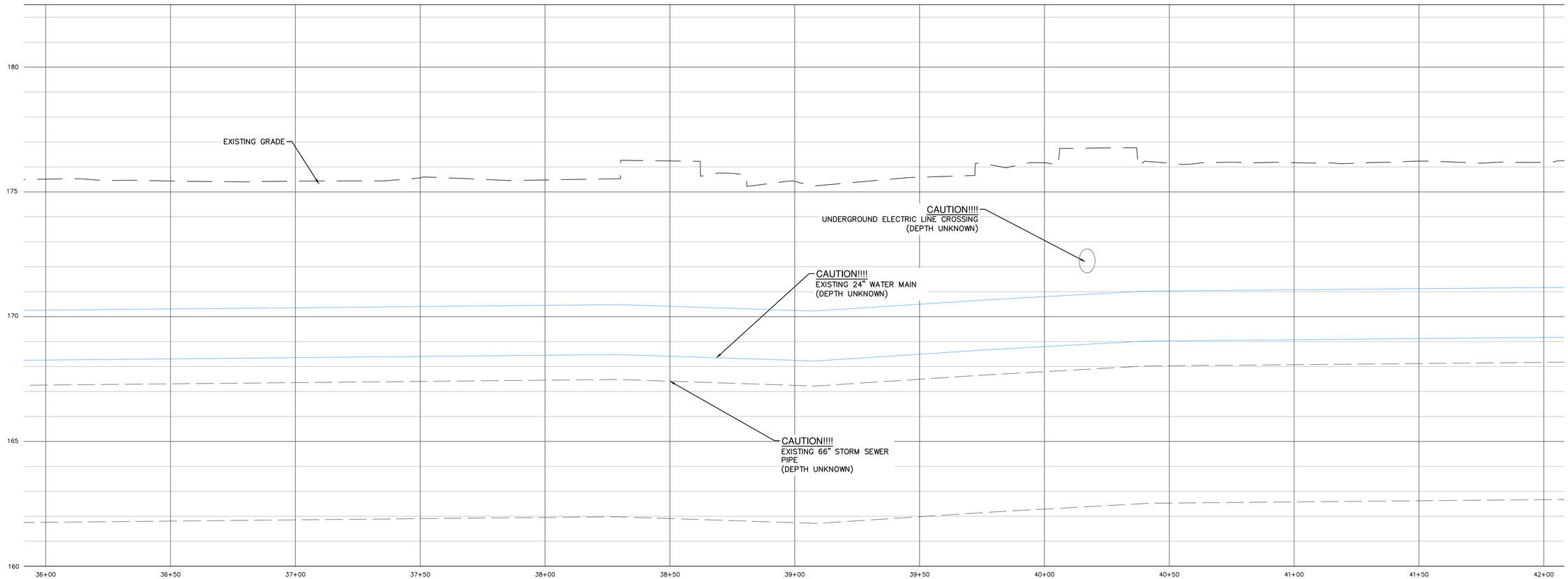
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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 36+00 TO 42+00

Sheet No: C513

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CONSTRUCTION PROFILE: STA. 36+00 TO STA. 42+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

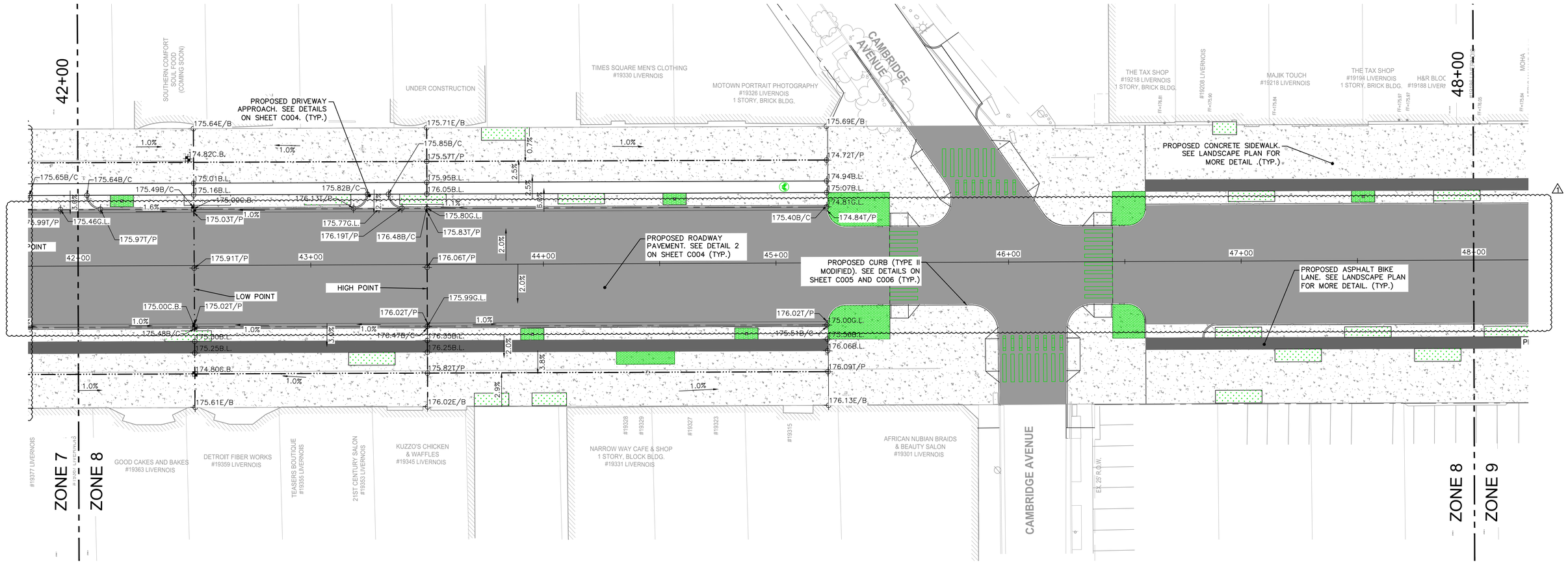
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 36+00 TO 42+00

Sheet No: C514

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CONSTRUCTION PLAN: STA. 42+00 TO STA. 48+00

SCALE: 1" = 20'

LABEL LEGEND

- 9.00T/P TOP OF PAVEMENT ELEVATION
- 9.00B/C BACK OF CURB ELEVATION
- 9.00G.L. GUTTER LINE ELEVATION
- 9.00E/B EDGE OF BUILDING ELEVATION
- 9.00B.L. BIKE LANE ELEVATION
- 9.00C.B. CATCH BASIN RIM ELEVATION
- LOW LINE
- HIGH LINE
- LOW POINT
- GUTTER LINE

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES — CALL MISS DIG

PRIME CONSULTANT

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

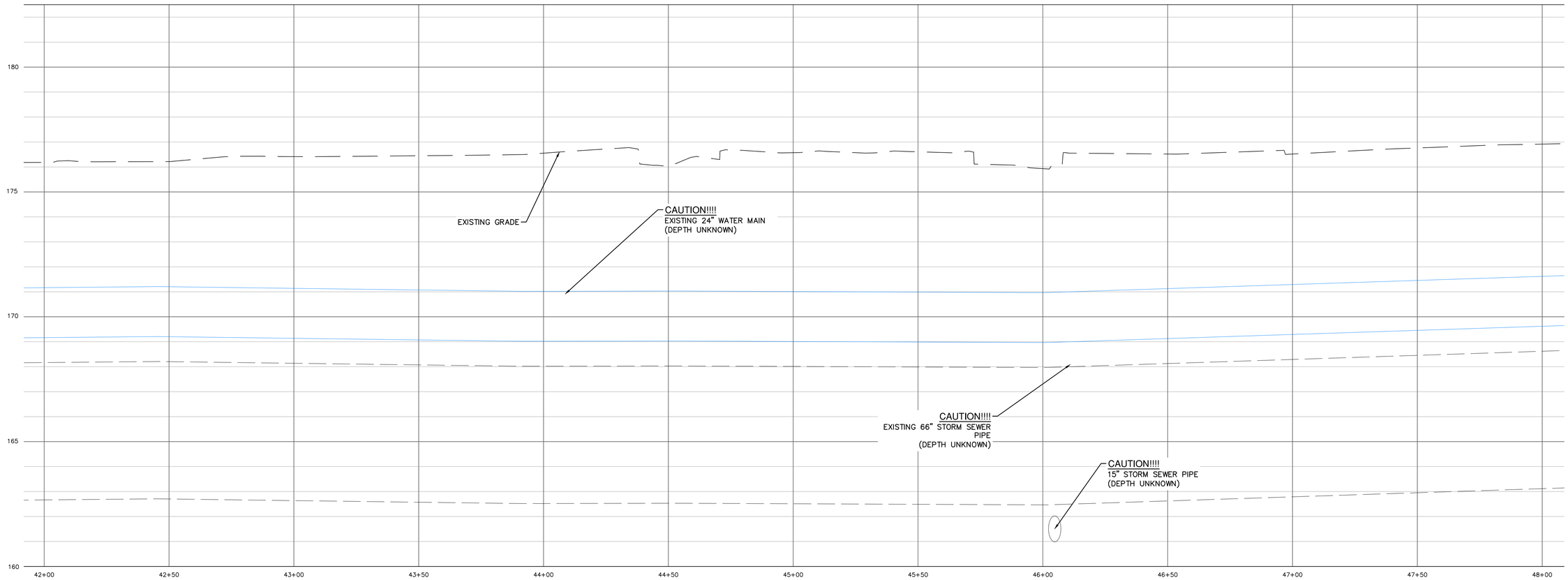
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 42+00 TO 48+00

Sheet No: C515

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CONSTRUCTION PROFILE: STA. 42+00 TO STA. 48+00
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

N

0 20' 40' 80'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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michaels

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

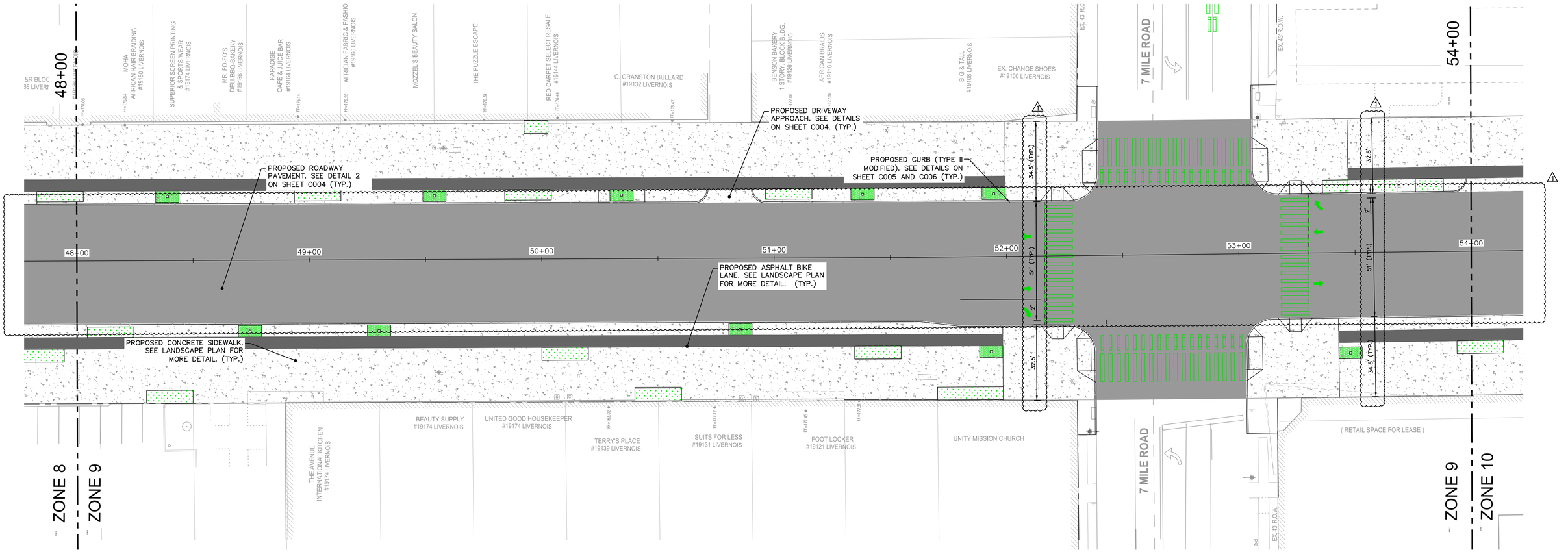
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 42+00 TO 48+00

Sheet No: C516

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CONSTRUCTION PLAN: STA. 48+00 TO STA. 54+00

SCALE: 1" = 40'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

PRIME CONSULTANT

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NTH Consultants
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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

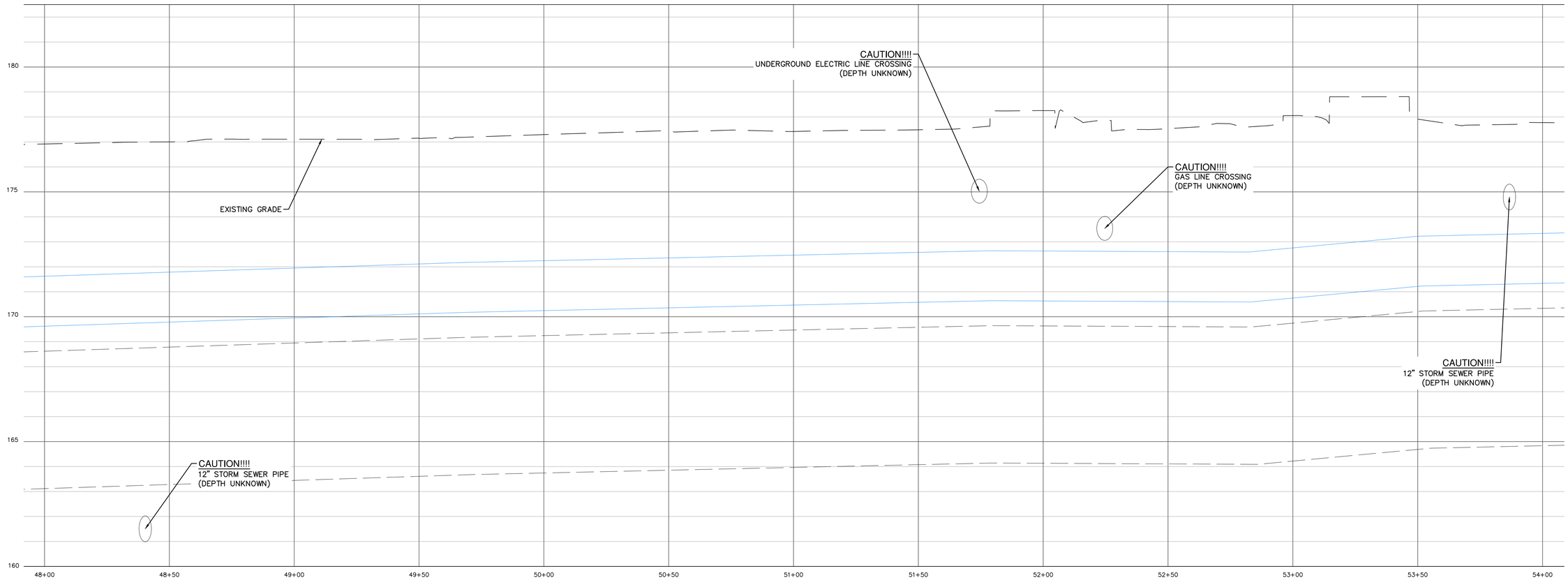
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 48+00 TO 54+00

Sheet No: C517

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CONSTRUCTION PROFILE: STA. 48+00 TO STA. 54+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

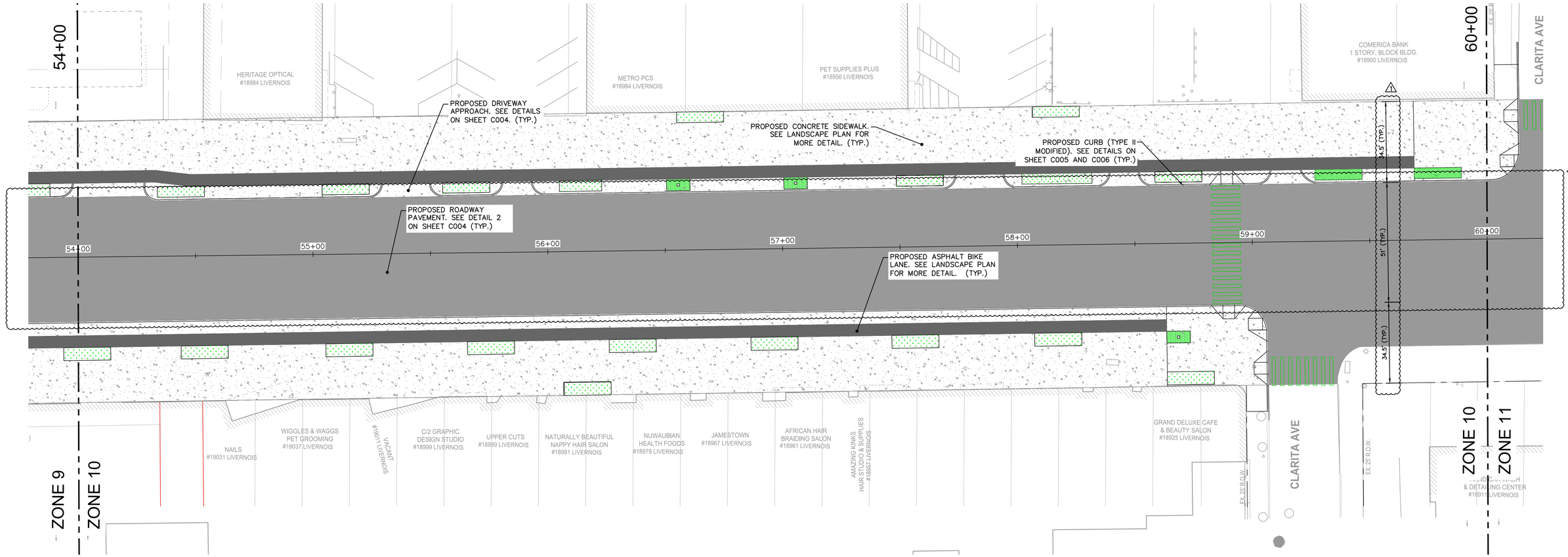
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 48+00 TO 54+00

Sheet No: C518

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CONSTRUCTION PLAN: STA. 54+00 TO STA. 60+00
SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
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Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
61-170118

PROJECT
LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

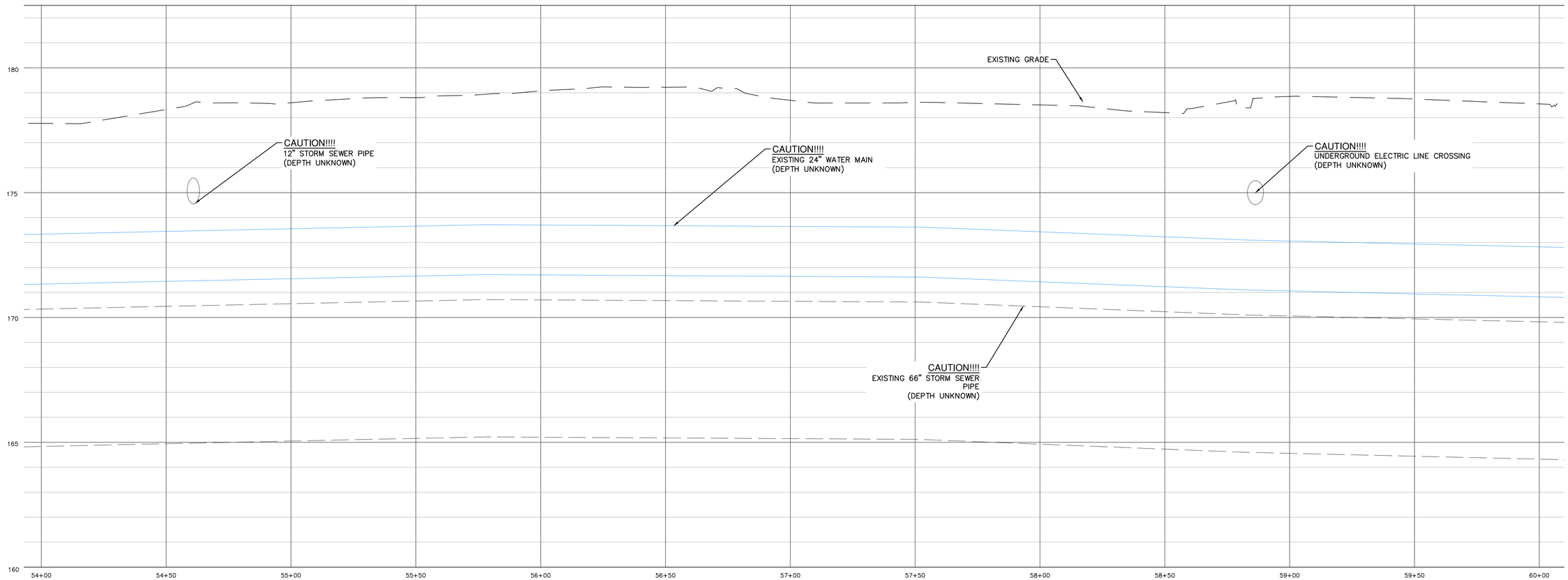
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 54+00 TO 60+00

Sheet No: C519

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CONSTRUCTION PROFILE: STA. 54+00 TO STA. 60+00
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

0 20' 40' 80'
SCALE

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

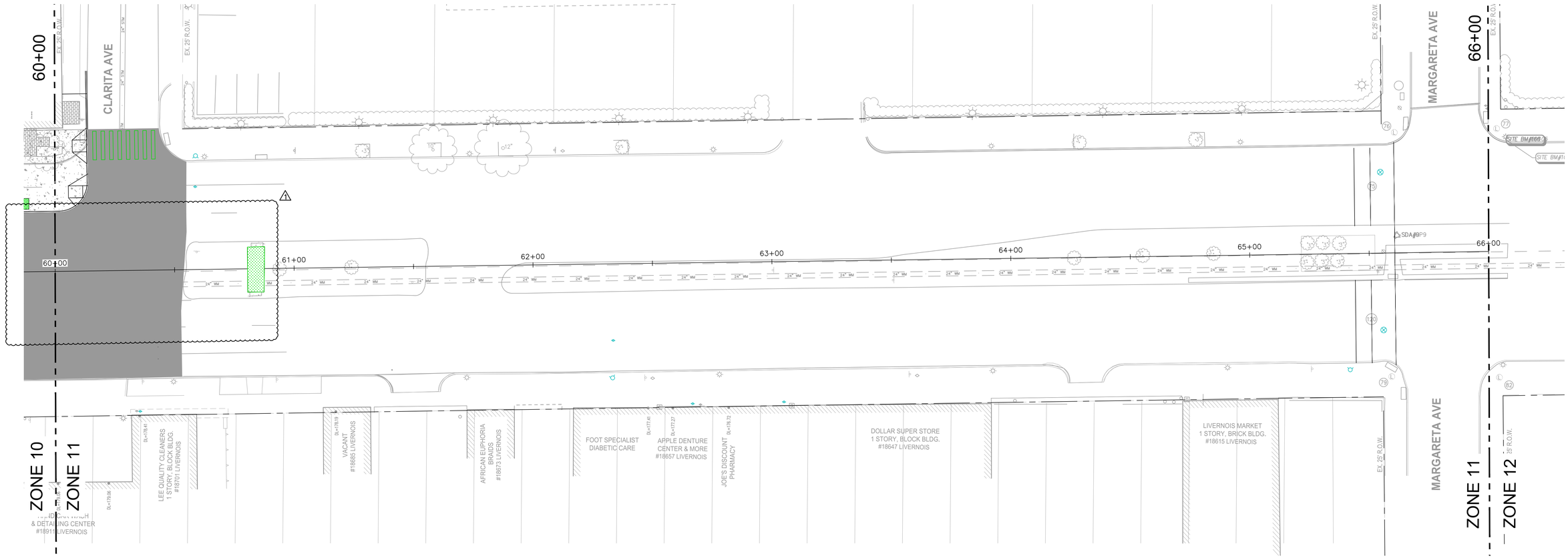
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 54+00 TO 60+00

Sheet No: C520

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CONSTRUCTION PLAN: STA. 60+40 TO STA. 66+00

SCALE: 1" = 20'

LEGEND

- PROPOSED CONCRETE PAVEMENT (ROADWAY)
- PROPOSED ASPHALT PAVEMENT (BIKE LANE)
- PROPOSED CONCRETE SIDEWALK

NOTES:

1. FOR MORE INFORMATION ON PROPOSED SIGNS AND PAVEMENT MARKINGS, SEE SHEET C605 TO C608.
2. FOR PAVEMENT AND JOINT DETAILS, SEE SHEET C004 TO C008.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG ®
1-800-482-7171
For free location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:

Yellow	OIL & GAS	Blue	WATER
Orange	PHONE & CATV	Green	STORM DRAIN
Red	ELECTRIC	Brown	SEWER
		Pink	SURVEYING

IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

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NTH Project No.
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 December 2018

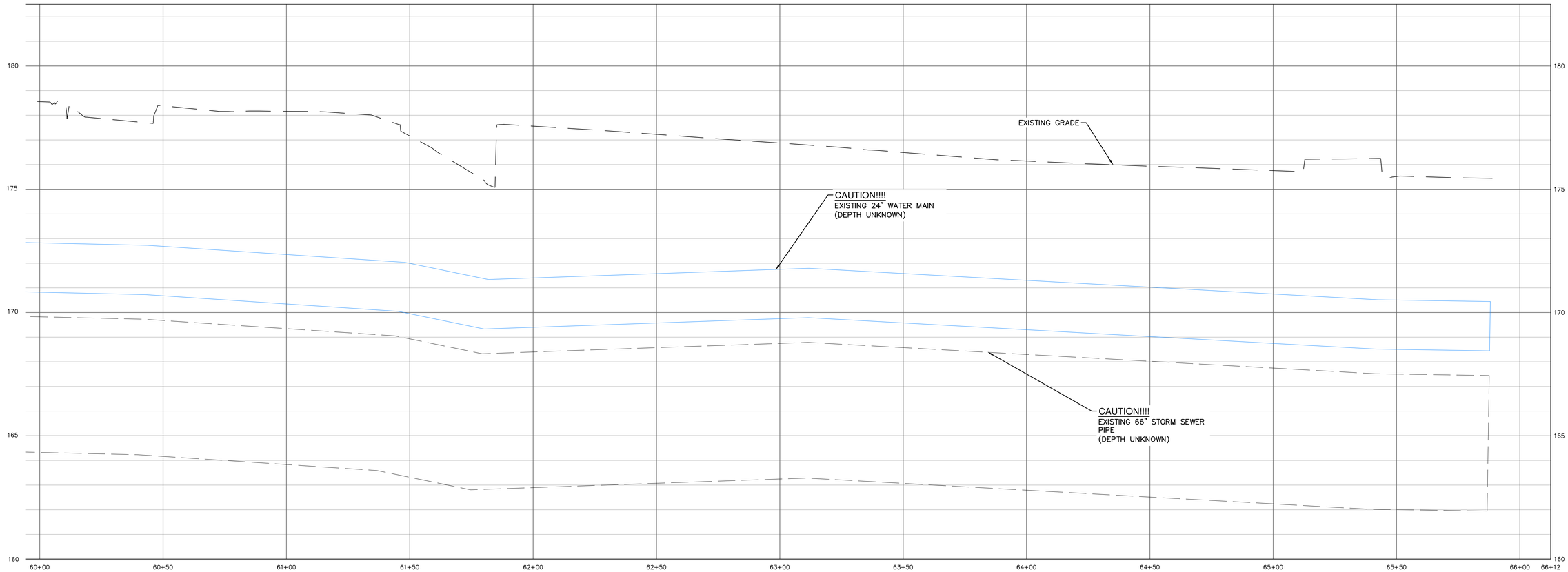
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PLAN SHEET - 60+00 TO 66+00

Sheet No: C521

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CONSTRUCTION PROFILE: STA. 60+00 TO STA. 66+00

HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 2'

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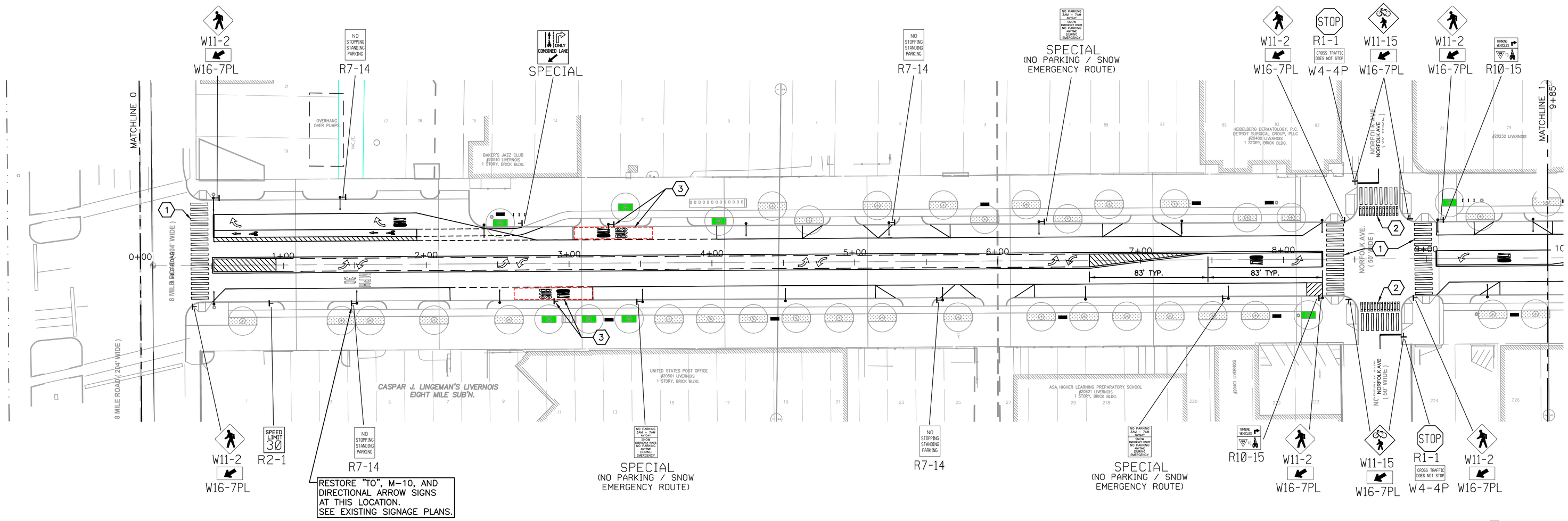
REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: CONSTRUCTION PROFILE SHEET - 60+00 TO 66+00

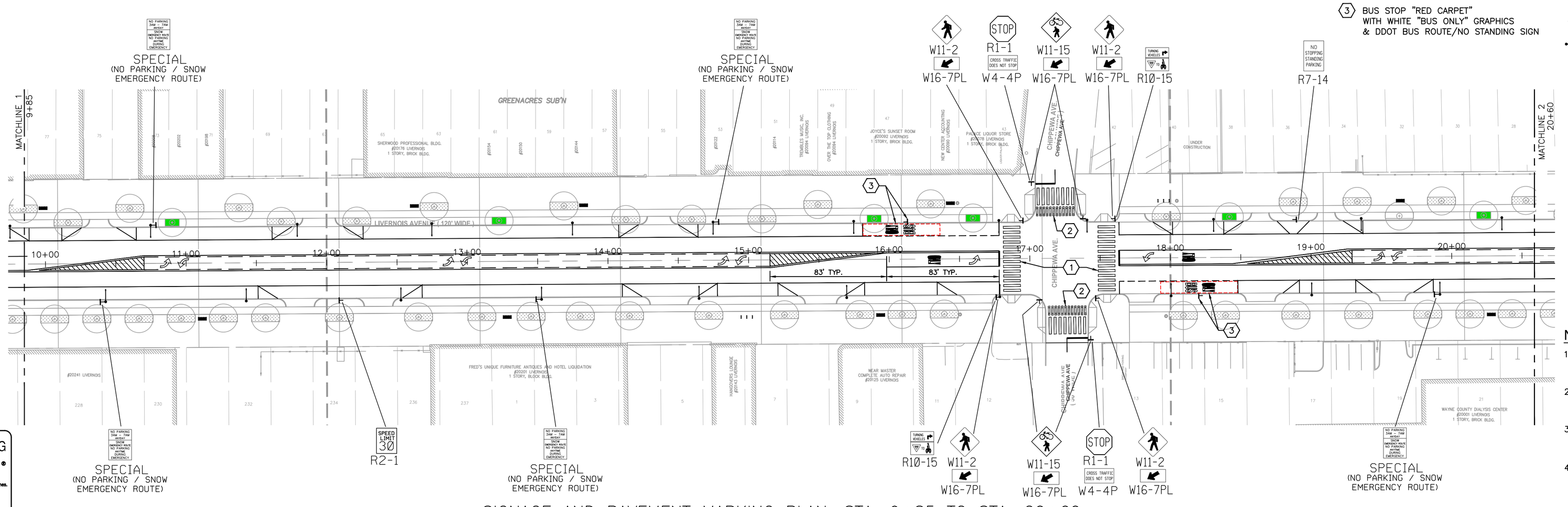
Sheet No: C522

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SIGNAGE AND PAVEMENT MARKING PLAN: STA. 0+00 TO STA. 9+85

SCALE: 1" = 40'



SIGNAGE AND PAVEMENT MARKING PLAN: STA. 9+85 TO STA. 20+60

SCALE: 1" = 40'

LEGEND

- DOUBLE YELLOW SOLID PAVEMENT MARKING (6" WIDE, EACH)
- SINGLE SOLID & DASHED YELLOW PAVEMENT MARKING FOR CENTER TURN LANES (6" WIDE, EACH)
- SINGLE SOLID WHITE PAVEMENT MARKING (LANES & CROSSWALKS WHERE APPLICABLE) (4" WIDE)
- DASHED WHITE PAVEMENT MARKING (BICYCLE CROSSINGS) (4" WIDE)
- 1.5' WIDE x 12' LONG SOLID WHITE CROSSWALK BAR (AS SHOWN)
- BICYCLE LANE TRAFFIC CROSSING – SOLID WHITE OUTER BARS WITH SOLID GREEN CENTER BAR (AS SHOWN) (SEE DETAIL ON SHEET No. C508)
- TRAFIC FLOW ARROW (AS SHOWN)
- PERMANENT POLE MOUNTED SIGN
- NEW LIGHT POLE (SEE NOTES REGARDING SIGN PLACMEMENT)

KEY NOTES

1. PEDESTRIAN CROSSWALK BARS
2. BICYCLE/PEDESTRIAN CROSSING (SEE TYPICAL BICYCLE/PEDESTRIAN CROSSING DETAIL ON SHT. No. C508)
3. BUS STOP "RED CARPET" WITH WHITE "BUS ONLY" GRAPHICS & DDOT BUS ROUTE/NO STANDING SIGN

N

0 20' 40' 80'
SCALE

NOTES

1. CONTRACTOR MAY COMBINE MULTIPLE SIGNS ON A COMMON POLE WHEREVER PRACTICAL.
2. EXISTING ELECTRONIC PARKING METER SYSTEM TO BE REUSED AND INSTALLED BY THE CITY OF DETROIT.
3. NEW SIGNS SHOWN ADJACENT TO PROPOSED LIGHT POLES TO BE MOUNTED ON LIGHT POLE.
4. "RED CARPET" BUS STOP ZONES AND GREEN BICYCLE CROSSING MARKINGS SHALL BE POLYMER CEMENT SURFACE SYSTEM (PCSS). ALL OTHER STRIPING AND PAVEMENT MARKINGS SHALL BE LATEX TRAFFIC MARKING PAINT. SEE SPECIFICATION SECTION 32 17 23.13 FOR MORE INFORMATION.

3 WORKING DAYS
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ALTERNATE NUMBER (810) MISS-DIG
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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

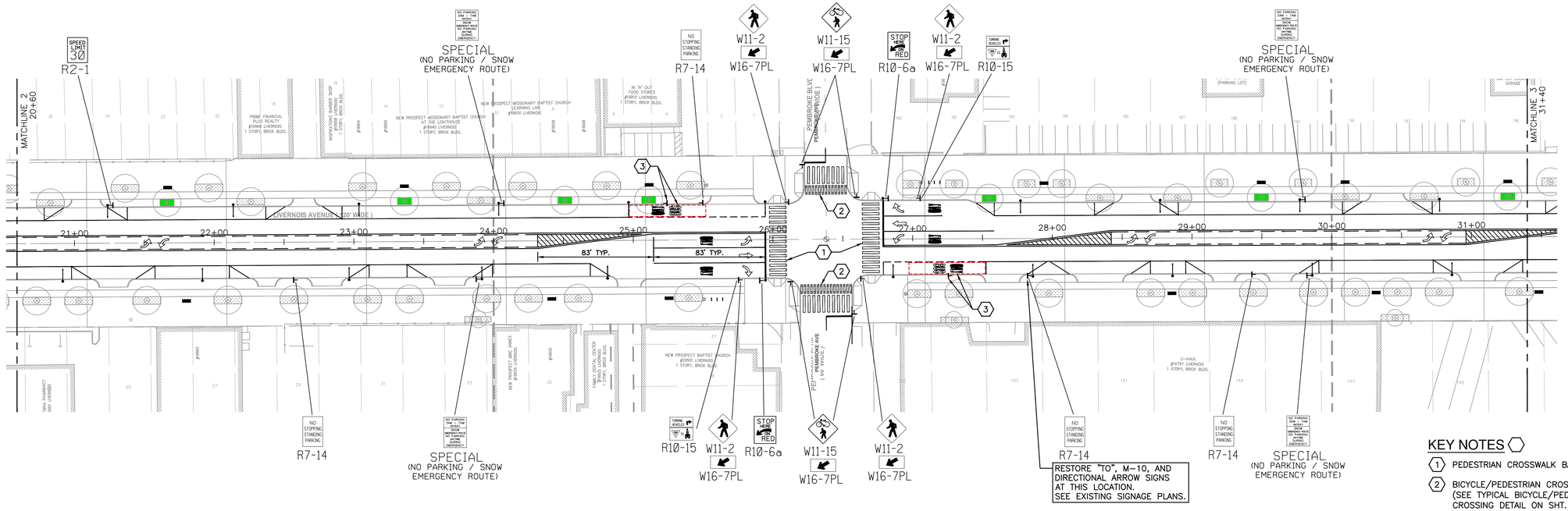
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FINAL SIGNAGE & PAVEMENT MARKING - STA. 0+00 TO 20+60

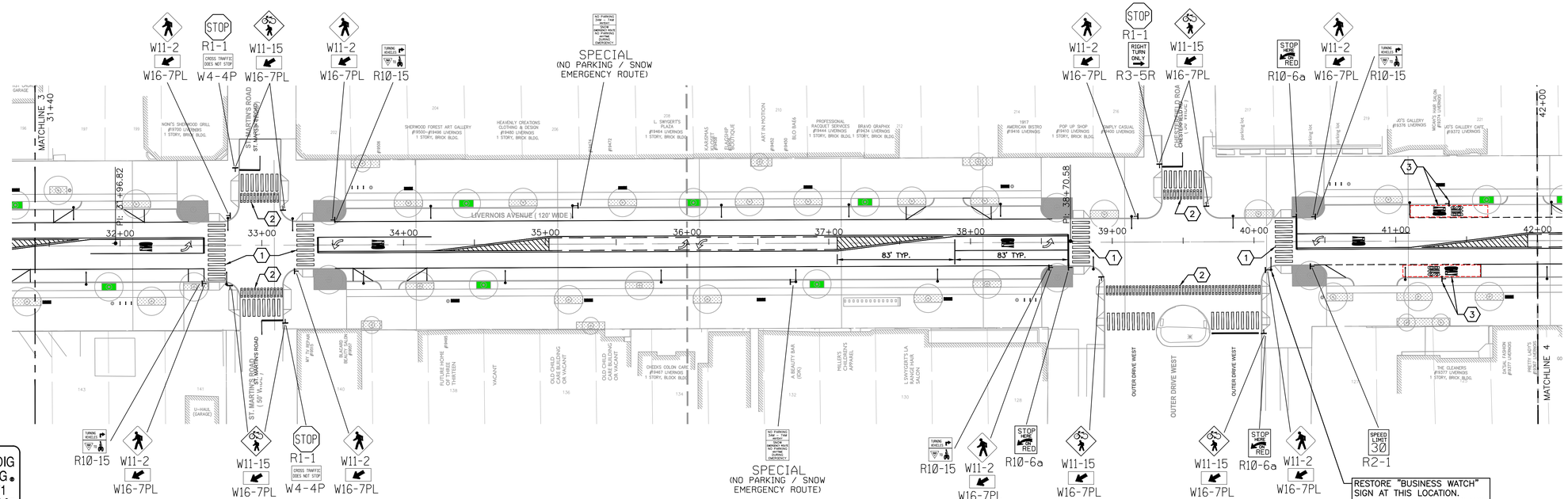
Sheet No: C601

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SIGNAGE AND PAVEMENT MARKING PLAN: STA. 20+60 TO STA. 31+40

SCALE: 1" = 40'



SIGNAGE AND PAVEMENT MARKING PLAN: STA. 31+40 TO STA. 42+00

SCALE: 1" = 40'

N

0 20' 40' 80'

SCALE

LEGEND

- DOUBLE YELLOW SOLID PAVEMENT MARKING (6" WIDE, EACH)
- SINGLE SOLID & DASHED YELLOW PAVEMENT MARKING FOR CENTER TURN LANES (6" WIDE, EACH)
- SINGLE SOLID WHITE PAVEMENT MARKING (LANES & CROSSWALKS WHERE APPLICABLE) (4" WIDE)
- DASHED WHITE PAVEMENT MARKING (BICYCLE CROSSINGS) (4" WIDE)
- 1.5' WIDE x 12' LONG SOLID WHITE CROSSWALK BAR (AS SHOWN)
- BICYCLE LANE TRAFFIC CROSSING – SOLID WHITE OUTER BARS WITH SOLID GREEN CENTER BAR (AS SHOWN) (SEE DETAIL ON SHEET No. C508)
- TRAFIC FLOW ARROW (AS SHOWN)
- PERMANENT POLE MOUNTED SIGN
- NEW LIGHT POLE (SEE NOTES REGARDING SIGN PLACMEMENT)

KEY NOTES

1. PEDESTRIAN CROSSWALK BARS
2. BICYCLE/PEDESTRIAN CROSSING (SEE TYPICAL BICYCLE/PEDESTRIAN CROSSING DETAIL ON SHT. No. C508)
3. BUS STOP "RED CARPET" WITH WHITE "BUS ONLY" GRAPHICS & DDOT BUS ROUTE/NO STANDING SIGN

NOTES

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3 WORKING DAYS
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Pink SURVEYING
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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

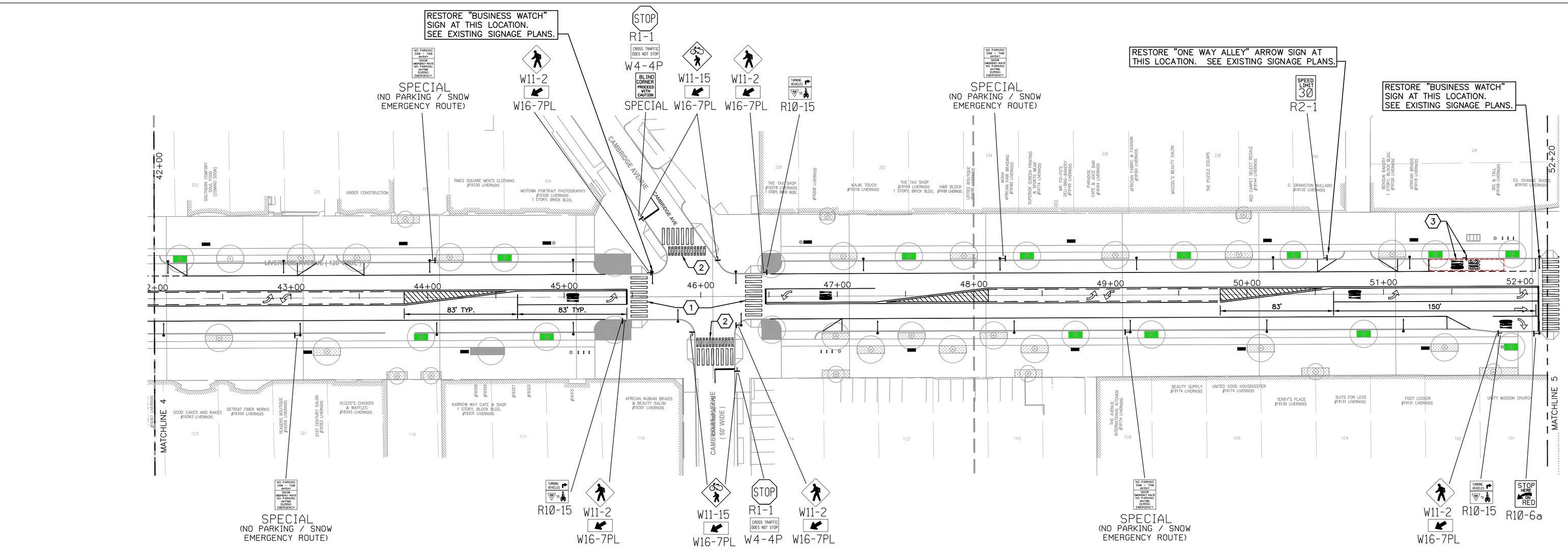
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FINAL SIGNAGE & PAVEMENT MARKING - STA. 20+60 TO 42+00

Sheet No: C602

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KEY NOTES

1. PEDESTRIAN CROSSWALK BARS
2. BICYCLE/PEDESTRIAN CROSSING (SEE TYPICAL BICYCLE/PEDESTRIAN CROSSING DETAIL ON SHT. No. C508)
3. BUS STOP "RED CARPET" WITH WHITE "BUS ONLY" GRAPHICS & DDOT BUS ROUTE/NO STANDING SIGN

0 20' 40' 80'
SCALE

LEGEND

- DOUBLE YELLOW SOLID PAVEMENT MARKING (6" WIDE, EACH)
- SINGLE SOLID & DASHED YELLOW PAVEMENT MARKING FOR CENTER TURN LANES (6" WIDE, EACH)
- SINGLE SOLID WHITE PAVEMENT MARKING (LANES & CROSSWALKS WHERE APPLICABLE) (4" WIDE)
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- TRAFIC FLOW ARROW (AS SHOWN)
- PERMANENT POLE MOUNTED SIGN
- NEW LIGHT POLE (SEE NOTES REGARDING SIGN PLACMEMENT)

NOTES

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3 WORKING DAYS
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

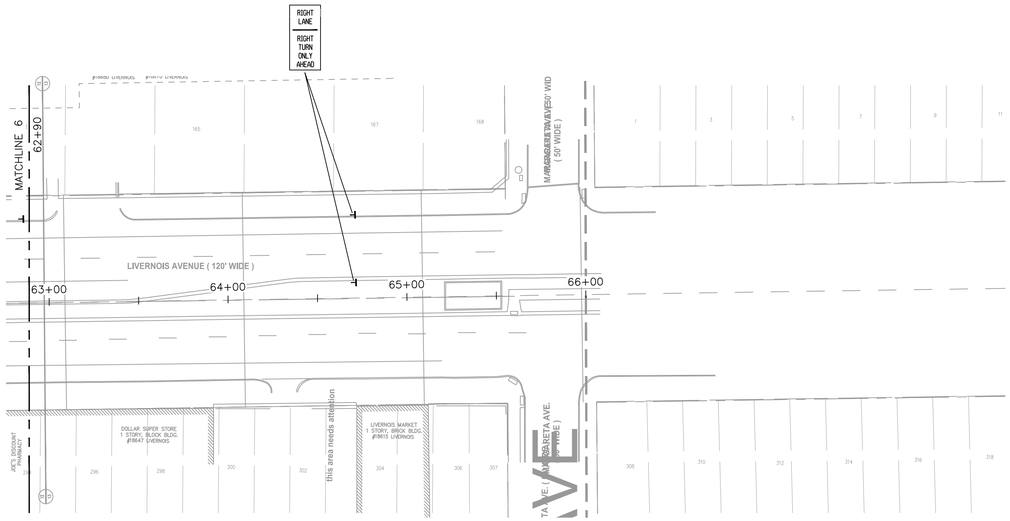
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FINAL SIGNAGE & PAVEMENT MARKING - STA. 42+00 TO 62+90

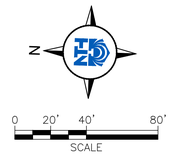
Sheet No: C603

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SIGNAGE AND PAVEMENT MARKING PLAN: STA. 62+90 TO POE

SCALE: 1" = 40'

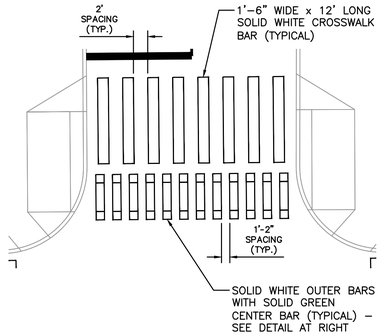


LEGEND

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- TRAFIC FLOW ARROW (AS SHOWN)
- PERMANENT POLE MOUNTED SIGN
- NEW LIGHT POLE (SEE NOTES REGARDING SIGN PLACMEMENT)

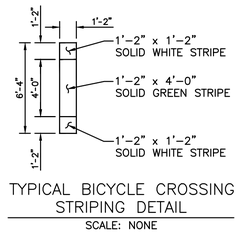
KEY NOTES

1. PEDESTRIAN CROSSWALK BARS
2. BICYCLE/PEDESTRIAN CROSSING (SEE TYPICAL BICYCLE/PEDESTRIAN CROSSING DETAIL ON SHT. No. C508)
3. BUS STOP "RED CARPET" WITH WHITE "BUS ONLY" GRAPHICS & DDOT BUS ROUTE/NO STANDING SIGN



TYPICAL BICYCLE/PEDESTRIAN CROSSING DETAIL

SCALE: 1" = 10'



TYPICAL BICYCLE CROSSING STRIPING DETAIL

SCALE: NONE

NOTES

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61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

DATE: 21 Dec 2018

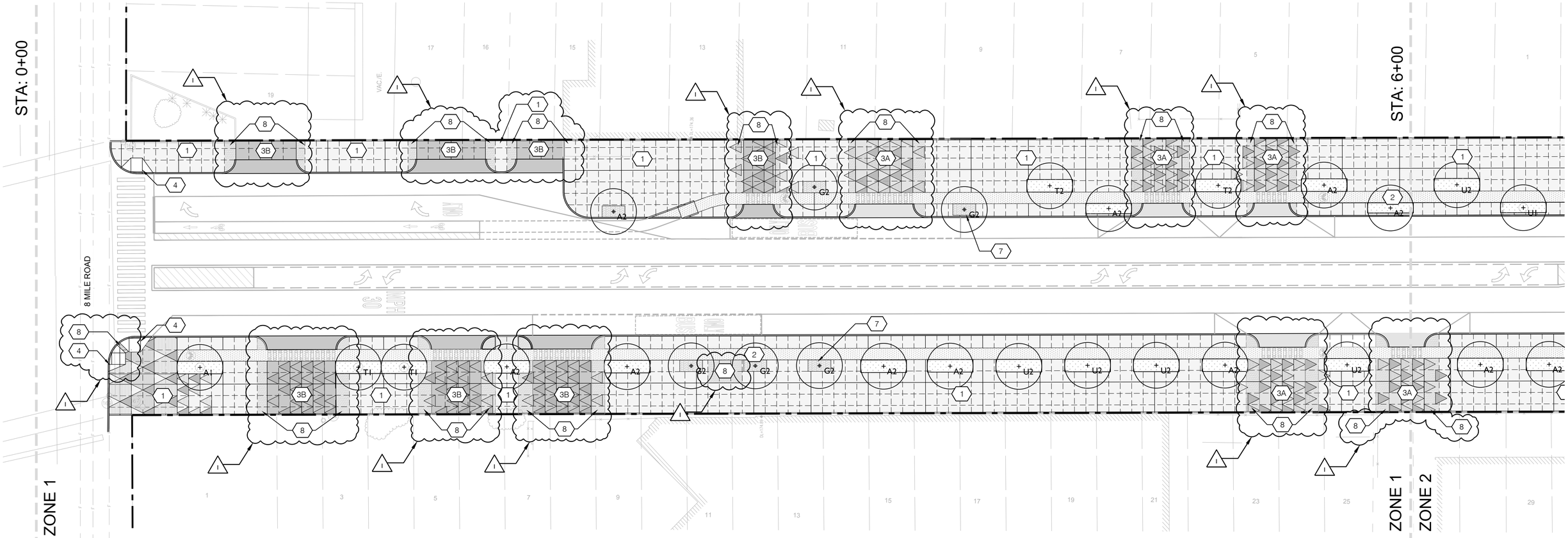
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FINAL SIGNAGE & PAVEMENT MARKING - STA. 62+90 TO 66+00

Sheet No: C604

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1 MATERIAL PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Design - For Bid

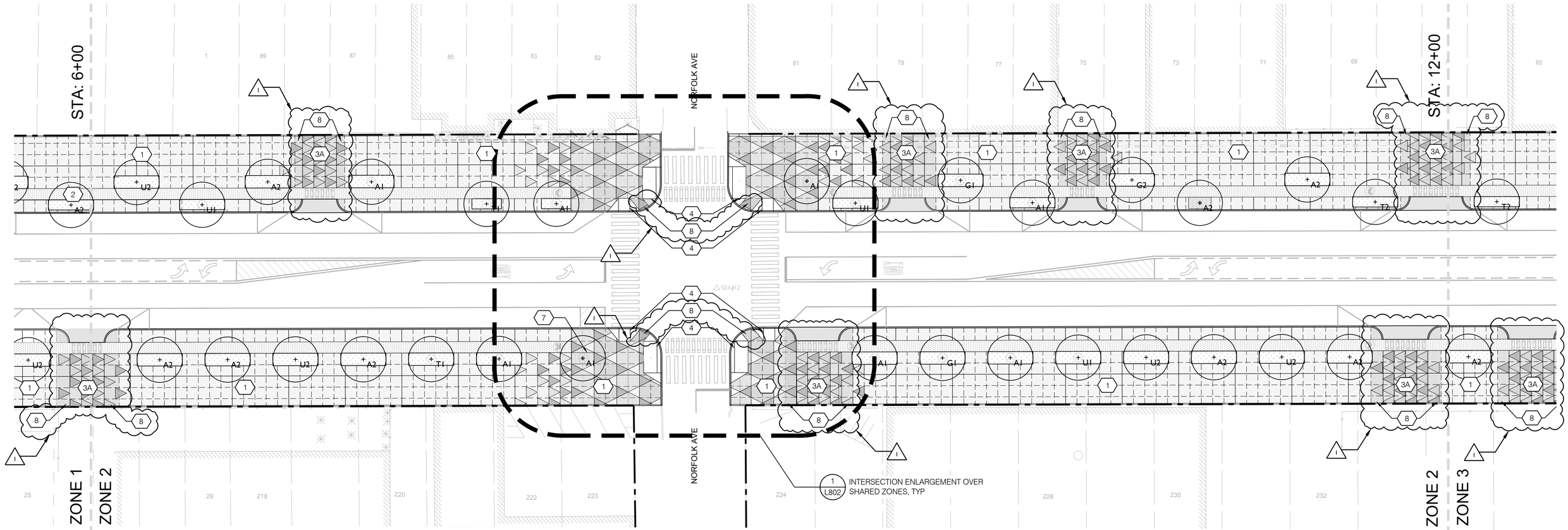
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 1

Sheet No: L201



1 MATERIAL PLAN- ZONE 2
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L901
2. BICYCLE PATH, SEE 1/L902
3A. 8" COMMERCIAL DRIVEWAY, SEE 2/L901
3B. 8" REINFORCED COMMERCIAL DRIVEWAY
4. ADA RAMP TYPE F, SEE 3A/L901
5. ADA RAMP TYPE RF, SEE 4/L901
6. CURB CUT, TYP SEE 2/L902
7. TREE GRATE, TYP, SEE 3A/L902
8. 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

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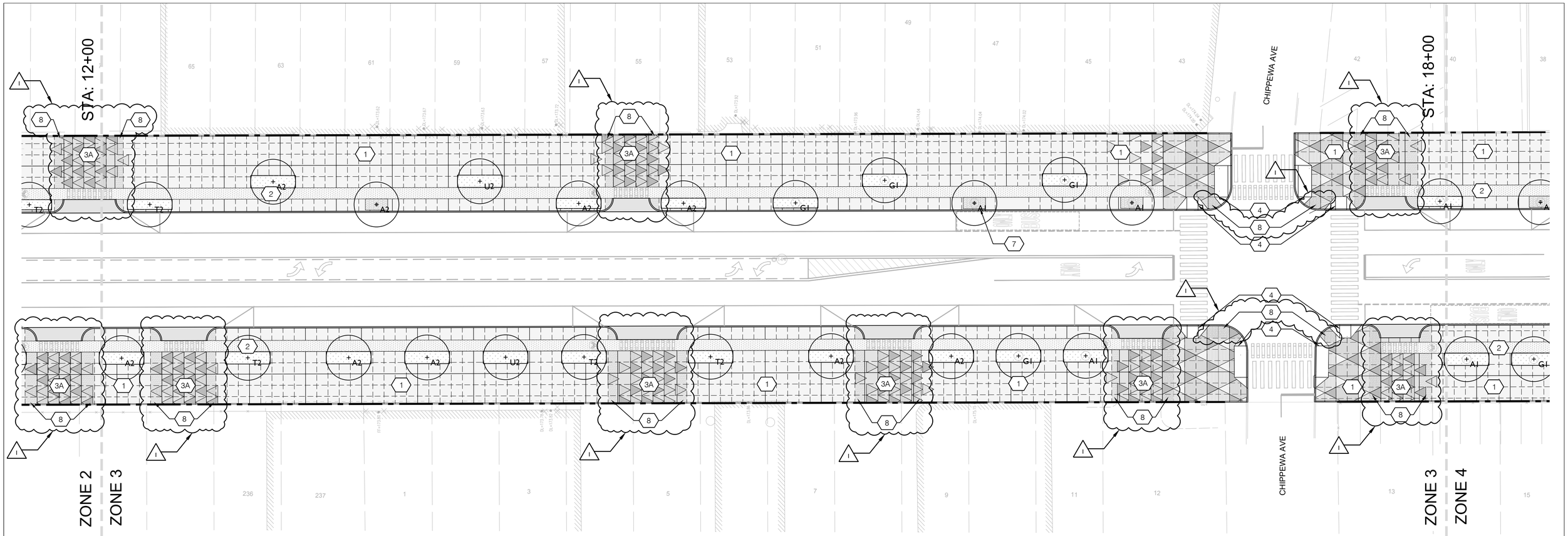
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
△	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 2

Sheet No: L202



1 MATERIAL PLAN- ZONE 3A
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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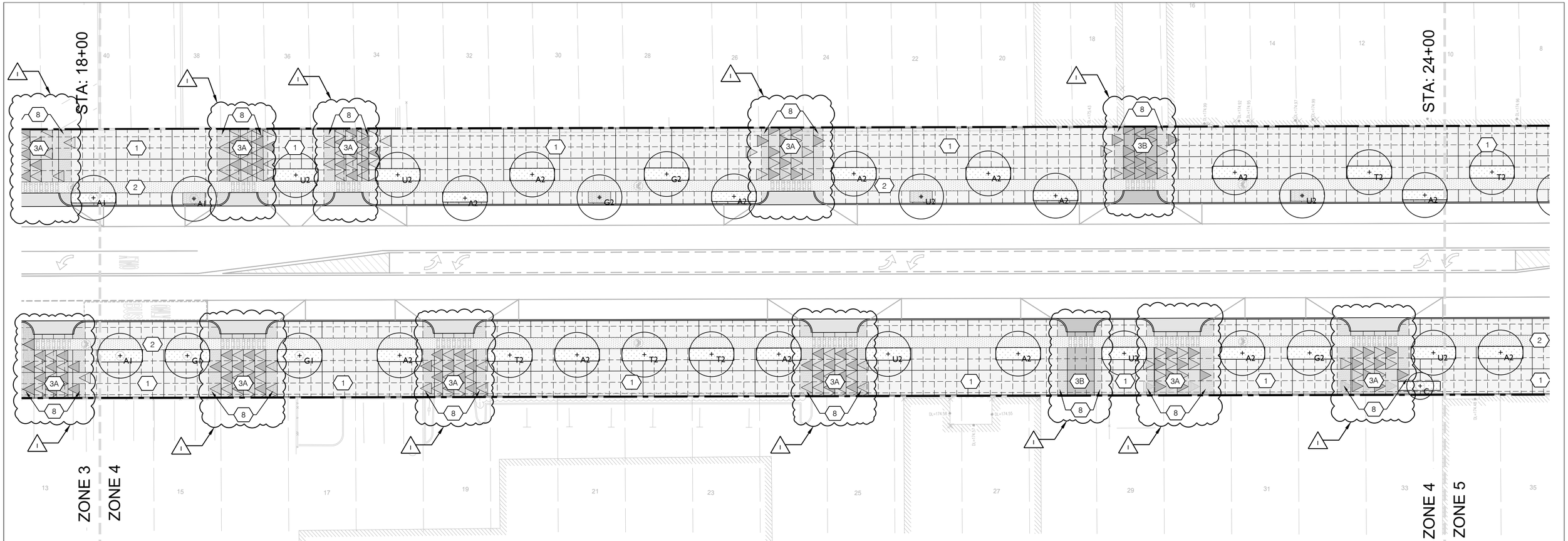
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REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 3A

Sheet No: L203



1 MATERIAL PLAN- ZONE 4
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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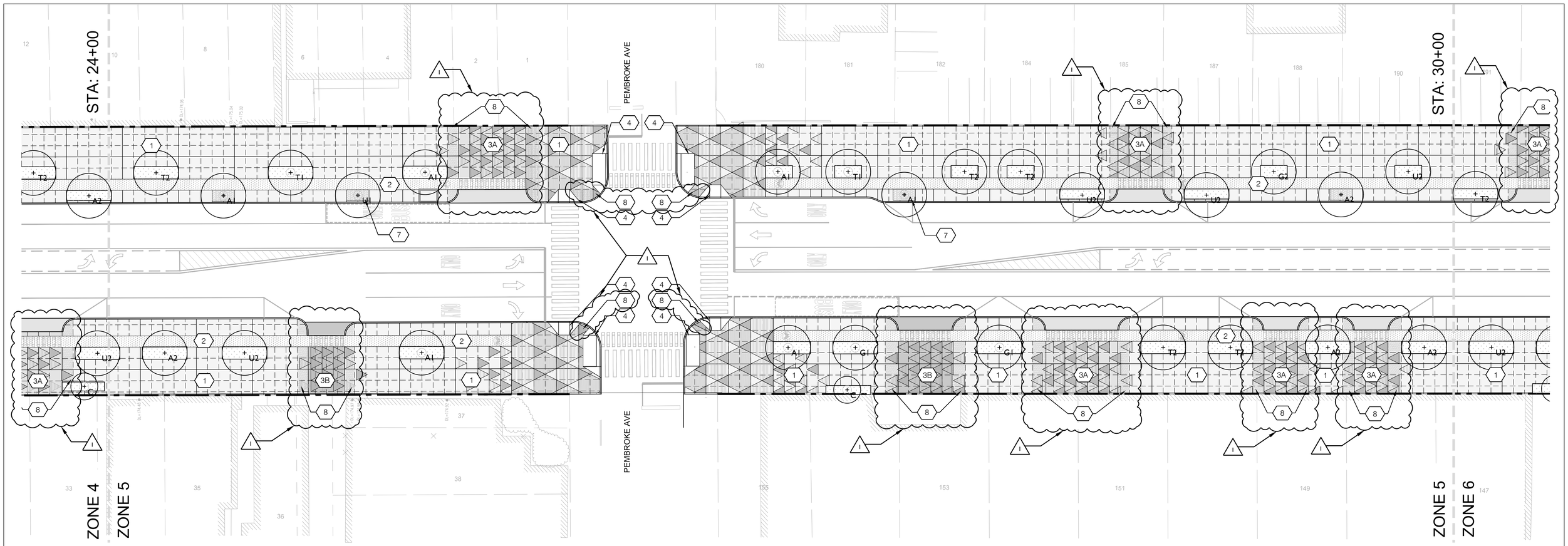
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 4

Sheet No: L204



1 MATERIAL PLAN- ZONE 5
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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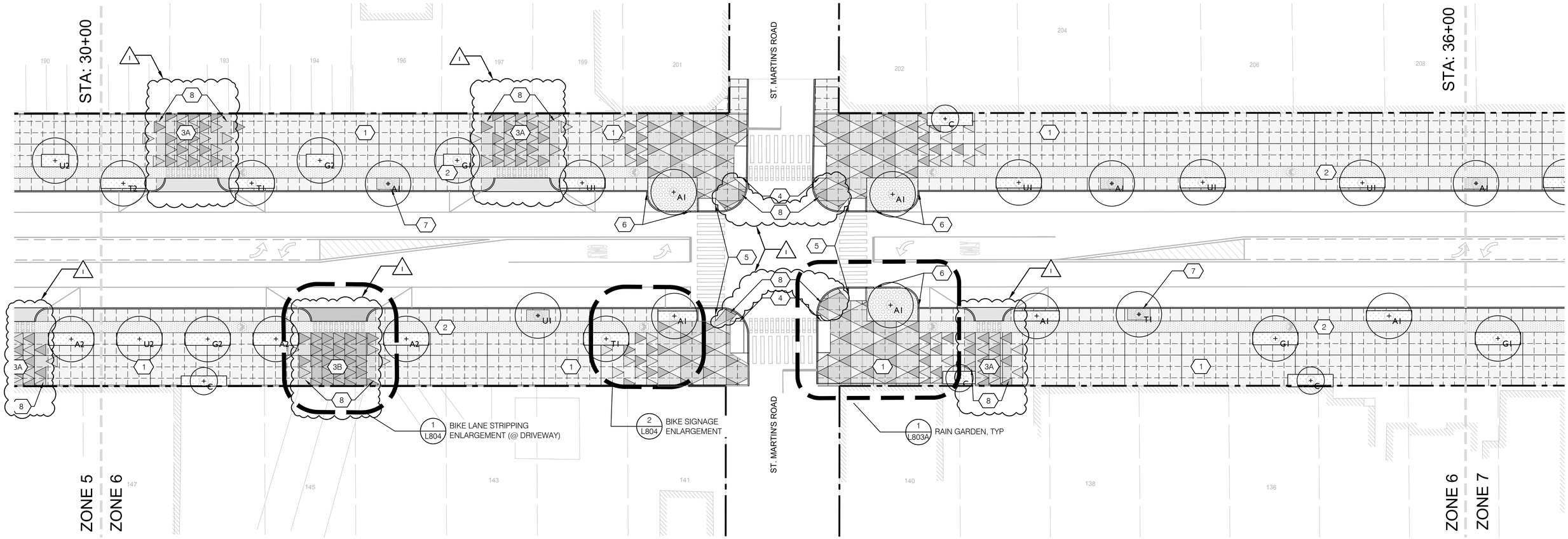
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 5

Sheet No: L205



1 MATERIAL PLAN- ZONE 6
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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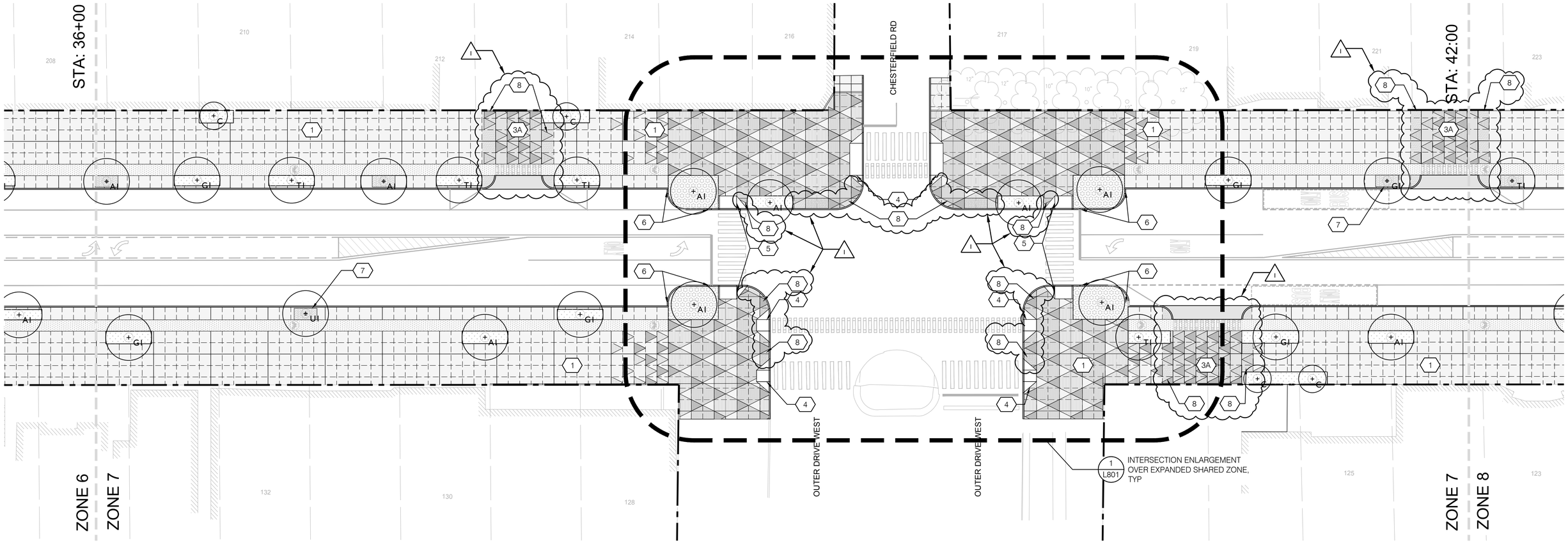
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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 6

Sheet No: L206



1 MATERIAL PLAN- ZONE 7
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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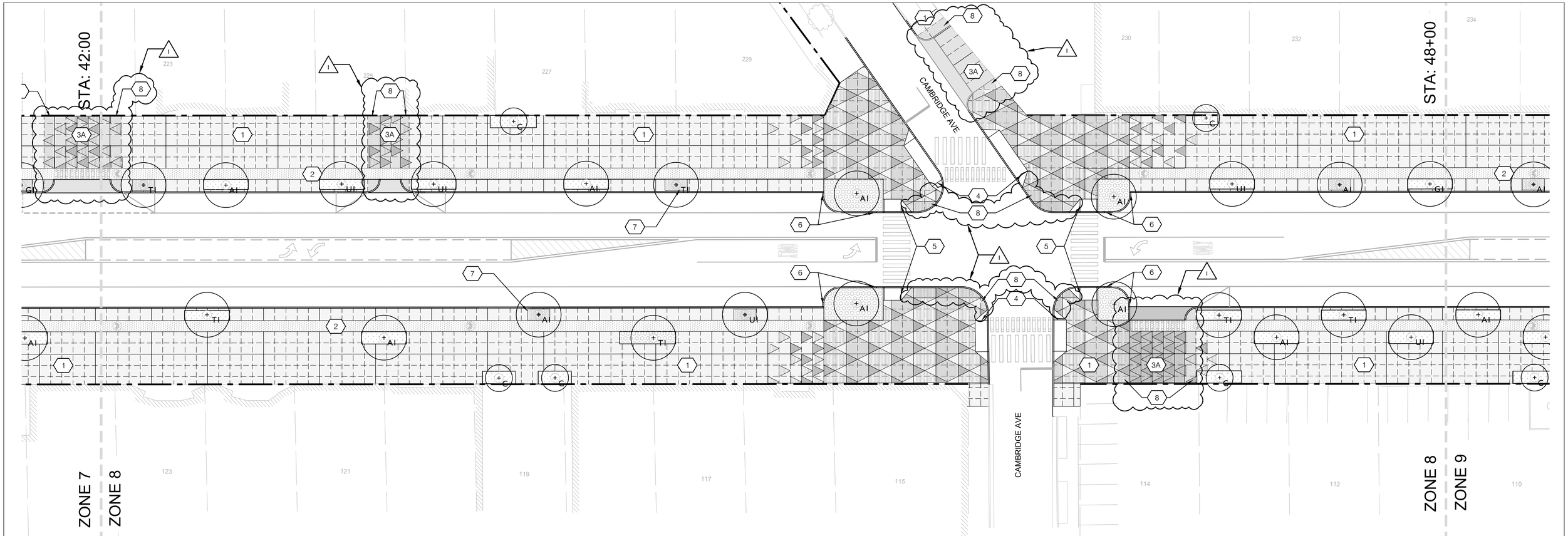
DATE: 21 December 2018

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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 7

Sheet No: L207



1 MATERIAL PLAN- ZONE 8
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

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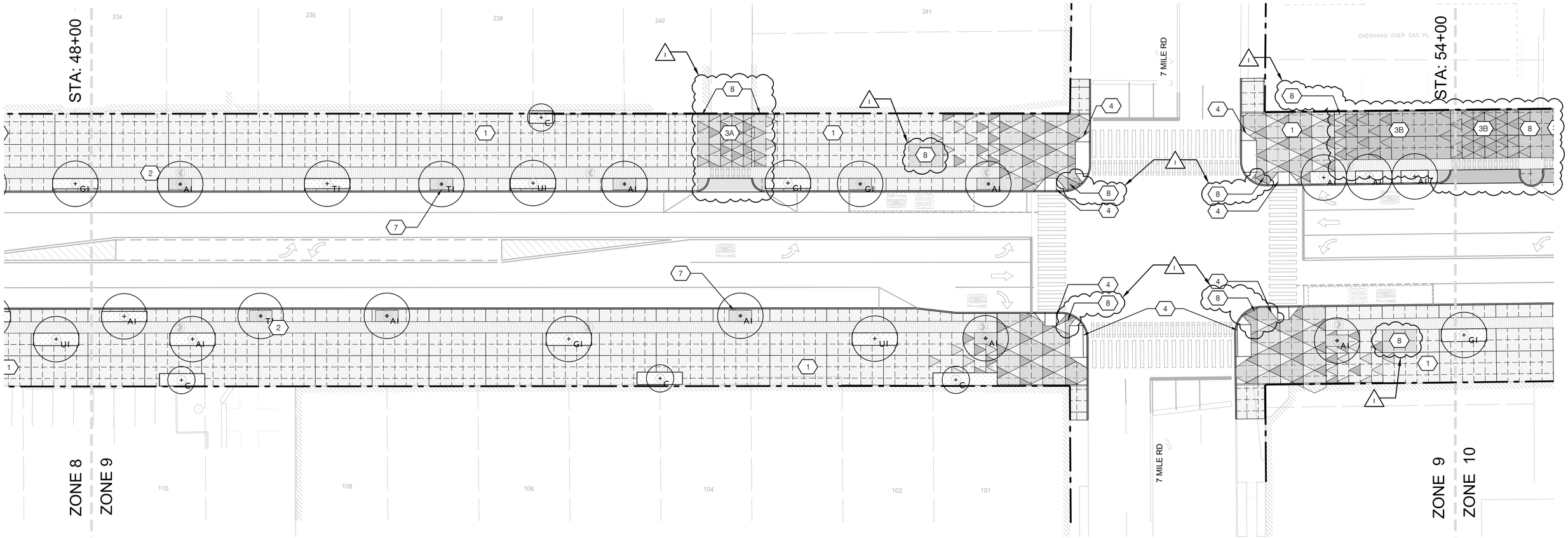
DATE: 21 December 2018

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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 8

Sheet No: L208



1 MATERIAL PLAN- ZONE 9
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
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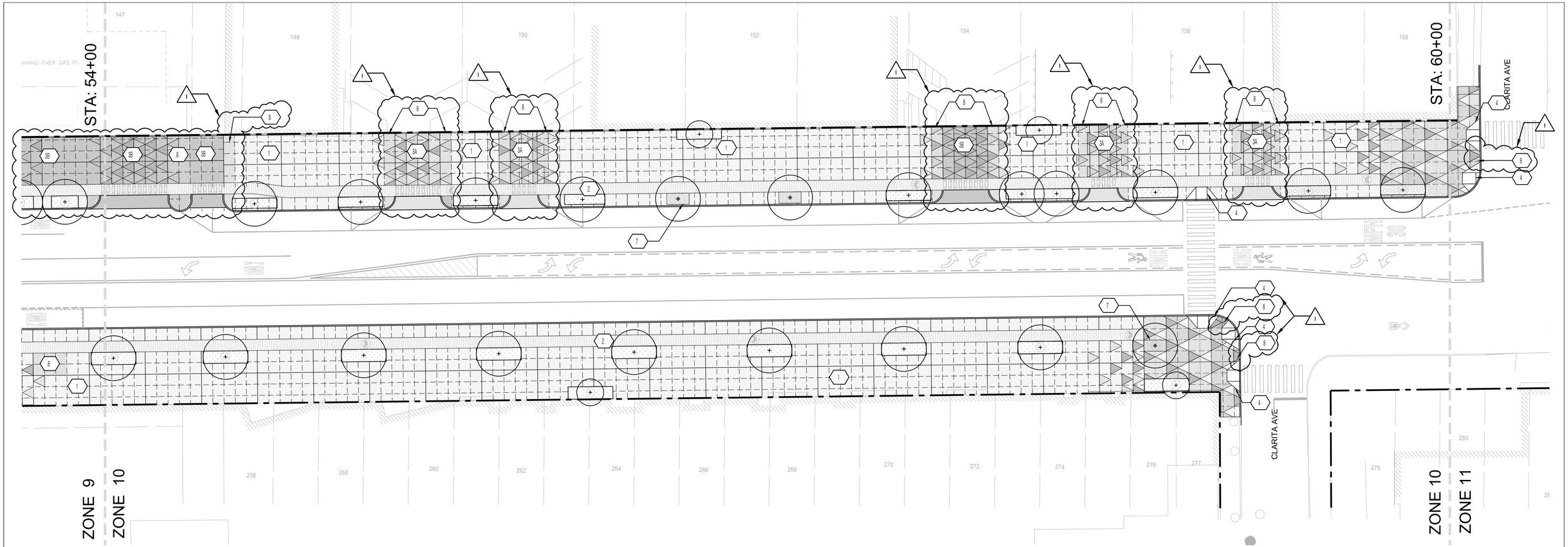
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NO.	DESCRIPTION	DATE
△	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 9

Sheet No: L209



1 MATERIAL PLAN- ZONE 10
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

- 1 — 4" STANDARD SIDEWALK, SEE 1/L901
- 2 — BICYCLE PATH, SEE 1/L902
- 3A — 8" COMMERCIAL DRIVEWAY, SEE 2/L901
- 3B — 8" REINFORCED COMMERCIAL DRIVEWAY
- 4 — ADA RAMP TYPE F, SEE 3A/L901
- 5 — ADA RAMP TYPE RF, SEE 4/L901
- 6 — CURB CUT, TYP SEE 2/L902
- 7 — TREE GRATE, TYP, SEE 3A/L902
- 8 — 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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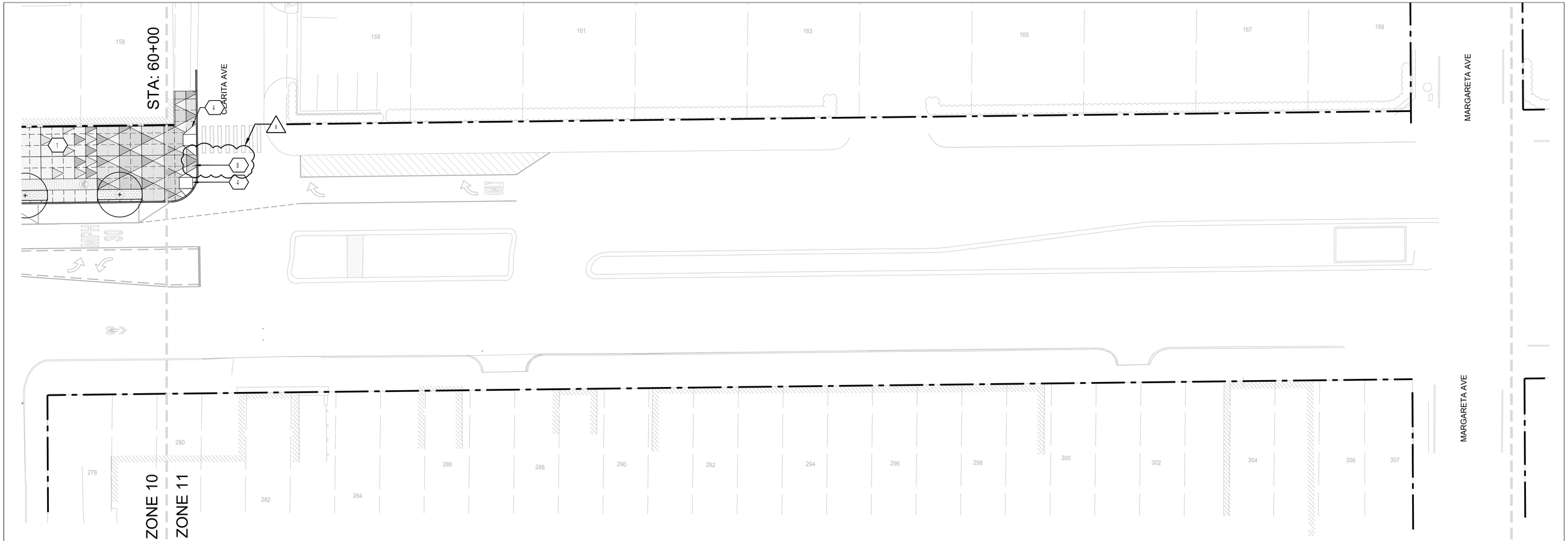
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 10

Sheet No: L210



1 MATERIAL PLAN- ZONE 11
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L901
2. BICYCLE PATH, SEE 1/L902
3A. 8" COMMERCIAL DRIVEWAY, SEE 2/L901
3B. 8" REINFORCED COMMERCIAL DRIVEWAY
4. ADA RAMP TYPE F, SEE 3A/L901
5. ADA RAMP TYPE RF, SEE 4/L901
6. CURB CUT, TYP SEE 2/L902
7. TREE GRATE, TYP, SEE 3A/L902
8. 6" STANDARD SIDEWALK

- CONTRACTION JOINT
- EXPANSION JOINT
- STAMPED CONCRETE PATTERN, TYP
- PAINTED BIKE CROSSING AT DRIVEWAYS, TYP. SEE L804 FOR BIKE STRIPING ENLARGEMENTS

NOTES: REFER TO L800 FOR STAMP PATTERN LAYOUT ENLARGEMENTS

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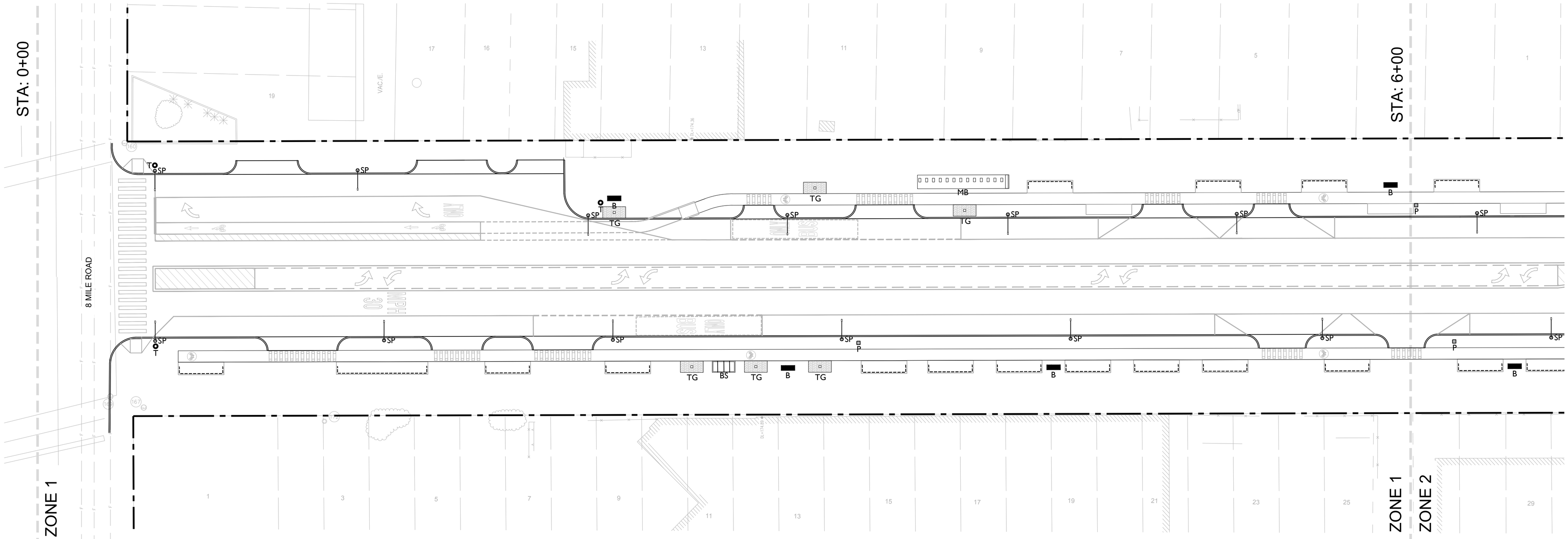
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NO.	DESCRIPTION	DATE
1	ADDENDUM 1	2/8/19

Sheet Title: MATERIALS PLAN ZONE 11

Sheet No: L211



1 FURNISHINGS PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY
TG	TREE GRATE, SEE 3/L902

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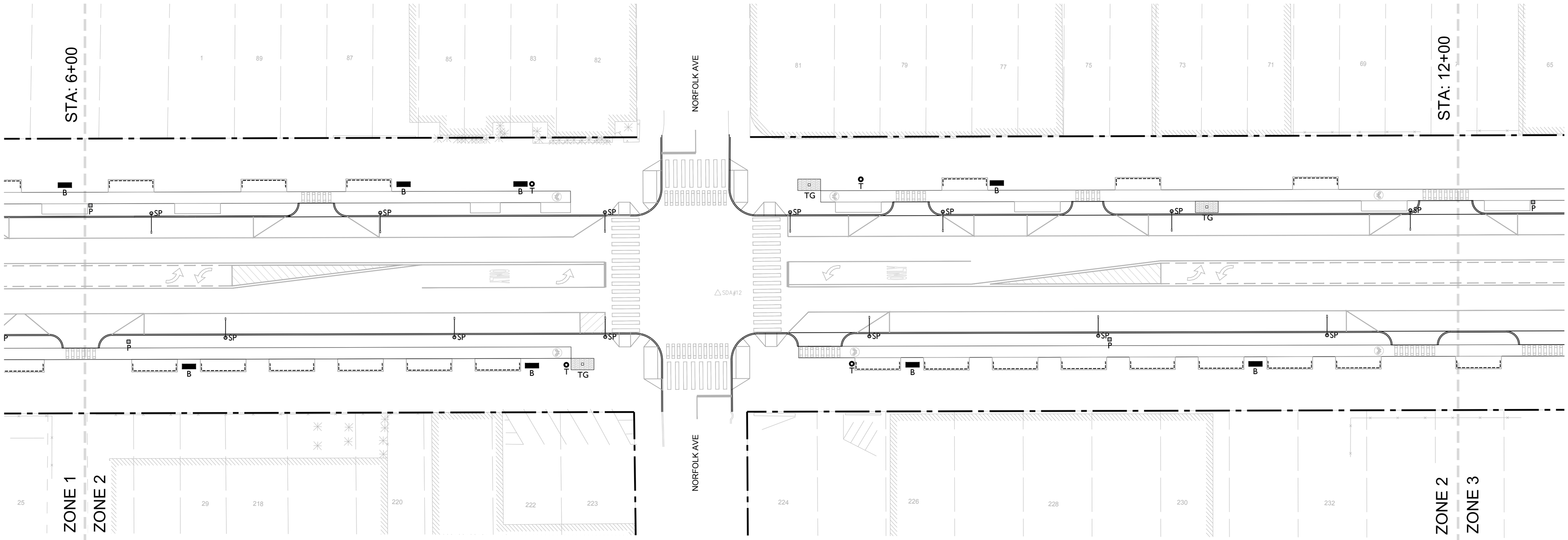
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FURNISHINGS PLAN ZONE 1

Sheet No: L221



1 FURNISHINGS PLAN- ZONE 2
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY
TG	TREE GRATE, SEE 3/L902

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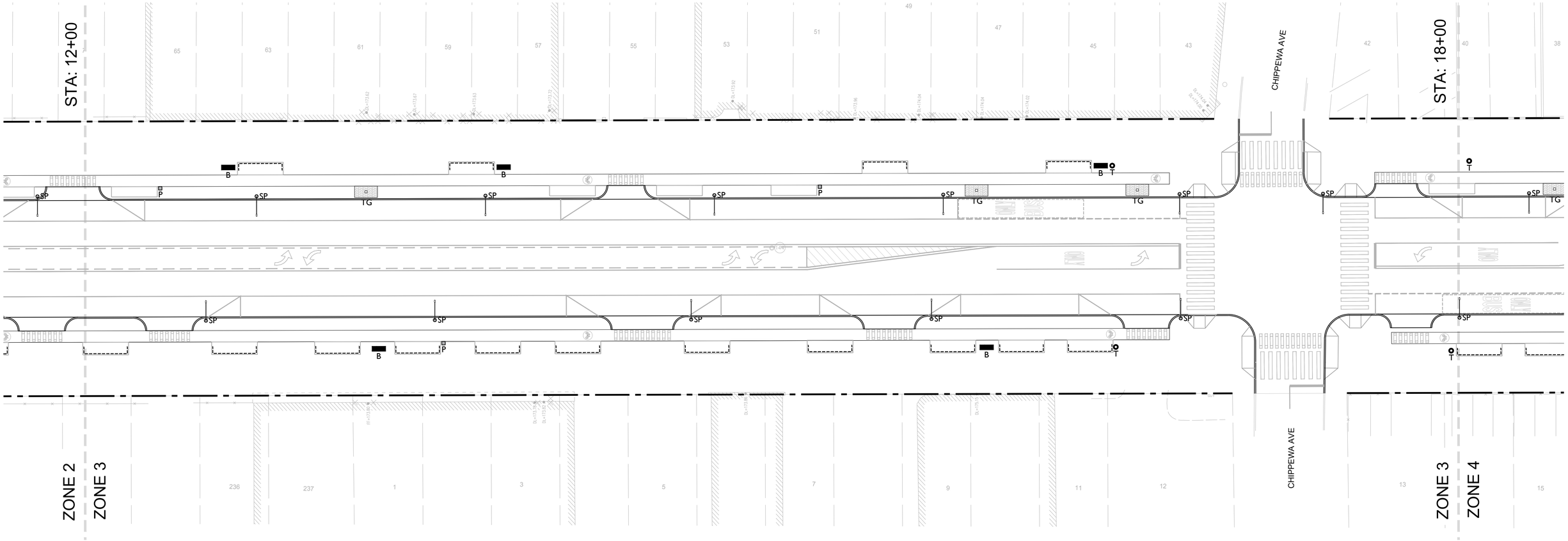
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Sheet Title

FURNISHINGS PLAN ZONE 2

Sheet No:

L222



1 FURNISHINGS PLAN- ZONE 3
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	
LOT BOUNDARY	
EXISTING FENCE	

LEGEND			
SP	CITY STANDARD LIGHT POLE, BY OTHERS	TG	TREE GRATE, SEE 3/L902
T	CITY STANDARD TRASH CAN, SEE 3/L920		
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920		
B	CITY STANDARD BENCH, SEE 2/L920		
MB	MOGO BIKE SHARE, BY OTHERS		
BS	BUS SHELTER, SEE 5/L920		
--------	PLANT RAIL, SEE 4/L920		
P	PARKING METER, BY CITY		

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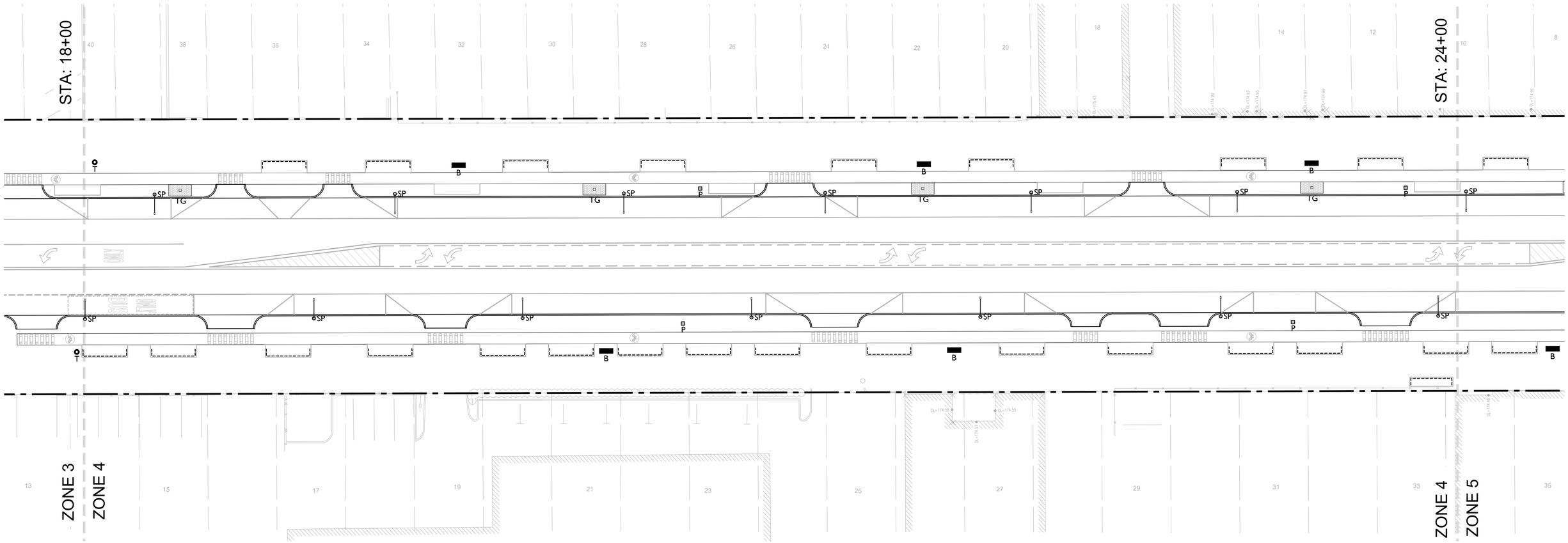
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
FURNISHINGS PLAN ZONE 3

Sheet No:
L223



1 FURNISHINGS PLAN- ZONE 4
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY

TG	TREE GRATE, SEE 3/L902

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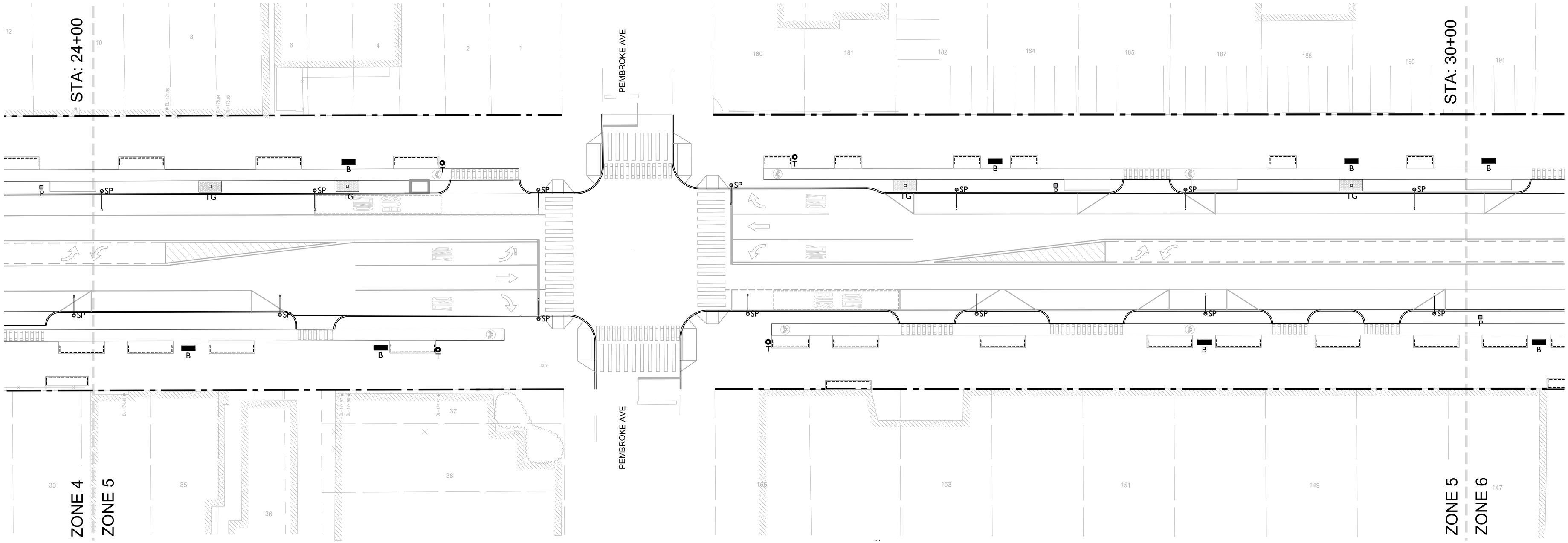
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Sheet Title

FURNISHINGS PLAN ZONE 4

Sheet No:

L224



1 FURNISHINGS PLAN- ZONE 5
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY
TG	TREE GRATE, SEE 3/L902

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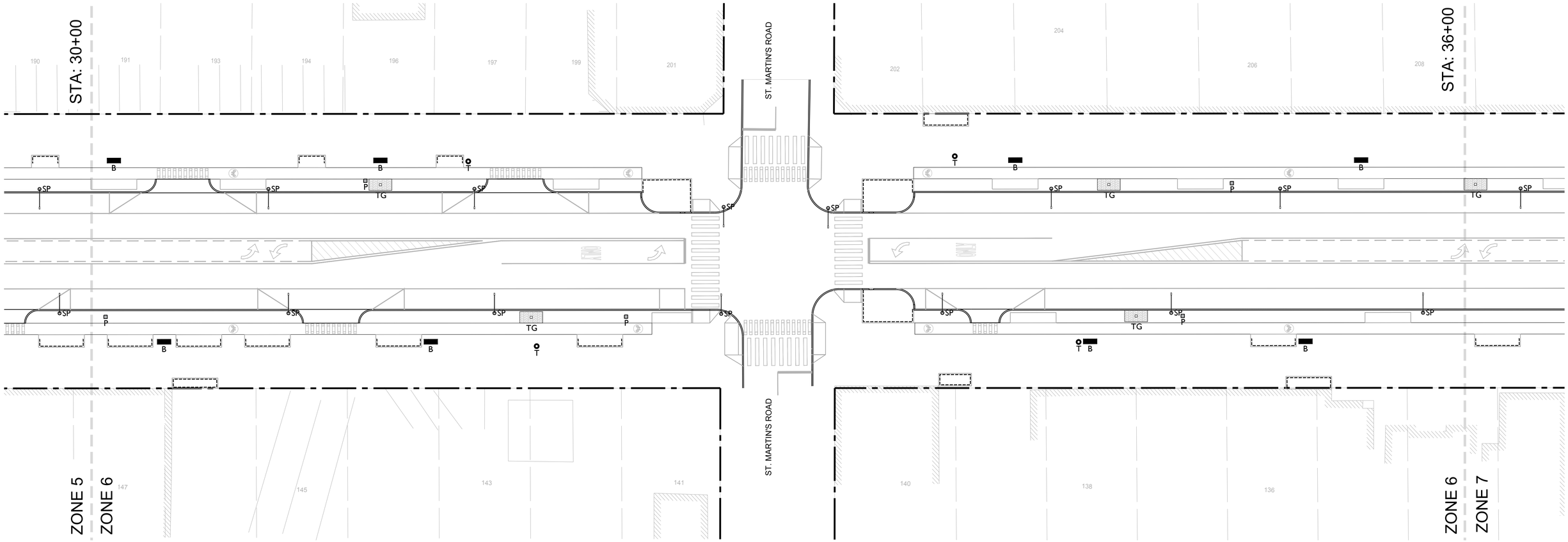
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
FURNISHINGS PLAN ZONE 5

Sheet No:
L225



1 FURNISHINGS PLAN- ZONE 6
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND			
SP	CITY STANDARD LIGHT POLE, BY OTHERS	TG	TREE GRATE, SEE 3/L902
T	CITY STANDARD TRASH CAN, SEE 3/L920		
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920		
B	CITY STANDARD BENCH, SEE 2/L920		
MB	MOGO BIKE SHARE, BY OTHERS		
BS	BUS SHELTER, SEE 5/L920		
--------	PLANT RAIL, SEE 4/L920		
P	PARKING METER, BY CITY		

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LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

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SMM PROJECT No: 17081

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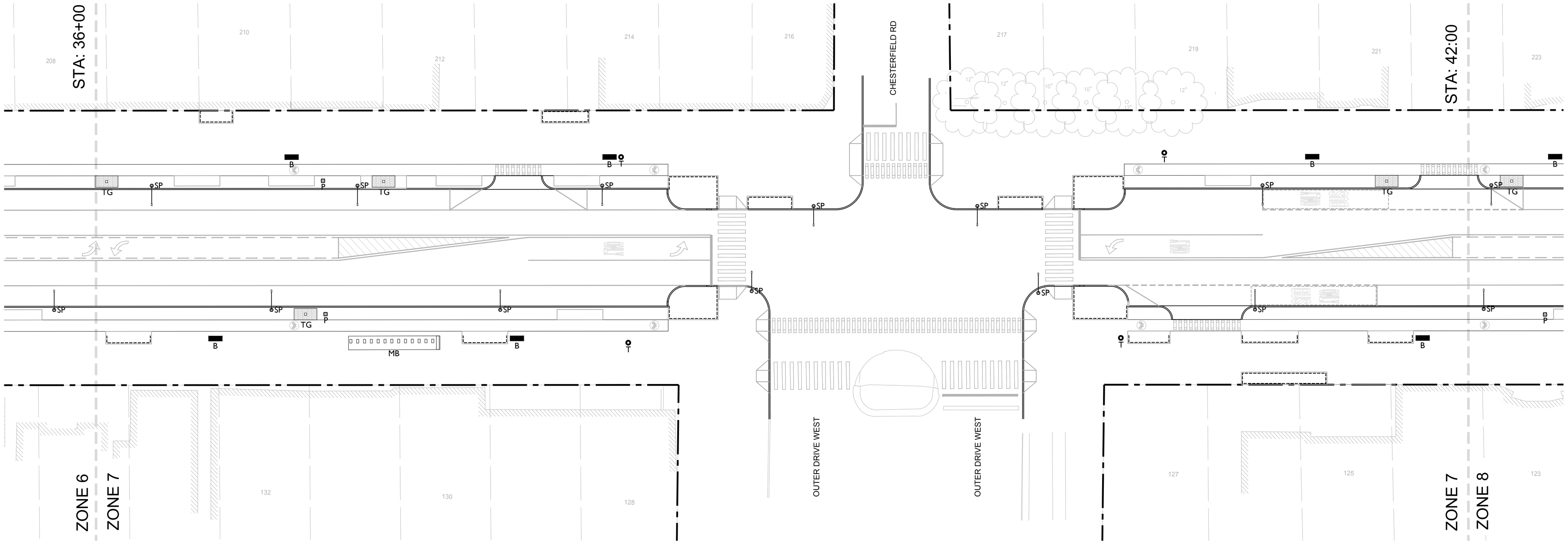
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
FURNISHINGS PLAN ZONE 6

Sheet No:
L226



1 FURNISHINGS PLAN- ZONE 7
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND			
SP	CITY STANDARD LIGHT POLE, BY OTHERS	TG	TREE GRATE, SEE 3/L902
T	CITY STANDARD TRASH CAN, SEE 3/L920		
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920		
B	CITY STANDARD BENCH, SEE 2/L920		
MB	MOGO BIKE SHARE, BY OTHERS		
BS	BUS SHELTER, SEE 5/L920		
	PLANT RAIL, SEE 4/L920		
P	PARKING METER, BY CITY		

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SMM PROJECT No: 17081

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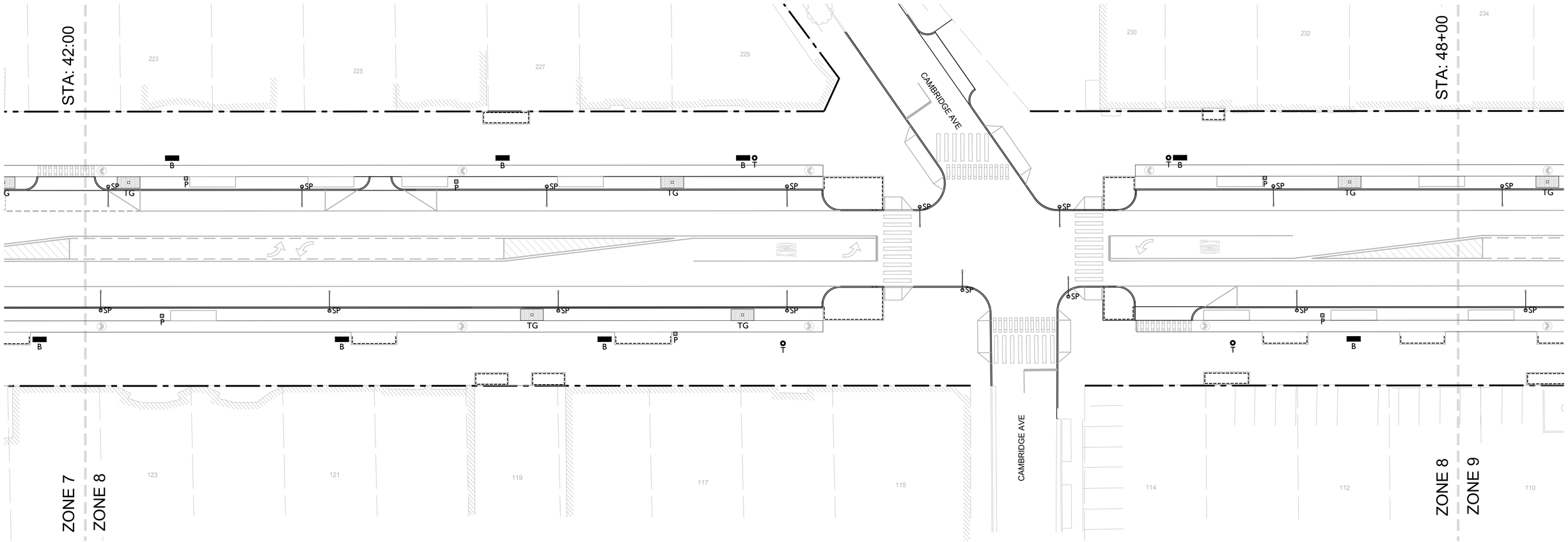
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FURNISHINGS PLAN ZONE 7

Sheet No: L227



1 FURNISHINGS PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY
TG	TREE GRATE, SEE 3/L902

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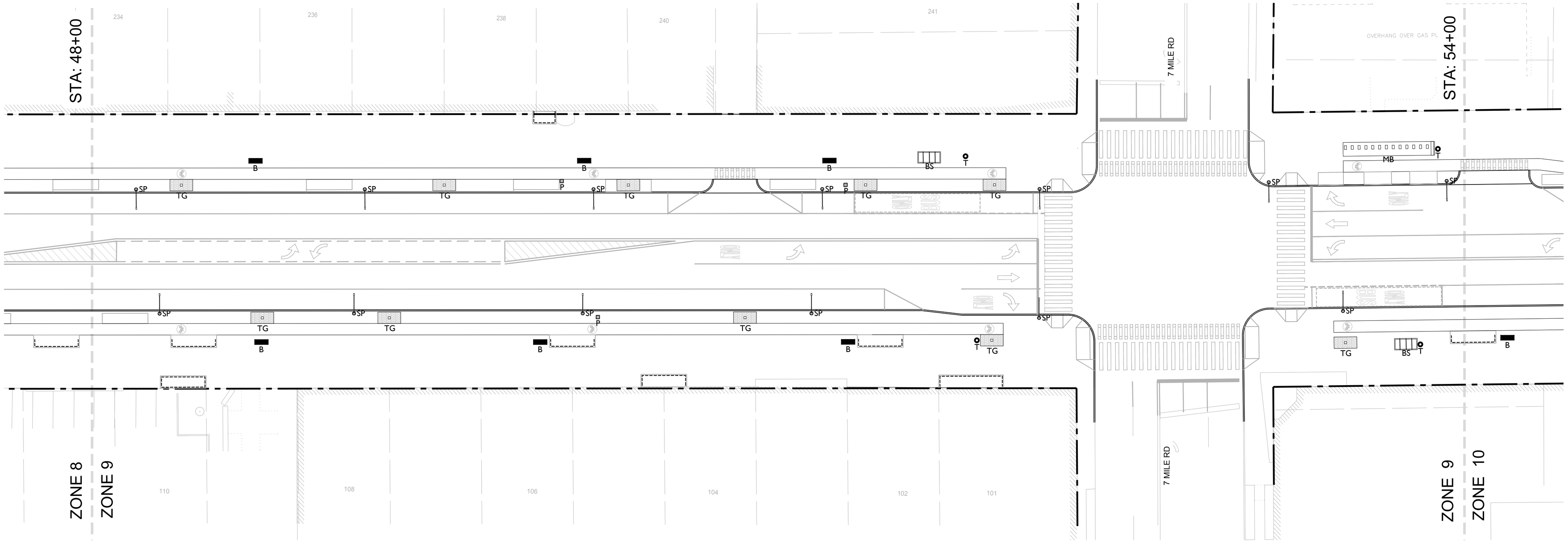
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
FURNISHINGS PLAN ZONE 1

Sheet No:
L228



1 FURNISHINGS PLAN- ZONE 9
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND		
SP	CITY STANDARD LIGHT POLE, BY OTHERS	TG — TREE GRATE, SEE 3/L902
T	CITY STANDARD TRASH CAN, SEE 3/L920	
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920	
B	CITY STANDARD BENCH, SEE 2/L920	
MB	MOGO BIKE SHARE, BY OTHERS	
BS	BUS SHELTER, SEE 5/L920	
	PLANT RAIL, SEE 4/L920	
P	PARKING METER, BY CITY	

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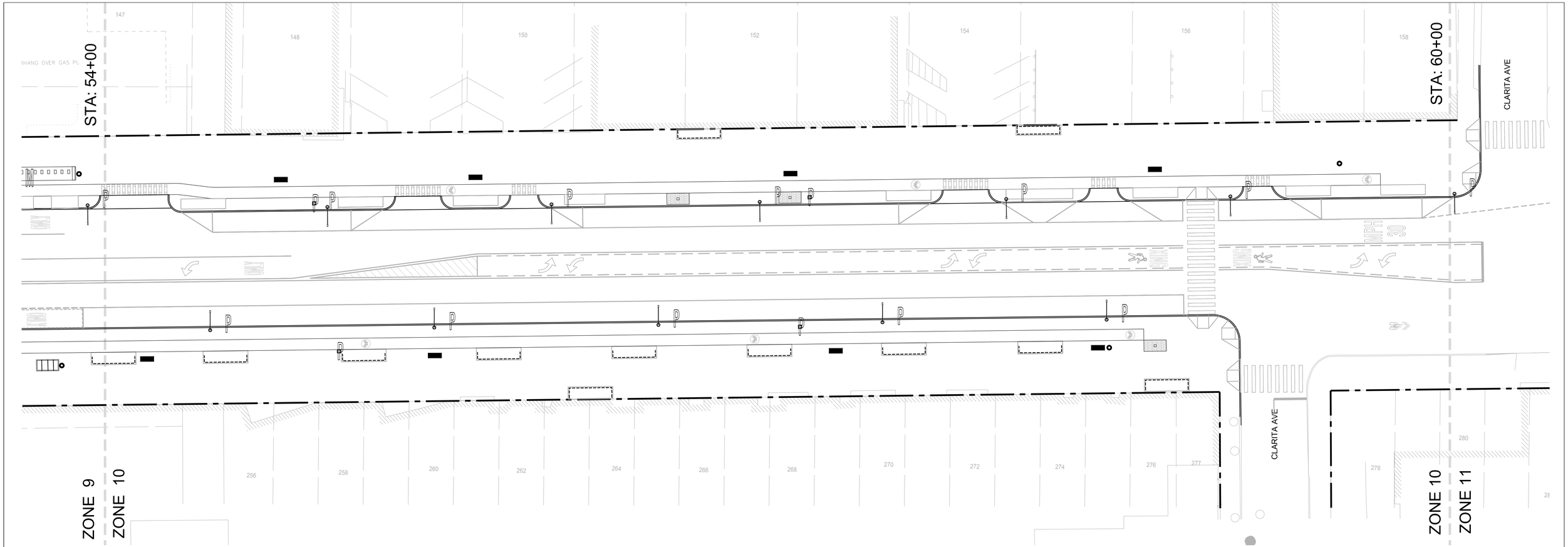
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FURNISHINGS PLAN ZONE 9

Sheet No: L229



1 FURNISHINGS PLAN- ZONE 10
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP	CITY STANDARD LIGHT POLE, BY OTHERS
T	CITY STANDARD TRASH CAN, SEE 3/L920
BR	CITY STANDARD BIKE RACK (3), SEE 1/L920
B	CITY STANDARD BENCH, SEE 2/L920
MB	MOGO BIKE SHARE, BY OTHERS
BS	BUS SHELTER, SEE 5/L920
--------	PLANT RAIL, SEE 4/L920
P	PARKING METER, BY CITY
TG	TREE GRATE, SEE 3/L902

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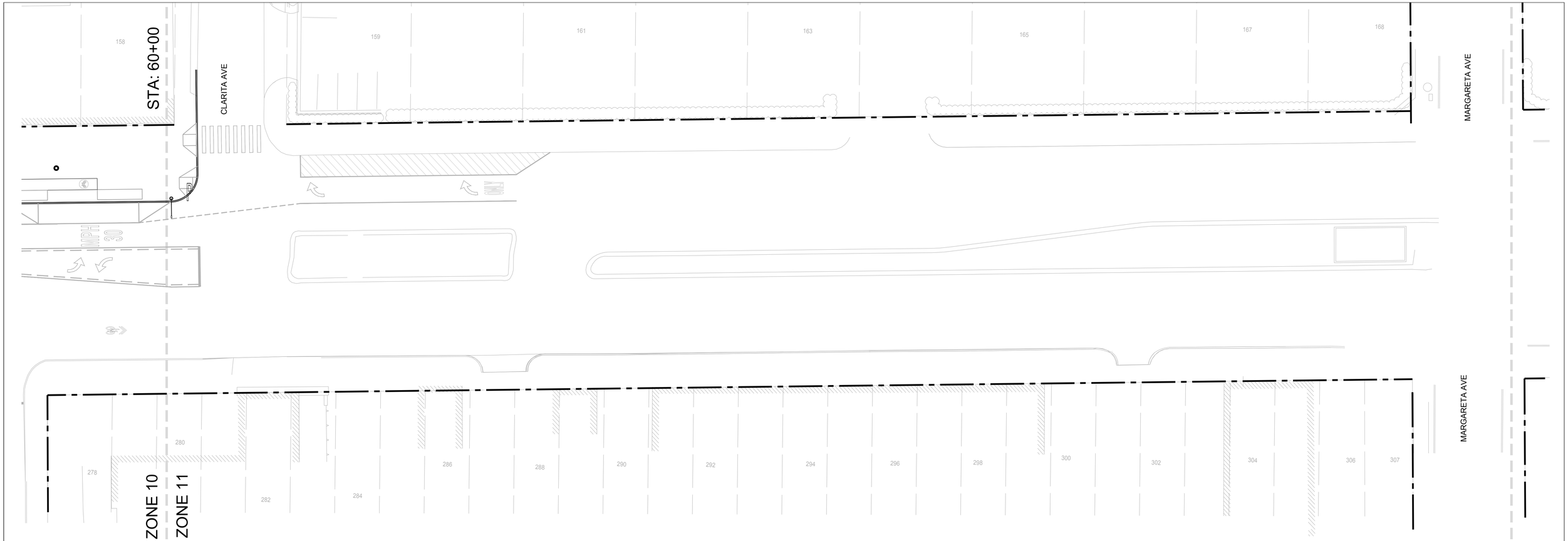
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FURNISHINGS PLAN ZONE 10

Sheet No: L230



1 FURNISHINGS PLAN- ZONE 11
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE

LEGEND	
SP — CITY STANDARD LIGHT POLE, BY OTHERS	TG — TREE GRATE, SEE 3/L902
T — CITY STANDARD TRASH CAN, SEE 3/L920	
BR — CITY STANDARD BIKE RACK (3), SEE 1/L920	
B — CITY STANDARD BENCH, SEE 2/L920	
MB — MOGO BIKE SHARE, BY OTHERS	
BS — BUS SHELTER, SEE 5/L920	
PLANT RAIL, SEE 4/L920	
P — PARKING METER, BY CITY	

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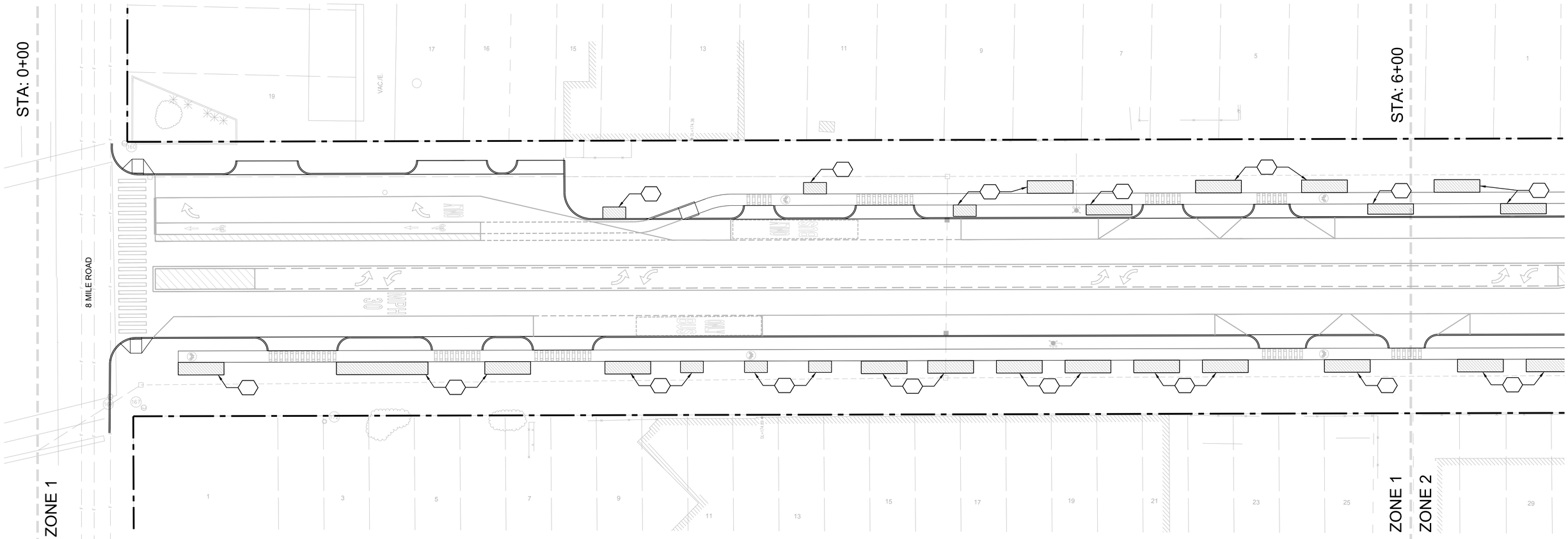
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: FURNISHINGS PLAN ZONE 11

Sheet No: L231



1 SOIL PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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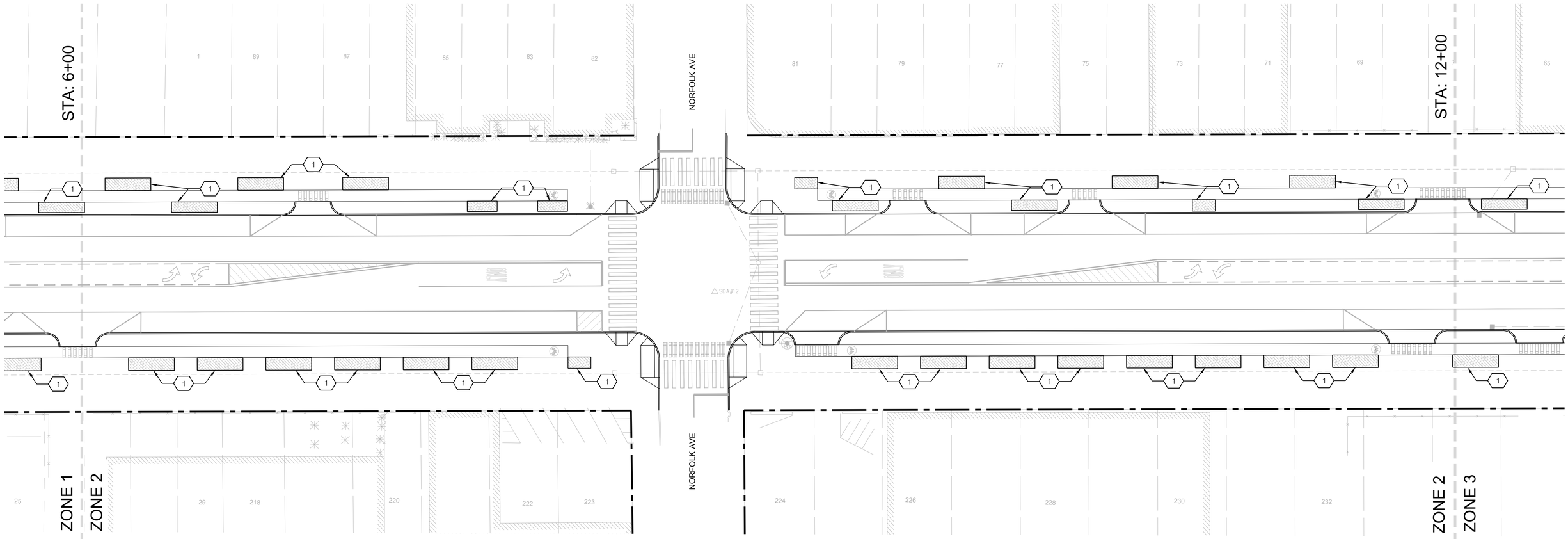
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 1

Sheet No: L401



1 SOIL PLAN- ZONE 2
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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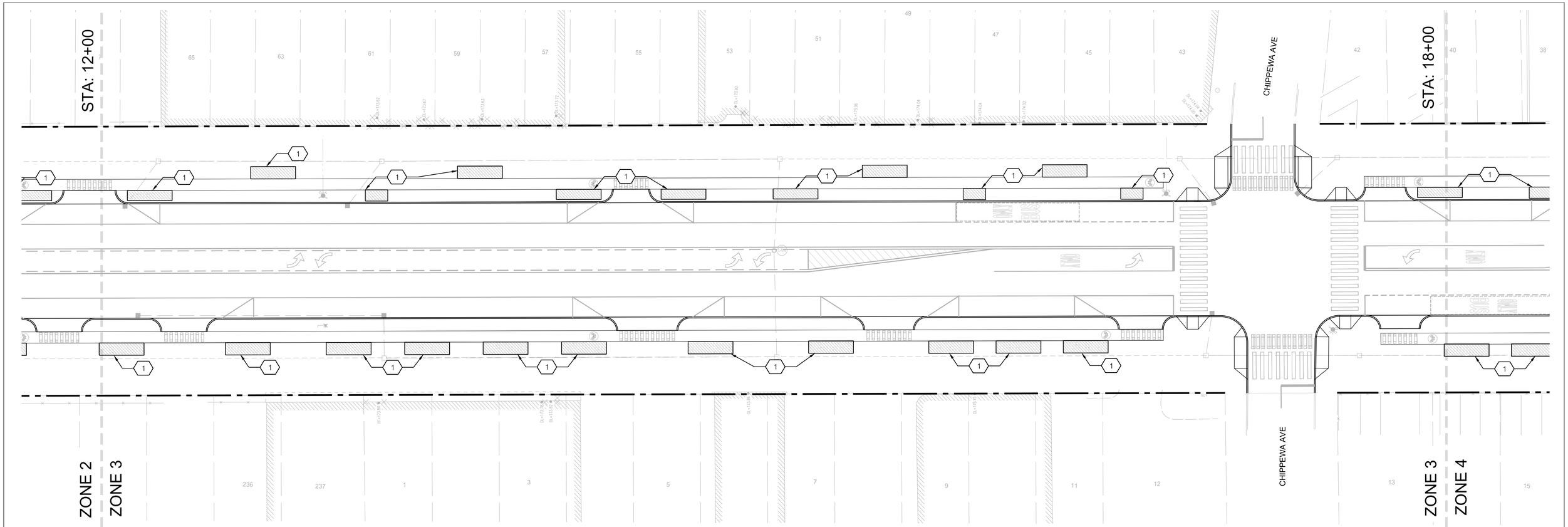
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 2

Sheet No: L402



1 SOIL PLAN- ZONE 3
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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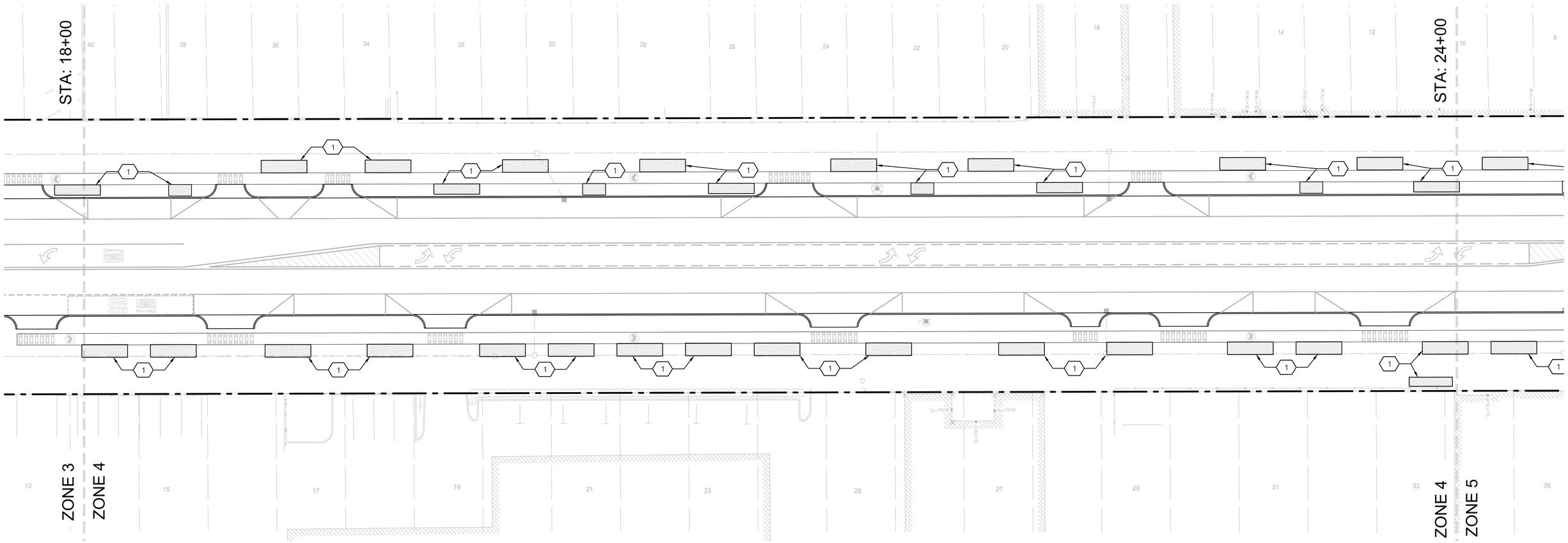
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 3

Sheet No: L403



1 SOIL PLAN- ZONE 4
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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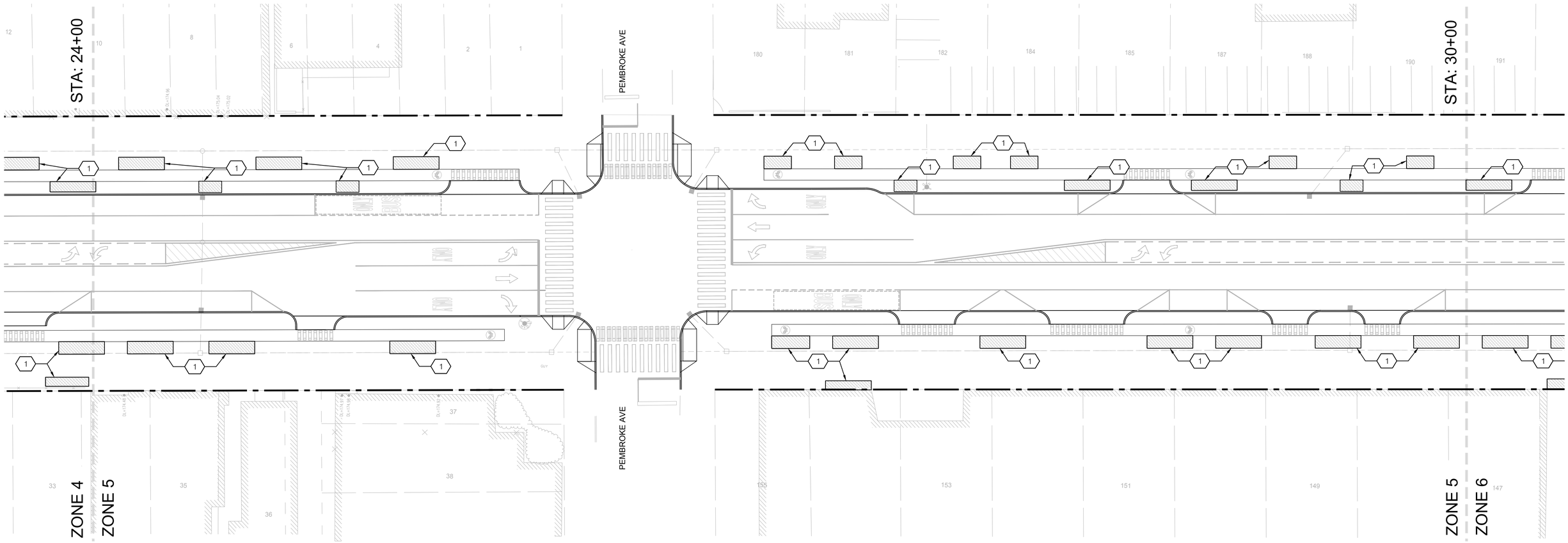
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 4

Sheet No: L404



1 SOIL PLAN- ZONE 5
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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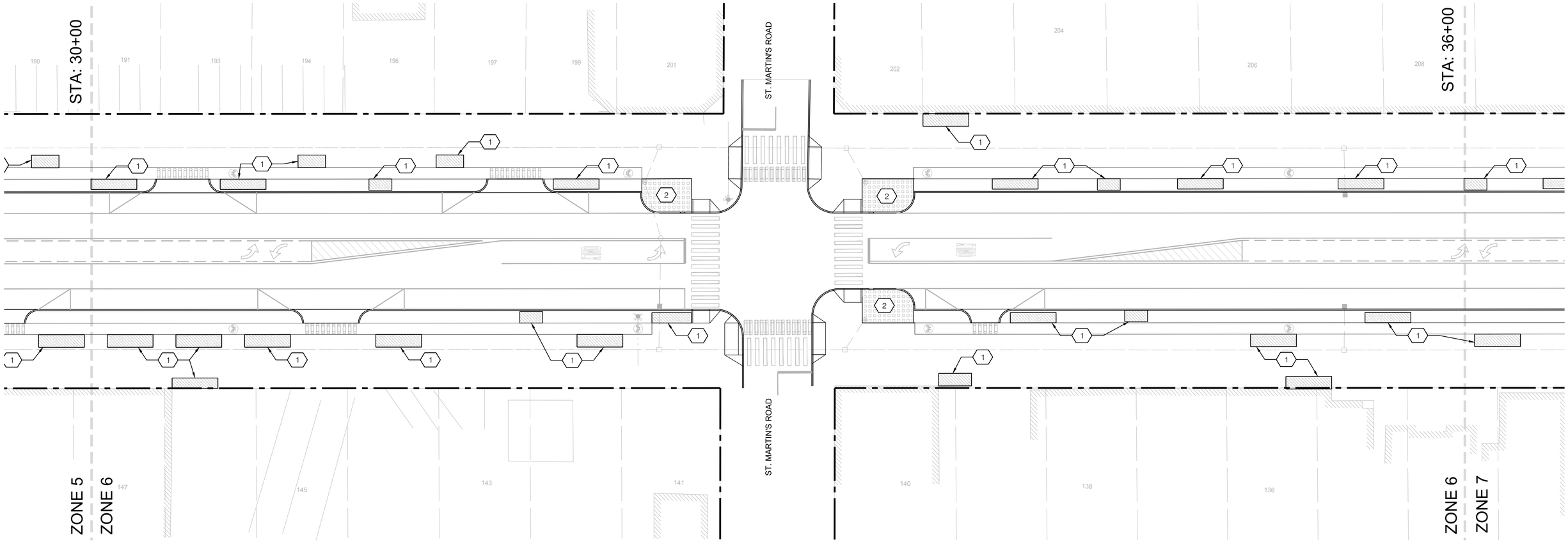
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SOIL PLAN
ZONE 5

Sheet No:
L405



1 SOIL PLAN- ZONE 6
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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SMM PROJECT No: 17081

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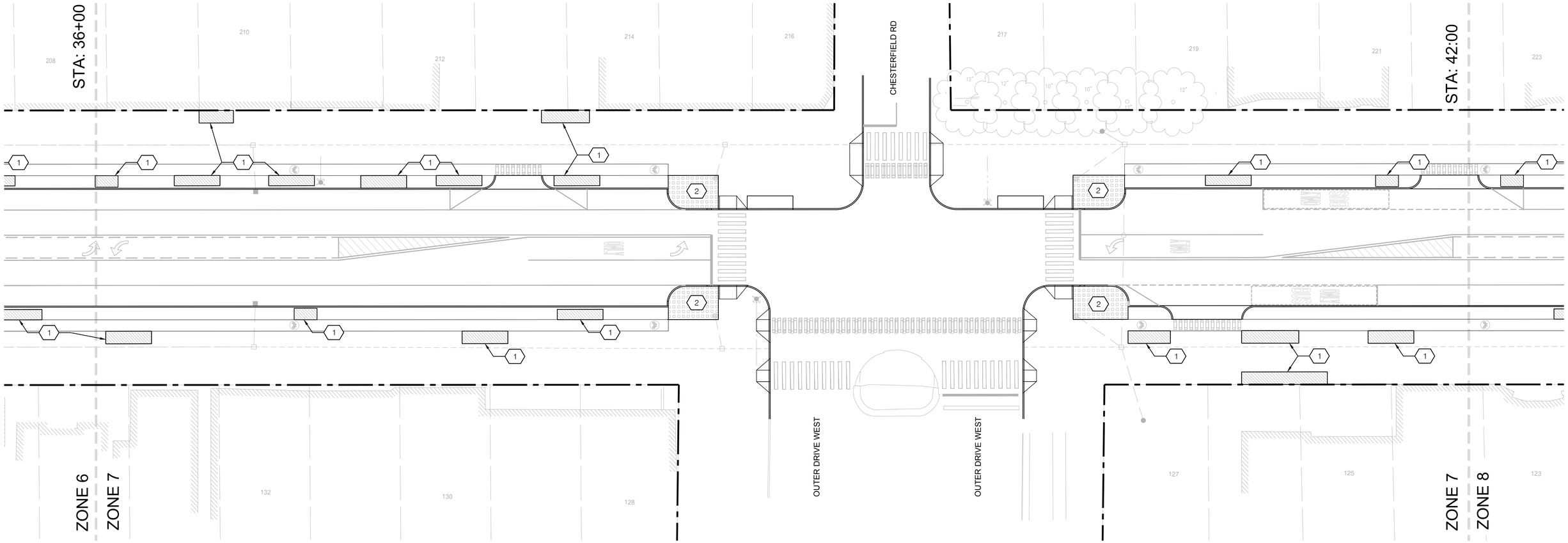
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SOIL PLAN
ZONE 6

Sheet No:
L406



1 SOIL PLAN- ZONE 7
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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SMM PROJECT No: 17081

STATUS: 60% Construction Documents

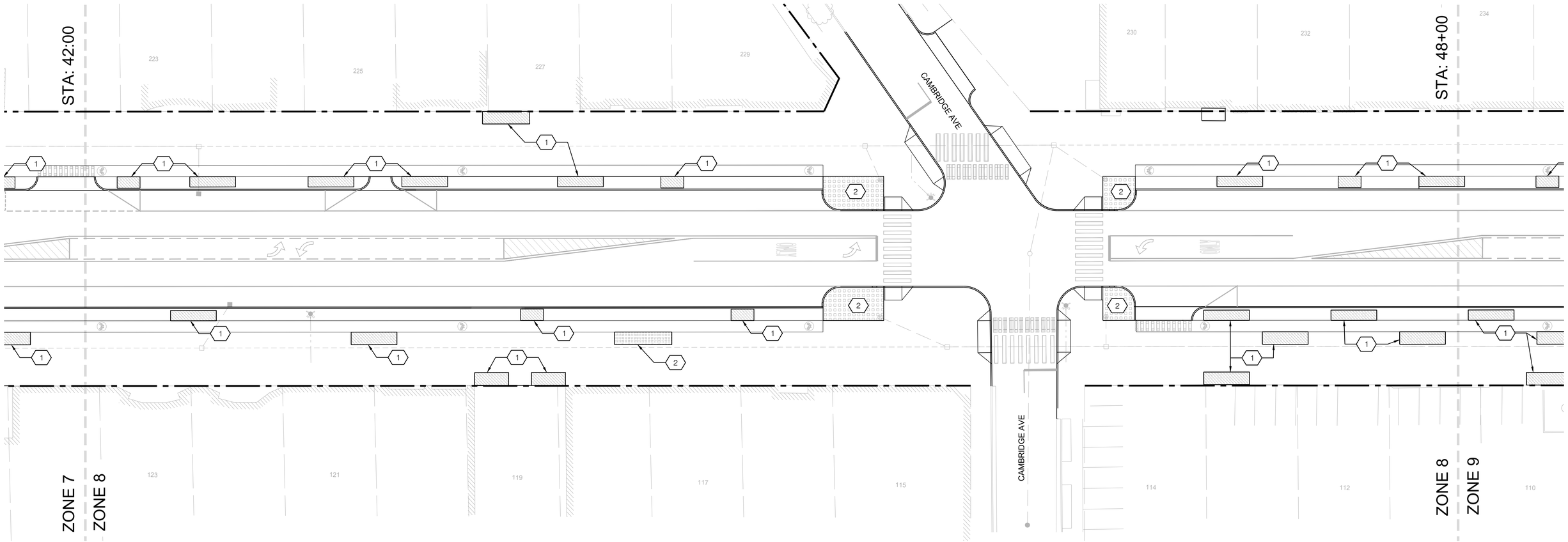
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 7

Sheet No: L407



1 SOIL PLAN- ZONE 8
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
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SMM PROJECT No:
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STATUS:
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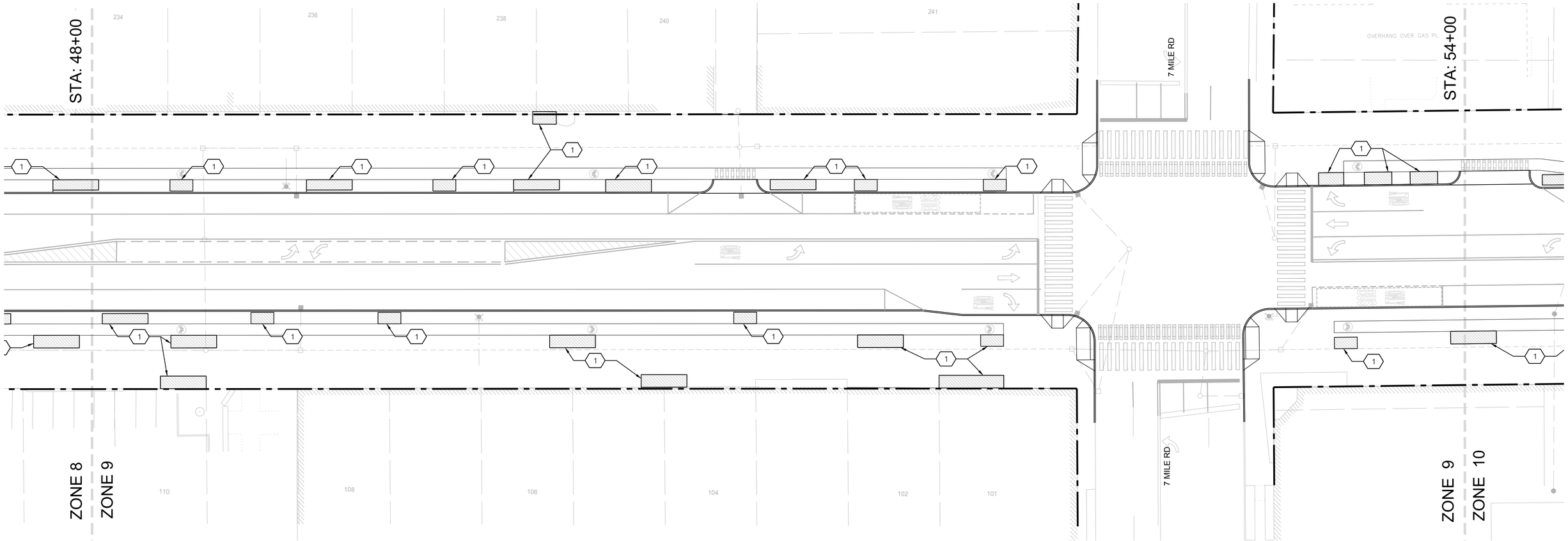
DATE:
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SOIL PLAN
ZONE 8

Sheet No:
L408



1 SOIL PLAN- ZONE 9
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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SMM PROJECT No: 17081

STATUS: 60% Construction Documents

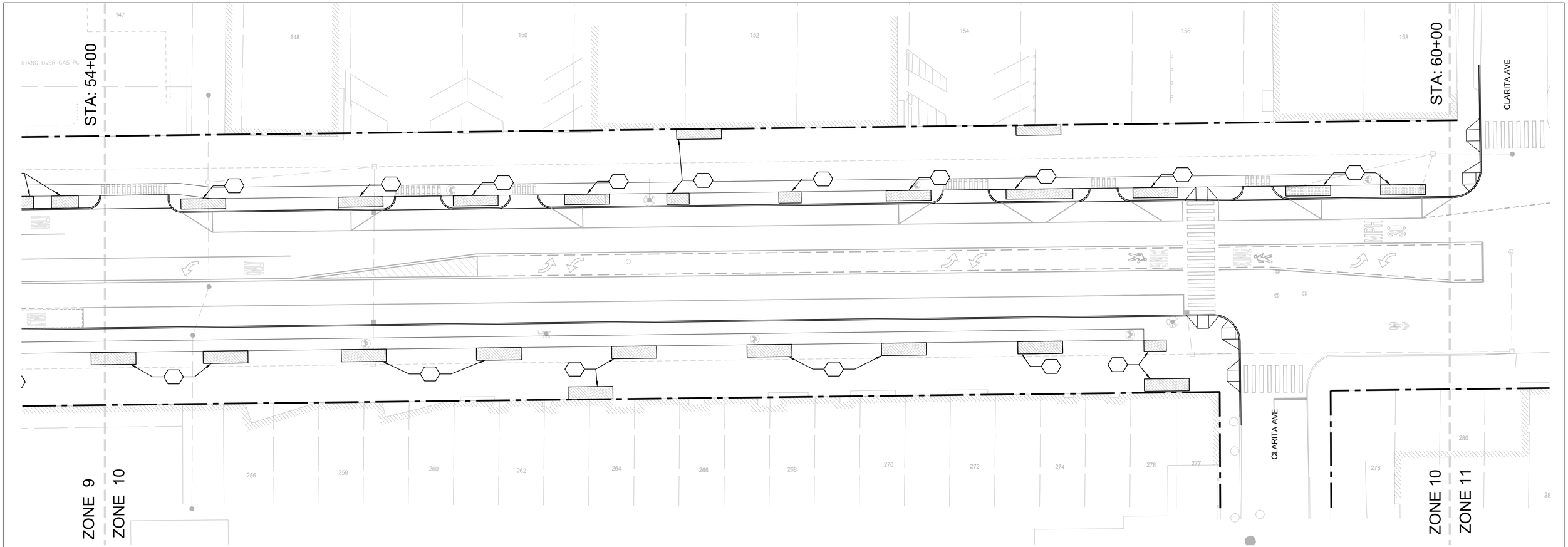
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 9

Sheet No: L409



1 SOIL PLAN- ZONE 10
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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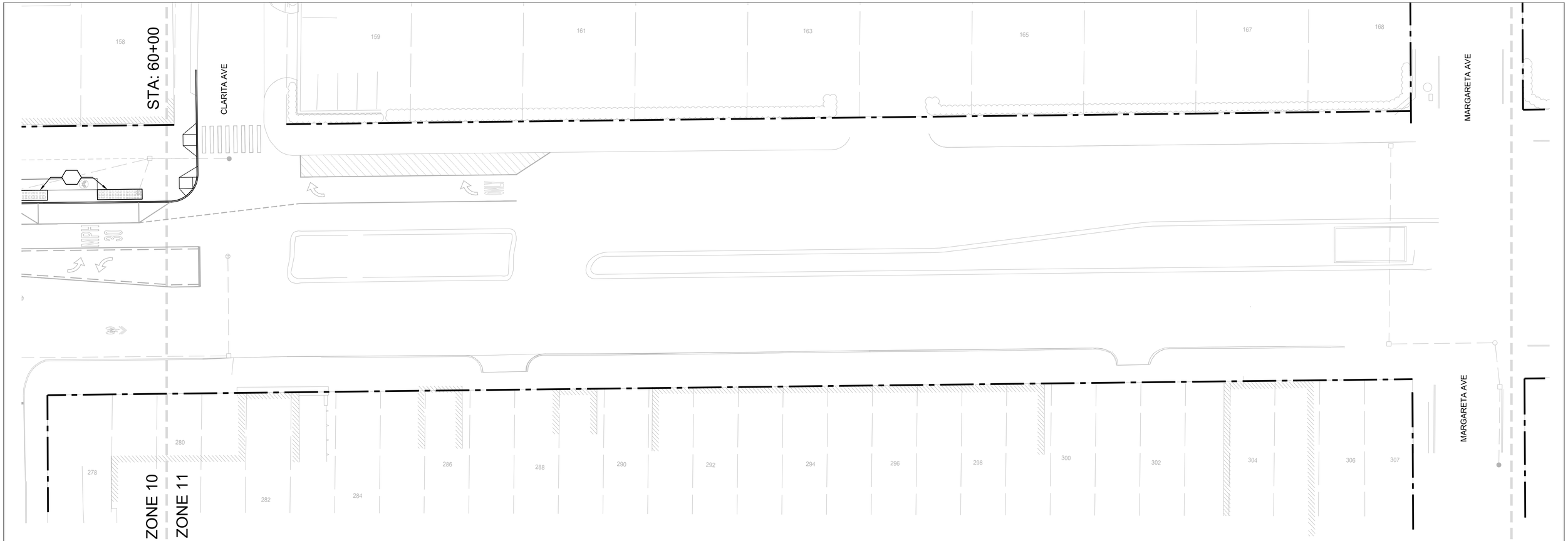
DATE: 21 December 2018

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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 10

Sheet No: L410



1 SOIL PLAN- ZONE 11
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	1 TREE PLANTING SOIL
LOT BOUNDARY	2 RAINGARDEN PLANTING SOIL
EXISTING FENCE	UNDERDRAIN LINE, SEE CIVIL
	PIPING LINE, SEE CIVIL
	STORM DRAIN, SEE CIVIL
	HYDRAIN, SEE CIVIL
	MANHOLE, SEE CIVIL

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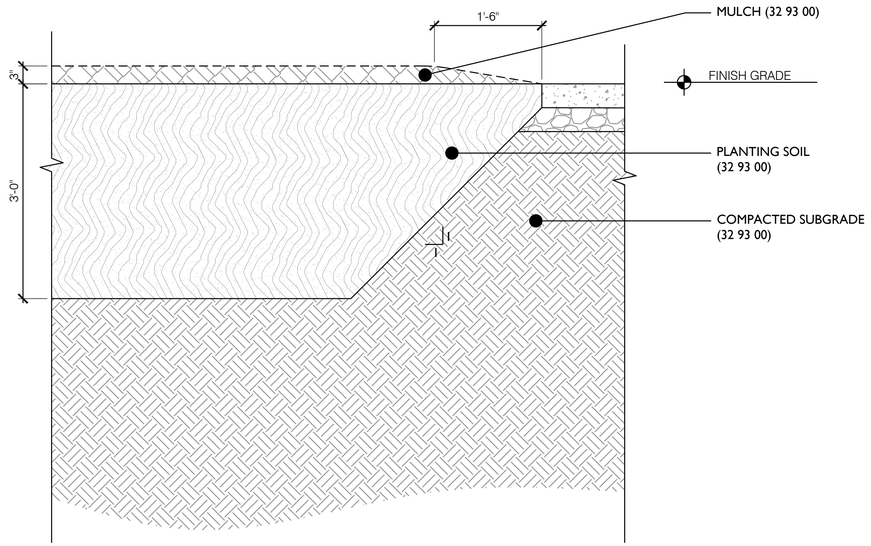
DATE: 21 December 2018

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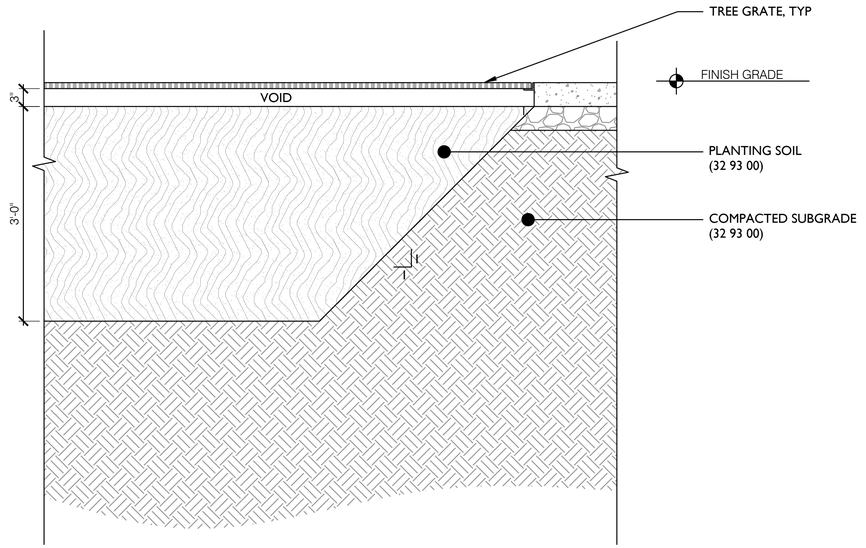
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PLAN ZONE 11

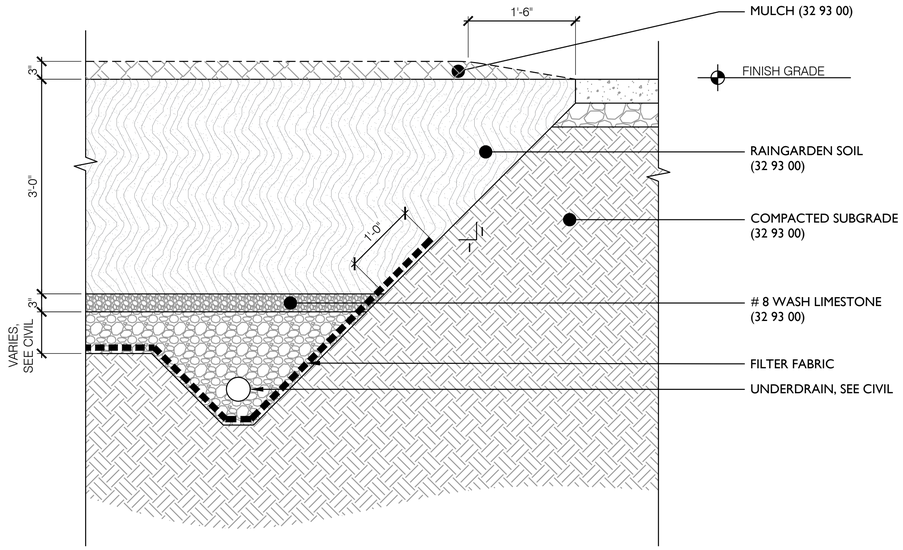
Sheet No: L411



1 TREE SOIL PROFILE — Section
Scale: 1"=1'-0"



2 TREE GRATE SOIL PROFILE — Section
Scale: 1"=1'-0"



3 RAINGARDEN TREE SOIL PROFILE — Section
Scale: 1"=1'-0"

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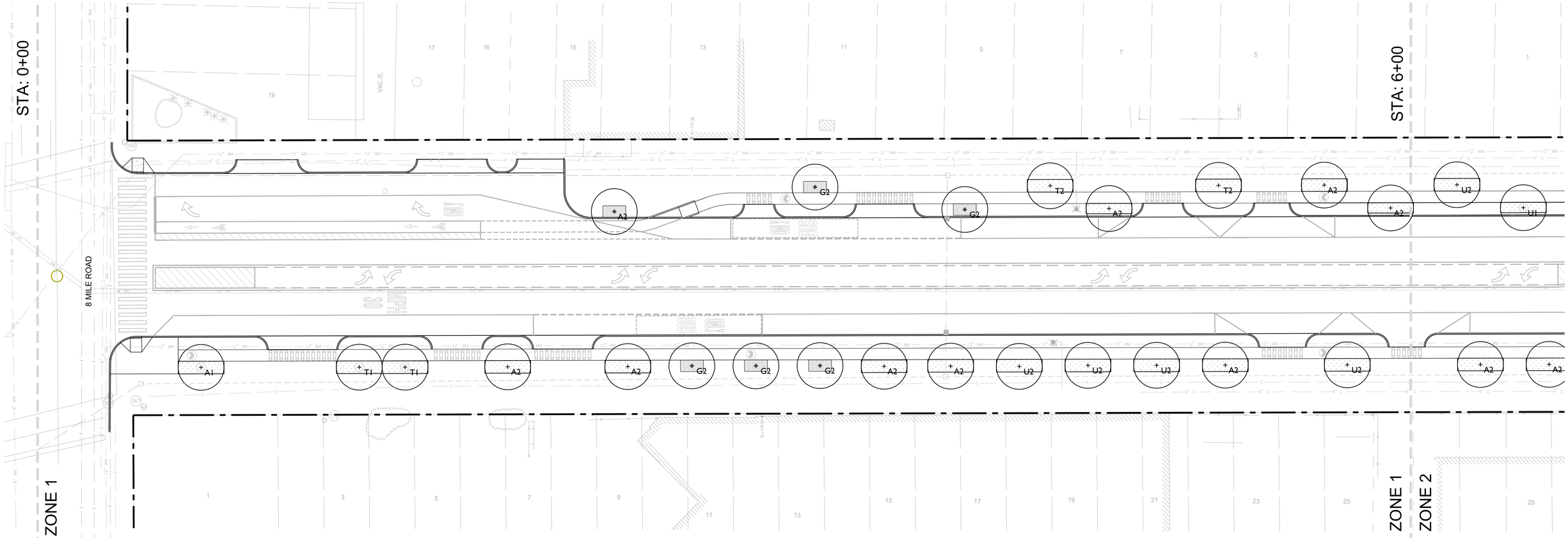
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SOIL PROFILES

Sheet No: L490



1 PLANTING PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
PROPERTY LINE	
LOT BOUNDARY	
EXISTING FENCE	
EXISTING ELECTRIC LINE	
EXISTING GAS LINE	
EXISTING WATERMAIN	
EXISTING STORMWATER PIPE	
EXISTING CATCH BASIN	
NEW STORMWATER PIPE	
NEW CATCH BASIN	

LEGEND	
+	PROPOSED TREE
	GROUNDCOVER
	RAIN GARDEN
	(1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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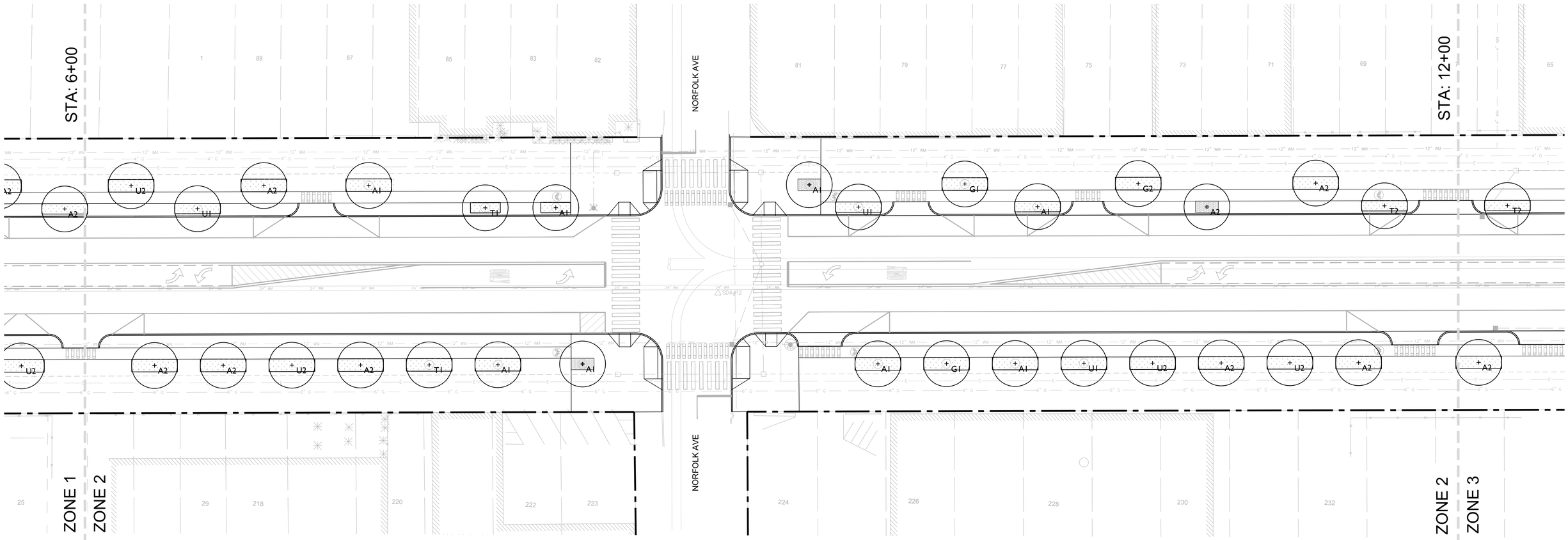
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PLANTING PLAN ZONE 1

Sheet No: L501



1 PLANTING PLAN- ZONE 2
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE
EXISTING ELECTRIC LINE
EXISTING GAS LINE
EXISTING WATERMAIN
EXISTING STORMWATER PIPE
EXISTING CATCH BASIN
NEW STORMWATER PIPE
NEW CATCH BASIN

LEGEND
PROPOSED TREE
GROUNDCOVER
RAIN GARDEN
(1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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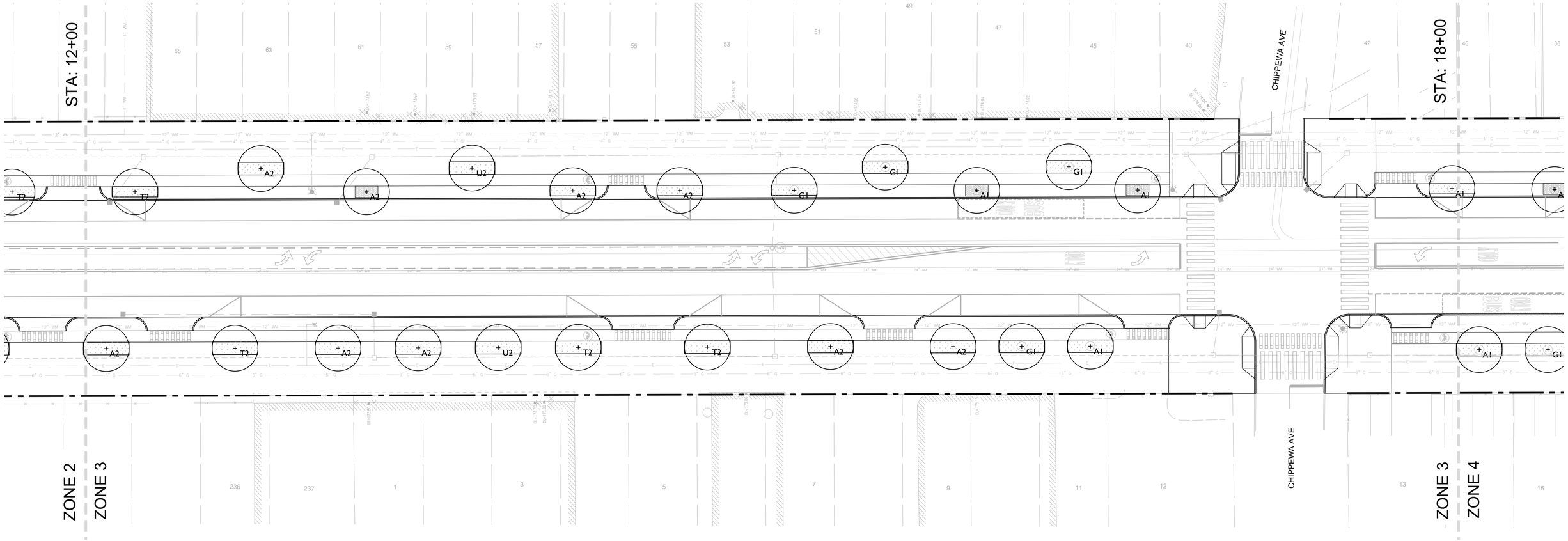
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PLANTING PLAN ZONE 2

Sheet No: L502



1 PLANTING PLAN- ZONE 3
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING WATERMAIN
- EXISTING STORMWATER PIPE
- EXISTING CATCH BASIN
- NEW STORMWATER PIPE
- NEW CATCH BASIN

LEGEND

- PROPOSED TREE
- GROUNDCOVER
- RAIN GARDEN
- (1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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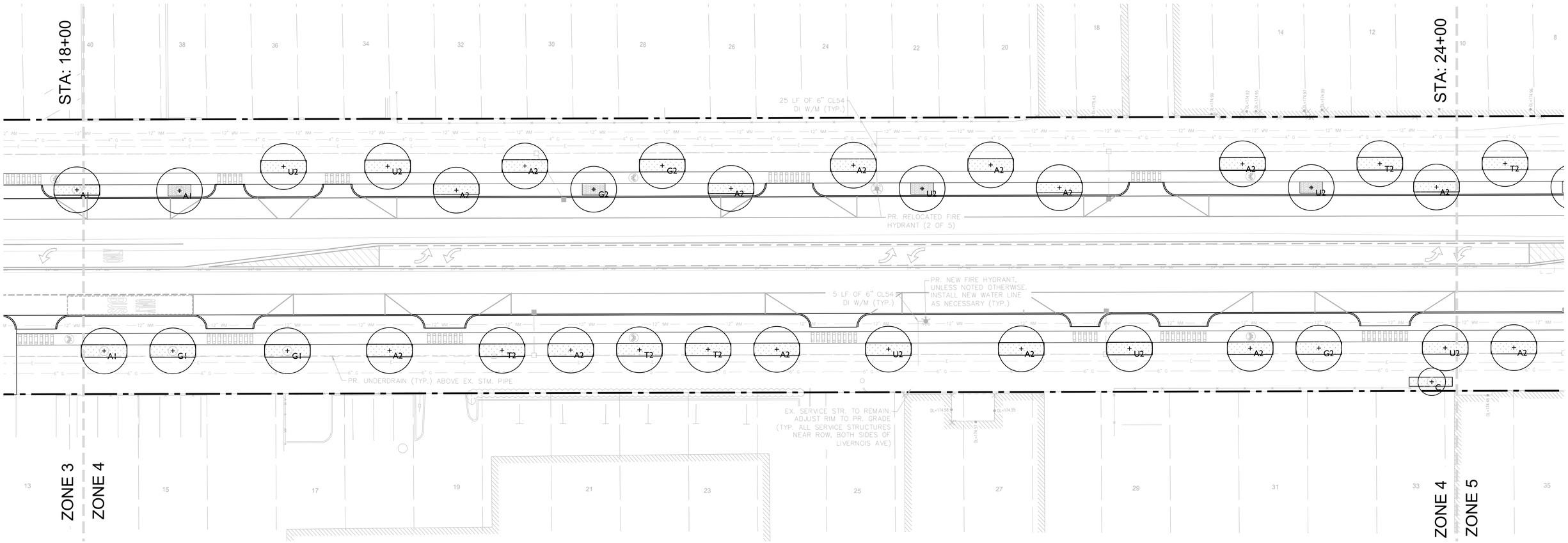
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PLANTING PLAN ZONE 3

Sheet No: L503



1 PLANTING PLAN- ZONE 1
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
	PROPERTY LINE
	LOT BOUNDARY
x	EXISTING FENCE
E	EXISTING ELECTRIC LINE
G	EXISTING GAS LINE
WM	EXISTING WATERMAIN
ST	EXISTING STORMWATER PIPE
	EXISTING CATCH BASIN
	NEW STORMWATER PIPE
	NEW CATCH BASIN

LEGEND	
+	PROPOSED TREE
	GROUNDCOVER
	RAIN GARDEN
	(1) TREE GRATES

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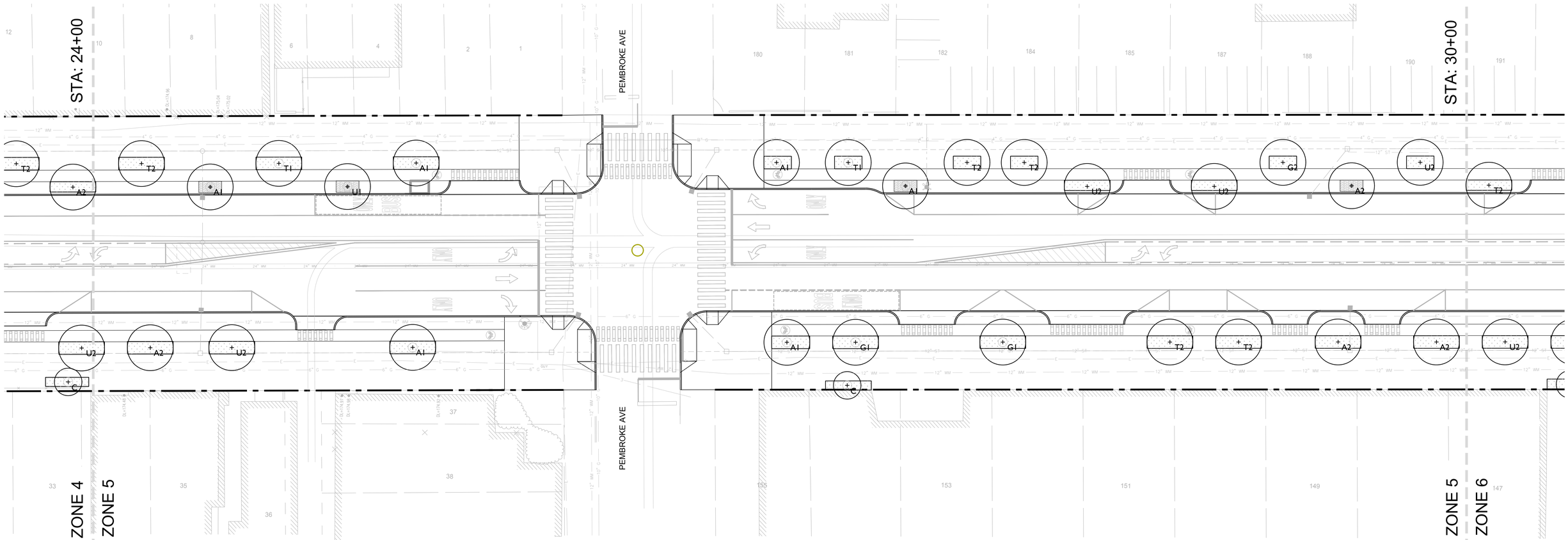
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
PLANTING PLAN ZONE 4

Sheet No:
L504



1 PLANTING PLAN- ZONE 5
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND
PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE
EXISTING ELECTRIC LINE
EXISTING GAS LINE
EXISTING WATERMAIN
EXISTING STORMWATER PIPE
EXISTING CATCH BASIN
NEW STORMWATER PIPE
NEW CATCH BASIN

LEGEND
PROPOSED TREE
GROUNDCOVER
RAIN GARDEN
(1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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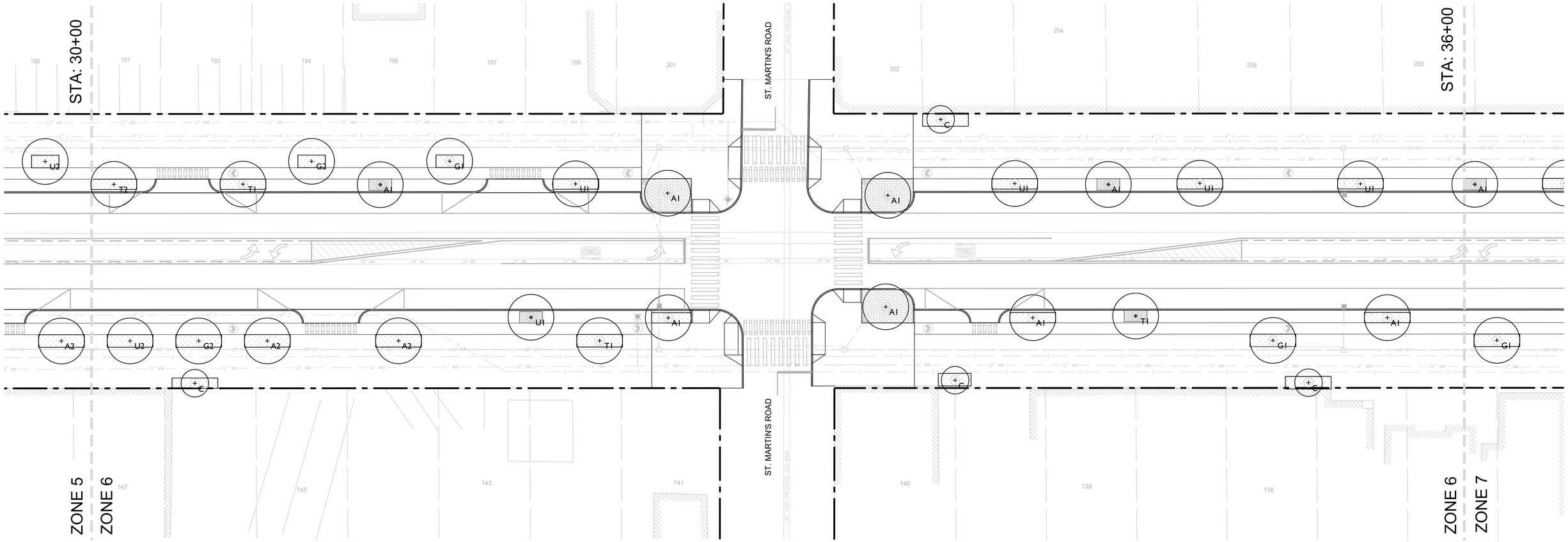
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
PLANTING PLAN ZONE 5

Sheet No:
L505



1 PLANTING PLAN- ZONE 6
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING WATERMAIN
- EXISTING STORMWATER PIPE
- EXISTING CATCH BASIN
- NEW STORMWATER PIPE
- NEW CATCH BASIN

LEGEND

- PROPOSED TREE
- GROUNDCOVER
- RAIN GARDEN
- (1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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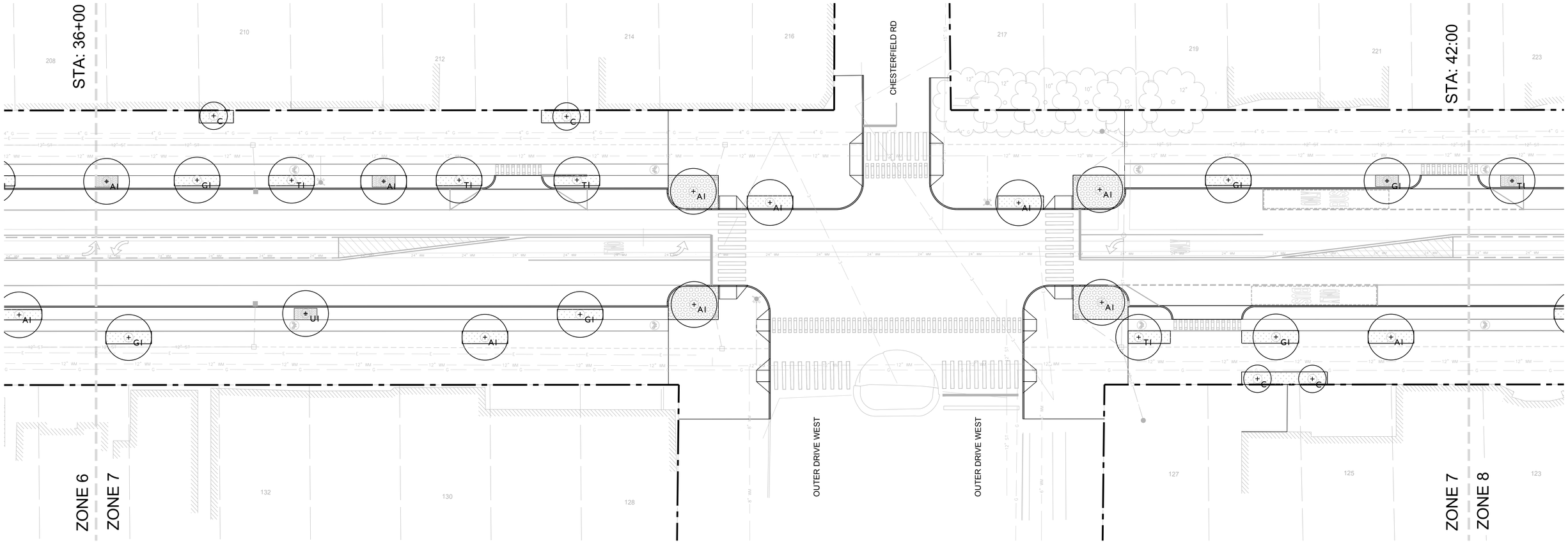
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PLANTING PLAN ZONE 6

Sheet No: L506



1 PLANTING PLAN- ZONE 7
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING WATERMAIN
- EXISTING STORMWATER PIPE
- EXISTING CATCH BASIN
- NEW STORMWATER PIPE
- NEW CATCH BASIN

LEGEND

- PROPOSED TREE
- GROUNDCOVER
- RAIN GARDEN
- (I) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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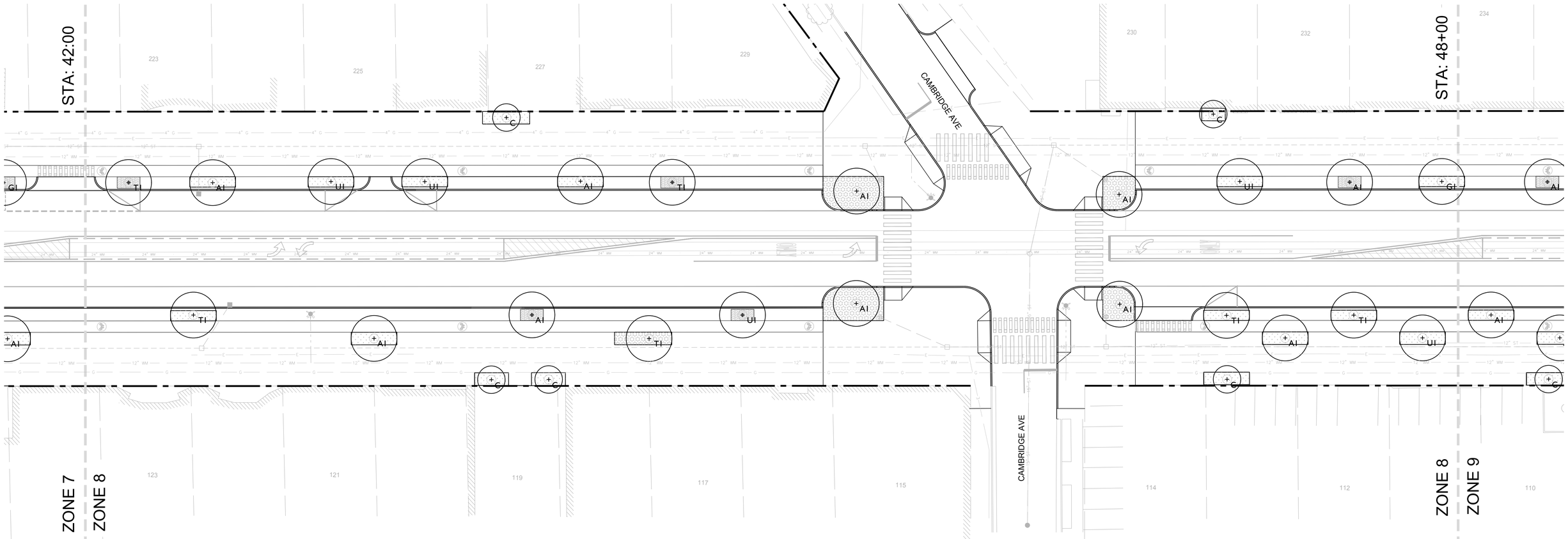
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

PLANTING PLAN ZONE 7

Sheet No:

L507



1 PLANTING PLAN- ZONE 8
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING WATERMAIN
- EXISTING STORMWATER PIPE
- EXISTING CATCH BASIN
- NEW STORMWATER PIPE
- NEW CATCH BASIN

LEGEND

- PROPOSED TREE
- GROUNDCOVER
- RAIN GARDEN
- (1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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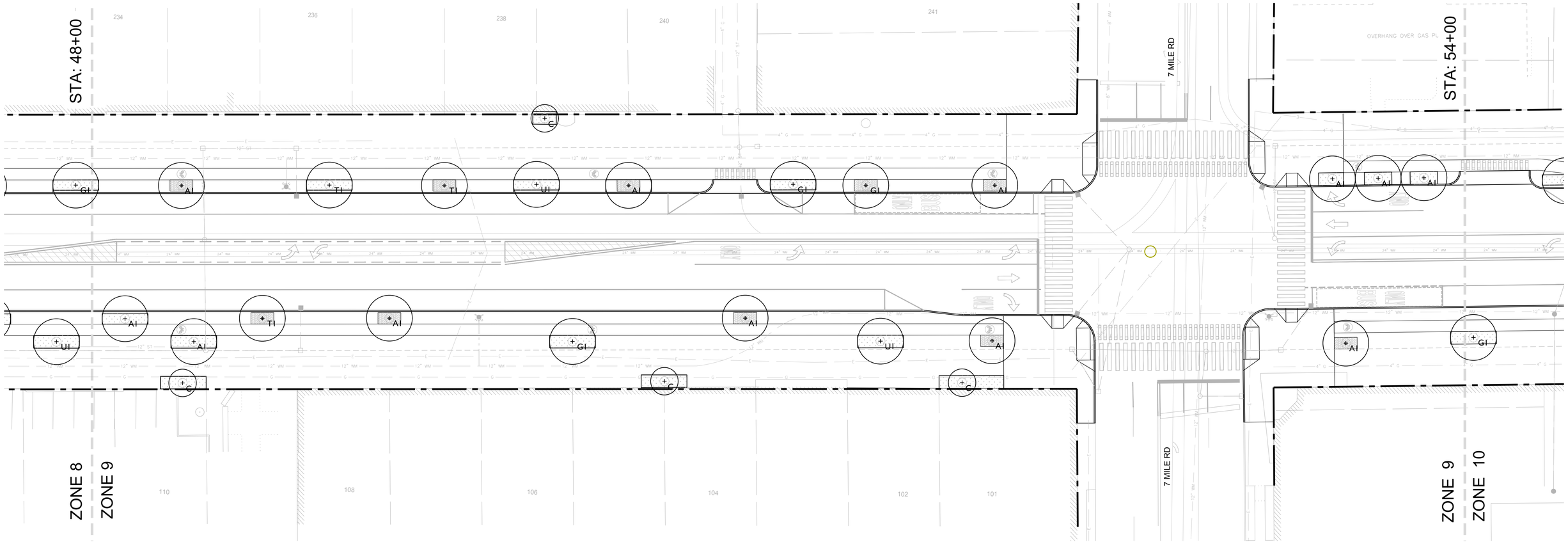
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

PLANTING PLAN
ZONE 8

Sheet No:

L508



1 PLANTING PLAN- ZONE 9
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND

- PROPERTY LINE
- LOT BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING WATERMAIN
- EXISTING STORMWATER PIPE
- EXISTING CATCH BASIN
- NEW STORMWATER PIPE
- NEW CATCH BASIN

LEGEND

- PROPOSED TREE
- GROUNDCOVER
- RAIN GARDEN
- (1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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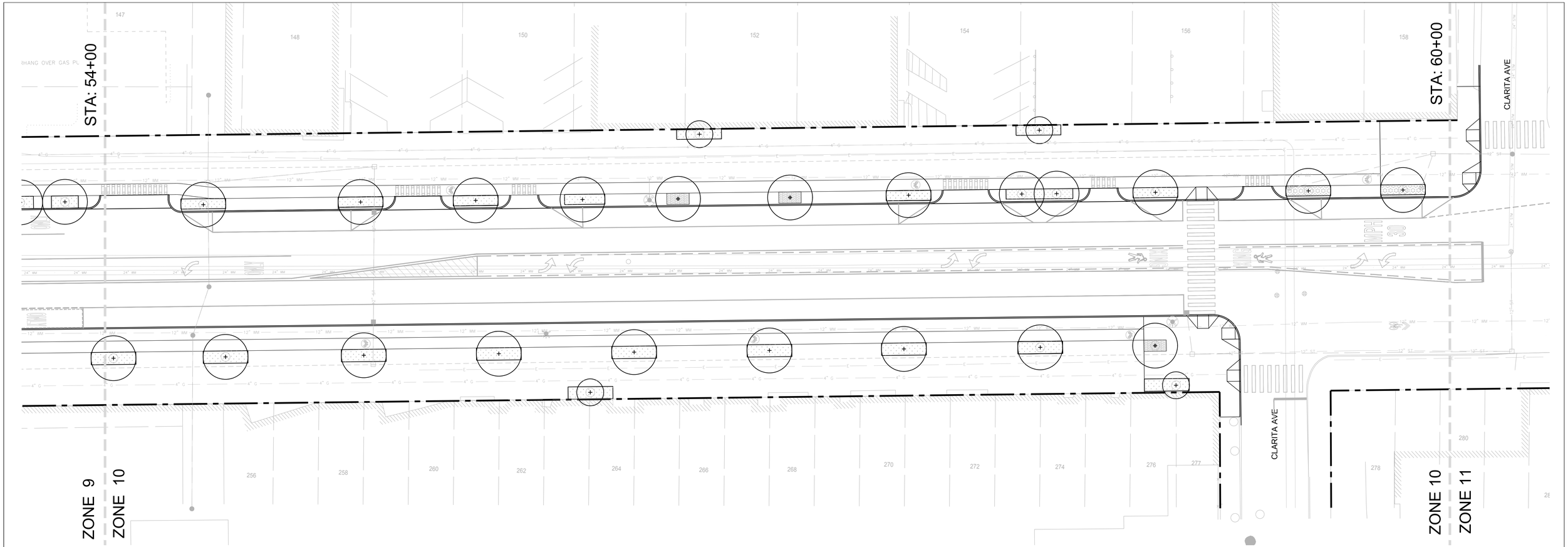
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

PLANTING PLAN ZONE 9

Sheet No:

L509



1 PLANTING PLAN- ZONE 10
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
	PROPERTY LINE
	LOT BOUNDARY
	EXISTING FENCE
E	EXISTING ELECTRIC LINE
G	EXISTING GAS LINE
WM	EXISTING WATERMAIN
ST	EXISTING STORMWATER PIPE
	EXISTING CATCH BASIN
	NEW STORMWATER PIPE
	NEW CATCH BASIN

LEGEND	
+	PROPOSED TREE
	GROUNDCOVER
	RAIN GARDEN
	(1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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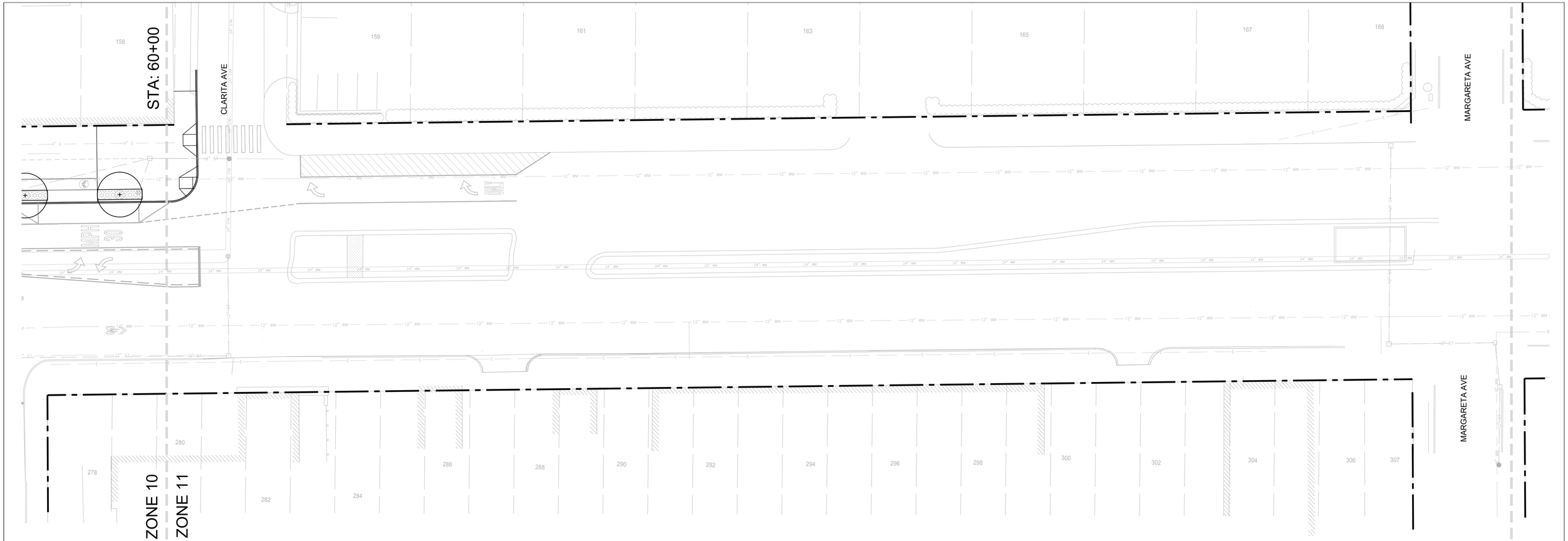
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
PLANTING PLAN ZONE 10

Sheet No:
L510



1 PLANTING PLAN- ZONE 11
Scale: 1"=20'-0"

Plan
0 10 20 40
Scale: 1"=20'-0"

GENERAL LEGEND	
	PROPERTY LINE
	LOT BOUNDARY
	EXISTING FENCE
	EXISTING ELECTRIC LINE
	EXISTING GAS LINE
	EXISTING WATERMAIN
	EXISTING STORMWATER PIPE
	EXISTING CATCH BASIN
	NEW STORMWATER PIPE
	NEW CATCH BASIN

LEGEND	
	PROPOSED TREE
	GROUNDCOVER
	RAIN GARDEN
	(1) TREE GRATES

NOTES: SEE L520 FOR FULL PLANTING SCHEDULE

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Sheet Title

PLANTING PLAN ZONE 11

Sheet No:

L511

TREES

SYMBOL	COMMON NAME	SCIENTIFIC NAME	QTY	SIZE	ROOT	NOTES
A1	Celebration Maple	*Acer x freemanii 'Celebration'*	65	6" CAL	B&B	MIN CROTCH HEIGHT 7'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
A2	Celebration Maple	*Acer x freemanii 'Celebration'*	51	3" CAL	B&B	MIN CROTCH HEIGHT 6'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
T1	Littleleaf Linden	*Tilia cordata*	24	6" CAL	B&B	MIN CROTCH HEIGHT 7'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
T2	Littleleaf Linden	*Tilia cordata*	19	3" CAL	B&B	MIN CROTCH HEIGHT 6'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
U1	Frontier Elm	*Ulmus* 'frontier'	19	6" CAL	B&B	MIN CROTCH HEIGHT 7'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
U2	Frontier Elm	*Ulmus* 'frontier'	25	3" CAL	B&B	MIN CROTCH HEIGHT 6'. MUST HAVE STRONG CENTRAL LEADER. SINGLE TRUNK
G1	Kentucky Coffee Tree	*Gymnocladus dioica*	24	6" CAL	B&B	
G2	Kentucky Coffee Tree	*Gymnocladus dioica*	12	3" CAL	B&B	
C	Eastern Redbud	*Cercis canadensis*	17	5-6' TALL	B&B	MULTI STEM

PERENNIALS AND SHRUBS

SYMBOL	COMMON NAME	SCIENTIFIC NAME	QTY	SIZE	SPACING	NOTES
	PLANT BED MIX	*50% Brunnera macrophylla 'Jack Frost'* *25% Perovskia atriplicifolia Lacey Blue* *25% Pennisetum orientale 'Karley Rose'*	20,192 SF	1 GAL	18" O.C.	
	RAIN GARDEN MIX	*55% Schizachyrium Scoparium* *25% Iris Versicolor* *15% Rudbeckia Hirta* *5% Bergenia Cordifolia*	3,620 SF	1 GAL	18" O.C.	

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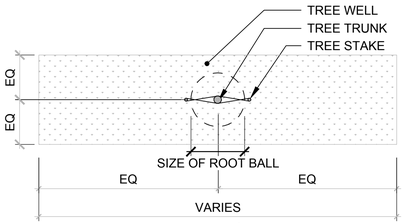
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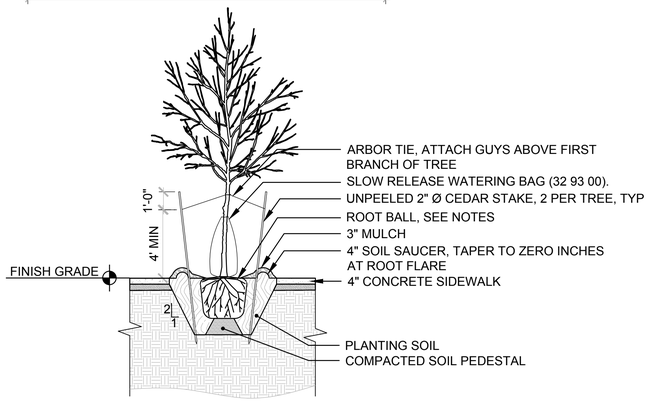
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NO.	DESCRIPTION	BY	APPV'D	DATE

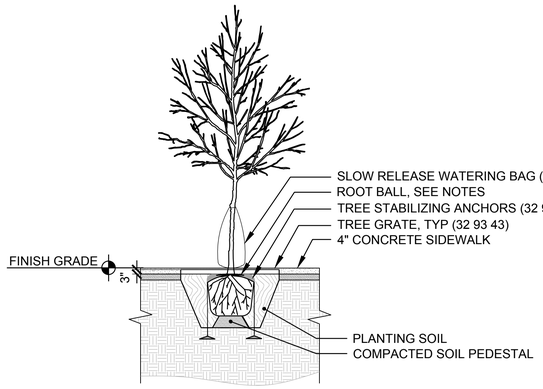
Sheet Title: PLANT SCHEDULE

Sheet No: L520





A: TREE PLANTING AND STAKING



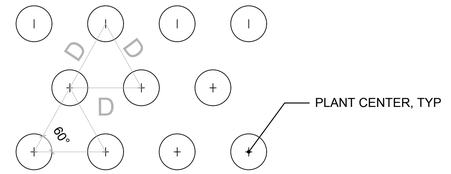
B: TREE PLANTING @ TREE GRATE

NOTES:

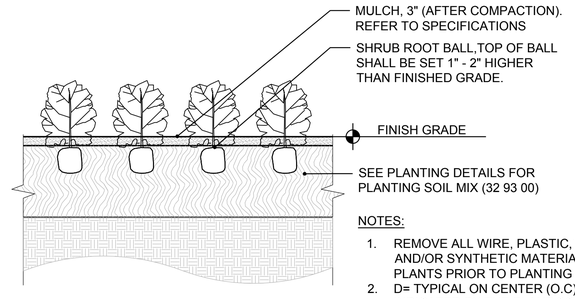
1. REMOVE EXCESS FILL FROM TOP OF ROOT BALL TO EXPOSE ROOT FLARE. SET 2-3" HIGHER THAN FINISH GRADE. CUT AND REMOVE TOP $\frac{1}{3}$ OF ROPE/ BURLAP. FOR WIRE BASKETS REMOVE $\frac{1}{3}$ AND CUT EVERY OTHER HORIZONTAL AND VERTICAL WIRE
2. TREE ROOT BALL (TOP OF BALL SHOULD MATCH EXISTING GRADE) OR SET 1" - 2" HIGHER THAN TOP OF GRADE

1 TREE PLANTING AND STAKING, TYP
1/4"=1'-0"

DETAIL



PLAN VIEW



NOTES:

1. REMOVE ALL WIRE, PLASTIC, TAGS AND/OR SYNTHETIC MATERIAL FORM PLANTS PRIOR TO PLANTING
2. D= TYPICAL ON CENTER (O.C) SPACE AS INDICATED BY THE PLANT SCHEDULE

2 SHRUB & GROUNDCOVER PLANTING LAYOUT PLAN, TYP
1/2"=1'-0"

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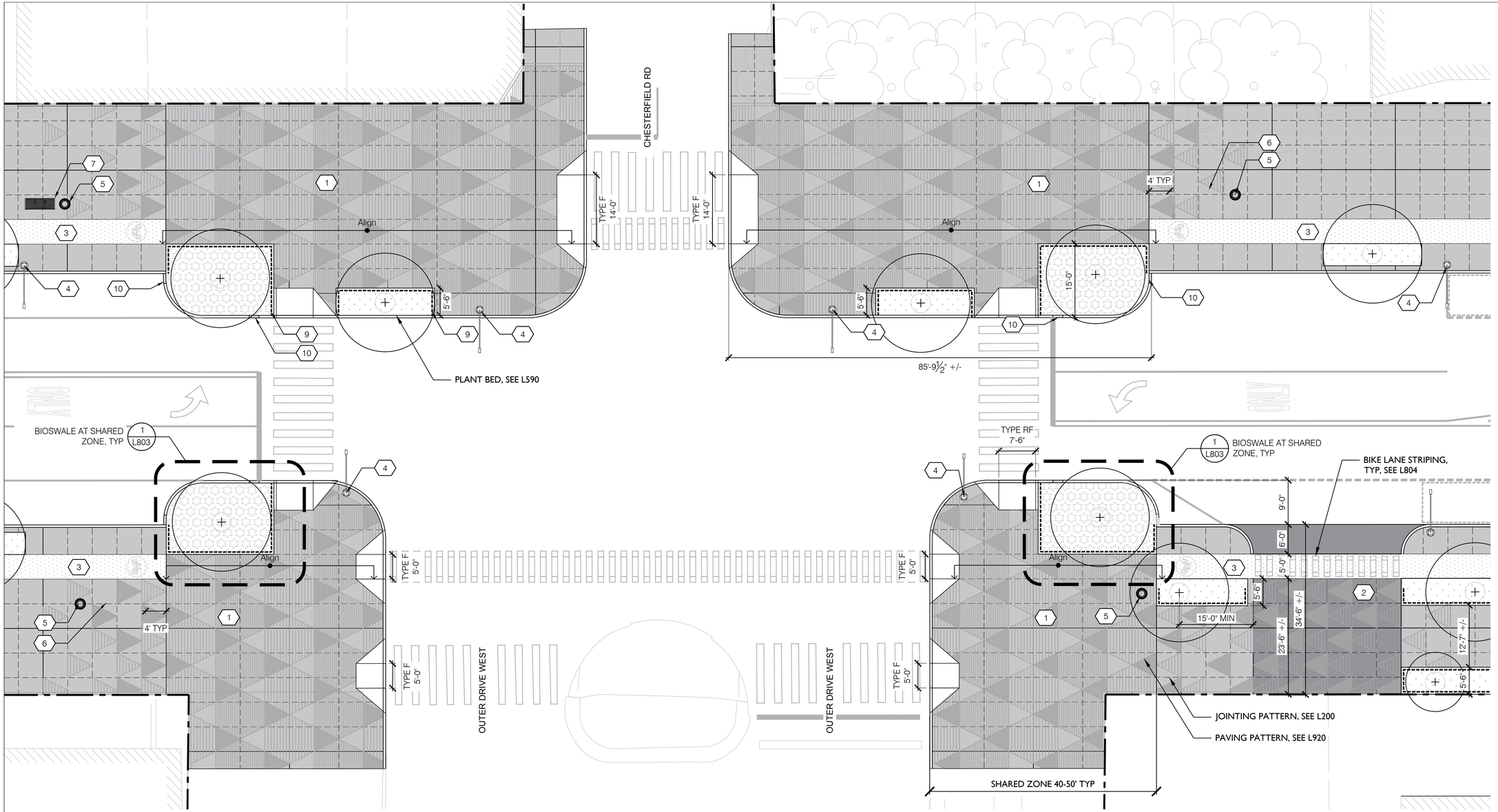
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

LANDSCAPE DETAILS

Sheet No:

L590



1 ENLARGEMENT- LIVERNOIS AND OUTER DRIVE WEST
1"=10'

Plan
0 5 10 20
Scale: 1"=10'-0"

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L800
2. 8" STANDARD DRIVEWAY, SEE 2/L800
3. ASPHALT PAVING, SEE 6/L800
4. CITY STANDARD LIGHT POLE
5. CITY STANDARD TRASH CAN, SEE 3/L920
6. CITY STANDARD BIKE RACK, SEE 1/L920
7. CITY STANDARD BENCH, SEE 2/L920
8. TREE GRATE, SEE 8/L900
9. PLANT RAIL, SEE L921
10. CURB CUT, SEE L902

EXPANSION JOINT

CONTROL JOINT

GENERAL LEGEND

PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE
EXISTING ELECTRIC LINE
EXISTING GAS LINE
EXISTING WATERMAIN
EXISTING STORMWATER PIPE
EXISTING CATCH BASIN
NEW STORMWATER PIPE
NEW CATCH BASIN

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LANDSCAPE ARCHITECTS

CONSULTANT

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

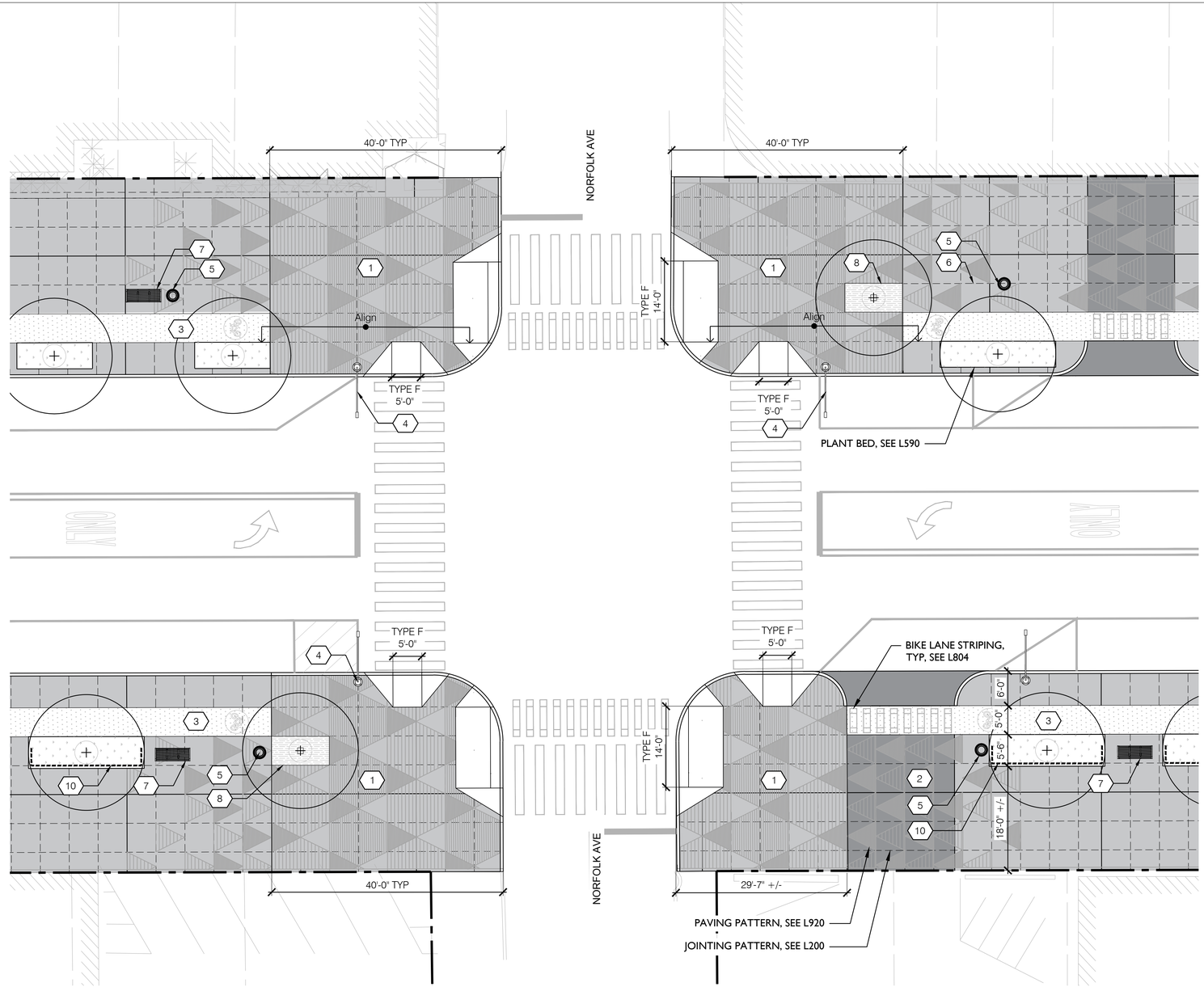
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

INTERSECTION ENLARGEMENT AT EXPANDED SHARED ZONE

Sheet No:

L801



1 ENLARGEMENT- LIVERNOIS AND NORFOLK AVE
Scale: 1"=10'-0"

Plan
0 10 20 40
Scale: 1"=10'-0"

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L800
2. 8" STANDARD DRIVEWAY, SEE 2/L800
3. ASPHALT PAVING, SEE 6/L800
4. CITY STANDARD LIGHT POLE
5. CITY STANDARD TRASH CAN, SEE 3/L920
6. CITY STANDARD BIKE RACK, SEE 1/L920
7. CITY STANDARD BENCH, SEE 2/L920
8. TREE GRATE, SEE 8/L900
9. PLANT RAIL, SEE L921
10. CURB CUT, SEE L902

EXPANSION JOINT
CONTROL JOINT

GENERAL LEGEND

PROPERTY LINE
LOT BOUNDARY
EXISTING FENCE
EXISTING ELECTRIC LINE
EXISTING GAS LINE
EXISTING WATERMAIN
EXISTING STORMWATER PIPE
EXISTING CATCH BASIN
NEW STORMWATER PIPE
NEW CATCH BASIN

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LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

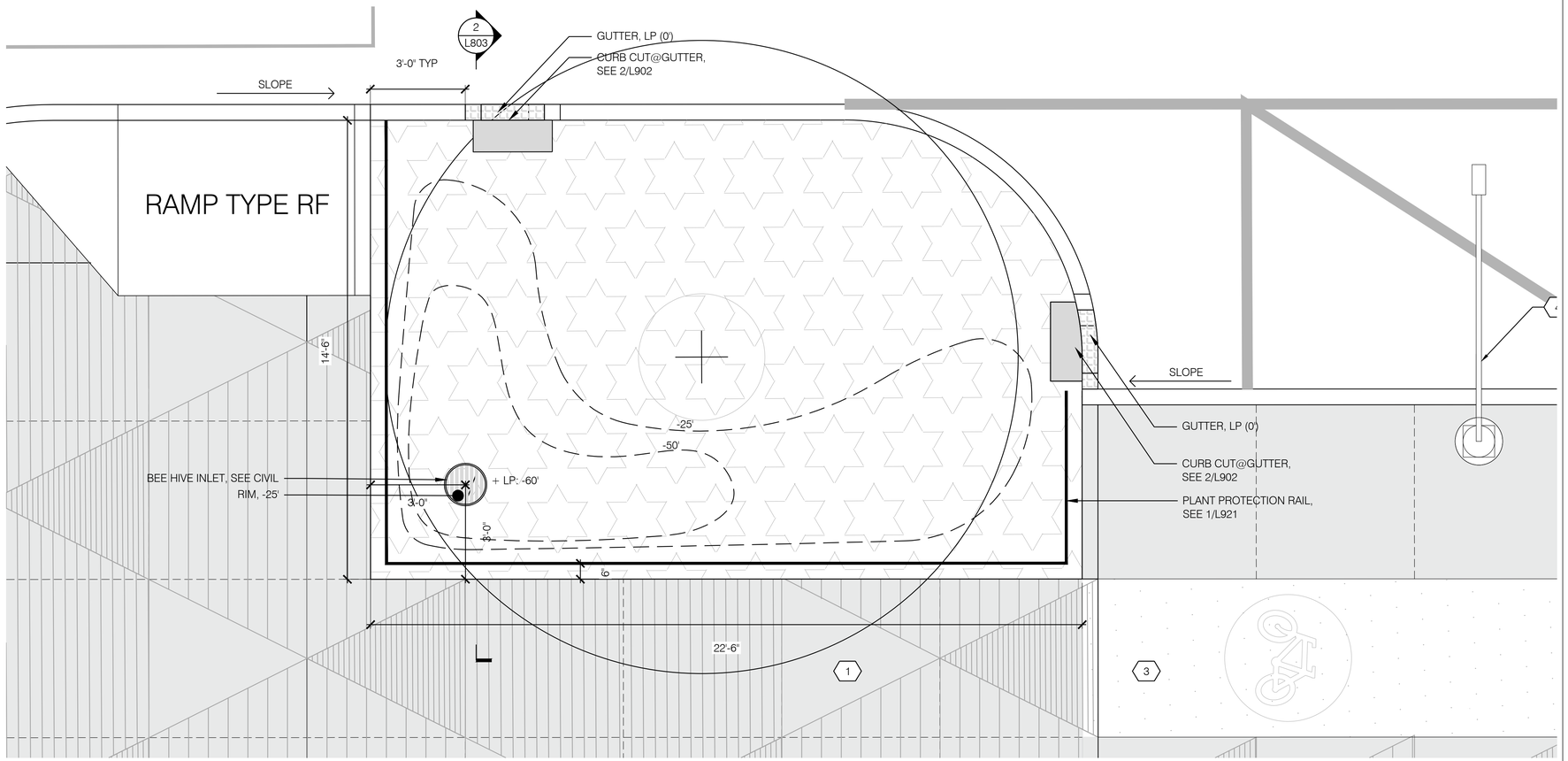
DATE: 21 December 2018

REVISION

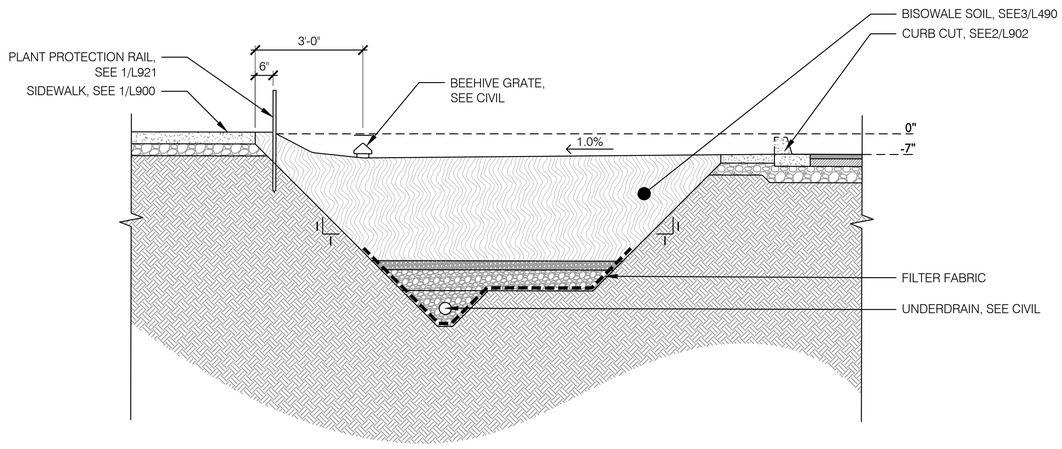
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
INTERSECTION ENLARGEMENT AT SHARED ZONE

Sheet No:
L802



1 RAINGARDEN ENLARGEMENT — Plan
Scale: 1/2"=1'-0"



2 RAINGARDEN — SECTION
Scale: 1/2"=1'-0"

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L800
2. 8" STANDARD DRIVEWAY, SEE 2/L800
3. ASPHALT PAVING, SEE 6/L800
4. CITY STANDARD LIGHT POLE
5. CITY STANDARD TRASH CAN, SEE 3/L920
6. CITY STANDARD BIKE RACK, SEE 1/L920
7. CITY STANDARD BENCH, SEE 2/L920
8. TREE GRATE, SEE 8/L900
9. PLANT RAIL, SEE L921
10. CURB CUT, SEE L902

EXPANSION JOINT

CONTROL JOINT

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LIVERNOIS AVENUE, DETROIT, MI

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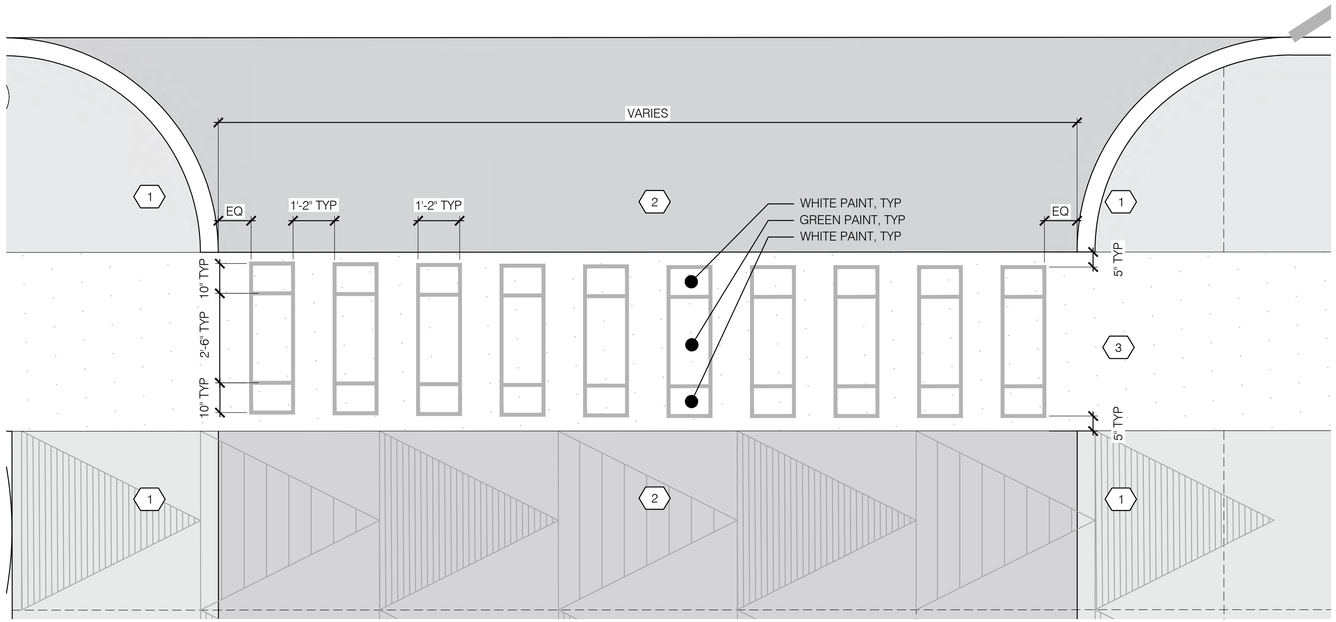
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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: RAINGARDEN ENLARGEMENT

Sheet No: L803



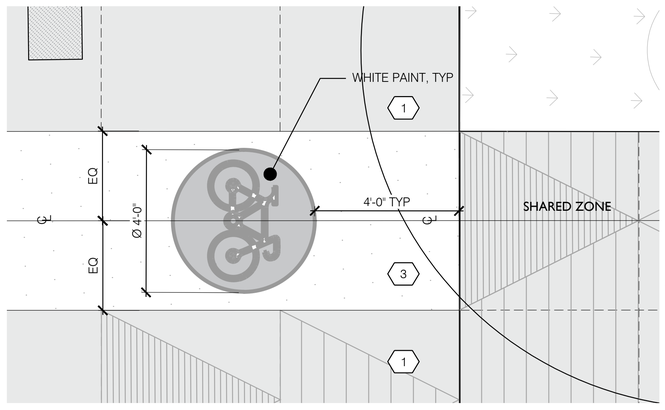
1 BIKE LANE STRIPING ENLARGEMENT (@ DRIVEWAY) — Plan
Scale: 1/2"=1'-0"

LEGEND

1. 4" STANDARD SIDEWALK, SEE 1/L800
2. 8" STANDARD DRIVEWAY, SEE 2/L800
3. ASPHALT PAVING, SEE 6/L800
4. CITY STANDARD LIGHT POLE
5. CITY STANDARD TRASH CAN, SEE 3/L920
6. CITY STANDARD BIKE RACK, SEE 1/L920
7. CITY STANDARD BENCH, SEE 2/L920
8. TREE GRATE, SEE 8/L900
9. PLANT RAIL, SEE L921
10. CURB CUT, SEE L902

EXPANSION JOINT

CONTROL JOINT



NOTES:
BIKE SIGNAGE TO BE PLACED IN THE DIRECTION OF TRAVEL

2 BIKE LANE SIGNAGE ENLARGEMENT — PLAN
Scale: 1/2"=1'-0"

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LANDSCAPE ARCHITECTS

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LIVERNOIS STREETSCAPE

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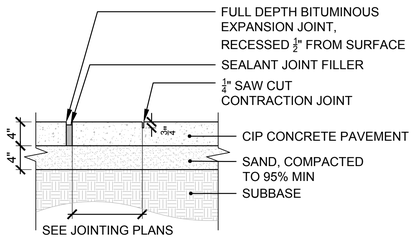
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: BIKE STRIPING ENLARGEMENT

Sheet No: L804



EXPANSION JOINTS

ALL EXPANSION JOINT PAPER SHALL EXTEND 1" BELOW THE BOTTOM OF THE THINNER OF ADJOINING PAVEMENT SECTIONS.

1. PLACE ½" PAPER EXPANSION JOINTS AT LOT LINES WHEN LOT LINES ARE BETWEEN 25' AND 50' APART.
2. PLACE ADDITIONAL ½" PAPER EXPANSION JOINTS SO THAT THE DISTANCE BETWEEN JOINTS DOES NOT EXCEED 15.2 m WHEN LOT LINES ARE OVER 15.240 m APART.
3. PLACE ½" PAPER EXPANSION JOINTS AT EVERY SECOND LOT LINE AND CONTRACTION JOINT AT INTERVENING LOT LINE WHEN LOT LINES ARE LESS THAN 25' APART.
4. PLACE 1" PAPER EXPANSION JOINTS AT CURB AND BUILDING OR PROPERTY LINE OR AT ALTERNATE POSITION (4A) AS SHOWN FOR DRIVEWAY.
5. PLACE 1" PAPER EXPANSION JOINTS AT CURB AND BUILDING OR PROPERTY LINE FOR FULL WIDTH SIDEWALK EXCEEDING 7' IN WIDTH.
6. PLACE 1" PAPER EXPANSION JOINTS AT CURB CIRCLES OR AT ALTERNATE POSITION (6A) AS SHOWN.
7. PLACE 1" PAPER EXPANSION JOINTS AT INTERSECTIONS OF SERVICE WALKS AND SIDEWALKS AND SERVICE WALKS AND CURBS.
8. PLACE 1" PAPER EXPANSION JOINTS AT MARGIN FLAGS AT CROSSWALKS.
9. PLACE 1" PAPER EXPANSION JOINTS AT ALLEY APRONS.
10. PLACE ½" PAPER EXPANSION JOINT BOTH SIDES OF SIDEWALK FLAG ABUTTING TREE AND ON CENTERLINE JOINT.

CONTRACTION JOINTS

1C. PLACE CONTRACTION JOINTS AT INTERVALS OF NOT LESS THAN 5' NOR MORE THAN 7' ON WALKS 5' WIDE OR WIDER, INCLUDING FULL WIDTH WALKS.

2C. PLACE CONTRACTION JOINTS AT INTERVALS OF NOT LESS THAN 4' NOR MORE THAN 7' ON WALKS 4' WIDE.

3C. PLACE CONTRACTION JOINTS AT THE MARGIN LINE ON FULL WIDTH WALKS (OPTIONAL).

DRIVEWAYS

10. PLACE CONTRACTION JOINTS IN DRIVEWAYS SO THAT NO SLAB WILL EXCEED THE DIMENSIONS OF 15' BY 15'.
20. PLACE 1" PAPER EXPANSION JOINTS ON ALL SIDES OF COMMERCIAL DRIVES.
30. PLACE CONSTRUCTION OR CONTRACTION JOINT ON CENTERLINE WHEN WIDTH OF DRIVEWAY EXCEEDS 15'
40. PLACE ½" PAPER EXPANSION JOINTS ON BOTH SIDES OF RESIDENTIAL DRIVEWAYS. IF DRIVEWAY EDGE IS WITHIN 2' OF LOT LINE, PLACE THIS EXPANSION PAPER AT PROPERTY LINE.

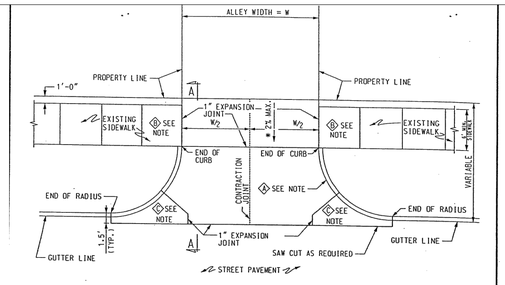
REVISED DATE: METRIC TO ENGLISH UNIT SYSTEM: DEC. 2002

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
SIDEWALK JOINTING STANDARD

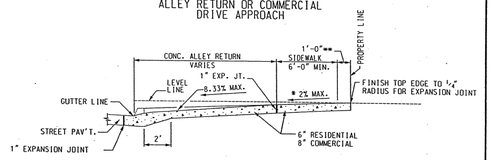
03/07/08 PLAN DATE	DRAWING NO. 9	DETAIL STANDARD NO. C-4462	SHEET 2 OF 2

PREPARED BY BUREAU OF STREETS AND HIGHWAYS

1 4" STANDARD SIDEWALK DETAIL
1"=1'-0"



ALLEY RETURN OR COMMERCIAL DRIVE APPROACH



SECTION A-A

C				
B	• SIDEWALK CROSS SLOPE	KSM	J.J.	2/7/07
A	METRIC TO ENGLISH UNIT SYSTEM	KSM	M.S.	N.H. 12/02
	DESCRIPTION	Drwn.	Chkd	Appd. Date

REVISION

CITY ENGINEERING DIVISION

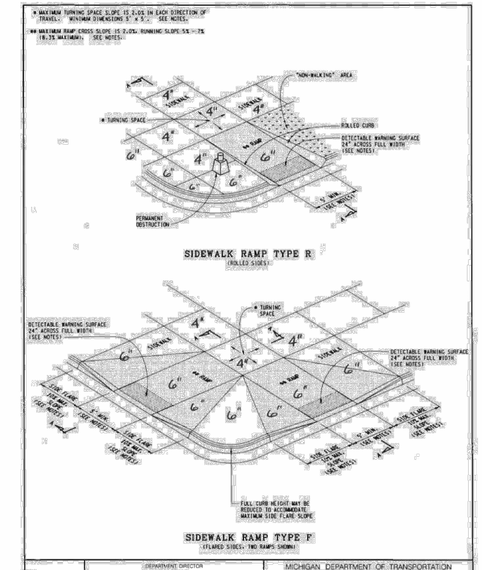
K.S.M. DRAWN BY:
J.J. CHECKED BY:

APPROVED
Sam Patel ENGINEER OF STREETS
Jerry Lucas HEAD ENGINEER CITY ENGINEER

CITY OF DETROIT
CITY ENGINEERING DIVISION. D.P.W.
STANDARD PLAN FOR
DETAIL OF ALLEY RETURN AND DRIVE APPROACH

03/07/08 PLAN DATE	DRAWING NO. 7	DETAIL STANDARD NO. C-4384	SHEET 1 OF 2

2 8" COMMERCIAL DRIVEWAY DETAIL
N.T.S.



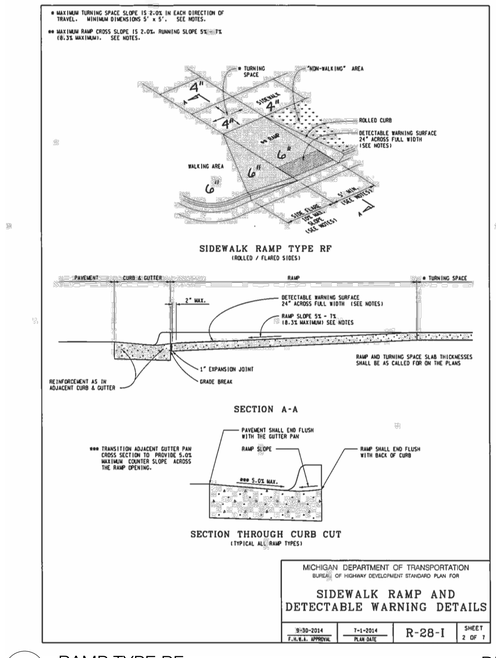
MDOT — PREPARED BY DESIGN DIVISION — DRAWN BY: K.S.M. — CHECKED BY: R.L.P.

DEPARTMENT DIRECTOR Kirk T. Steudle
APPROVED BY: Robert L. Pitts DIRECTOR, BUREAU OF FIELD SERVICES
APPROVED BY: Matthew C. Chynoweth DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

9-30-2014 F.H.W.A. APPROVAL	7-1-2014 PLAN DATE	R-28-1	SHEET 1 OF 1

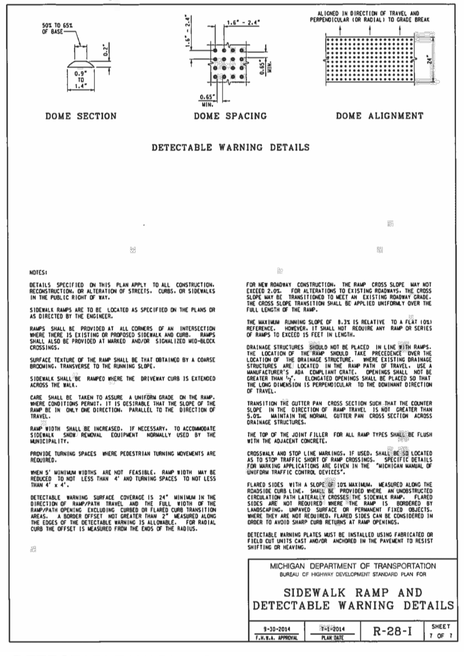
3 RAMP TYPE R & F DETAIL
N.T.S.



MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

9-30-2014 F.H.W.A. APPROVAL	7-1-2014 PLAN DATE	R-28-1	SHEET 2 OF 2

4 RAMP TYPE RF DETAIL
N.T.S.



MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

9-30-2014 F.H.W.A. APPROVAL	7-1-2014 PLAN DATE	R-28-1	SHEET 3 OF 3

5 DETECTABLE WARNING PAVER DETAIL
N.T.S.

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

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SMM PROJECT No: 17081

STATUS: 60% Construction Documents

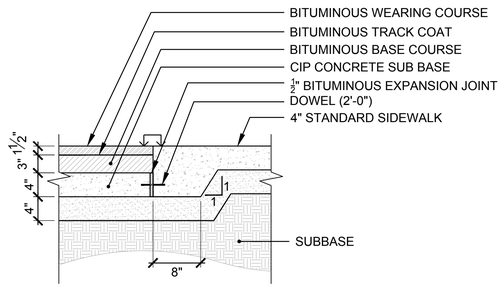
DATE: 21 December 2018

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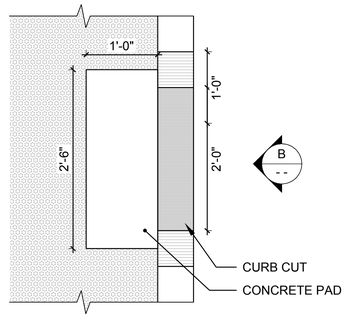
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PAVEMENT DETAILS

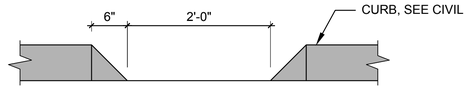
Sheet No: L901



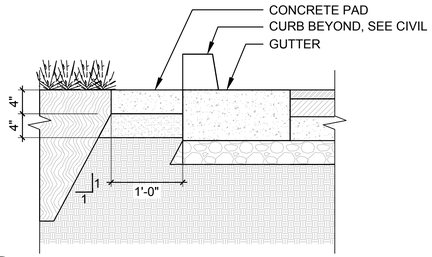
1 ASPHALT PAVEMENT DETAIL
1"=1'-0"



A CURB CUT PLAN

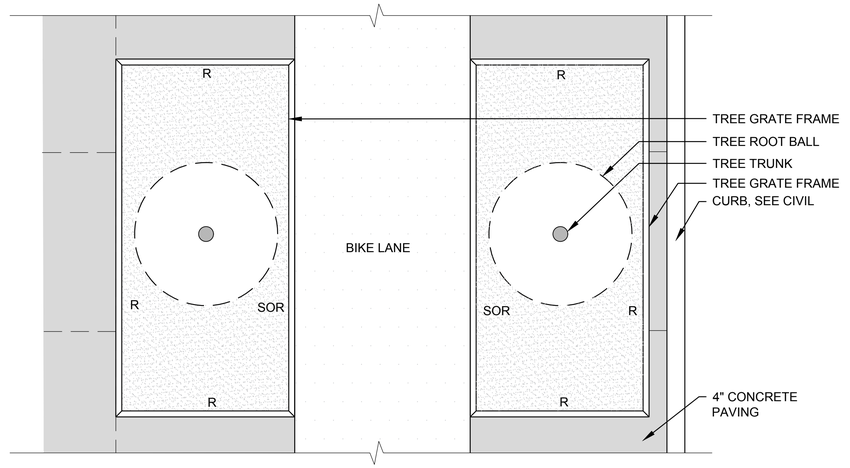


B CURB CUT ELEVATION

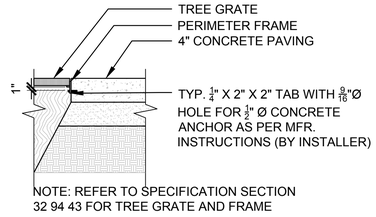


C CURB CUT DETAIL

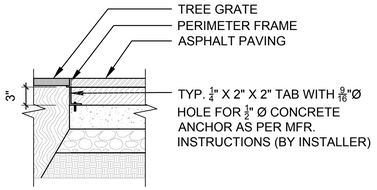
2 CURB CUT DETAIL
1"=1'-0"



A TREE GRATE FRAME PLAN
1/2"=1'-0"

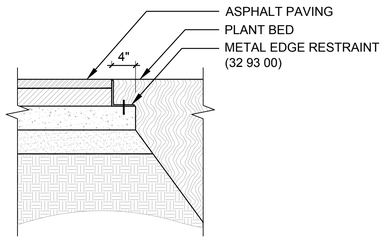


B TREE GRATE FRAME TYPE R PLAN
1"=1'-0"

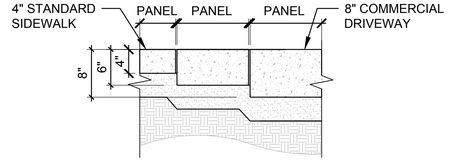


C TREE GRATE FRAME TYPE SOR PLAN
1"=1'-0"

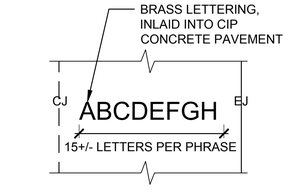
3 TREE GRATE FRAME
1"=1'-0"



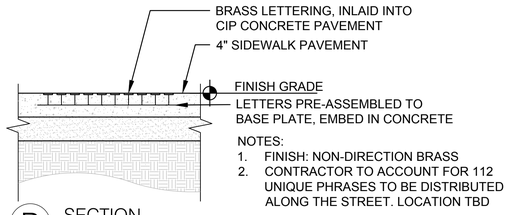
4 ASPHALT PAVEMENT AT PLANTING DETAIL
1"=1'-0"



5 SIDEWALK TO DRIVEWAY TRANSITION DETAIL
1"=1'-0"



A PLAN



B SECTION

6 BRASS INLAID LETTERING DETAIL
1"=1'-0"

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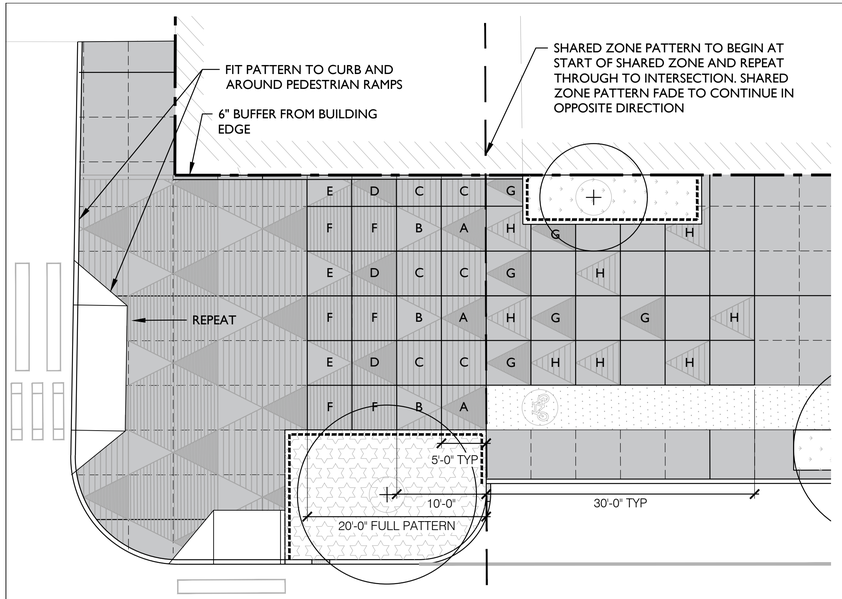
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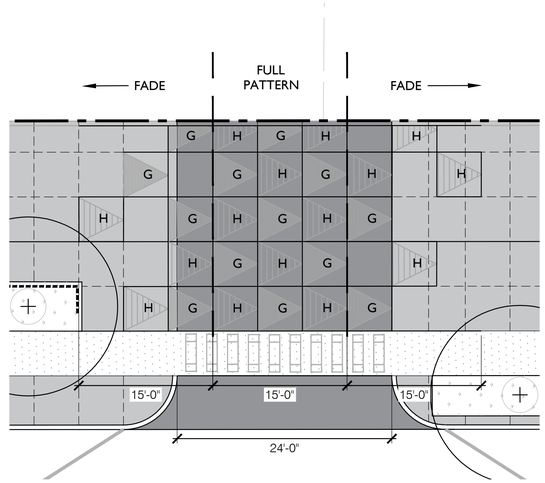
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: PAVEMENT DETAILS

Sheet No: L902



1 PAVING PATTERN LAYOUT PLANS AT SHARED ZONE, TYP Plan
SCALE: 1/8" = 1'-0"



2 PAVING PATTERN LAYOUT PLANS AT DRIVEWAY, TYP Plan
SCALE: 1/8" = 1'-0"

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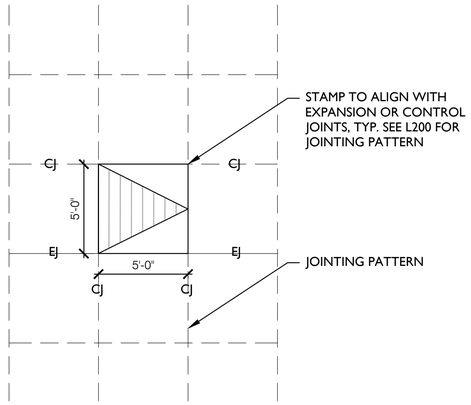
DATE:
21 December 2018

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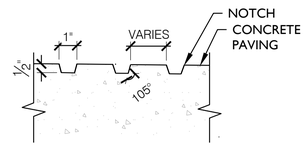
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
PAVING PATTERN DETAILS

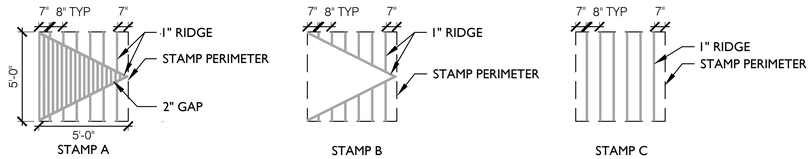
Sheet No:
L910

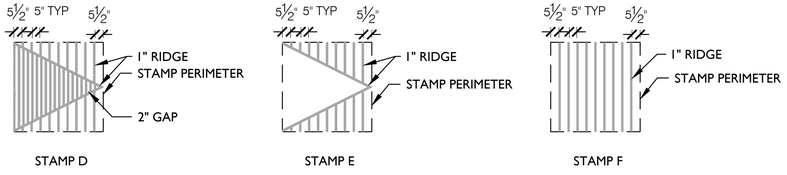


1 CONCRETE STAMP DETAIL LAYOUT, TYP Plan
Scale: 1/4"=1'-0"



2 STAMPED CONCRETE, TYP DETAIL
Scale: 1/4"=1'-0"





3 CONCRETE STAMPS FOR SIDEWALK PATTERN Plan
Scale: 1/4"=1'-0"

PRIME CONSULTANT
spackman mossop michaels
440 Burroughs Street
Suite 696
Detroit | MI | 48202
T: 313.720.1055
LANDSCAPE ARCHITECTS

CONSULTANT

PROJECT
LIVERNOIS STREETSCAPE
LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

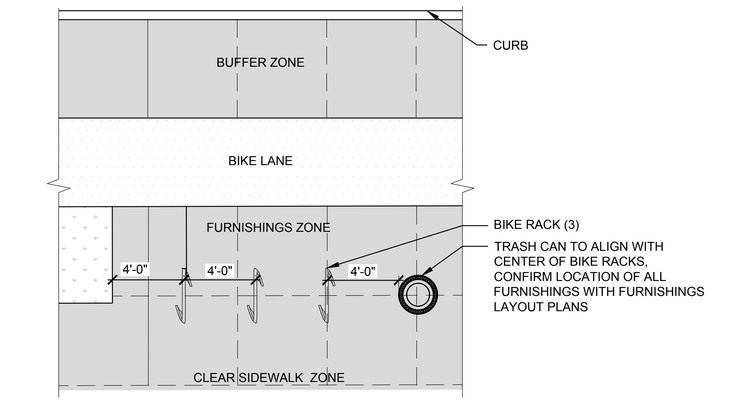
DATE: 21 December 2018

REVISION

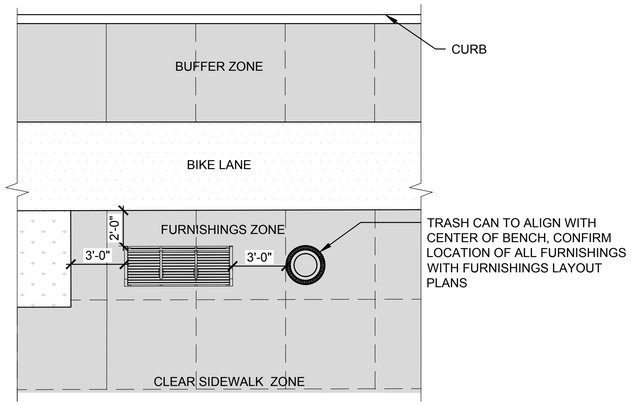
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Sheet Title
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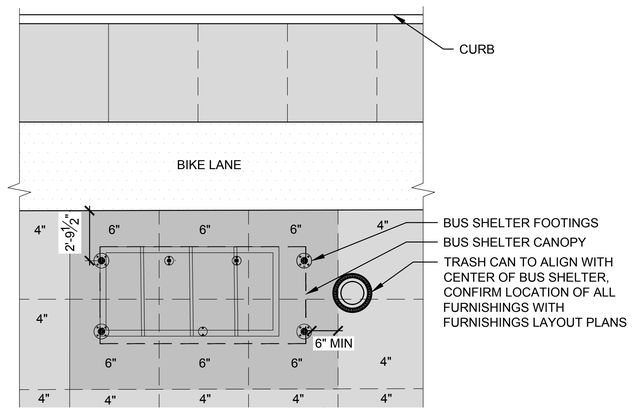
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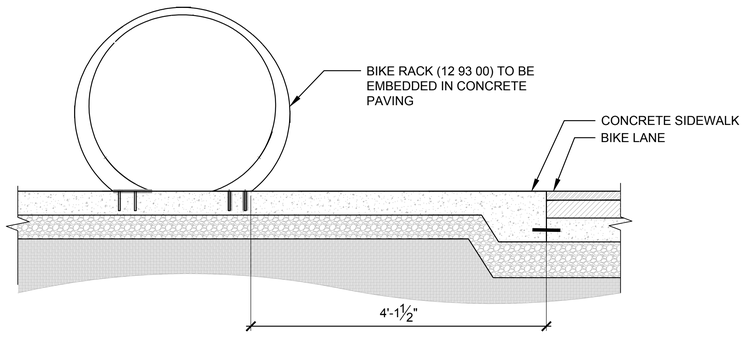
A PLAN
1/4"= 1'-0"



A PLAN
1/4"= 1'-0"

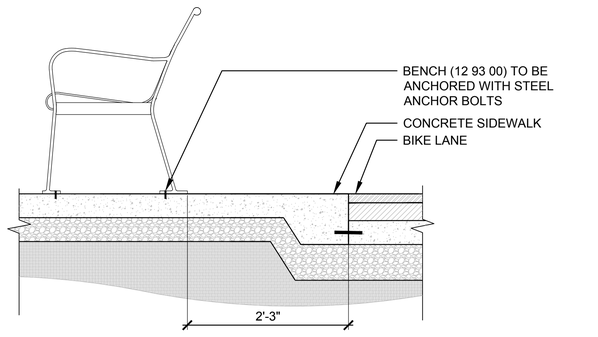


A PLAN
1/4"= 1'-0"



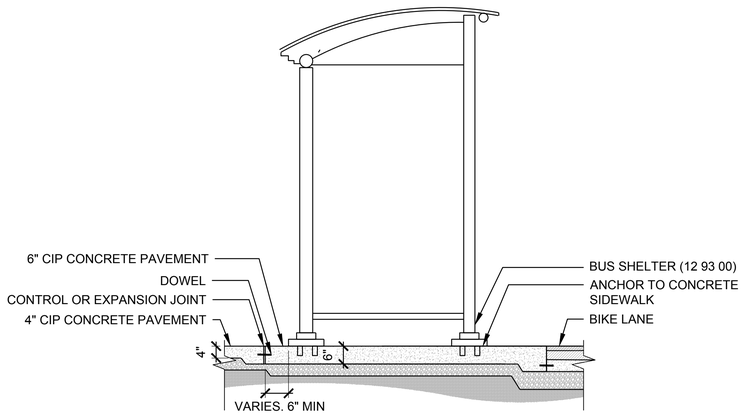
B DETAIL
1"= 1'-0"

1 CITY STANDARD BIKE RACK DETAIL — DETAIL



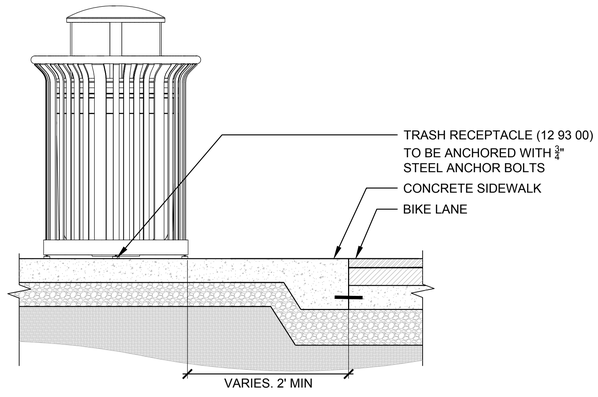
B DETAIL
1"= 1'-0"

2 CITY STANDARD BENCH DETAIL — DETAIL



B DETAIL
1/2"=1'-0"

3 BUS SHELTER LAYOUT — DETAIL



4 CITY STANDARD TRASH RECEPTACLE — DETAIL
1"=1'-0"

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LANDSCAPE ARCHITECTS

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

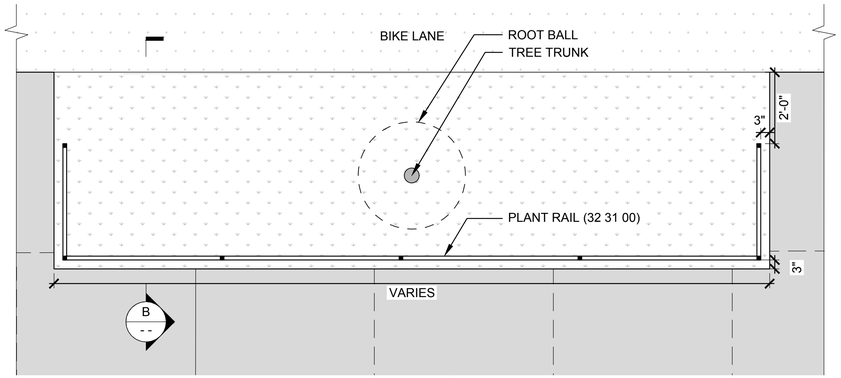
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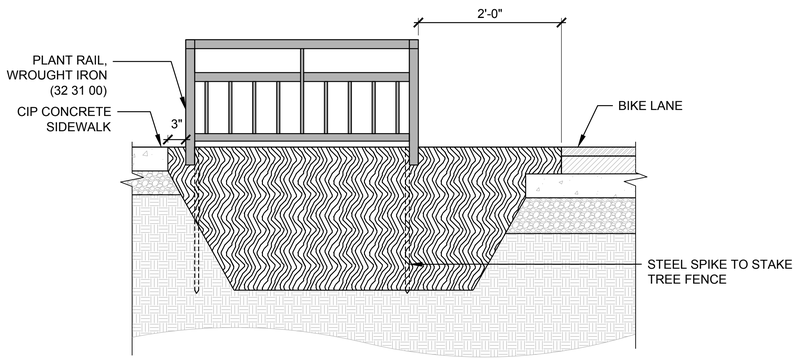
FURNISHING DETAILS

Sheet No:

L920



A PLAN
1/4"= 1'-0"



B DETAIL
1"= 1'-0"

1 PLANT RAIL DETAIL

PRIME CONSULTANT

spackman
mossop
michaels
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440 Burroughs Street
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Detroit | MI | 48202
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

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STATUS:
60% Construction Documents

DATE:
21 December 2018

REVISION

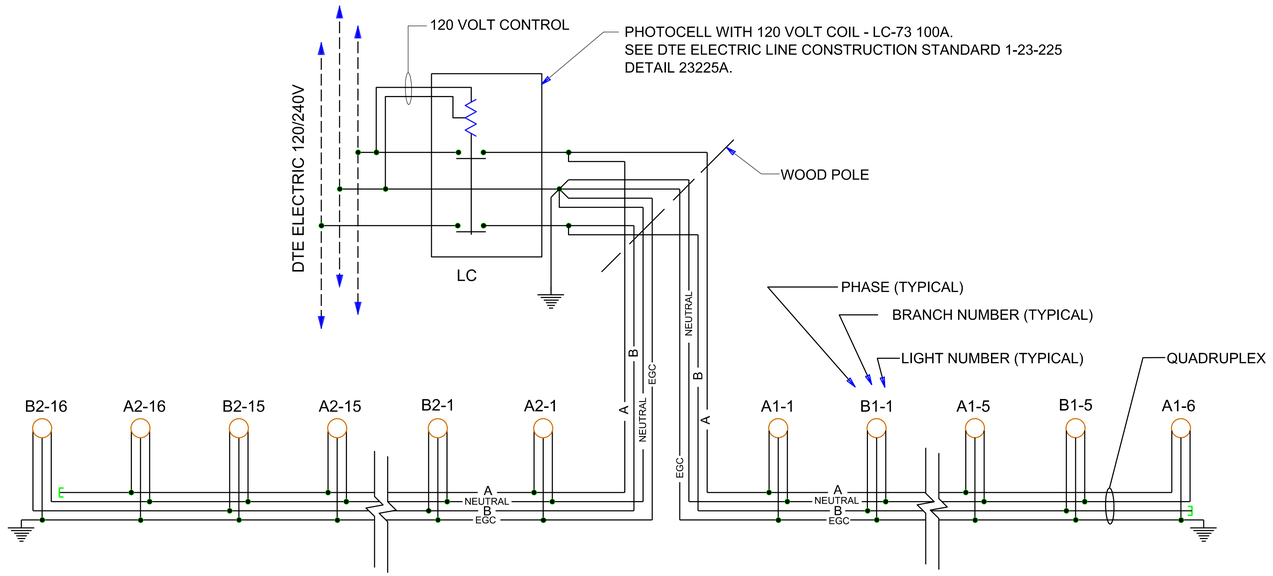
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title

FURNISHING DETAILS

Sheet No:

L921



CURRENT LIGHTING CONTROL DIAGRAM
QUADRUPLEX WITH EQUIPMENT GROUND CONDUCTOR (EGC)
(TYPICAL)
N.T.S.

UNDERGROUND PHASE IDENTIFICATION

CURRENT UNDERGROUND CONSTRUCTION WIRING STANDARD				
CONDUCTOR ID	**BLACK**	**WHITE/WHITE STRIPE**	**RED/RED STRIPE**	**GREEN/BARE**
PHASE	A PHASE	NEUTRAL	B PHASE	EGC
OBSOLETE UNDERGROUND CONSTRUCTION WIRING STANDARD				
CONDUCTOR ID	**BLACK**	**WHITE/WHITE STRIPE**	**RED/RED STRIPE**	**GREEN/BARE**
PHASE	A PHASE	NEUTRAL	B PHASE	----

*** WHEN MODIFICATIONS OR ADDITIONS ARE REQUIRED ON OBSOLETE STYLE CONSTRUCTION CIRCUITS, THE CHANGES SHOULD BE MADE WITH THE OBSOLETE STYLE OR THE ENTIRE CIRCUIT MUST BE UPDATED.

*** THE CURRENT UNDERGROUND CONSTRUCTION AND THE OBSOLETE UNDEGROUND CONSTRUCTION STANDARDS SHALL NOT BE INTERMINGLED EXCEPT AT THE CIRCUIT SOURCE POINT WHERE THE NEUTRAL IS BONDED TO THE GROUND AT THE MAIN BREAKER.

*** THERE ARE INSTALLATIONS WHERE NEITHER COLOR-CODED, EITHER COLORED INSULATION OR PHASE MARKED, CONDUCTORS ARE USED SO THAT ALL THE CONDUCTORS ARE THE SAME COLOR, TYPICALLY BLACK. PHASING MUST BE FIELD VERIFIED PRIOR TO CONNECTING ANY COLOR-CODED CONDUCTORS TO NON-CODED CONDUCTORS.

*** PRIOR TO CONNECTING ANY NEW CIRCUIT CABLING TO EXISTING CIRCUIT CABLING, CARE IS TO BE TAKEN BY VERIFYING THE EXISTING CIRCUIT CABLING PHASING TO ENSURE THAT PROPER ELECTRICAL CONNECTIONS ARE MADE. IF THE EXISTING CIRCUIT CABLING IS FOUND TO HAVE IMPROPER PHASE IDENTIFICATIONS THEN THE EXISTING CIRCUIT CABLING MUST BE CORRECTED PRIOR TO CONNECTING ANY NEW CABLING.

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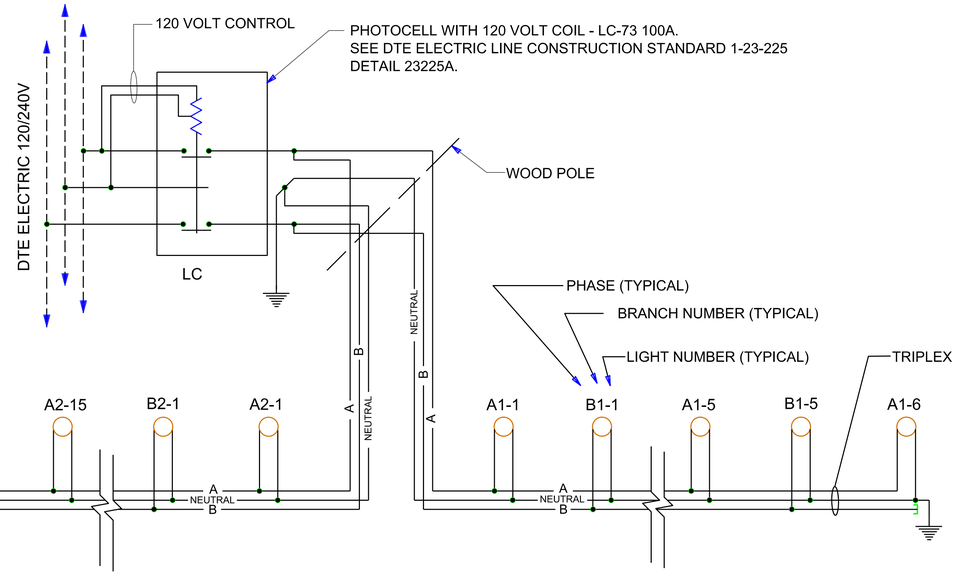
OVERHEAD PHASE IDENTIFICATION

CURRENT OVERHEAD CONSTRUCTION WIRING STANDARD				
CABLE TYPE	**NO RIB**	**1 RIB**	**2 RIBS**	**MESSENGER**
QUADRUPLEX	A PHASE	NEUTRAL	B PHASE	EGC
TRIPLEX	A PHASE	NEUTRAL	----	EGC
DUPLEX	----	----	----	----
OBSOLETE OVERHEAD CONSTRUCTION WIRING STANDARD				
CABLE TYPE	**NO RIB**	**1 RIB**	**2 RIBS**	**MESSENGER**
QUADRUPLEX	----	----	----	----
TRIPLEX	A PHASE	B PHASE	----	NEUTRAL
DUPLEX	A PHASE	----	----	NEUTRAL

*** WHEN MODIFICATIONS OR ADDITIONS ARE REQUIRED ON OBSOLETE STYLE CONSTRUCTION CIRCUITS, THE CHANGES SHOULD BE MADE WITH THE OBSOLETE STYLE OR THE ENTIRE CIRCUIT MUST BE UPDATED.

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OBSOLETE LIGHTING CONTROL DIAGRAM
TRIPLEX WITH NEUTRAL BONDED TO GROUND
(TYPICAL)
N.T.S.

Public Lighting Authority of Detroit
65 Cadillac Square, Suite 3100
Detroit, Michigan 48226
313-324-8290 office
313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

LIGHTING CONTROLLER WIRING DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture
16580 Wyoming
Detroit, Michigan 48221
313-341-5797
WADE TRIM
Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

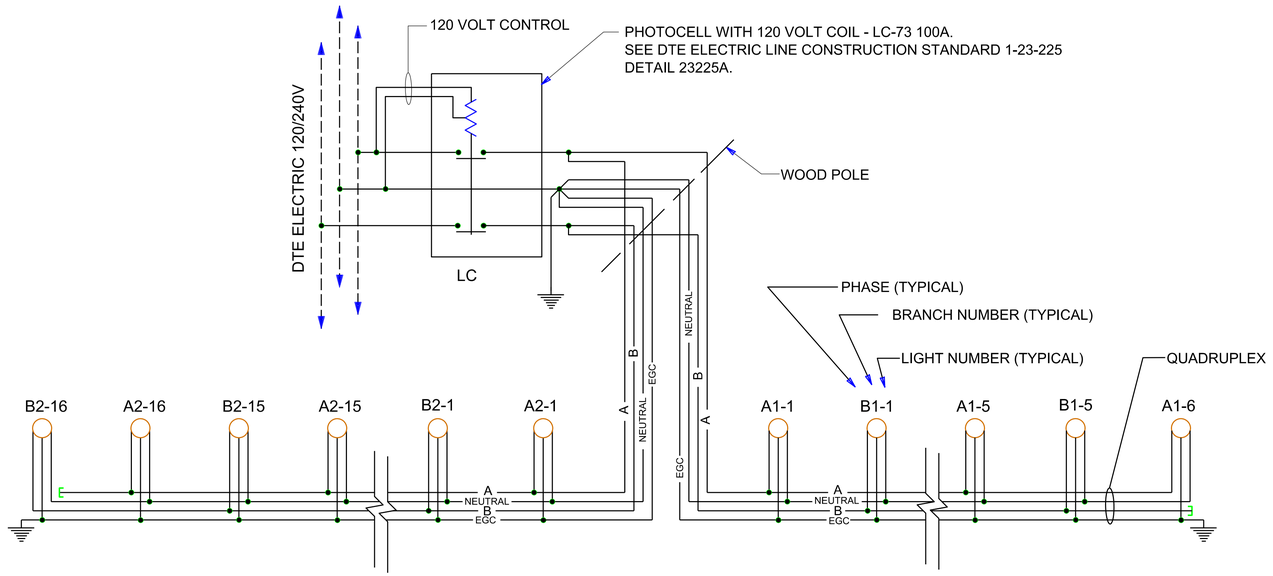
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DATE:	DESCRIPTION:
12-18-2018	50% REVIEW SUBMITTAL
12-19-2018	51% REVIEW SUBMITTAL
12-23-2018	60% REVIEW SUBMITTAL

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DT-14.1

P.O. NO. 1792
JOB NO. 142822

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CURRENT LIGHTING CONTROL DIAGRAM
QUADRUPLEX WITH EQUIPMENT GROUND CONDUCTOR (EGC)
(TYPICAL)
N.T.S.

PLACEHOLDER PAGE

UNDERGROUND PHASE IDENTIFICATION

CURRENT UNDERGROUND CONSTRUCTION WIRING STANDARD				
CONDUCTOR ID	**BLACK**	**WHITE/WHITE STRIPE**	**RED/RED STRIPE**	**GREEN/BARE**
PHASE	A PHASE	NEUTRAL	B PHASE	EGC
OBSOLETE UNDERGROUND CONSTRUCTION WIRING STANDARD				
CONDUCTOR ID	**BLACK**	**WHITE/WHITE STRIPE**	**RED/RED STRIPE**	**GREEN/BARE**
PHASE	A PHASE	NEUTRAL	B PHASE	----

*** WHEN MODIFICATIONS OR ADDITIONS ARE REQUIRED ON OBSOLETE STYLE CONSTRUCTION CIRCUITS, THE CHANGES SHOULD BE MADE WITH THE OBSOLETE STYLE OR THE ENTIRE CIRCUIT MUST BE UPDATED.

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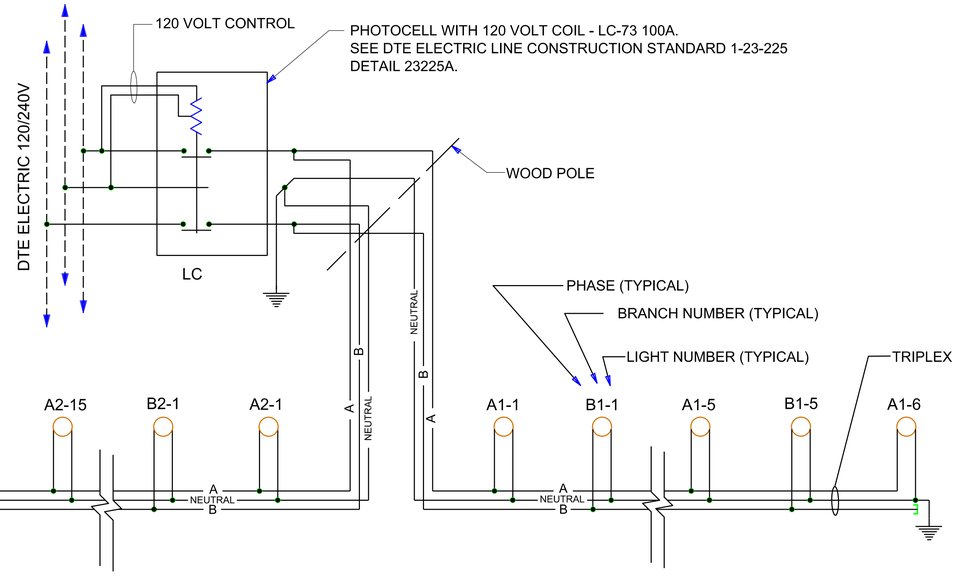
OVERHEAD PHASE IDENTIFICATION

CURRENT OVERHEAD CONSTRUCTION WIRING STANDARD				
CABLE TYPE	**NO RIB**	**1 RIB**	**2 RIBS**	**MESSENGER**
QUADRUPLEX	A PHASE	NEUTRAL	B PHASE	EGC
TRIPLEX	A PHASE	NEUTRAL	----	EGC
DUPLEX	----	----	----	----
OBSOLETE OVERHEAD CONSTRUCTION WIRING STANDARD				
CABLE TYPE	**NO RIB**	**1 RIB**	**2 RIBS**	**MESSENGER**
QUADRUPLEX	----	----	----	----
TRIPLEX	A PHASE	B PHASE	----	NEUTRAL
DUPLEX	A PHASE	----	----	NEUTRAL

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OBSOLETE LIGHTING CONTROL DIAGRAM
TRIPLEX WITH NEUTRAL BONDED TO GROUND
(TYPICAL)
N.T.S.

Public Lighting Authority of Detroit
65 Cadillac Square, Suite 3100
Detroit, Michigan 48226
313-324-8290 office
313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

LIGHTING CONTROLLER WIRING DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture
16580 Wyoming
Detroit, Michigan 48221
313-341-5797
WADE TRIM
Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

REVISIONS

DATE:	DESCRIPTION:
12-18-2018	50% REVIEW SUBMITTAL
12-19-2018	51% REVIEW SUBMITTAL
12-23-2018	60% REVIEW SUBMITTAL

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P.O. NO. 1792
JOB NO. 142822

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PLACEHOLDER PAGE

Public Lighting Authority of Detroit

65 Cadillac Square, Suite 3100
Detroit, Michigan 48226
313-324-8290 office
313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

STANDARDS FOUNDATIONS DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

Consulting Engineering Associates, Inc.
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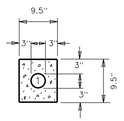
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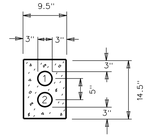
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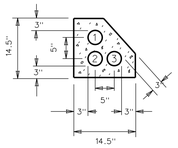
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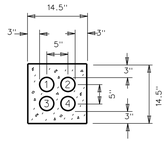
1 - 3" CONDUIT



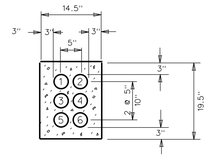
2 - 3" CONDUITS



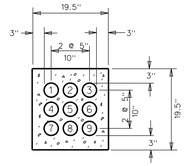
3 - 3" CONDUITS



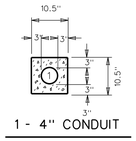
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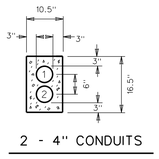
6 - 3" CONDUITS



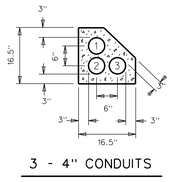
9 - 3" CONDUITS



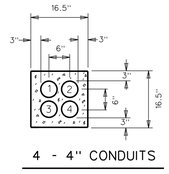
1 - 4" CONDUIT



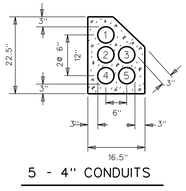
2 - 4" CONDUITS



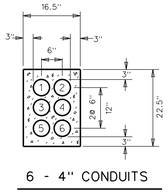
3 - 4" CONDUITS



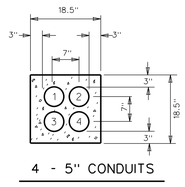
4 - 4" CONDUITS



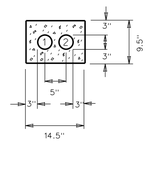
5 - 4" CONDUITS



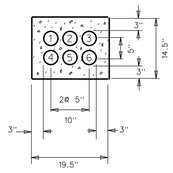
6 - 4" CONDUITS



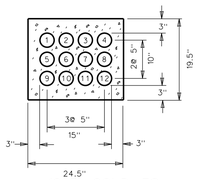
4 - 5" CONDUITS



2-3" CONDUITS



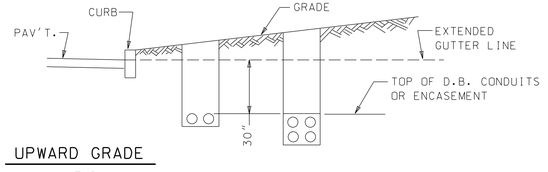
6-3" CONDUITS



12-3" CONDUITS

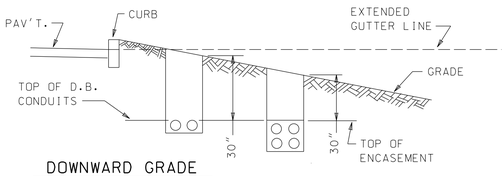
ALTERNATE ARRANGEMENT OF 3" CONDUIT

(TO SUIT FIELD CONDITIONS)
(TO BE APPROVED BY THE ENGINEER)



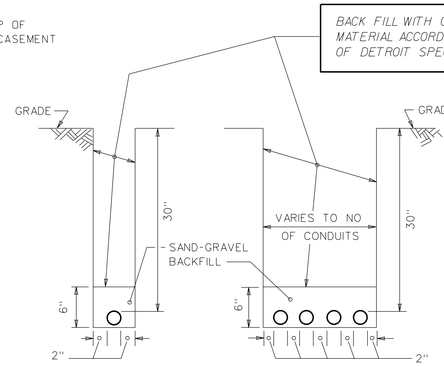
UPWARD GRADE

N.T.S.

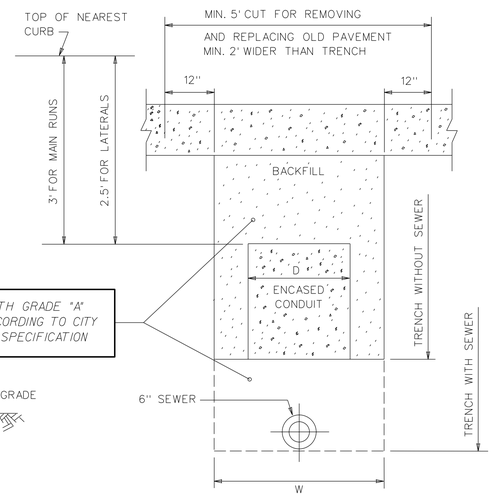


DOWNWARD GRADE

N.T.S.



DIRECT BURIAL CONDUIT(S)

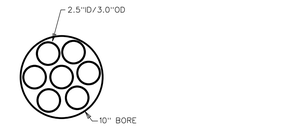


ENCASED CONDUIT(S)

BACK FILL WITH GRADE "A" MATERIAL ACCORDING TO CITY OF DETROIT SPECIFICATION

NOTE:

THE PREFERRED TRENCH WIDTH "W" IS THE WIDTH OF "D" OF CONDUIT ENCASEMENT.



7-2.5" CONDUITS
IN
10" DIRECTIONAL BORE

MISCELLANEOUS CONDUIT SECTIONS

Public Lighting Authority of Detroit

65 Cadillac Square, Suite 3100
Detroit, Michigan 48226
313-324-8290 office
313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

CONDUIT INSTALLATION DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

REVISIONS	DATE:	DESCRIPTION:

SHEET

DT-16

P.O. NO. 1792 JOB NO. 142822

PAGE E045 OF 54

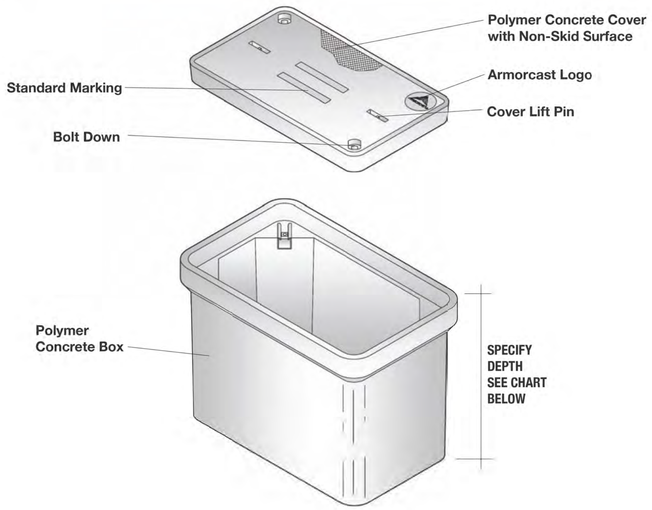
13” x 24” BOX ASSEMBLY

12” to 24” DEPTHS

POLYMER CONCRETE — ARMORCAST PRODUCTS COMPANY

A6001946

POLYMER CONCRETE BOXES



13”W x 24”L BOX ASSEMBLIES Specify Depth Below

DESCRIPTION	NOMINAL SIZE W x L x D	LOAD RATING	ANSI TIER	PART NUMBER	APPROX. WEIGHT	PALLET QTY.
Box & Cover Assembly	13” x 24” x 12”	10K	8	A6001946APCX12	83 lbs.	15
	13” x 24” x 12”	20K	15 / 22	A6001946TAPCX12 / A6001946HDAPCX12	91 lbs.	15
Box & Cover Assembly	13” x 24” x 18”	10K	8	A6001946APCX18	117 lbs.	10
	13” x 24” x 18”	20K	15 / 22	A6001946TAPCX18 / A6001946HDAPCX18	125 lbs.	10
Box & Cover Assembly	13” x 24” x 24”	10K	8	A6001946APCX24	125 lbs.	5
	13” x 24” x 24”	20K	15 / 22	A6001946TAPCX24 / A6001946HDAPCX24	133 lbs.	5

COMPONENTS

MORE COVER VARIATIONS ARE AVAILABLE IN OUR “COVER SECTION”

DESCRIPTION	NOMINAL SIZE W x L x D	LOAD RATING	ANSI TIER	PART NUMBER	APPROX. WEIGHT	PALLET QTY.
Replacement Covers	13” x 24”	10K	8	A6001866	33 lbs.	50
	13” x 24”	20K	15 / 22	A6001969 / A6001969HD	41 lbs.	50
Replacement Boxes	13” x 24” x 12”	10K/ 20K	8 /15	A6001946PCX12	50 lbs.	15
	13” x 24” x 18”	10K / 20K	8 /15	A6001946PCX18	84 lbs.	10
	13” x 24” x 24”	10K / 20K	8 /15	A6001946PCX24	92 lbs.	5

- Boxes are Open Bottom and Stackable, also available with Solid Bottoms.
- For sizes not shown please contact Armorcast Products for more information.

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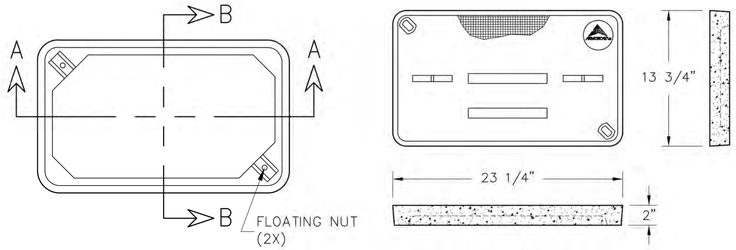
13” x 24” BOX ASSEMBLY

STANDARD DIMENSIONS

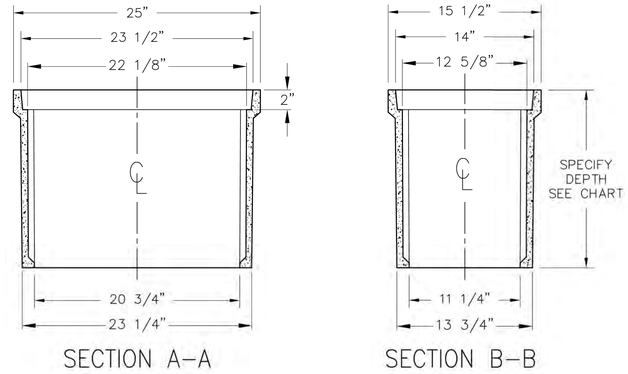
ARMORCAST PRODUCTS COMPANY — **POLYMER CONCRETE**

A6001946

POLYMER CONCRETE BOXES



POLYMER CONCRETE COVER



POLYMER CONCRETE BOX

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65 Cadillac Square, Suite 3100
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313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

13" X 24" POLYMER HANDHOLE DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture
16580 Wyoming
Detroit, Michigan 48221
313-341-5797
WADE TRIM
Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

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	12-23-2018	60% REVIEW SUBMITTAL

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DT-17

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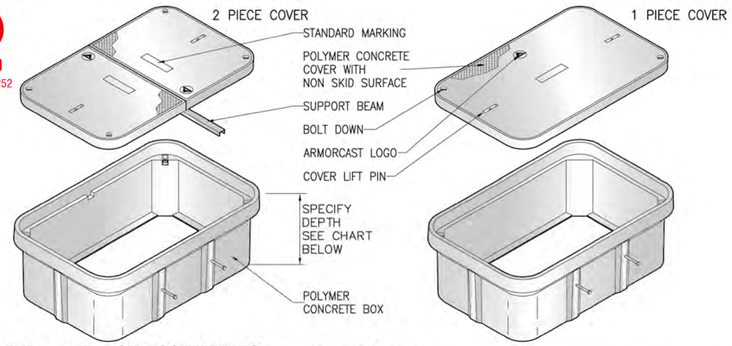
30” x 48” BOX ASSEMBLY

12” to 48” DEPTHS

POLYMER CONCRETE — ARMORCAST PRODUCTS COMPANY

A6001430

LISTED
FILE #E364252



POLYMER CONCRETE BOXES

30”W x 48”L BOX ASSEMBLIES Specify Depth Below

DESCRIPTION	NOMINAL SIZE W x L x D	LOAD RATING	ANSI TIER	PART NUMBER	APPROX. WEIGHT	PALLET QTY.
Box & Cover Assembly	30” x 48” x 12”	10K	8	A6001430APCX12	317 lbs.	5
	30” x 48” x 12”	20K	15 / 22	A6001430TAPCX12 / A6001430HDAPCX12	325 lbs.	5
Box & Cover Assembly	30” x 48” x 18”	10K	8	A6001430APCX18	377 lbs.	2
	30” x 48” x 18”	20K	15 / 22	A6001430TAPCX18 / A6001430HDAPCX18	385 lbs.	2
Box & Cover Assembly	30” x 48” x 24”	10K	8	A6001430APCX24	427 lbs.	3
	30” x 48” x 24”	20K	15 / 22	A6001430TAPCX24 / A6001430HDAPCX24	435 lbs.	3
Box & Cover Assembly	30” x 48” x 30”	10K	8	A6001430APCX30	498 lbs.	3
	30” x 48” x 30”	20K	15 / 22	A6001430TAPCX30 / A6001430HDAPCX30	506 lbs.	3
Box & Cover Assembly	30” x 48” x 36”	10K	8	A6001430APCX36	568 lbs.	1
	30” x 48” x 36”	20K	15 / 22	A6001430TAPCX36 / A6001430HDAPCX36	576 lbs.	1
Box & Cover Assembly	30” x 48” x 48”	10K	8	A6001430APCX48	663 lbs.	1
	30” x 48” x 48”	20K	15 / 22	A6001430TAPCX48 / A6001430HDAPCX48	671 lbs.	1

COMPONENTS

MORE COVER VARIATIONS ARE AVAILABLE IN OUR “COVER SECTION”

DESCRIPTION	NOMINAL SIZE W x L x D	LOAD RATING	ANSI TIER	PART NUMBER	APPROX. WEIGHT	PALLET QTY.
Replacement Covers	30” x 48” - 1 pc.	10K	8	A6001630	146 lbs.	10
	30” x 48” - 1 pc.	20K	15 / 22	A6001630T / A6001630HD	180 lbs.	10
	30” x 48” - 2 pc.	10K	8	A6001470 (2 pc. Req.)	96 lbs. ea.	20
	30” x 48” - 2 pc.	20K	15 / 22	A6001470T / A6001470HD (2 pc. Req.)	100 lbs. ea.	20
Replacement Boxes	30” x 48” x 12”	10K / 20K	22	A6001430PCX12	137 lbs.	8
	30” x 48” x 18”	10K / 20K	22	A6001430PCX18	189 lbs.	2
	30” x 48” x 24”	10K / 20K	22	A6001430PCX24	265 lbs.	3
	30” x 48” x 30”	10K / 20K	22	A6001430PCX30	300 lbs.	3
	30” x 48” x 36”	10K / 20K	22	A6001430PCX36	371 lbs.	1
	30” x 48” x 48”	10K / 20K	22	A6001430PCX48	468 lbs.	1

- **Boxes are Open Bottom and Stackable, also available with Solid Bottoms.**
- **For sizes not shown please contact Armorcast Products for more information**

THIS PRODUCT IS LISTED TO APPLICABLE UL STANDARDS AND REQUIRMENTS BY UL.

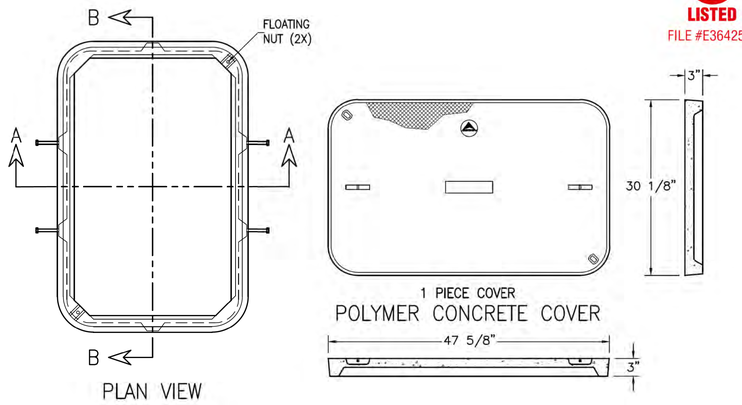
30” x 48” BOX ASSEMBLY

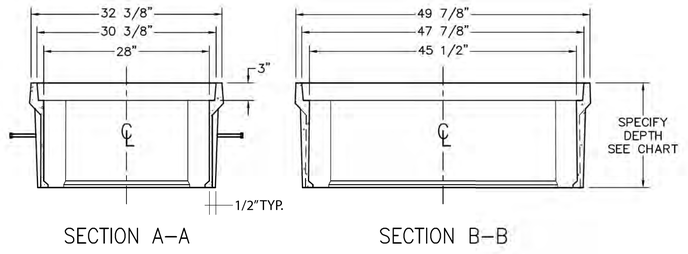
STANDARD DIMENSIONS

ARMORCAST PRODUCTS COMPANY — **POLYMER CONCRETE**

A6001430

LISTED
FILE #E364252





POLYMER CONCRETE BOXES

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Public Lighting Authority of Detroit
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313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

30" X 48" POLYMER HANDHOLE DETAILS

Consulting Engineering Associates and Wade Trim Joint Venture
16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM
Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

REVISIONS	DATE:	DESCRIPTION:
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SHEET
DT-18

P.O. NO. 1792 JOB NO. 142822

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			QUANTITIES																		
MDOT CODE	DESCRIPTION	SHEET	RM-01	RM-02	RM-03	RM-04	RM-05	RM-06	UG-01	UG-02	UG-03	UG-04	UG-05	UG-06	IN-01	IN-02	IN-03	IN-04	IN-05	IN-06	TOTAL	UOM
6020074	Conc Pavt, Misc, Reinf, 8 inch								1												1	Syd
8190016	Cable, Rem		2,100	2,100	2,100	2,100	2,100	2,100													12,600	Ft
8190032	Conduit, DB, 2, 3 inch								260	310	280	310	300	300							1,760	Ft
8197001	Conduit, DB, 6, 3 inch								1,600	1,950	2,100	1,900	1,950	1,800							11,300	Ft
8190278	Light Std Arm, Rem and Salv					26	40	40													106	Ea
8190280	Light Std Fdn, Rem					13	20	20													53	Ea
8190306	Light Std Shaft, Rem and Salv					13	20	20													53	Ea
8190360	Luminaire, Rem		15	20	18	33	40	40													166	Ea
8190473	Wood Pole, Cl 4, 40 Foot								1												1	Ea
8190489	Wood Pole, Fit Up, Metered Sec Elec Serv																				4	Ea
8190490	Wood Pole, Fit Up, Metered Sec Elec Serv with Photo Control															2			2		4	Ea
8190495	Wood Pole, Fit Up, Sec Cable Pole															2			2		4	Ea
8190505	Wood Pole, Rem		15	20	18	7															60	Ea
8197050	Bracket Arm, Bolt On, Rem		15	20	18	7															60	Ea
8197001	Conduit, Directional Bore, 6, 3 inch									360	240	340	300	340							1,580	Ft
8197001	Cable, Sec, Quadruplex															1,000			1,000		2,000	Ft
8197050	Ground Rod, Install, Wood Pole									4			4								8	Ea
8197050	Light Std, Tapered Aluminum														16	21	18	21	20	20	116	Ea
8197050	Luminaire, 101W														16	21	18	21	20	20	116	Ea
8197050	Luminaire, 139W														16	21	18	21	20	20	116	Ea
8197250	Hh, Polymer Conc, 13"x24", Modified								14	14	17	15	14	13							87	Ea
8197250	Hh, Polymer Conc, 30"x48", Modified								2	8	4	6	6	7							33	Ea
8197279	Light Std Fdn, Modified								16	21	18	21	20	20							116	Ea
8197050	Bracket Arm, Clamp On, Install														16	21	18	21	20	20	116	Ea
8197050	Bracket Arm, Bolt On, Install														16	21	18	21	20	20	116	Ea
8197234	Cable, Equipment Grounding Wire, 1/C#4, Modified														2,300	3,200	3,100	2,900	2,850	2,850	17,200	Ft
8197405	Cable, Sec, 600V, 3, 1/C#4, Modified														3,800	5,400	7,200	5,000	5,000	5,000	31,400	Ft
8197001	Cable, Sec, 600V, 4, 1/C#4														400	500	500	400	350	350	2,500	Ft
8197050	Photo Control, Lighting															2			2		4	Ea

Public Lighting Authority of Detroit

65 Cadillac Square, Suite 3100
Detroit, Michigan 48226
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313-638-2805 fax
pladetroit.org

PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

QUANTITIES SUMMARY SHEET

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

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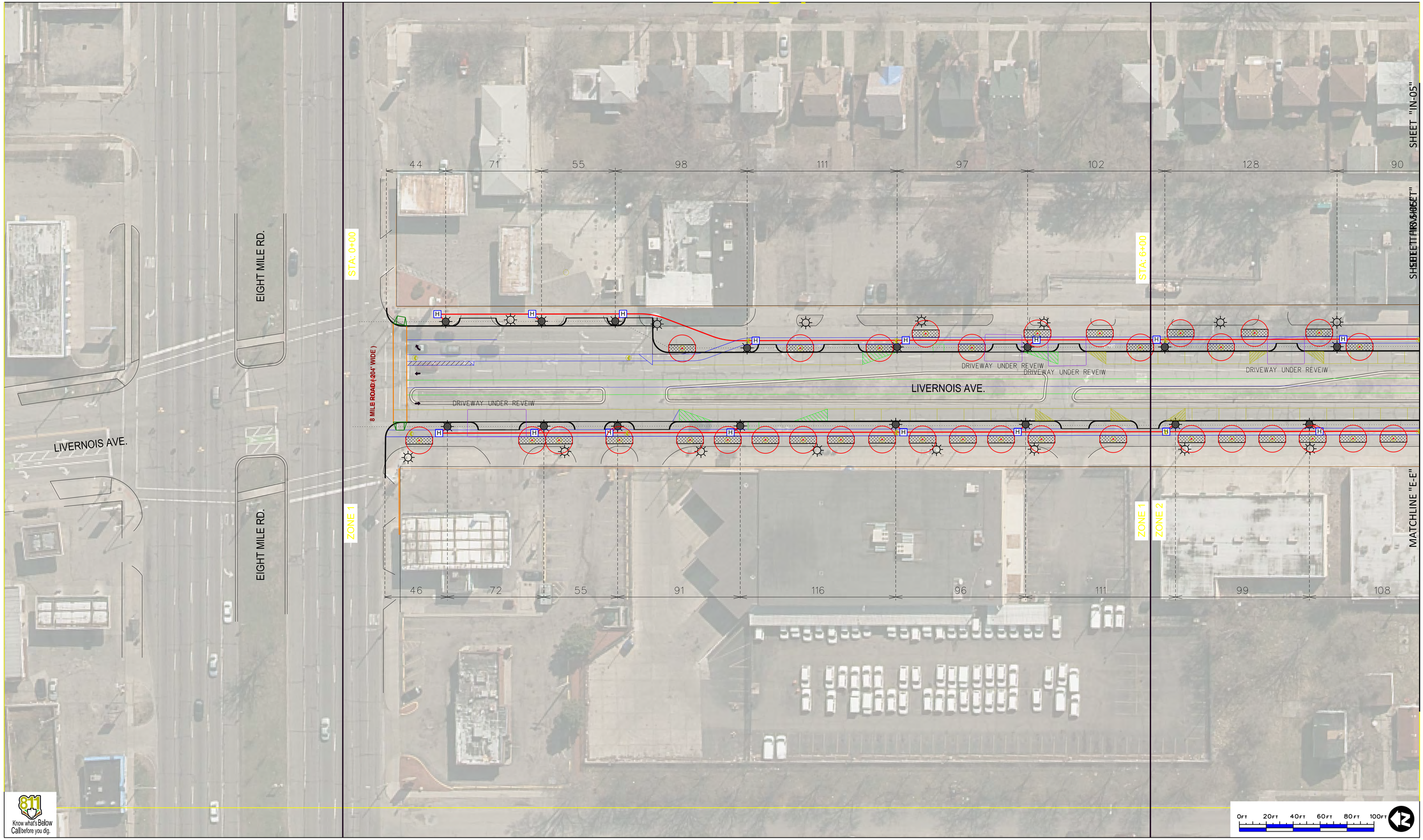
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PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 1 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

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WADE TRIM

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Engineering & Information Technology Consultants

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JOB NO. 142822

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PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 2 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
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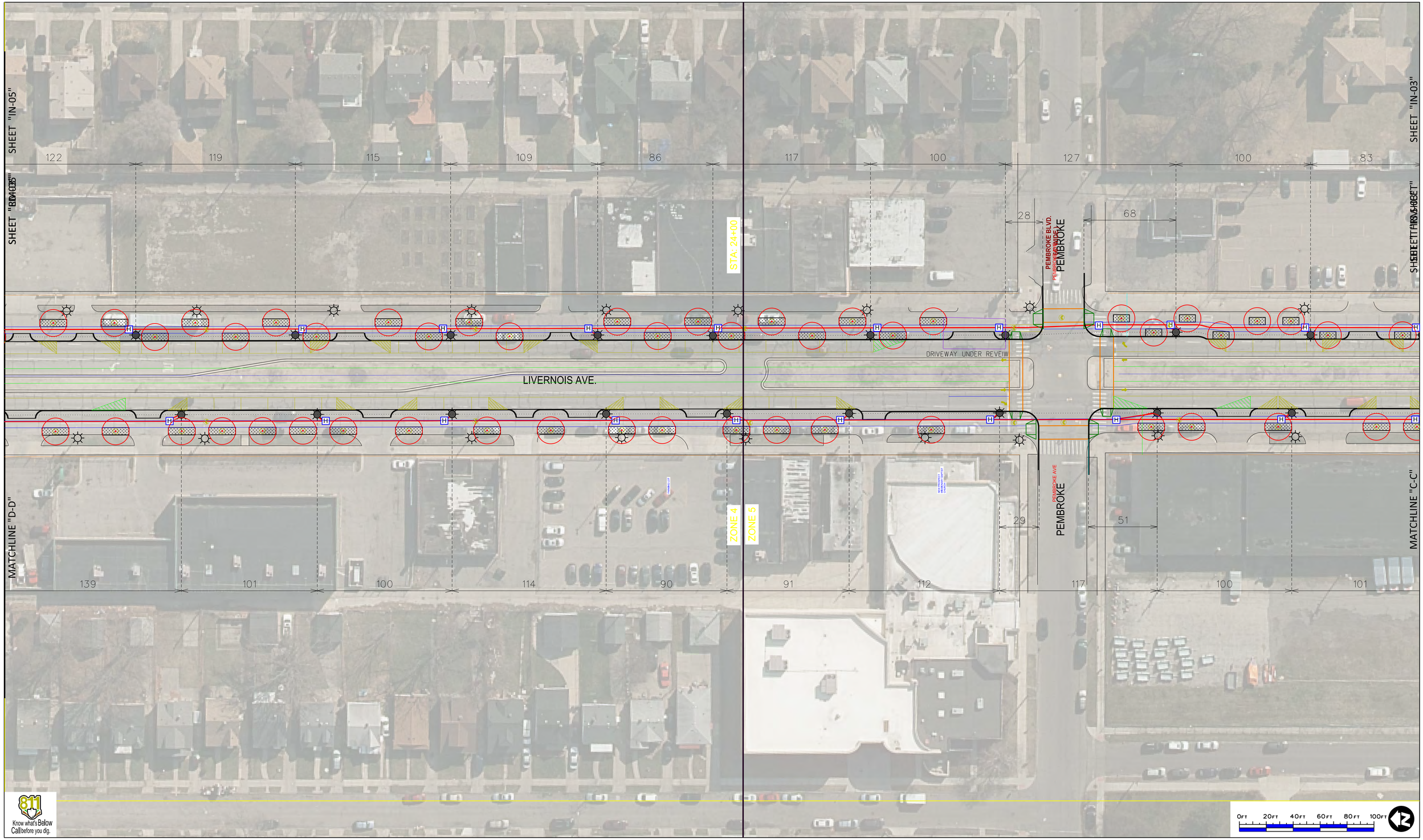
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PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 3 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

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OV-03

P.O. NO. 1792
JOB NO. 142822

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L206

L207

SHEET "IN-04"

SHEET "RM-03"

94 | 112 | 112 | 102 | 94 | 100 | 100 | 94 | 111 | 83 | 87

STA: 30+00

STA: 36+00

63

10

ST. MARTIN'S ROAD
ST. MARTINS

LIVERNOIS AVE.

KARIMAS HEART

FLAGSHIP BOUTIQUE

ART IN MOTION

BLO BAE6

29

CHESTERFIELD

CHESTERFIELD SHEET "BM-02"

SHEET "IN-02"

MATCHLINE "C-C"

ZONE 5

ZONE 6

75

ST. MARTIN'S ROAD
ST. MARTINS

10

FUTURE HOME OF THREE THIRTEEN

VACANT

OLD CHILD CARE BUILDING OR VACANT

OLD CHILD CARE BUILDING OR VACANT

ZONE 6

ZONE 7

A BEAUTY BAR (IDA)

MILLER'S CHILDREN'S APPAREL

L'SWYGERT'S LA RANGE HAIR SALON

64

WEST BD OUTER DRIVE

OUTER DRIVE WEST

MATCHLINE "B-B"

118 | 98 | 85 | 115 | 97 | 103 | 102 | 90 | 114 | 180

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0FT 20FT 40FT 60FT 80FT 100FT

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PROJECT DESCRIPTION

DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 4 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

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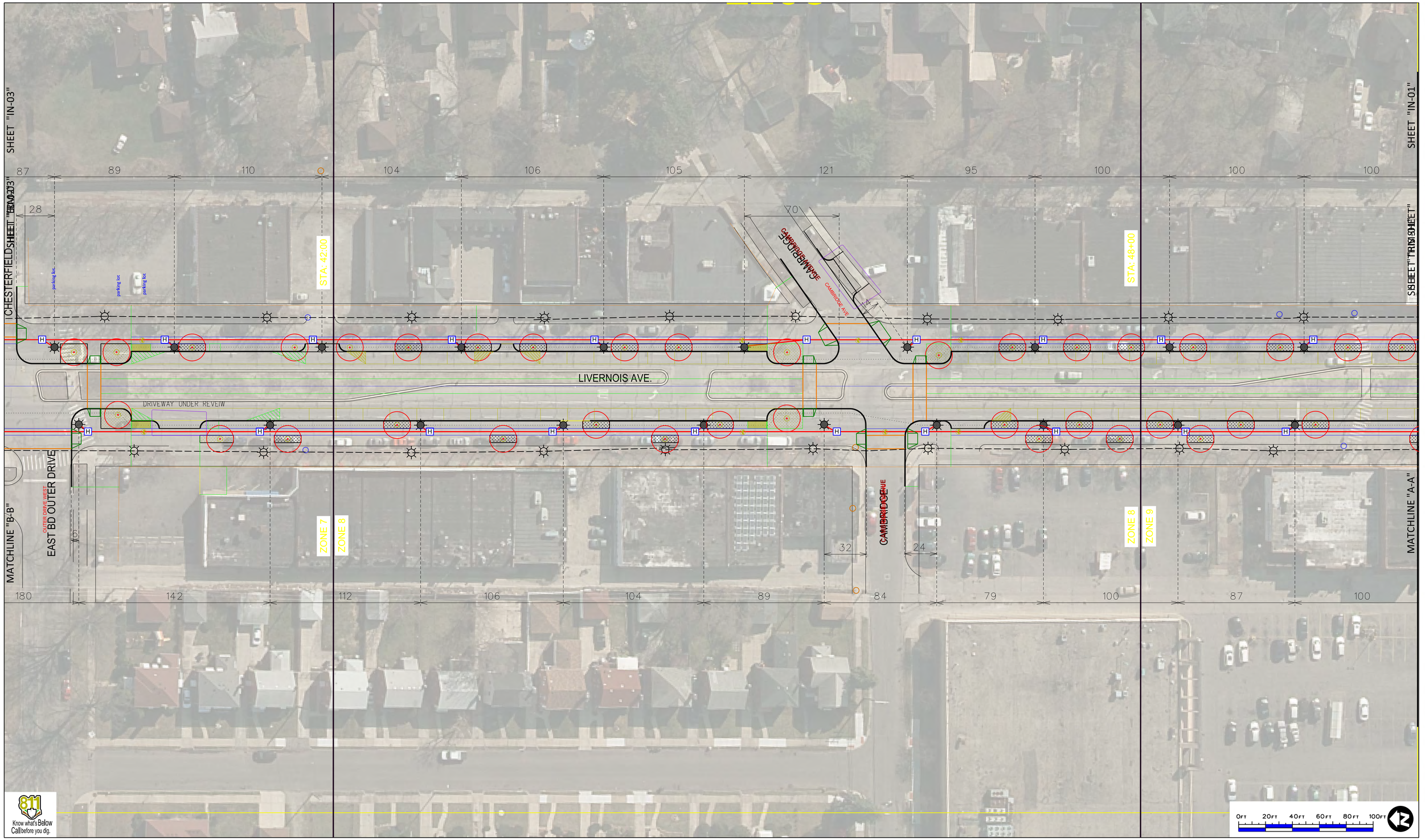
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PROJECT DESCRIPTION
DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 5 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
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WADE TRIM

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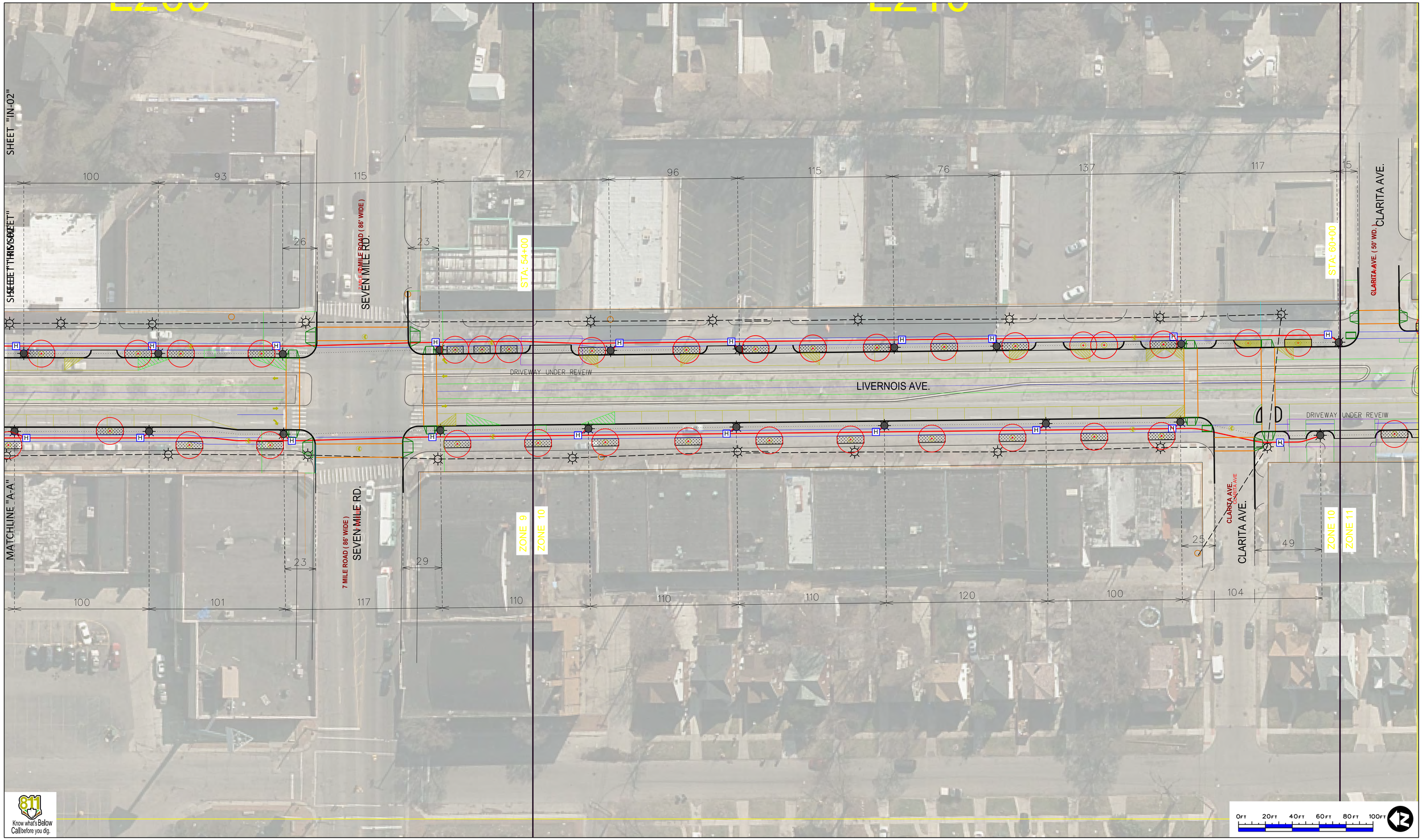
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DESIGN ENGINEERING FOR LIVERNOIS STREETSCAPE

PROJECT OVERVIEW
SHEET 6 OF 6

Consulting Engineering Associates and Wade Trim Joint Venture

16580 Wyoming
Detroit, Michigan 48221
313-341-5797

WADE TRIM

Consulting Engineering Associates, Inc.
Engineering & Information Technology Consultants

PREPARED UNDER THE SUPERVISION OF

REGISTRATION NO. DATE:

REVISIONS

DATE:	DESCRIPTION:
12-18-2018	50% REVIEW SUBMITTAL
12-19-2018	51% REVIEW SUBMITTAL
12-23-2018	60% REVIEW SUBMITTAL

SHEET
OV-06

P.O. NO. 1792
JOB NO. 142822

PAGE E054 OF 54

SURVEY

GENERAL

- ALIGNMENT POINT MONUMENT
- MONUMENT BOX

CONTROL

- CP CONTROL POINT
- BM BENCHMARK
- REFERENCE – GPS
- REFERENCE – NGS
- REFERENCE – USGS

BOUNDARY

- CITY LIMIT – MAP
- CITY LIMIT
- PARCEL-L – PARCEL – LEGAL
- PARCEL-NL – PARCEL – NON-LEGAL
- PLAT-L – PLAT – LEGAL
- PLAT-NL – PLAT – NON-LEGAL
- ROW – FREE ACCESS
- ROW – LIMITED ACCESS
- SEC – SECTION LINE
- SEC 1/4 – SECTION LINE – QUARTER
- SEC 1/8 – SECTION LINE – EIGHTH
- SEC 1/16 – SECTION LINE – SIXTEENTH
- TOWNSHIP LINE (MAP)
- CONCRETE MONUMENT
- CONTIGUOUS PROPERTY SYMBOL
- PARCEL CORNER – CAPPED IRON
- PARCEL CORNER – IRON PIN
- PARCEL CORNER – IRON PIPE
- PARCEL CORNER – NO ID
- 123456 PARCEL NUMBER BOX
- PLAT CORNER
- PROPERTY OWNERSHIP ARROW
- PROPERTY OWNERSHIP ARROW – DOUBLE
- ROW MONUMENT
- SECTION CORNER – CENTER
- SECTION CORNER – MEANDER
- SECTION CORNER – QUARTER
- SECTION CORNER – QUARTER-HALF
- SECTION CORNER – SECTION
- SECTION CORNER – SECTION-HALF
- SECTION CORNER – SIXTEENTH
- SECTION CORNER – WITNESS

MONUMENT PRESERVATION

- PRESERVE – PRESERVE MONUMENT
- PROTECT – PROTECT MONUMENT

STRUCTURES

- BEAM UNDERCLEARANCE
- REFERENCE POINT
- S01 OF 12345 – STRUCTURE NO. + CONTROL SEC. LABEL

BORINGS

- BH# – BORING

GENERAL LABELING

GENERAL

- LEFT TURN ARROW
- TRAFFIC FLOW ARROW

REMOVAL

- A – ABANDON
- B – BULKHEAD
- C – CLEARING
- R – REMOVE
- SALV – SALVAGE
- S – SAVE

CONSTRUCTION

- ADJ – ADJUST
- ADJ-B – ADJUST – STRUC COVER WITH TYPE
- ADJ-B/O – ADJUST – BY OTHERS

REMOVAL AND CONSTRUCTION

- REL-1 – RELOCATE – WITH CASE NUMBER
- REL-B/O – RELOCATE – BY OTHERS

CONSTRUCTION LIMITS

- SSL SSL – SLOPE STAKE LINE

VEGETATION

- BRUSH LINE
- HEDGE LINE
- TREE LINE – CANOPY OR TRUNK
- TREE LINE – TRUNK (TRUNK LINE)
- SHRUB
- TREE – CONIFER
- TREE – DECIDUOUS
- TREE – STUMP

ENVIRONMENTAL

- 26 – EROSION CONTROL – SILT FENCE
- WETLAND – LEGAL
- WETLAND – NON-LEGAL
- CONTAMINATION – MONITORING WELL
- 12 – EROSION CONTROL NUMBER
- EROSION CONTROL – RIPRAP
- W.T. 12' – WATER TABLE – PLAN NOTE
- WETLAND – SPOT EL
- POTENTIALLY CONTAMINATED SITE

ROADSIDE / SITE

- ANTENNA
- BIG ROCK
- FLAG POLE
- PICNIC STOVE
- PICNIC TABLE
- SATELLITE DISH

RAILROAD

- TRACK
- CROSSING – GATE
- RR CROSSING – SIGNAL BOX
- CROSSING – SIGNAL FLASHING
- CROSSING – SYMBOL

SIGNS

- POST – DOUBLE
- POST – SINGLE
- STRUCTURE – CANTILEVER (EXISTING)
- STRUCTURE – CANTILEVER
- STRUCTURE – TRUSS (EXISTING)
- STRUCTURE – TRUSS
- SS SUSPENDED (EXISTING)

MAINTAINING TRAFFIC

- TYPE III BARRICADE
- CHANNELIZING DEVICE – CONE
- CHANNELIZING DEVICE – DRUM
- LIGHT – HIGH INTENSITY TYPE B
- LIGHT – STEADY BURN TYPE C
- LIGHTED ARROW PANEL – BAR
- LIGHTED ARROW PANEL
- PORTABLE CHANGEABLE MESSAGE SIGN
- TRAFFIC REGULATOR
- TEMPORARY SIGN
- TEMPORARY TRAFFIC SIGNAL
- WORK AREA

BARRIERS

- CABLE BARRIER – NOT TO SCALE
- CABLE BARRIER – TRUE SCALE
- CONCRETE BARRIER – DOUBLE FACE
- CONCRETE BARRIER – SINGLE FACE
- FENCE
- GUARDRAIL – NOT TO SCALE
- GUARDRAIL – TRUE SCALE
- NOISE BARRIER
- FENCE POST
- 123 GUARDRAIL RUN NUMBER
- IMPACT ATTENUATOR
- POST – MAILBOX
- POST – NO ID

TYPICAL SECTION

- CONCRETE – PROPOSED
- HMA – PROPOSED

CURB & GUTTER

- CURB & GUTTER REMOVAL

COMBINED SEWER

- COMBINED SEWER
- COMBINED SEWER – OUT OF SERVICE
- COMBINED SEWER – TO BE TAKEN OUT OF SERVICE
- COMBINED SEWER – TO BE REMOVED

COMMUNICATION

- FO – FIBER OPTIC
- FO – FIBER OPTIC – OUT OF SERVICE
- FO-OH – FIBER OPTIC – OVERHEAD
- FIBER OPTIC MARKER
- C – CABLE
- C – CABLE – OUT OF SERVICE
- C-OH – CABLE – OVERHEAD
- CABLE MARKER
- CABLE PEDESTAL
- T – TELEPHONE
- T – TELEPHONE – OUT OF SERVICE
- T-OH – TELEPHONE – OVERHEAD
- TELEPHONE BOX
- T TELEPHONE MANHOLE
- TELEPHONE PEDESTAL

FUEL / PETROLEUM

- GASOLINE FILLER PIPE
- GASOLINE PUMP
- GASOLINE UNDERGROUND TANK
- PETRO – PETROLEUM PIPELINE
- PETRO – PETROLEUM PIPELINE – OUT OF SERVICE
- PETROLEUM PIPELINE MARKER
- P PETROLEUM WELL
- P PROPANE TANK

NATURAL GAS

- G – GAS LINE
- G – GAS LINE – OUT OF SERVICE
- MARKER
- VALVE
- WELL

PROPOSED

- AGGREGATE APPROACH
- BRIDGE APPROACH
- HMA APPROACH
- MISCELLANEOUS CONCRETE

SIDEWALK

- SIDEWALK – REMOVAL
- SIDEWALK – CONCRETE RAMP
- SIDEWALK – DETECT. WARNING SURF.
- SIDEWALK – LANDING
- SWR-F SIDEWALK – RAMP LABEL

SURFACING

REMOVAL

- CONCRETE RUBBLIZING OR HMA CRUSH & SHAPE
- HMA COLDMILLING
- HMA SURFACE REMOVAL AND / OR PAVEMENT REMOVAL

SANITARY SEWER

- S MANHOLE WITH COVER (DIA VARIES)
- SEWER
- SEWER – OUT OF SERVICE
- SEWER – TO BE TAKEN OUT OF SERVICE
- SEWER – TO BE REMOVED

WATER

- FIRE HYDRANT
- GATE VALVE AND BOX
- W GATE VALVE IN WELL
- IRRIGATION CONTROL VALVE
- IRRIGATION SPRINKLER HEAD
- SERVICE METER
- SERVICE SHUTOFF
- WATER WELL
- I IRRIGATION
- W WATER MAIN
- W WATER MAIN – OUT OF SERVICE
- W WATER MAIN – TO BE TAKEN OUT OF SERVICE
- W WATER MAIN – TO BE REMOVED

STEAM

- STEAM – STEAM
- STEAM – STEAM – OUT OF SERVICE

GENERIC EXISTING UTILITIES

- CATCH BASIN COVER
- MANHOLE COVER
- MARKER
- PEDESTAL
- SEWER CLEANOUT ACCESS
- STRUCTURE BOTTOM (DIA VARIES)
- UTILITY BOX
- U UTILITY

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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LEGEND

Sheet No: T001

DRAINAGE

- CATCH BASIN W/ COVER (DIA VARIES)
- 12 DRAINAGE STRUCTURE NUMBER
- DRAIN CASTING
- DROP INLET
- END SECTION (SIZE VARIES)
- FLOW DIRECTION ARROW
- HEADWALL (SIZE VARIES)
- MANHOLE W/ COVER (DIA VARIES)
- MANHOLE BASE W/ COVER (SIZE VARIES)
- MANHOLE TEE W/ COVER (SIZE VARIES)
- OUTLET HEADWALL (SIZE VARIES)
- CULVERT - EXISTING
- CULVERT (SIZE VARIES)
- DITCH CENTERLINE
- STORM SEWER - EXISTING
- STORM SEWER
- STORM SEWER - TO BE REMOVED
- UNDERDRAIN
- WATER EDGE

ARCHITECTURAL

- EXIT SIGN WITH EMERGENCY LIGHT
- LIGHT RECESSED FIXTURE
- MOTOR
- OUTLET BOX
- OUTLET SINGLE
- OUTLET TELEPHONE
- SERVICE DISCONNECT
- SERVICE METER
- $ SWITCH
- $3 SWITCH THREE WAY
- WALL BRACKET FIXTURE

LIGHTING

- CONTROL PANEL - EXISTING
- CONTROL PANEL
- R&S LIGHT STANDARD EXISTING - TO BE REMOVED & SALVAGED
- LIGHT STANDARD DOUBLE ARM - EXISTING
- LIGHT STANDARD DOUBLE ARM
- LIGHT STANDARD POST TOP - EXISTING
- LIGHT STANDARD POST TOP
- LIGHT STANDARD SINGLE ARM - EXISTING
- LIGHT STANDARD SINGLE ARM
- LIGHT POLE - TEMPORARY
- LUMINAIRE WALL MOUNTED UNDERBRIDGE - EXISTING
- LUMINAIRE WALL MOUNTED UNDERBRIDGE
- T- TOWER LIGHTING UNIT - EXISTING
- T- TOWER LIGHTING UNIT

ELECTRICAL

- CONTROLLER CABINET - PAD MOUNTED
- HH HANDHOLE
- MH MANHOLE
- POLE UTILITY - EXISTING
- POLE UTILITY
- T TRANSFORMER - PAD MOUNTED
- TP TRANSFORMER - POLE MOUNTED
- E CABLE
- E CABLE - TO BE REMOVED
- E-OH CABLE OVERHEAD
- E-OH CABLE OVERHEAD - TO BE REMOVED
- E CABLE IN CONDUIT
- E CABLE IN CONDUIT - TO BE REMOVED
- CABLE IN CONDUIT - DIRECTIONAL BORE

ITS / SIGNALS

- DYNAMIC MESSAGE SIGN - EXISTING
- DYNAMIC MESSAGE SIGN
- ENVIRONMENTAL SENSOR STATION SITE
- FIBER OPTIC SPLICE CABINET
- HANDHOLE, ROUND, 3 FOOT DIAMETER
- HANDHOLE, ROUND, COMMUNICATIONS
- HANDHOLE, ROUND, ELECTRIC
- 1 HANDHOLE, TYPE D
- ITS CABINET - EXISTING
- ITS CABINET
- MICROWAVE VEHICLE DETECTION SYSTEM - EXISTING
- MICROWAVE VEHICLE DETECTION SYSTEM
- MICROWAVE VEHICLE DETECTION SYSTEM ZONE COVERAGE - EXISTING
- MICROWAVE VEHICLE DETECTION SYSTEM ZONE COVERAGE
- SPUN CONCRETE POLE - EXISTING
- SPUN CONCRETE POLE
- SURVEILLANCE SYSTEM - EXISTING
- SURVEILLANCE SYSTEM
- WIRELESS LINK - EXISTING
- WIRELESS LINK
- ITS COMMUNICATIONS CABLE IN CONDUIT
- ITS COMMUNICATIONS CABLE IN CONDUIT - TO BE REMOVED

- ANTENNA
- CASE SIGN (1-WAY OR 2-WAY)
- CASE SIGN (4-WAY)
- DEDICATED SHORT RANGE COMMUNICATIONS
- CONTROLLER CABINET - POLE MOUNTED
- CONTROL EMERGENCY PREEMPTION OPTICOM
- DILEMMA ZONE DETECTION
- GLOBAL POSITIONING SYSTEM MODULE
- GUY ANCHOR
- PEDESTRIAN PEDESTAL
- PEDESTRIAN PUSHBUTTON
- POLE MAST ARM (LENGTH VARIES) - EXISTING
- POLE MAST ARM (LENGTH VARIES)
- POLE STRAIN
- ROAD SIGN W/ FLASHING SIGN OPTICAL (1-WAY)
- SIGNAL HANDHOLE - POLYMER CONCRETE
- SIGNAL HANDHOLE - 2 FOOT ROUND
- SIGNAL HANDHOLE - 3 FOOT ROUND
- SIGNAL HANDHOLE - 2 FOOT SQUARE
- TS SIGNAL HANDHOLE - 4 FOOT SQUARE
- SIGNAL HEAD PEDESTRIAN - EXISTING
- SIGNAL HEAD PEDESTRIAN 1-WAY
- SIGNAL HEAD PEDESTRIAN 2-WAY
- SIGNAL HEAD VEHICLE 1-WAY - EXISTING
- SIGNAL HEAD VEHICLE 2-WAY - EXISTING
- SIGNAL HEAD VEHICLE 3-WAY - EXISTING
- SIGNAL HEAD VEHICLE 4-WAY - EXISTING
- SIGNAL HEAD VEHICLE 1-WAY
- SIGNAL HEAD VEHICLE 2-WAY
- SIGNAL HEAD VEHICLE 3-WAY
- SIGNAL HEAD VEHICLE 4-WAY
- SIGNAL HEAD VEHICLE BAGGED
- SIGNAL HEAD VEHICLE PROGRAMMABLE
- VEHICLE DETECTION CAMERA
- VEHICLE DETECTION CAMERA - HEMISPHERICAL
- VEHICLE DETECTION LOOP
- VEHICLE DETECTION - RADAR
- WIRELESS VEHICLE DETECTION RADIO RECEIVER
- WIRELESS VEHICLE DETECTION RADIO REPEATER
- WIRELESS VEHICLE DETECTION SENSOR - EXISTING
- WIRELESS VEHICLE DETECTION SENSOR

CABLING / WIRING DIAGRAM

- CIRCUIT BREAKER
- COILED WIRE
- FUSE
- FUSE SWITCH
- GROUND
- ILLUMINATED CASE SIGN
- M METER
- $ SERVICE DISCONNECT
- SIGNAL HEAD

NOTE:

EXISTING ITEMS ARE REPRESENTED BY THIN LINE WEIGHTS.
PROPOSED ITEMS ARE REPRESENTED BY HEAVIER LINE WEIGHTS.

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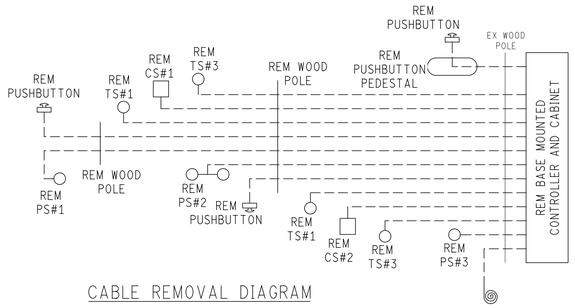
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LEGEND

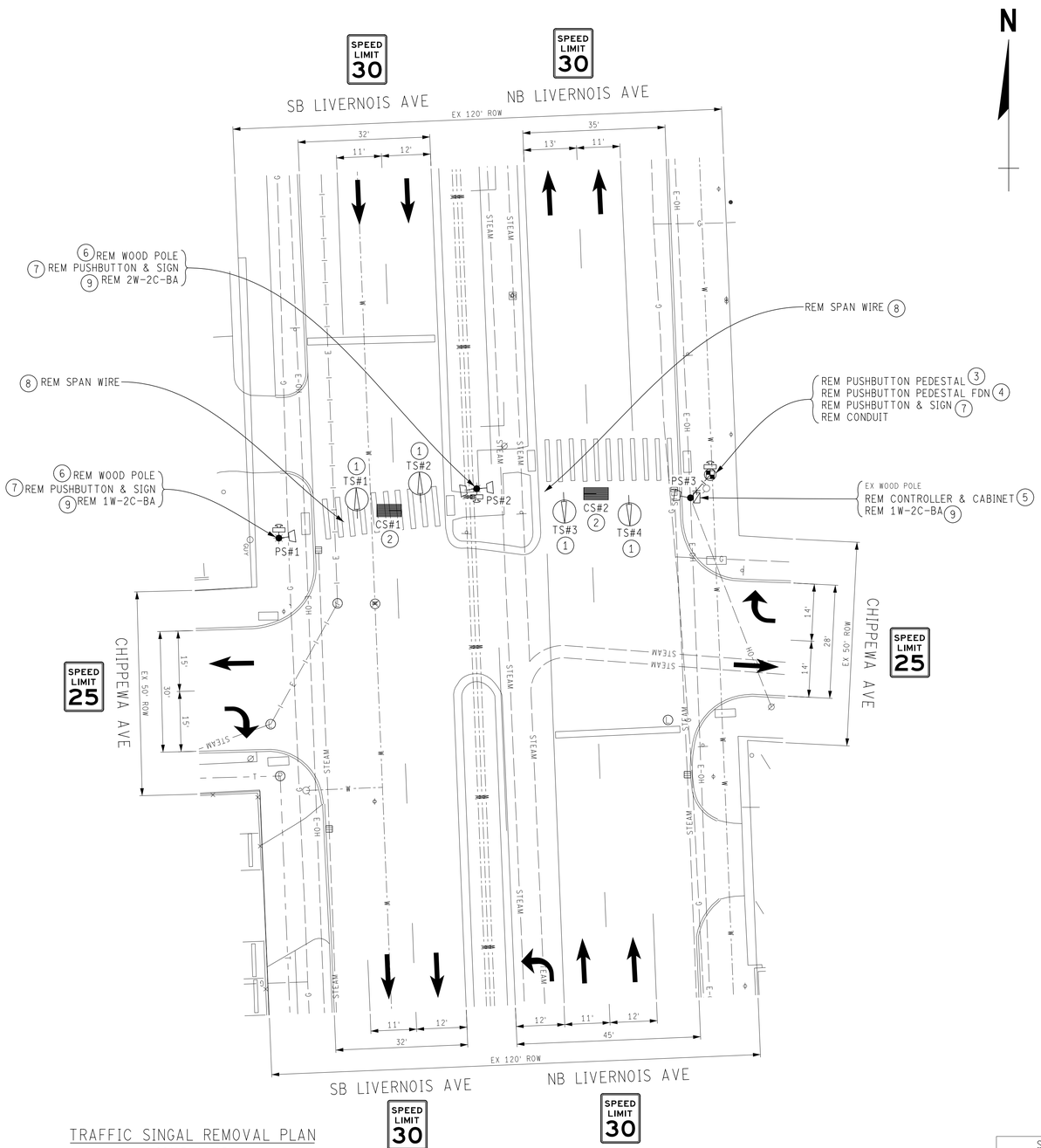
Sheet No: T002

LIST OF MATERIAL		
NO.	ITEM	QUANTITIES
(1)	TS, Span Wire Mtd, Rem	4 Ea
(2)	Case Sign, Rem	2 Ea
(3)	Pushbutton Pedestal, Rem	1 Ea
(4)	Pedestal Fdn, Rem	1 Ea
(5)	Controller and Cabinet, Rem	1 Ea
(6)	Wood Pole, Rem	2 Ea
(7)	Pushbutton, Rem	3 Ea
(8)	Span Wire, Rem	2 Ea
(9)	TS, Pedestrian, Bracket Arm Mtd, Rem	3 Ea
( )	Cable, Sec, Rem	100 Ft
( )	Conduit, Rem	10 Ft



CABLE REMOVAL DIAGRAM

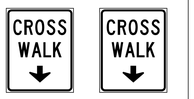
NOT TO SCALE



TRAFFIC SINGAL REMOVAL PLAN

SCALE: 1"=15'

REM - CS#1, CS#2
2-WAY, 24" X 36"
ILLUMINATED CASE SIGN



FACING NORTH FACING SOUTH

SIGNALS	
OPENINGS:	20
CYCLIC WATTS:	196
STEADY WATTS:	180

NOTES:
1. USE DETROIT CITY SPECS WHEN APPLICABLE

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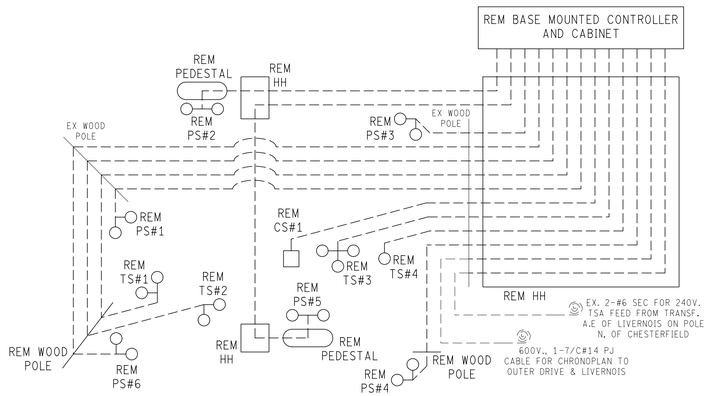
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: CROSSWALK ON LIVERNOIS AVE N. OF CHIPPEWA AVE TRAFFIC SIGNAL REMOVAL

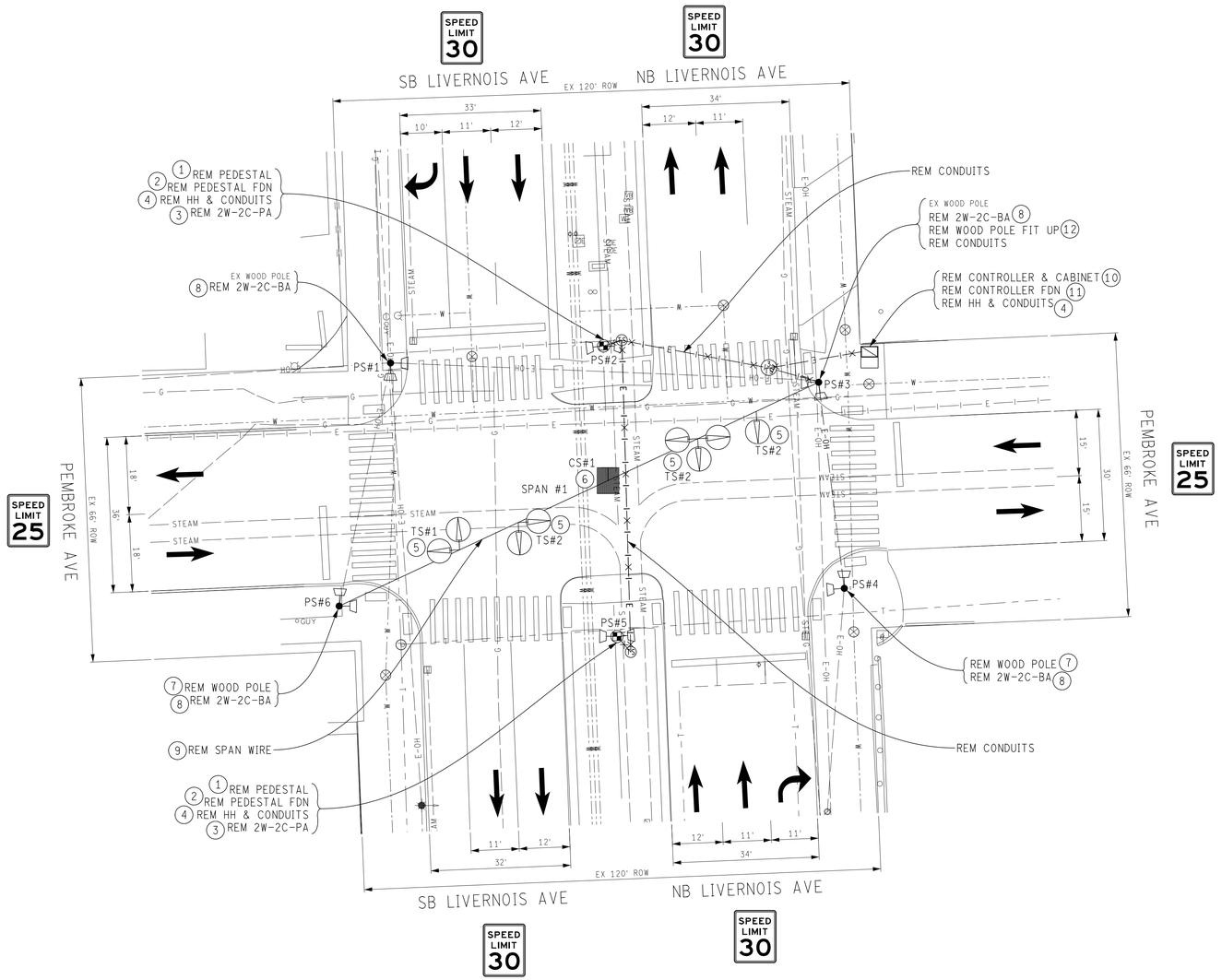
Sheet No: T101

LIST OF MATERIAL		
NO.	ITEM	QUANTITIES
(1)	Pedestal, Rem	2 Ea
(2)	Pedestal Fdn, Rem	2 Ea
(3)	TS, Pedestrian, Pedestal Mtd, Rem	2 Ea
(4)	Hh, Rem	3 Ea
(5)	TS, Span Wire Mtd, Rem	4 Ea
(6)	Case Sign, Rem	1 Ea
(7)	Wood Pole, Rem	2 Ea
(8)	TS, Pedestrian, Bracket Arm Mtd, Rem	4 Ea
(9)	Span Wire, Rem	1 Ea
(10)	Controller and Cabinet, Rem	1 Ea
(11)	Controller Fdn, Rem	1 Ea
(12)	Cable Pole, TS and Sec, Disman	1 Ea
( )	Cable, Sec, Rem	200 Ft
( )	Conduit, Rem	155 Ft



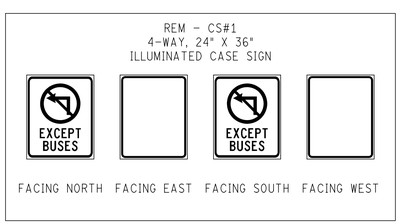
CABLE REMOVAL DIAGRAM

NOT TO SCALE



TRAFFIC SINGAL REMOVAL PLAN

SCALE: 1"=15'



SIGNALS	
OPENINGS:	40
CYCLIC WATTS:	476
STEADY WATTS:	180

NOTES:
1. USE DETROIT CITY SPECS WHEN APPLICABLE

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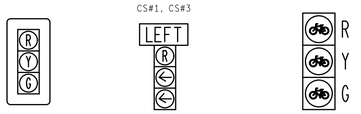
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LIVERNOIS AVE AT PEMBROKE AVE TRAFFIC SIGNAL REMOVAL

Sheet No: T201

TS/PS HEAD TYPE	Cable Type
1W3C TS	1-7/C # 16 PJ
2W3C TS	1-10/C # 16 PJ
3W3C TS	1-12/C # 16 PJ
4W3C TS	2-10/C # 16 PJ
1W2S PS	1-5/C # 16 PJ
2W2S PS	1-7/C # 16 PJ
Case Sign	1-3/C # 16 PJ
Pushbutton	1-2/C #12 SHIELDED (IMSA 50-2)

TS= Vehicular Traffic Signal
PS= Pedestrian Traffic Signal



TS#2, TS#3, TS#4, TS#5, TS#7, TS#8, TS#9, TS#10

TS#1, TS#6

TS#11, TS#12, TS#13, TS#14

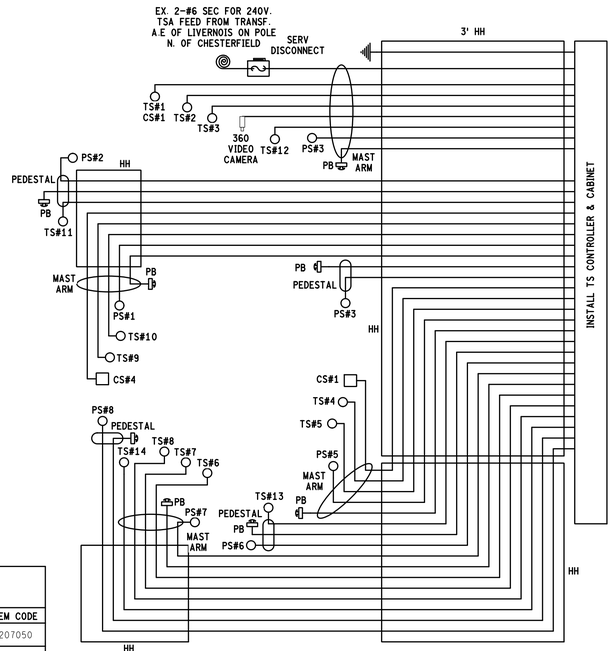


CS#2: FACING WEST
CS#4: FACING EAST



COUNT DOWN HEAD

PS#1, PS#2, PS#3, PS#4, PS#5, PS#6, PS#7, PS#8

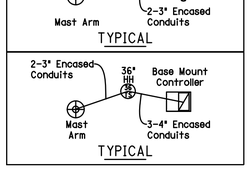


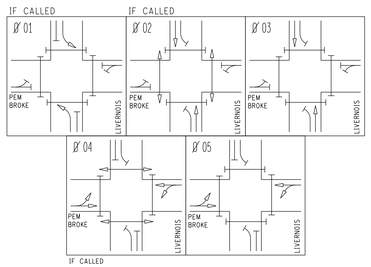
CABLE INSTALL DIAGRAM
N.T.S.

INSTALLATION

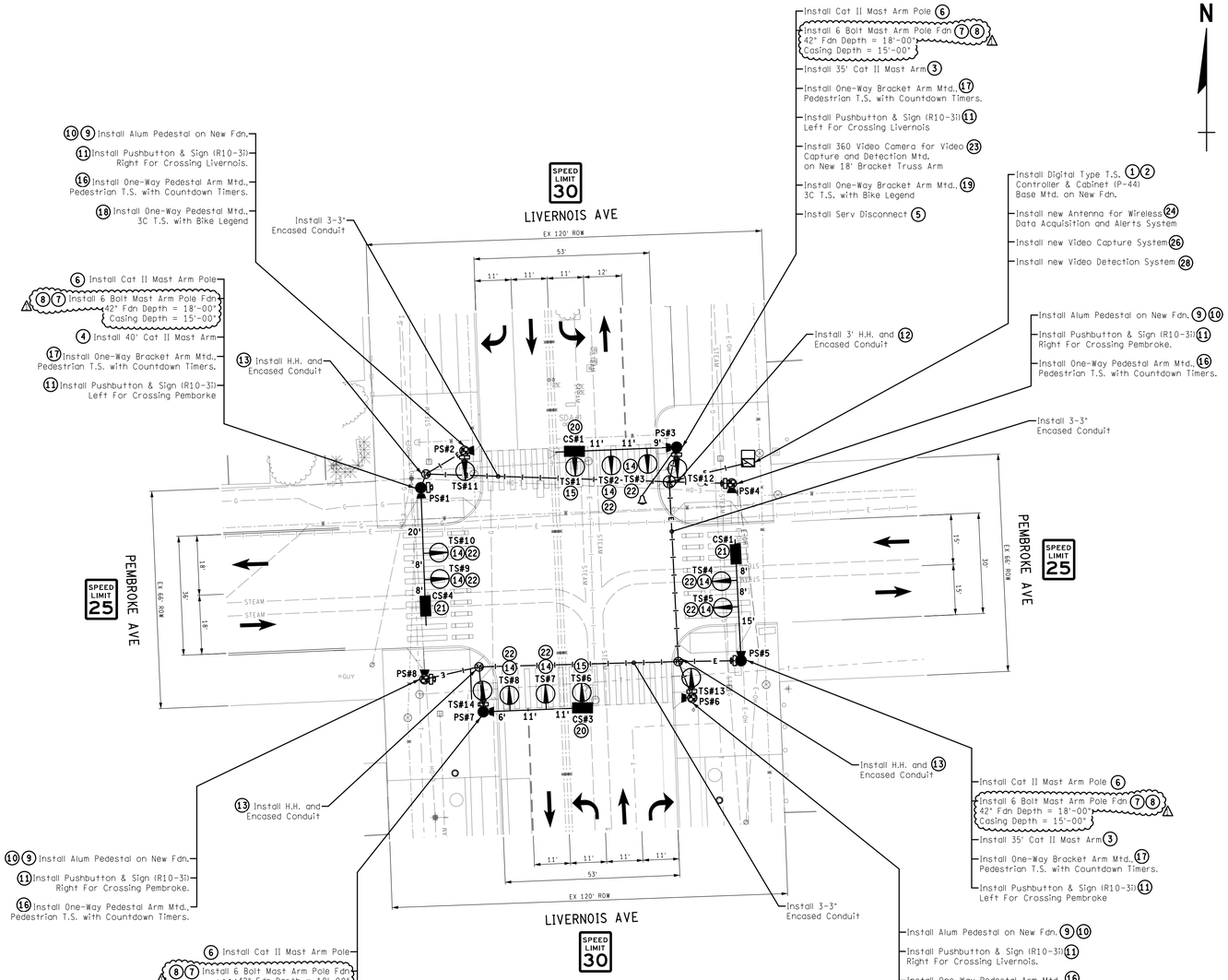
LIST OF MATERIAL

NO.	ITEMS	QTY	ITEM CODE
1	Controller and Cabinet, Digital Type, ITS	1 Ea	8207050
2	Controller Fdn, Base Mount	1 Ea	8200045
3	Mast Arm, 35 foot, Cat II	3 Ea	8100530
4	Mast Arm, 40 foot, Cat II	1 Ea	8100531
5	Serv Disconnect	1 Ea	8200135
6	Mast Arm Pole, Cat II	4 Ea	8100511
7	Mast Arm, Pole Fdn, 6 Bolt	72 Ft	8100550
8	Casing	60 Ft	8200480
9	Pedestal, Alum, Modified	4 Ea	8207050
10	Pedestal, Fdn, Modified	4 Ea	8207050
11	Pushbutton and Sign	8 Ea	8200121
12	Hh, Round, 3 foot Dia.	1 Ea	8190259
13	Hh, Round	3 Ea	8190260
14	TS, One Way Mast Arm Mtd (LED)	8 Ea	8200359
15	TS, One Way Mast Arm Mtd, LTGA (LED)	2 Ea	8200304
16	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	4 Ea	8200345
17	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	4 Ea	8200340
18	TS, One Way Pedestal Mtd (LED)	2 Ea	8200342
19	TS, One Way Bracket Arm Mtd (LED)	2 Ea	8200333
20	Case Sign (LED), One Way, 12 inch by 27 inch	2 Ea	8200019
21	Case Sign (LED), One Way, 24 inch by 30 inch	2 Ea	8200029
22	Backplate, TS	8 Ea	8200501
23	Bracket, Truss, With 18 Foot Arm	1 Ea	8200378
24	Wireless Data Acquisition, Alerts and Analytics System	1 Ea	8207050
25	Cellular Data Streaming for 3 Years	1 Ea	8207050
26	Video Capture and Streaming System	1 Ea	8207050
27	Cellular Data Streaming for 2 hours per month and for 3 Years	1 Ea	8207050
28	Video Detection and Analytics System	1 Ea	8207050
29	Conduit, Encased, 2, 3 inch, Modified	90 Ft	8207050
30	Conduit, Encased, 3, 3 inch, Modified	220 Ft	8207050
31	Conduit, Encased, 3, 4 inch, Modified	20 Ft	8207050
32	Cable, Sec, 600V, 1, 3/C#6	200 Ft	8190399
33	Power Co. (Est. Cost to Contractor)	1000 Dlr	8200116





SIGNAL PHASING DIAGRAM



INSTALLATION PLAN

SCALE: 1"=20'

	MOUNTED ON	Refer to Detail Sheet	Refer to Detail
2-way P.S.	Pedestal	1509	Pedestal
2-way P.S.	Pole	1510	Pole
1-way P.S.	Pedestal	1509	Pedestal
1-way P.S.	Pole	1508	Pole
2-way T.S.	Pedestal	1509	Pedestal
2-way T.S.	Pole	1510	Pole
1-way T.S.	Pedestal	1509	Pedestal
1-way T.S.	Pole	1508	Pole
TS and PS	Pedestal	1509	Mount Ped signals on back of Pedestal
TS and PS	Pole	1510	Mount Ped signals on back of Pole

INSTALLATION NOTES:
1. Contact Kirit Patel at 313-628-5641 of the City of Detroit DPW, Traffic Engineering Division, 48 hours prior to activation of new traffic signals.
2.Contractor shall be responsible for programming the controller, and wiring the cabinet. Timing permits can be obtained by contactingr Kirit Patel, 313-628-5641, of the City of Detroit DPW, Traffic Engineering Division.
3. Payment for Builrings will be included in the pay item "Span Wire" and will not be paid for separately.
4. All Span Wire Mounted Traffic Signals will be fitted with Backplates.
5. Contractor to get approval from City's Project Engineer prior to installing the pay item "Casing" (8200480) at any location.
6. Refer to detail sheet 1511 for mounting of Controller Cabinet.
7. Refer to Sheet No. 3 (General Information) for table on mounting details for Pedestrian and Traffic Signals, unless noted otherwise on plan sheet.
8. Contractor to base cost proposal for traffic signal mast arm foundations for all work associated with installation of a 42-inch diameter, 18 ft. deep, reinforced concrete, fully cased, drilled pier through loose to medium sand soils with a groundwater table at 5 ft. below ground surface. ⚠

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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

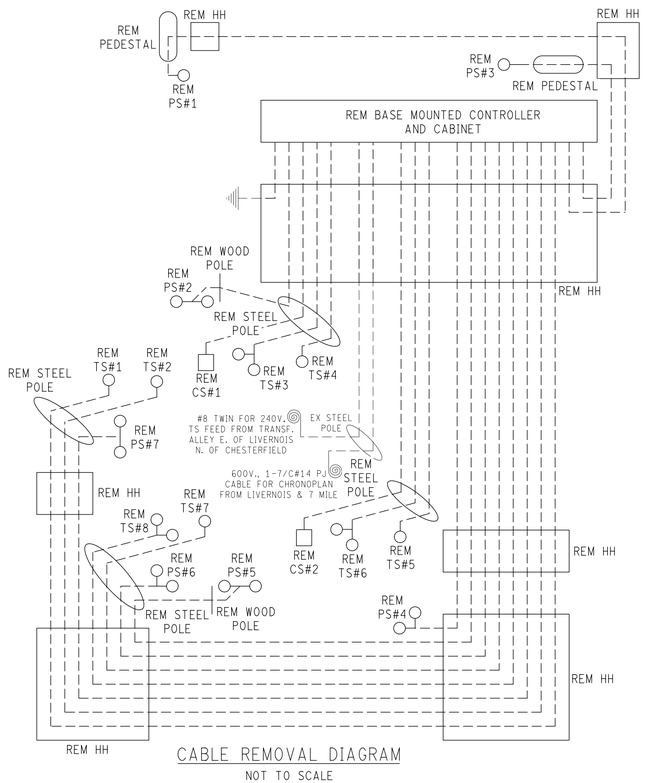
NO.	DESCRIPTION	BY	APP'D	DATE
⚠	ADDENDUM 1			2/8/19

Sheet Title: LIVERNOIS AVE AT PEMBROKE AVE TRAFFIC SIGNAL INSTALL

Sheet No: T202

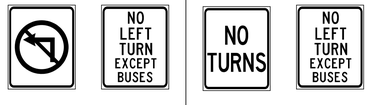
LIST OF MATERIAL

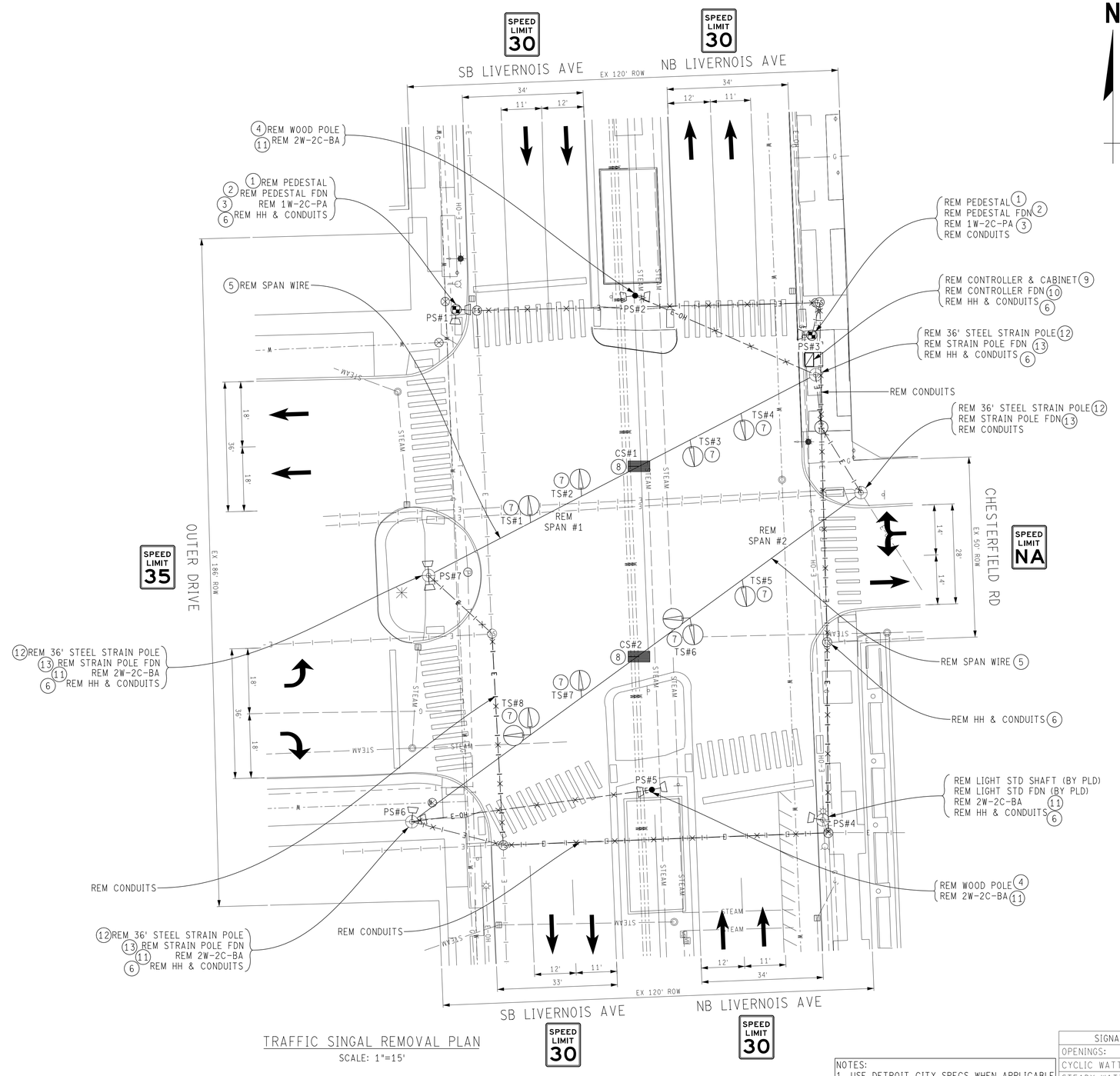
NO.	ITEM	QUANTITIES
(1)	Pedestal, Rem	2 Ea
(2)	Pedestal Fdn, Rem	2 Ea
(3)	TS, Pedestrian, Pedestal Mtd, Rem	2 Ea
(4)	Wood Pole, Rem	2 Ea
(5)	Span Wire, Rem	2 Ea
(6)	Hh, Rem	7 Ea
(7)	TS, Span Wire Mtd, Rem	8 Ea
(8)	Case Sign, Rem	2 Ea
(9)	Controller and Cabinet, Rem	1 Ea
(10)	Controller Fdn, Rem	1 Ea
(11)	TS, Pedestrian, Bracket Arm Mtd, Rem	5 Ea
(12)	Steel Pole, Rem	4 Ea
(13)	Fdn, Rem	4 Ea
	Cable, Sec, Rem	200 Ft
	Conduit, Rem	495 Ft



CABLE REMOVAL DIAGRAM

NOT TO SCALE

REM – CS#1 2-WAY, 24" X 36" ILLUMINATED CASE SIGN	REM – CS#2 2-WAY, 24" X 36" ILLUMINATED CASE SIGN
	
FACING NORTH FACING SOUTH	FACING NORTH FACING SOUTH



TRAFFIC SINGAL REMOVAL PLAN

SCALE: 1"=15'

SIGNALS	
OPENINGS:	50
CYCLIC WATTS:	452
STEADY WATTS:	90

NOTES:
1. USE DETROIT CITY SPECS WHEN APPLICABLE

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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: I7081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

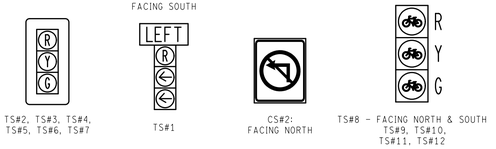
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LIVERNOIS AVE AT OUTER DRIVE TRAFFIC SIGNAL REMOVAL

Sheet No: T301

TS/PS HEAD TYPE	Cable Type
1W3C TS	1-7/C # 16 PJ
2W3C TS	1-10/C # 16 PJ
3W3C TS	1-12/C # 16 PJ
4W3C TS	2-10/C # 16 PJ
1W2S PS	1-5/C # 16 PJ
2W2S PS	1-7/C # 16 PJ
Case Sign	1-3/C # 16 PJ
Pushbutton	1-2/C #12 SHIELDED (IMSA 50-2)

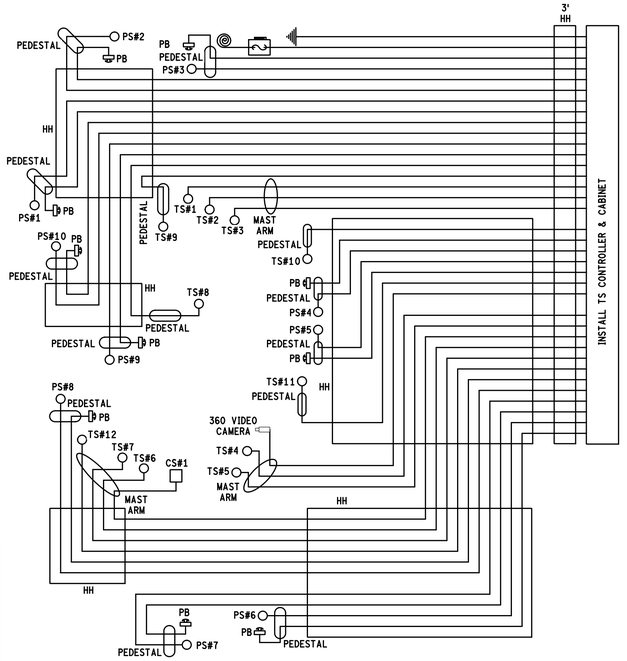
TS= Vehicular Traffic Signal
PS= Pedestrian Traffic Signal





COUNT DOWN HEAD

PS#1, PS#2, PS#3,
PS#4, PS#5, PS#6,
PS#7, PS#8

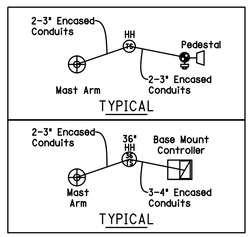


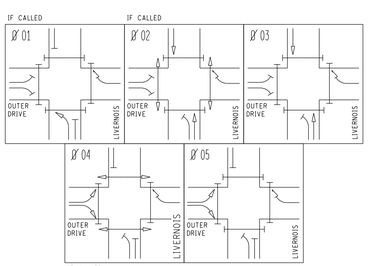
CABLE INSTALL DIAGRAM
N.T.S.

INSTALLATION

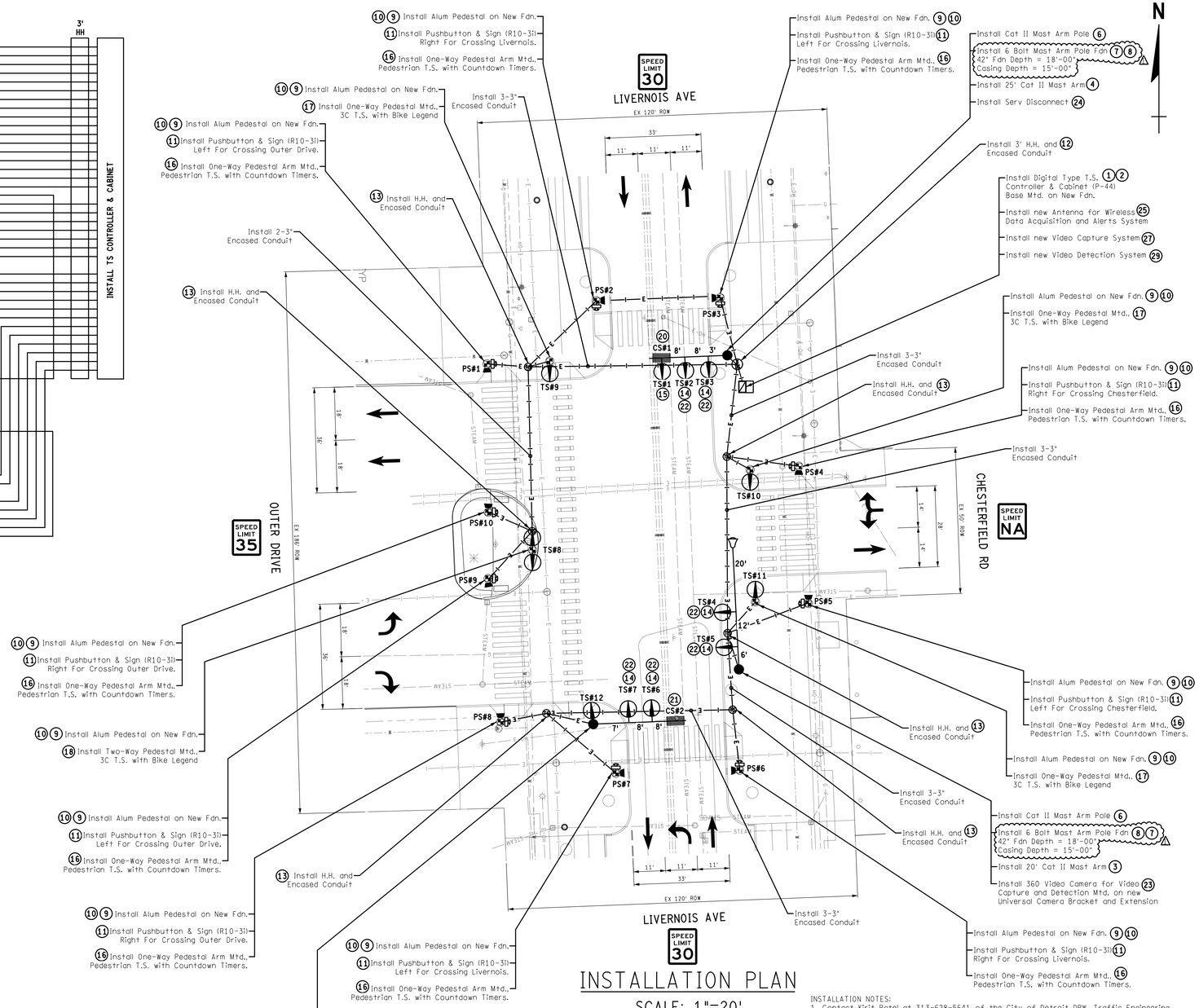
LIST OF MATERIAL

NO.	ITEMS	QTY	ITEM CODE
1	Controller and Cabinet, Digital Type, ITS	1 Ea	8207050
2	Controller Fdn, Base Mount	1 Ea	8200045
3	Mast Arm, 20 foot, Cat II	1 Ea	8100530
4	Mast Arm, 25 foot, Cat II	1 Ea	8100531
5	Mast Arm, 30 foot, Cat II	1 Ea	8100532
6	Mast Arm Pole, Cat II	3 Ea	8100511
7	Mast Arm, Pole Fdn, 6 Bolt	54 Ft	8100550
8	Casing	45 Ft	8200480
9	Pedestal, Alum, Modified	14 Ea	8207050
10	Pedestal, Fdn, Modified	14 Ea	8207050
11	Pushbutton and Sign	10 Ea	8200121
12	Hh, Round, 3 foot Dia.	1 Ea	8190259
13	Hh, Round	6 Ea	8190260
14	TS, One Way Mast Arm Mtd (LED)	6 Ea	8200359
15	TS, One Way Mast Arm Mtd, LTGA (LED)	1 Ea	8200304
16	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	10 Ea	8200345
17	TS, One Way Pedestal Mtd (LED)	3 Ea	8200340
18	TS, Two Way Pedestal Mtd (LED)	1 Ea	8200342
19	TS, One Way Bracket Arm Mtd (LED)	1 Ea	8200333
20	Case Sign (LED), One Way, 12 inch by 27 inch	1 Ea	8200019
21	Case Sign (LED), One Way, 24 inch by 30 inch	1 Ea	8200029
22	Backplate, TS	6 Ea	8200501
23	Universal Camera Bracket and Extension	1 Ea	8200378
24	Serv Disconnect	1 Ea	8200135
25	Wireless Data Acquisition, Alerts and Analytics System	1 Ea	8207050
26	Cellular Data Streaming for 3 Years	1 Ea	8207050
27	Video Capture and Streaming System	1 Ea	8207050
28	Cellular Data Streaming for 2 hours per month and for 3 Years	1 Ea	8207050
29	Video Detection and Analytics System	1 Ea	8207050
30	Conduit, Encased, 2, 3 inch, Modified	90 Ft	8207050
31	Conduit, Encased, 3, 3 inch, Modified	300 Ft	8207050
32	Conduit, Encased, 3, 4 inch, Modified	10 Ft	8207050
33	Cable, Sec, 600V, 1, 3/C#6	200 Ft	8190399
34	Power Co. (Est. Cost to Contractor)	1000 Dlr	8200116





SIGNAL PHASING DIAGRAM



INSTALLATION PLAN

INSTALLATION PLAN
SCALE: 1"=20'

	MOUNTED ON	Refer to Detail Sheet	Refer to Detail
2-way P.S.	Pedestal	1509	Pedestal
2-way P.S.	Pole	1510	Pole
1-way P.S.	Pedestal	1509	Pedestal
1-way P.S.	Pole	1508	Pole
2-way T.S.	Pedestal	1509	Pedestal
2-way T.S.	Pole	1510	Pole
1-way T.S.	Pedestal	1509	Pedestal
1-way T.S.	Pole	1508	Pole
TS and PS	Pedestal	1509	Mount Ped signals on back of Pedestal
TS and PS	Pole	1510	Mount Ped signals on back of Pole

INSTALLATION NOTES:
1. Contact Kirit Patel at 313-628-5641 of the City of Detroit DPW, Traffic Engineering Division, 48 hours prior to activation of new traffic signals.
2. Contractor shall be responsible for programming the controller, and wiring the cabinet. Timing permits can be obtained by contacting Kirit Patel, 313-628-5641, of the City of Detroit DPW, Traffic Engineering Division.
3. Payment for Builrings will be included in the pay item "Span Wire" and will not be paid for separately.
4. All Span Wire Mounted Traffic Signals will be fitted with Backplates.
5. Contractor to get approval from City's Project Engineer prior to installing the pay item "Casing" (8200480) at any location.
6. Refer to detail sheet 1511 for mounting of Controller Cabinet.
7. Refer to Sheet No. 3 (General Information) for table on mounting details for Pedestrian and Traffic Signals, unless noted otherwise on plan sheet.
8. Contractor to base cost proposal for traffic signal mast arm foundations for all work associated with installation of a 42-inch diameter, 18 ft. deep, reinforced concrete, fully cased, drilled pier through loose to medium sand soils with a groundwater table at 5 ft. below ground surface.

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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: I7081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

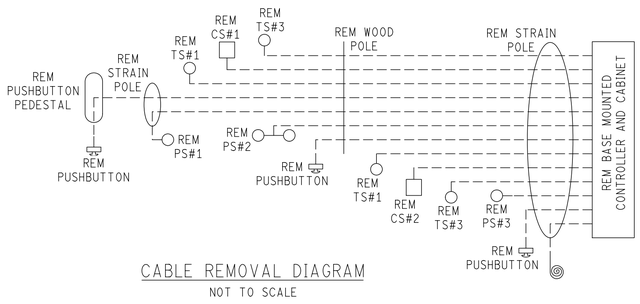
NO.	DESCRIPTION	BY	APPV'D	DATE
1	ADDENDUM 1			2/8/19

Sheet Title: LIVERNOIS AVE AT OUTER DRIVE TRAFFIC SIGNAL INSTALL

Sheet No: T302

LIST OF MATERIAL

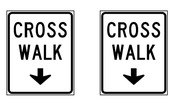
NO.	ITEM	QUANTITIES
(1)	TS, Span Wire Mtd, Rem	4 Ea
(2)	Case Sign, Rem	2 Ea
(3)	Pushbutton Pedestal, Rem	1 Ea
(4)	Pedestal Fdn, Rem	1 Ea
(5)	Steel Pole, Rem	2 Ea
(6)	Fdn, Rem	2 Ea
(7)	Controller and Cabinet, Rem	1 Ea
(8)	Wood Pole, Rem	1 Ea
(9)	Pushbutton, Rem	3 Ea
(10)	Span Wire, Rem	2 Ea
(11)	TS, Pedestrian, Bracket Arm Mtd, Rem	3 Ea
( )	Cable, Sec, Rem	100 Ft
( )	Conduit, Rem	10 Ft



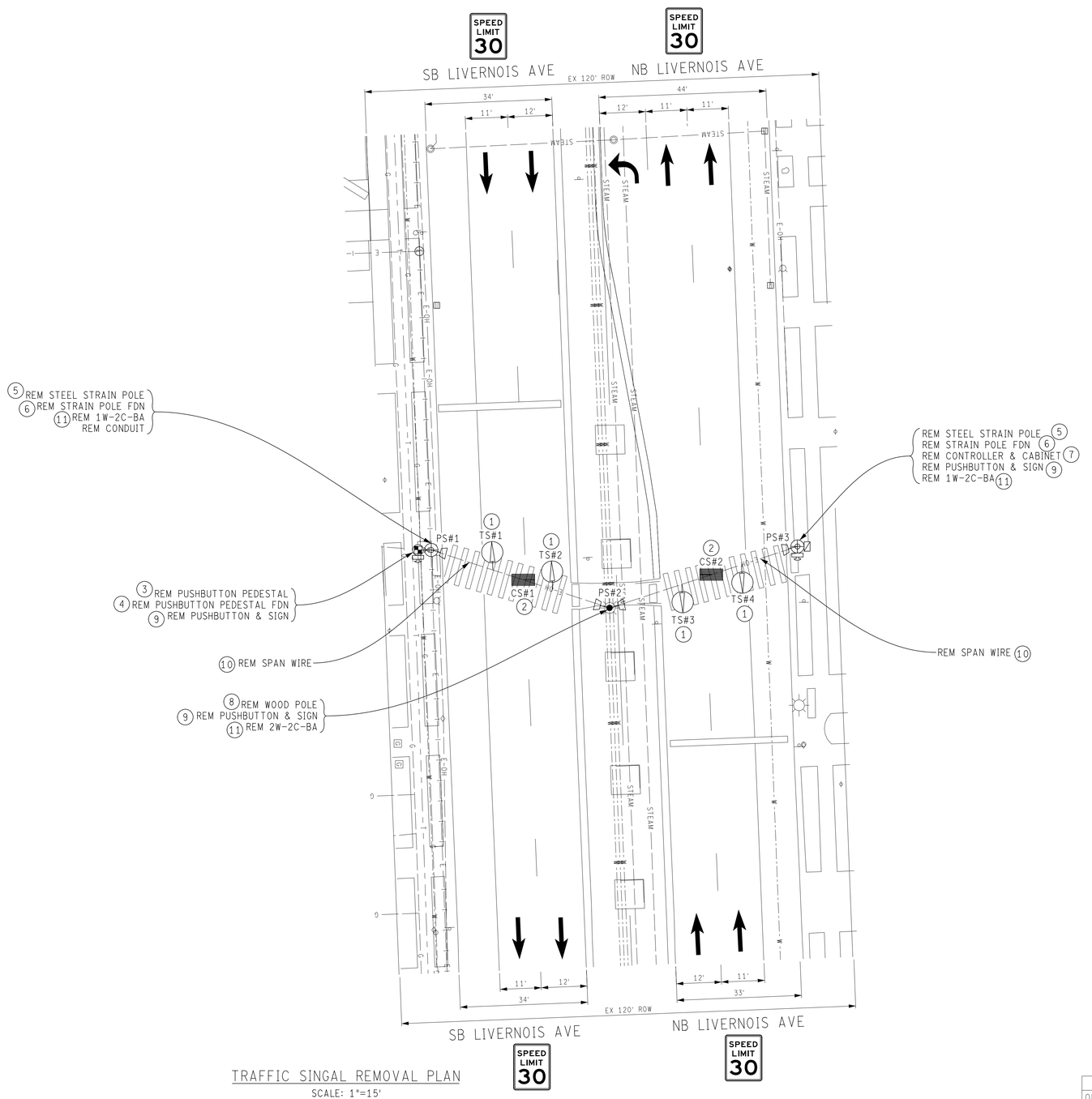
CABLE REMOVAL DIAGRAM

NOT TO SCALE

REM - CS#1, CS#2
2-WAY, 24" X 36"
ILLUMINATED CASE SIGN



FACING NORTH FACING SOUTH



TRAFFIC SINGAL REMOVAL PLAN

SCALE: 1"=15'

N

SIGNALS	
OPENINGS:	20
CYCLIC WATTS:	196
STEADY WATTS:	180

NOTES:
1. USE DETROIT CITY SPECS WHEN APPLICABLE

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

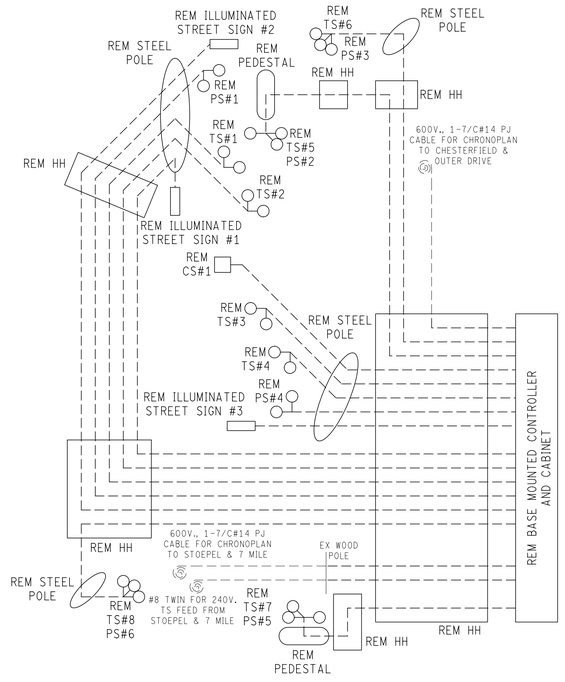
Sheet Title

CROSSWALK ON LIVERNOIS AVE
N. OF 7 MILE RD
TRAFFIC SIGNAL REMOVAL

Sheet No:

T401

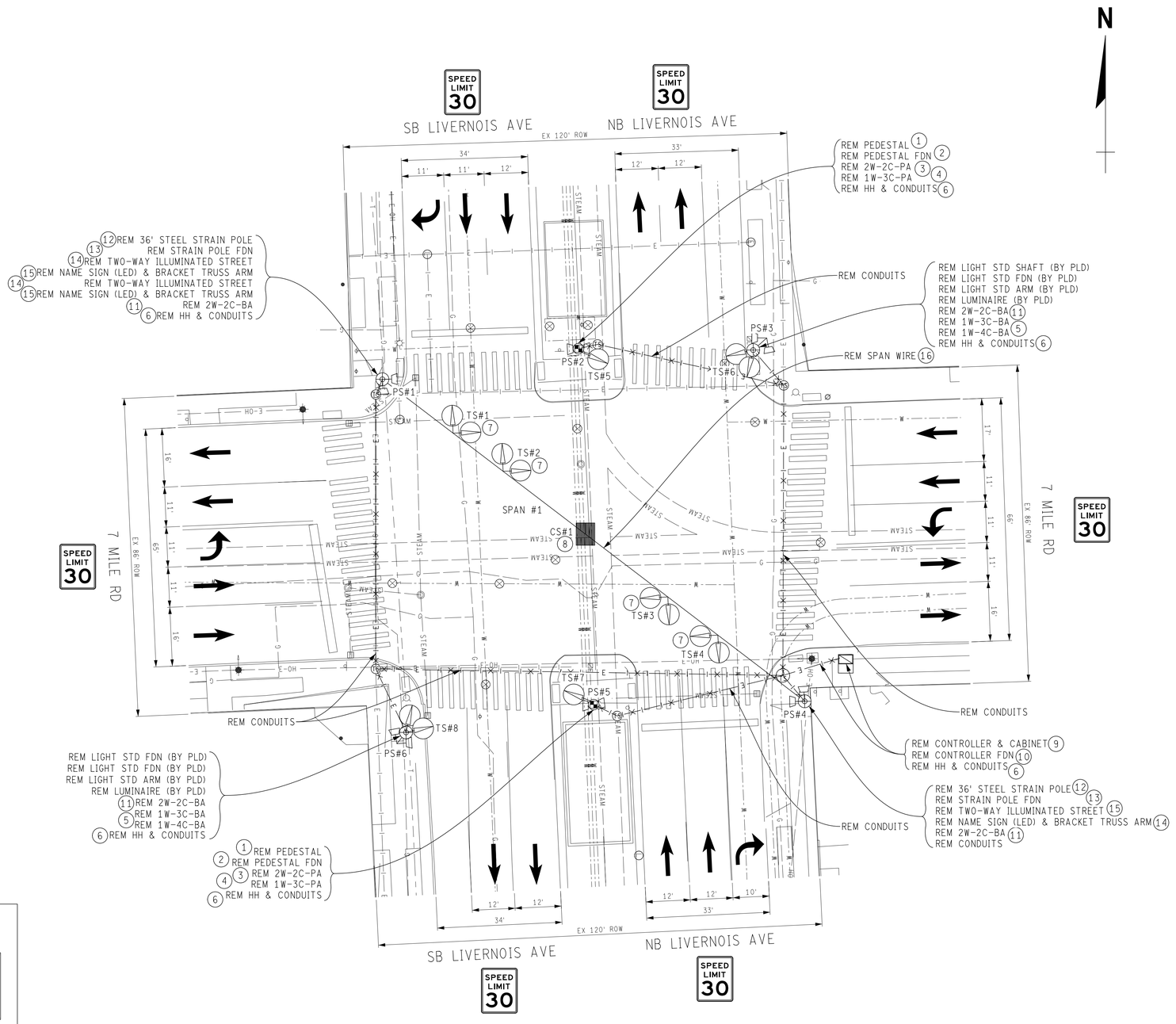
LIST OF MATERIAL		
NO.	ITEM	QUANTITIES
1	Pedestal, Rem	2 Ea
2	Pedestal Fdn, Rem	2 Ea
3	TS, Pedestrian, Pedestal Mtd, Rem	2 Ea
4	TS, Pedestal Mtd, Rem	2 Ea
5	TS, Bracket Arm Mtd, Rem	2 Ea
6	Hh, Rem	6 Ea
7	TS, Span Wire Mtd, Rem	4 Ea
8	Case Sign, Rem	1 Ea
9	Controller and Cabinet, Rem	1 Ea
10	Controller Fdn, Rem	1 Ea
11	TS, Pedestrian, Bracket Arm Mtd, Rem	4 Ea
12	Steel Pole, Rem	2 Ea
13	Fdn, Rem	2 Ea
14	Street Name Sign, Two Way, Illuminated, Rem	3 Ea
15	Bracket, Truss, Rem	3 Ea
16	Span Wire, Rem	1 Ea
	Cable, Sec, Rem	200 Ft
	Conduit, Rem	440 Ft



CABLE REMOVAL DIAGRAM

NOT TO SCALE

REM 2-WAY, 6' ILLUMINATED STREET NAME SIGN ON BRACKET TRUSS ARM	REM 2-WAY, 6' ILLUMINATED STREET NAME SIGN ON BRACKET TRUSS ARM	REM 4-WAY, 24" X 36" ILLUMINATED CASE SIGN			
Seven Mile	Livernois	EXCEPT BUSES		EXCEPT BUSES	
STREET SIGN #2 FACING NORTH AND SOUTH STREET SIGN #3 FACING NORTH AND SOUTH	STREET SIGN #1 FACING EAST AND WEST	FACING NORTH	FACING EAST	FACING SOUTH	FACING WEST



TRAFFIC SINGAL REMOVAL PLAN

SCALE: 1"=15'

SIGNALS	
OPENINGS:	56
CYCLIC WATTS:	588
STEADY WATTS:	474

NOTES:
1. USE DETROIT CITY SPECS WHEN APPLICABLE

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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: I7081

STATUS: 60% Construction Documents

DATE: 21 December 2018

REVISION

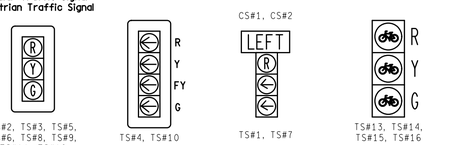
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: LIVERNOIS AVE AT 7 MILE RD TRAFFIC SIGNAL REMOVAL

Sheet No: T402

TS/PS HEAD TYPE	Cable Type
1W3C TS	1-7/C # 16 PJ
2W3C TS	1-10/C # 16 PJ
3W3C TS	1-12/C # 16 PJ
4W3C TS	2-10/C # 16 PJ
1W2S PS	1-5/C # 16 PJ
2W2S PS	1-7/C # 16 PJ
Case Sign	1-3/C # 16 PJ
Pushbutton	1-2/C #12 SHIELDED (IMSA 50-2)

TS= Vehicular Traffic Signal
PS= Pedestrian Traffic Signal



EX 2-WAY, 6' ILLUMINATED STREET NAME SIGN ON BRACKET TRUSS ARM

Seven Mile

STREET SIGN #1:
FACING NORTH & SOUTH
STREET SIGN #3:
FACING NORTH & SOUTH

INSTALL 2-WAY, 6' ILLUMINATED STREET NAME SIGN ON BRACKET TRUSS ARM

Livernois

STREET SIGN #2:
FACING EAST & WEST
STREET SIGN #4:
FACING EAST & WEST

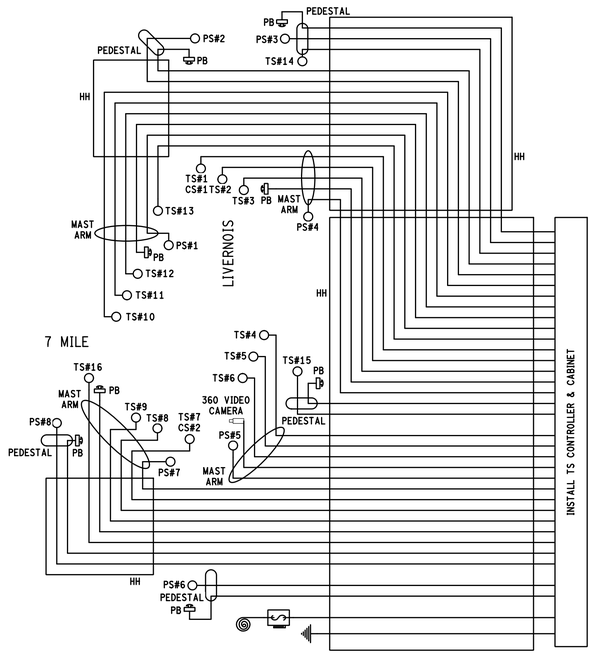
L.E.D. COUNT DOWN HEAD

PS#1, PS#2, PS#3, PS#4, PS#5, PS#6, PS#7, PS#8

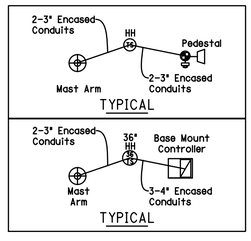
INSTALLATION

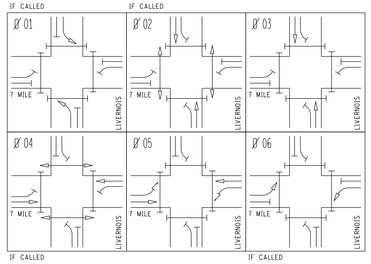
LIST OF MATERIAL

NO.	ITEMS	QTY	ITEM CODE
1	Controller and Cabinet, Digital Type, ITS	1 Ea	8207050
2	Controller Fdn, Base Mount	1 Ea	8200045
3	Mast Arm, 35 foot, Cat II	1 Ea	8100533
4	Mast Arm, 45 foot, Cat II	1 Ea	8100535
5	Mast Arm, 50 foot, Cat II	2 Ea	8100536
6	Mast Arm Pole, Cat II	4 Ea	8100511
7	Mast Arm, Pole Fdn, 6 Bolt	72 Ft	8100550
8	Casing	60 Ft	8200480
9	Pedestal, Alum, Modified	5 Ea	8207050
10	Pedestal, Fdn, Modified	5 Ea	8207050
11	Pushbutton and Sign	8 Ea	8200121
12	Hh, Round, 3 foot Dia.	1 Ea	8190259
13	Hh, Round	3 Ea	8190260
14	TS, One Way Mast Arm Mtd (LED)	8 Ea	8200359
15	TS, One Way Mast Arm Mtd, FYA (LED)	2 Ea	8200304
16	TS, One Way Mast Arm Mtd, LTGA (LED)	2 Ea	8200304
17	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	4 Ea	8200336
18	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	4 Ea	8200345
19	TS, One Way Pedestal Mtd (LED)	2 Ea	8200345
20	TS, One Way Bracket Arm Mtd (LED)	2 Ea	8200333
21	Case Sign (LED), One Way, 12 inch by 27 inch	2 Ea	8200019
22	Backplate, TS	10 Ea	8200501
23	St Name Sign, Two Way, (LED) 6 foot	4 Ea	8207050
24	Bracket, Truss, With 18 Foot Arm	1 Ea	8200378
25	Serv Disconnect	1 Ea	8200135
26	Wireless Data Acquisition, Alerts and Analytics System	1 Ea	8207050
27	Cellular Data Streaming for 3 Years	1 Ea	8207050
28	Video Capture and Streaming System	1 Ea	8207050
29	Cellular Data Streaming for 2 hours per month and for 3 Years	1 Ea	8207050
30	Video Detection and Analytics System	1 Ea	8207050
31	Conduit, Encased, 2, 3 inch, Modified	90 Ft	8207050
32	Conduit, Encased, 3, 3 inch, Modified	300 Ft	8207050
33	Conduit, Encased, 3, 4 inch, Modified	10 Ft	8207050
34	Cable, Sec, 600V, 1, 3/C#6	200 Ft	8190399
35	Power Co. (Est. Cost to Contractor)	1000 Dlr	8200116

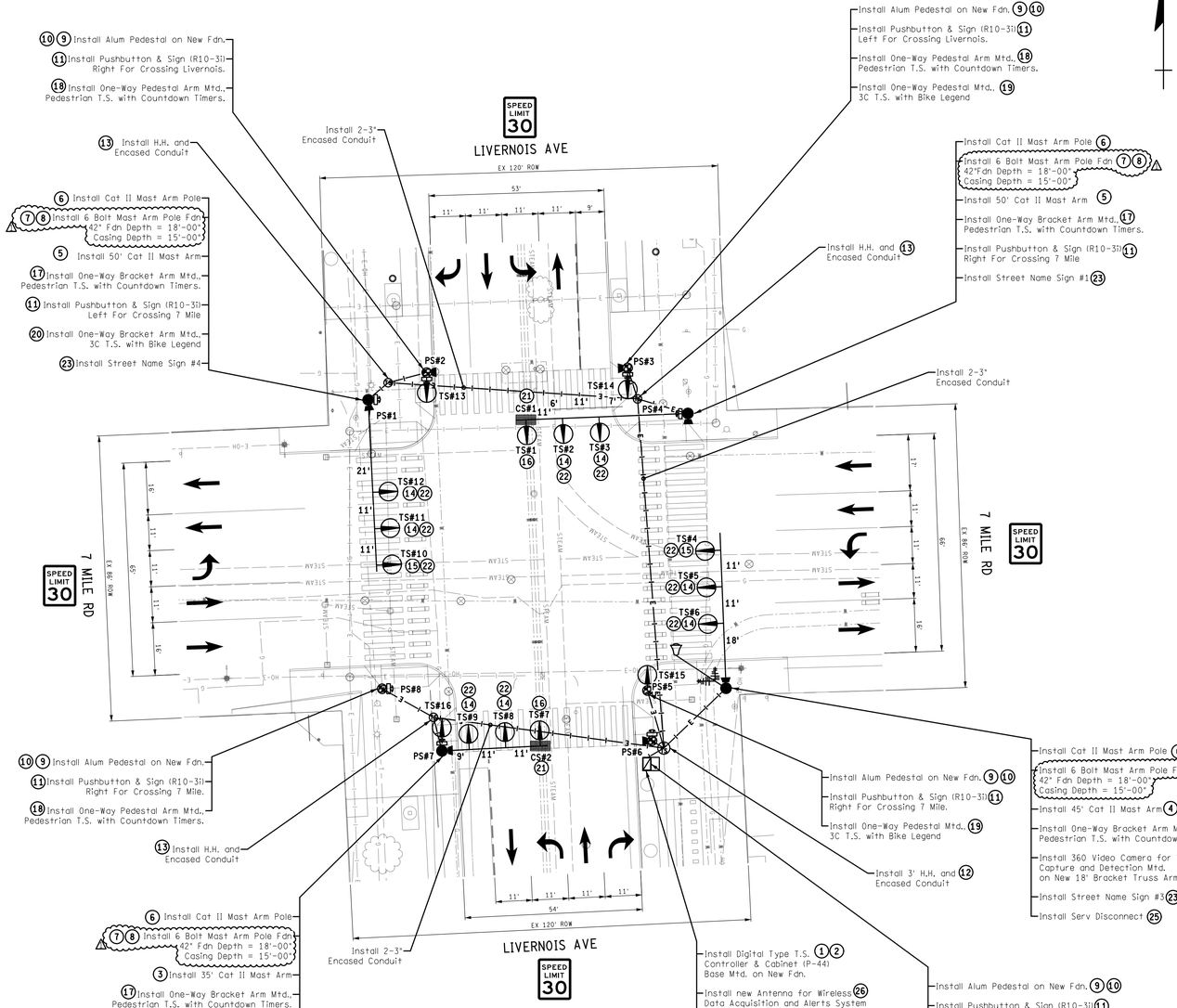


CABLE INSTALL DIAGRAM
N.T.S.





SIGNAL PHASING DIAGRAM



INSTALLATION PLAN
SCALE: 1"=20'

	MOUNTED ON	Refer to Detail Sheet	Refer to Detail
2-way P.S.	Pedestal	1509	Pedestal
2-way P.S.	Pole	1510	Pole
1-way P.S.	Pedestal	1509	Pedestal
1-way P.S.	Pole	1508	Pole
2-way T.S.	Pedestal	1509	Pedestal
2-way T.S.	Pole	1510	Pole
1-way T.S.	Pedestal	1509	Pedestal
1-way T.S.	Pole	1508	Pole
TS and PS	Pedestal	1509	Mount Ped signals on back of Pedestal
TS and PS	Pole	1510	Mount Ped signals on back of Pole

INSTALLATION NOTES:
1. Contact Kirit Patel at 313-628-5641 of the City of Detroit DPW, Traffic Engineering Division, 48 hours prior to activation of new traffic signals.
2.Contractor shall be responsible for programming the controller, and wiring the cabinet. Timing permits can be obtained by contactingr Kirit Patel, 313-628-5641, of the City of Detroit DPW, Traffic Engineering Division.
3. Payment for Bullrings will be included in the pay item "Span Wire" and will not be paid for separately.
4. All Span Wire Mounted Traffic Signals will be fitted with Backplates.
5. Contractor to get approval from City's Project Engineer prior to installing the pay item "Casing" (8200480) at any location.
6. Refer to detail sheet 1511 for mounting of Controller Cabinet.
7. Refer to Sheet No. 3 (General Information) for table on mounting details for Pedestrian and Traffic Signals, unless noted otherwise on plan sheet.
8. Contractor to base cost proposal for traffic signal mast arm foundations for all work associated with installation of a 42-inch diameter, 18 ft. deep, reinforced concrete, fully cased, drilled pier through loose to medium sand soils with a groundwater table at 5 ft. below ground surface.

INSTALLATION PLAN

PRIME CONSULTANT
spackman mossop michaels
440 Burroughs Street
Suite 696
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LANDSCAPE ARCHITECTS

CONSULTANT
SPALDING DeDECKER
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Rochester Hills | MI | 48307
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RS Engineering, LLC

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

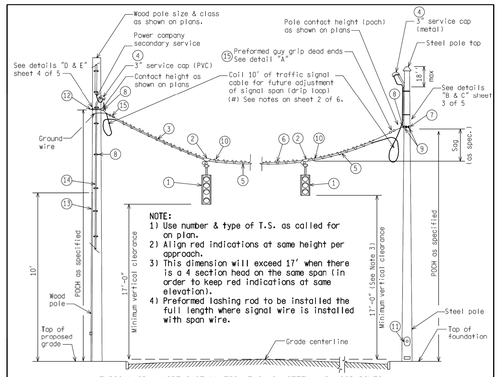
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE
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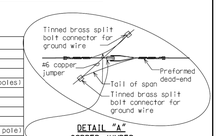
Sheet Title: LIVERNOIS AVE AT 7 MILE RD TRAFFIC SIGNAL INSTALL

Sheet No: T403



TYPICAL SPAN WIRE INSTALLATION T.S. ON STEEL AND WOOD POLES

NO.	ITEM
1	Traffic signal (no. heads as indicated)
2	Span wire hanger
3	5/16" extra high strength span wire
4	3" Service cap (weatherhead). (metal for steel and PVC for wood poles)
5	P.J. traffic signal cable (as specified)
6	Preformed lashing rods
7	Pole band clamp (steel pole)
8	Guy thimble (2" dia.)
9	(2) 5/8" x 4" long bolt, nut, washers per pole band clamp (steel pole)
10	Install span wire preformed (armor rod) under each span hanger
11	Access hand hole all new & existing steel poles
12	5/8" eyebolt, oval eye and nut
13	Wood moulding or plastic duct (10' from ground level)
14	3" schedule 80 PVC or rigid metal (*) See note on sheet 2 of 5
15	Preformed guy grip dead ends



DETAIL "A"
COPPER JUMPER

NOTE: Porcelain strain insulator (if required shall meet the codes and placement requirements of the local utility co.

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/Fin/S100104.dgn Rev. 02/16/17

MDOT Michigan State Department of Transportation

PREPARED BY TRAFFIC AND SAFETY

DRAWN BY: DJF

CHECKED BY: ?

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

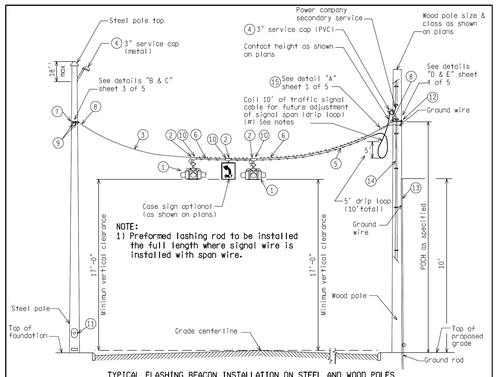
(SPECIAL DETAIL)

FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

ALL SPAN WIRE T.S. ON STEEL AND WOOD POLES

PLAN DATE | SIG-010-A | SHEET 1 of 7



TYPICAL FLASHING BEACON INSTALLATION ON STEEL AND WOOD POLES

NO.	ITEM
1	Traffic signal (no. heads as indicated)
2	Span wire hanger
3	5/16" extra high strength span wire
4	3" service cap (weatherhead). (metal for steel and PVC for wood poles)
5	P.J. traffic signal cable (as specified)
6	Preformed lashing rods
7	Pole band clamp (steel pole)
8	Guy thimble (2" dia.)
9	(2) 5/8" x 4" long bolt, nut, washers per pole band clamp (steel pole)
10	Install span wire preformed (armor rod) under each span hanger
11	Access hand hole all new & existing steel poles
12	5/8" eyebolt, oval eye and nut
13	Wood moulding or plastic duct (10' from ground level)
14	1 1/2" to 2" schedule 80 PVC or rigid metal (*) See note
15	Preformed guy grip dead ends

NOTES:
(*) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

(#) For projects maintained by the Road Commission for Oakland County (RCOC), use drip loop (without coil) for future adjustment of signal span.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-010-A | SHEET 2 of 7

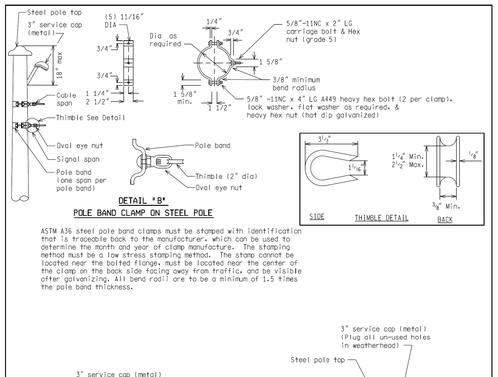
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AS-LET PLAN REVISIONS

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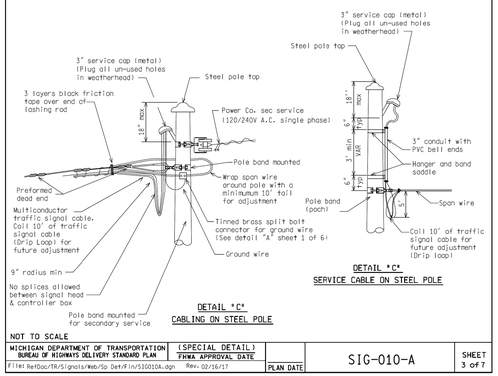
MDOT Michigan Department of Transportation

FILE: | DATE: | DESIGN UNIT: | TSC: | CS: | JN: | DRAWING | SHEET



DETAIL "B"
POLE BAND CLAMP ON STEEL POLE

ASTM A36 steel pole band clamps must be stamped with identification that is traceable back to the manufacturer, which can be used to determine the month and year of clamp manufacture. The stamping method must be a low stress stamping method. The stamp cannot be located near the bolted flange, must be located near the center of the clamp on the back side facing away from traffic, and be visible after galvanizing. All bend radii are to be a minimum of 1.5 times the pole band thickness.



DETAIL "C"
CABLING ON STEEL POLE

DETAIL "C"
SERVICE CABLE ON STEEL POLE

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-010-A | SHEET 3 of 7

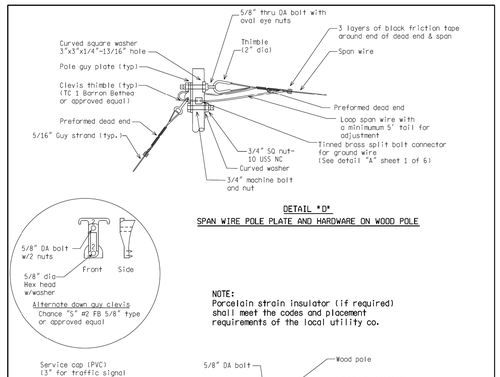
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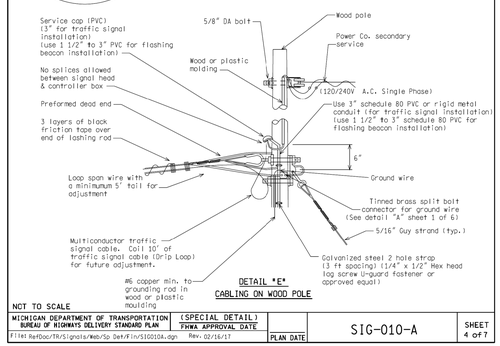
MDOT Michigan Department of Transportation

FILE: | DATE: | DESIGN UNIT: | TSC: | CS: | JN: | DRAWING | SHEET



DETAIL "D"
SPAN WIRE POLE PLATE AND HARDWARE ON WOOD POLE

NOTE:
Porcelain strain insulator (if required) shall meet the codes and placement requirements of the local utility co.



DETAIL "E"
CABLING ON WOOD POLE

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-010-A | SHEET 4 of 7

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AS-LET PLAN REVISIONS

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LANDSCAPE ARCHITECTS

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

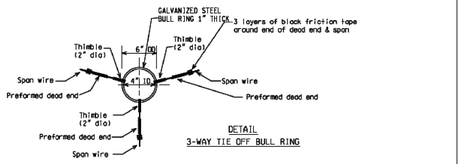
DATE: 21 December 2018

REVISION

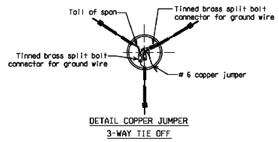
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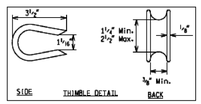
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DETAIL
3-WAY TIE OFF BULL RING

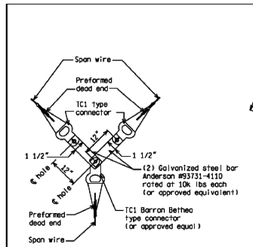


DETAIL COPPER JUMPER
3-WAY TIE OFF

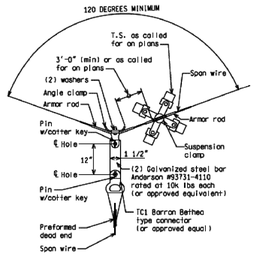


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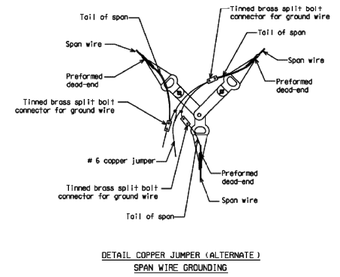
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File= RefDoc/TR/Signals/Web/Sp Det/Fin/SIG010A.dgn Rev- 02/16/17		PLAN DATE		



PULL-OFF CONNECTION DETAIL (ALTERNATE)
FOR 3-WAY SUSPENSION



PULL-OFF CONNECTION DETAIL (ALTERNATE)
FOR 3-WAY SUSPENSION



DETAIL COPPER JUMPER (ALTERNATE)
SPAN WIRE GROUNDING

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-010-A	SHEET 6 of 7
File= RefDoc/TR/Signals/Web/Sp Det/Fin/SIG010A.dgn Rev- 02/16/17		PLAN DATE		

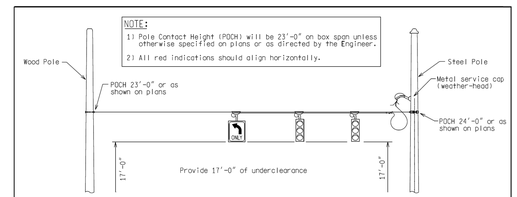
AS-LET PLAN REVISIONS

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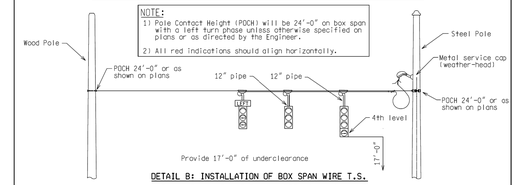
MDOT Michigan Department of Transportation

DATE: CS:
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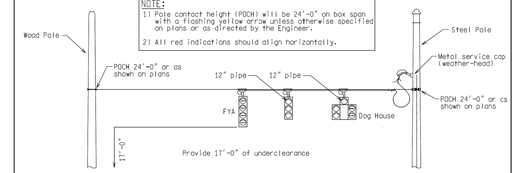
DRAWING SHEET



DETAIL A: INSTALLATION OF BOX SPAN WIRE T.S. ON STEEL OR WOOD POLES



DETAIL B: INSTALLATION OF BOX SPAN WIRE T.S.
W/LT PHASE OR 4TH LEVEL ON STEEL OR WOOD POLES



DETAIL C: INSTALLATION OF BOX SPAN WIRE T.S.
FYA AND DOGHOUSE ON STEEL OR WOOD POLES

BOX SPAN WIRE T.S. ON STEEL OR WOOD POLES
For use on Oakland County roads only.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-010-A	SHEET 7 of 7
File= RefDoc/TR/Signals/Web/Sp Det/Fin/SIG010A.dgn Rev- 02/16/17		PLAN DATE		

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

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DATE: CS:
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PRIME CONSULTANT

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LANDSCAPE ARCHITECTS

CONSULTANT

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T: 248.844.5400

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

DATE:
21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T902

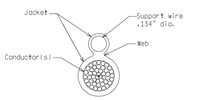
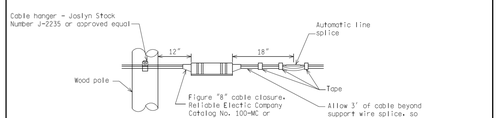
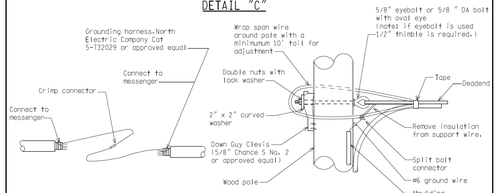


FIGURE 8 CABLE

INTERGRAL MESSENGER (I.M.) CABLE SECTION
DETAIL "A"



AERIAL SPLICE
DETAIL "C"



CABLE CLOSURE
DETAIL "D"

DEAD-END POLE
DETAIL "E"

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/FinVS102114.dgn Rev- 02/16/17

MDOT — PREPARED BY TRAFFIC AND SAFETY

DRAWN BY: DJF

CHECKED BY:

ENGINEER OF DELIVERY

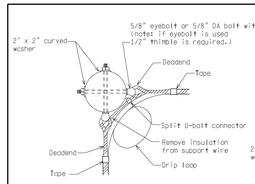
ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)
FHWA APPROVAL DATE

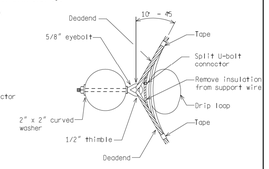
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

INSTALLATION OF INTEGRAL MESSENGER CABLE

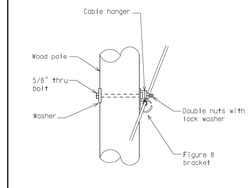
PLAN DATE | SIG-011-A | SHEET 1 of 4



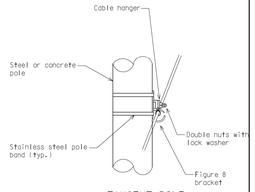
90 DEG. CORNER POLE
DETAIL "F"



10 DEG. - 45 DEG. ANGLE POLE
DETAIL "G"



TANGENT POLE (WOOD POLE)
DETAIL "H"



TANGENT POLE
(STEEL OR CONCRETE POLE)
DETAIL "I"

NOTE FOR DETAILS "E", "F", "G":
Individual connectors to be taped with 3
layers of approved plastic tape & overall
one layer of half lap approved plastic tape

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-011-A | SHEET 2 of 4

File: RefDoc/TR/Signals/Web/Sp Det/FinVS102114.dgn Rev- 02/16/17

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT

DATE: | CS: | DRAWING | SHEET
DESIGN UNIT: | JN:
FILE: | TSC:

DESCRIPTION:
Integral messenger wire consists of a support wire and a conductor core laid parallel and covered with a single extrusion of black low density polyethylene. The single extrusion provides a jacket over the support wire and core, and forms a web joining the two. See detail "A" this sheet. The support wire is 0.134 inches in diameter. Grade 190 steel. Class A galvanized. Extra High Strength steel having a rated breaking strength of 2680 pounds.

INSTALLATION:
Every effort shall be made to limit the length of spans to a maximum of 250 feet. Integral messenger wire is prone to low frequency wind vibration commonly referred to as "dancing" while "dancing" may not be so violent in low wind areas as to attract attention. Prolonged low amplitude vibration will eventually cause open circuits and/or support wire failure. Therefore, REA recommends that all integral messenger distribution wire be spiraled approximately one spiral for each 15 feet of span.

Spiraling of the wire should be done from every other pole by applying the spiraling torque to the support clamp after the two outside bolts have been properly tightened, thus keeping the spiraling torque on the support wire and not on the core. As spiraling operations proceed along a lead, spiraling at alternate poles should be in opposite directions, thereby reducing the torsion otherwise imposed on those clamps which are at the intermediate poles. The procedure to be followed in spiraling distribution wire is shown in detail "B" of this sheet.

If clamps are not adequately tightened the torsion developed in spiraling will cause the support wire to turn in the clamp resulting in the migration of the spirals from the spans toward the pole. "Dancing" of the wire and damage to it at the poles will be the final results of inadequate clamping. The proper type of support clamps must be used on all corners as shown in details "E", "F", "G" and "I" of this sheet.

When pulling the wire up to correct sag, a suitable wire grip should be used directly on the insulated support wire. The grip should be of such design as to give proper holding power and yet not damage the support wire jacket. The Crescent Tool Company #800 or an equivalent grip is suggested. A standard line wire grip should not be used because it will damage the insulation. If the insulation is damaged in any way, it must be repaired with sealing compound or by cutting out the damaged portion. At deadends, it is necessary to remove the support wire covering before applying the deadend grips. It must be done carefully to avoid damaging the support wire or core the eclectrical continuity of the support wire must be maintained throughout the lead.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-011-A | SHEET 3 of 4

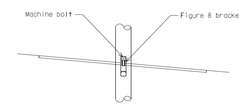
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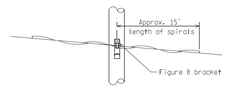


Step 1 - Support and position integral messenger wire with cable brackets.

Step 2 - Fasten and support clamp to the support messenger at the pole. Tighten the carriage bolts to the manufacturer's specifications.

Step 3 - Spiral wire in the opposite direction from which the previous adjacent spiraling operation was performed. If the adjacent spans are unequal, use the shorter span for determining the number of spirals.

Step 4 - Place the clamp on the machine bolt and tighten nuts to the manufacturer's specifications.



I.M. CABLE SPIRALS
DETAIL "B"

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-011-A | SHEET 4 of 4

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

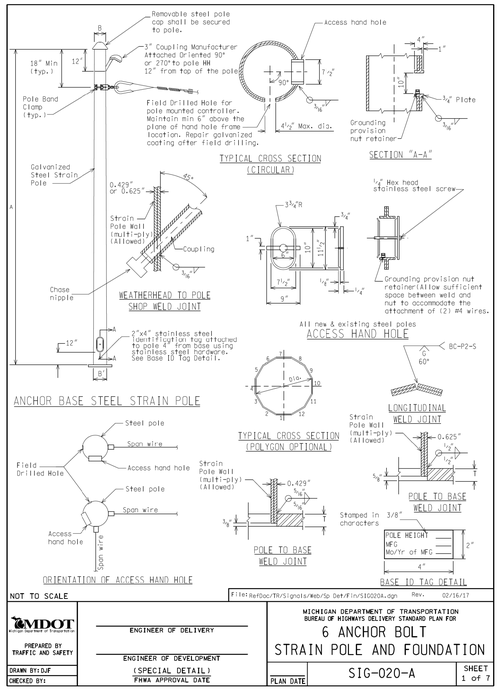
DATE: 21 December 2018

REVISION

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Sheet Title: SIGNAL DETAILS

Sheet No: T903



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MICHIGAN DEPARTMENT OF TRANSPORTATION	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	6 ANCHOR BOLT STRAIN POLE AND FOUNDATION
DRAWN BY: DJF		PLAN DATE: SIG-020-A SHEET 1 of 7
CHECKED BY:		

POLE REQUIREMENTS				
Pole Length	A	30 feet	36 feet	40 feet
Thickness (min.)		0.429 inches	0.625 inches	0.625 inches
Pole dia. At top / At bottom	B / B'	8" min ± 1½" / 13" ± ½"	8" min + 1½" / 13" ± ½"	8½" min + 1½" / 14" ± ½"
Full length taper		+0.002in/ft 0.14in/ft -0.000in/ft	+0.002in/ft 0.14in/ft -0.000in/ft	+0.002in/ft 0.14in/ft -0.000in/ft
Anchor bolt cord	C	9"	10½"	10½"
Base plate edge	D	12¼"	14¼"	14¼"
Base plate thickness	T	2"	2¼"	2¼"
Anchor bolt circle	BC	18"	21"	21"
Anchor base bolt hole dia.		1⅞"	2⅛"	2⅛"
Anchor bolt dia.	d	1½"	1¾"	1¾"
Foundation dia.		36"	42"	42"
Anchor bolt length		72"	72"	72"
Pole band (span clamp)	8.5"	FDOH 25'-6" to 28' 6"	MDOH 32'-6" to 34'-6"	MDOH 36'-0" to 38'-6"
	9.5"	FDOH 20'-0" to 25'-0"	MDOH 25'-0" to 32'-0"	MDOH 29'-0" to 35'-6"

NOTES:

1. Acceptable mill tolerances to apply to all nominal dimensions.
2. Materials and galvanizing:
   a. Steel for poles shall conform to ASTM A572, Grade 50, fy=50 ksi, or ASTM A595, Grade A, fy=65 ksi.
   b. Base plate and steel bottom template ASTM A36, fy=36 ksi.
   c. Galvanize all exposed nuts, bolts, and washers according to ASTM F2329. Galvanize all other steel items according to ASTM A123. Embedded nuts, bolts,washers, and steel ring need not be galvanized.
   d. Anchor bolts shall conform to ASTM F1554, Grade 105, fy=105 ksi. Coarse pitch thread will be allowed provided threads conform to designation: 06 UNC 2A (1.5 inch dia) 05 UNC 2A (1.75 inch dia).
   e. Nuts for anchor bolts shall conform to ASTM A194 Grade 2H or ASTM A563 Grade DH
   f. Washers for anchor bolts shall conform to ASTM F436 Type 1.
3. Welding
   a. Welding shall conform to ANSI/AWS D1.1
   b. 100% of welds shall be inspected. Full-penetration groove weld inspection shall be performed by nondestructive ultrasonic methods. Other welds shall have visual and/or magnetic particle inspection.
4. Tolerances
   a. overall height ± 1%.
   b. Sweep and camber 1/8 in/ft.
   c. Twist 10° max. overall.
5. Design conforms to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 5th Edition, 2009.

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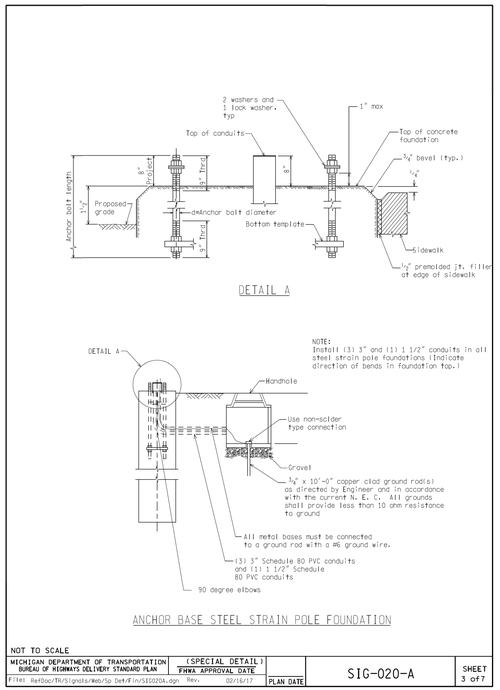
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-020-A	SHEET 2 of 7

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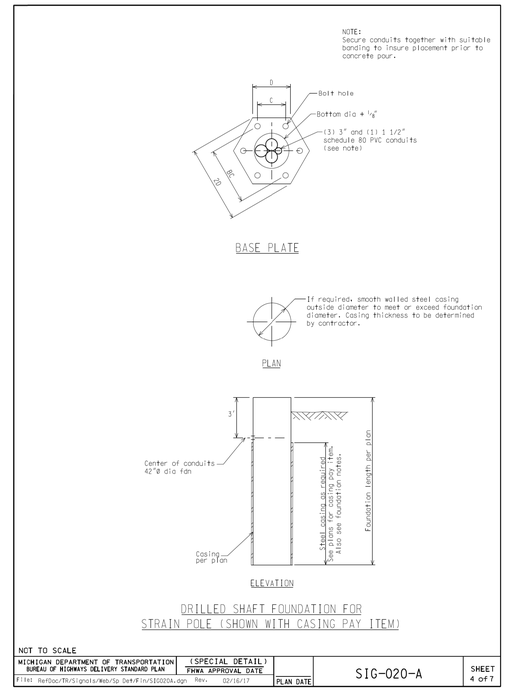
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-020-A	SHEET 3 of 7

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

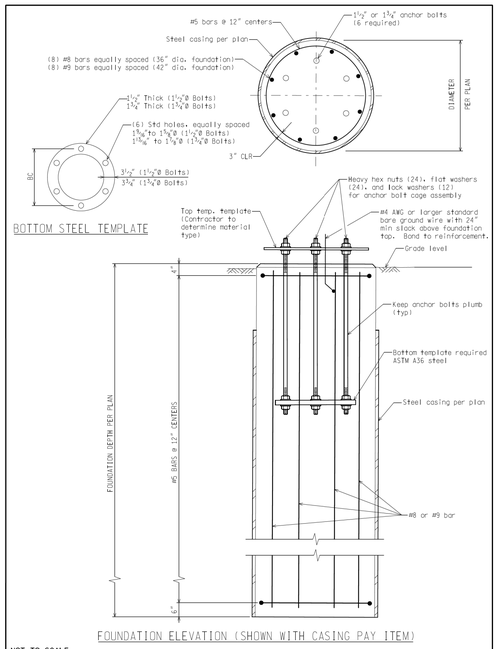
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Sheet Title: SIGNAL DETAILS

Sheet No: T904



BOTTOM STEEL TEMPLATE

FOUNDATION ELEVATION (SHOWN WITH CASING PAY ITEM)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-020-A	SHEET 5 of 7
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FOUNDATION NOTES:

1) Construct strain pole foundations according to 718.03 of the Standard Specifications for Construction. All work and materials shall be in accordance with the MDOT Standard Specifications.

2) If soil conditions indicate there is no need for a casing pay item as shown on the plans, the contractor should request permission of the engineer to install the foundation without casing.

3) When the casing pay item is included on the plans for a foundation (due to granular soils or a wet hole), steel casing (smooth walled) is to be installed to enable the foundation to be poured. The thickness of the steel casing is to be determined by the contractor. The steel casing shall be left in place. A suitable method of compaction must be employed to ensure the soil immediately outside the casing is compacted properly.

4) When the casing pay item is called for on the plans, the steel casing may stop at the conduit entrance to foundation. Top of foundation must then be formed separately. The casing pay item quantity will be paid for based on actual linear feet installed.

5) Dewatering of wet shafts is not allowed. A wet shaft is defined as having more than 3 inches of standing water or as having water infiltrating at a rate equal to or exceeding 12 inches per hour. For wet shafts, Concrete is to be placed in accordance with section 718.03. (wet construction method) with a tremie tube or concrete pump beginning at the shaft bottom. Grade T concrete must be used for underwater placement. Grade S2 may be used in dry excavations only. See MDOT standard specifications Tables 701-1A and 701-1B (Concrete Structure Mixtures)

6) Per MDOT standard specifications 718-02, the Grade S2 acceptable slump range is 6-8 inches. The Grade T acceptable slump range is 7-9 inches.

7) Steel reinforcement shall be ASTM A615 grade 60 without epoxy coating.

8) Exposed concrete surfaces shall be cast in forms. Exposed concrete edges shall be beveled 3/4 inches.

9) Steel reinforcement shall have a clear cover of 3 inches unless noted otherwise. Steel Reinforcement may be adjusted to ensure proper clear cover.

10) Conduits and anchor bolts shall be rigidly installed before concrete is placed. Anchor bolts shall be spaced by means of a template. The center of the template shall coincide with the center of the foundation.

11) Grounding of pole includes adding #4 bare copper ground wire bonded by mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.

12) Refer to the following special provisions related to 6 anchor bolt strain poles:
Steel Strain Pole
Strain Pole Foundation and Anchor Bolts
Casing Used With Strain Poles and Mast Arm Poles

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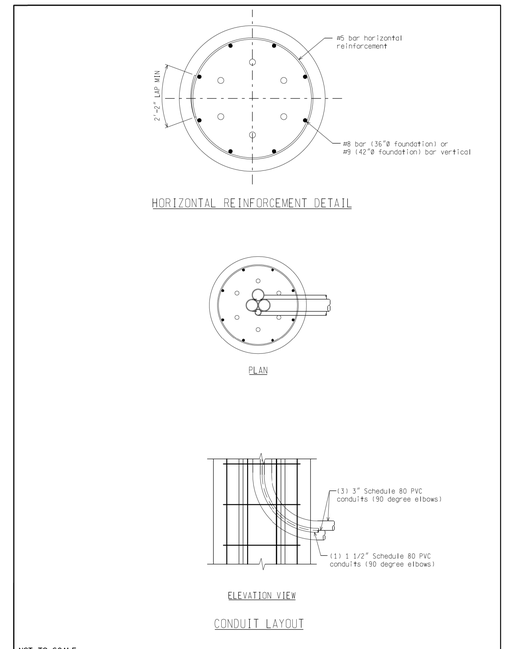
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HORIZONTAL REINFORCEMENT DETAIL

PLAN

ELEVATION VIEW

CONDUIT LAYOUT

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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-020-A	SHEET 7 of 7
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

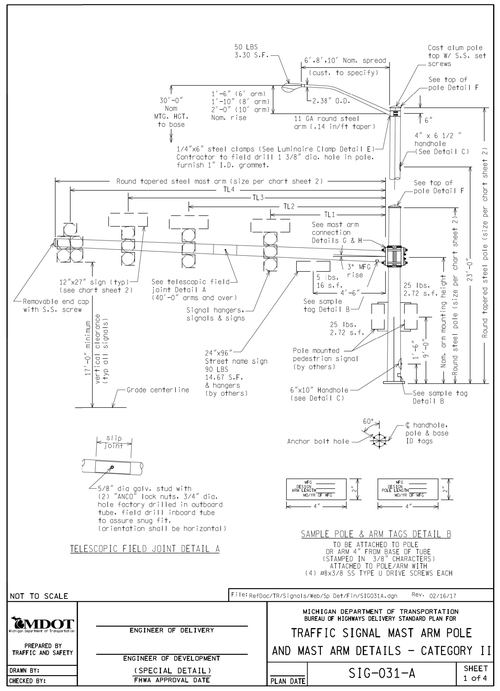
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Sheet Title
SIGNAL DETAILS

Sheet No:
T905



TELESCOPIC FIELD JOINT DETAIL A

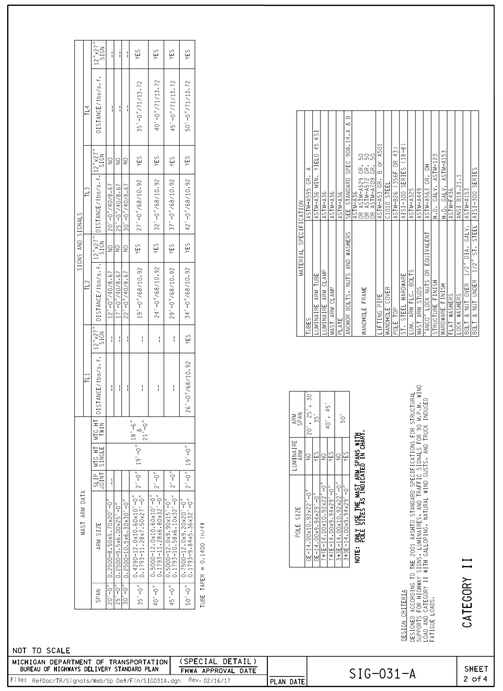
SAMPLE POLE & ARM TAGS DETAIL B

TO BE ATTACHED TO POLE
OR ARM 4" FROM BASE OF TUBE
(STAMPED IN 3/8" CHARACTERS)
ATTACHED TO POLE/ARM WITH
(4) #8x3/8 SS TYPE U DRIVE SCREWS EACH

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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR		
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DELIVERY	TRAFFIC SIGNAL MAST ARM POLE AND MAST ARM DETAILS - CATEGORY II
DRAWN BY:	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-031-A SHEET 1 of 4
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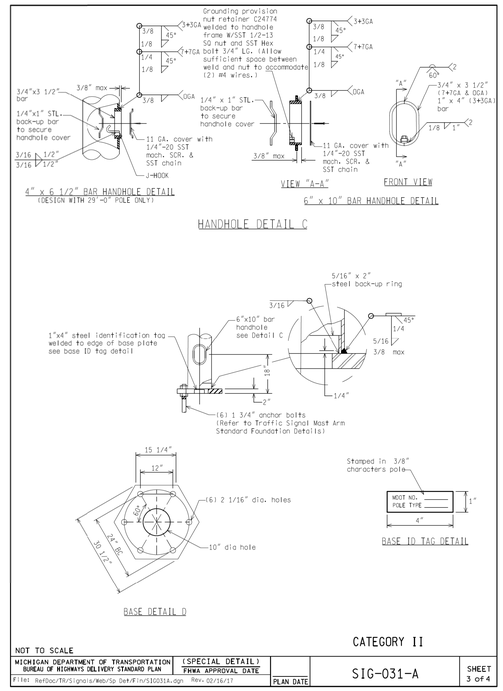
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File: ReFdoc/TR/Signals/Web/Sp Det/FInl/SIG031A.dgn Rev. 02/16/17	PLAN DATE:	SIG-031-A	SHEET 2 of 4

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CATEGORY II

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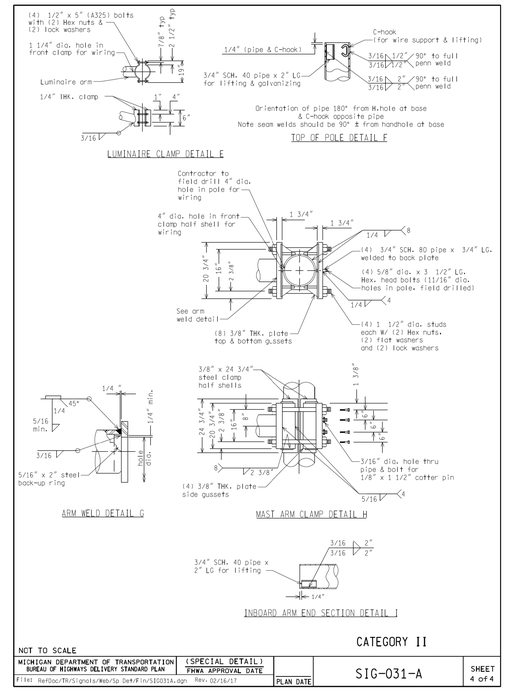
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CATEGORY II

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

DATE:
21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T906

NOTES:

1) All ground rods shall be 3/4"x10' copper clad rod a minimum of 2 ground rods shall be used (one for the service disconnect and one for the messenger cable & pole).

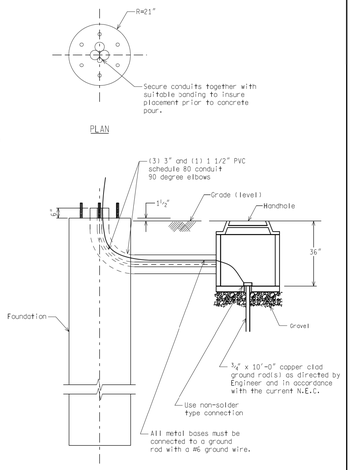
2) Ground rod placement shall not be less than 12" from the foundation with a minimum of 6' between ground rods. Placement shall be as directed by the Engineer and in compliance with N.E.C.

3) Ground wire connection to grounding rod(s) shall utilize a non-solder type connection.

4) Indicate the direction of conduits in foundation top with an arrow.

5) Install pole that the foundation & anchor bolts are plumb.

6) All grounds shall provide less than 10 ohm resistance to ground.



MAST ARM FOUNDATION CONDUIT AND GROUNDING

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MDOT Michigan Department of Transportation

PREPARED BY TRAFFIC AND SAFETY

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

DRAWN BY:

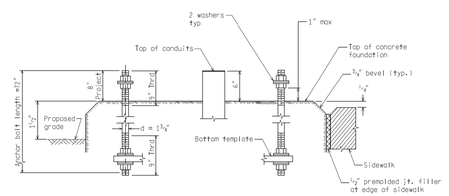
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(SPECIAL DETAIL) FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

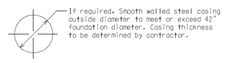
TRAFFIC SIGNAL MAST ARM STANDARD FOUNDATIONS

PLAN DATE | SIG-040-A | SHEET 1 of 4

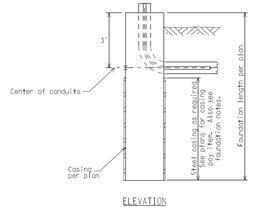


ANCHOR BOLTS

NOTE:
Trench for placement of conduits after casing is in place and before dewatering.



PLAN



DRILLED FOUNDATION SHAFT (SHOWN WITH CASING PAY ITEM)

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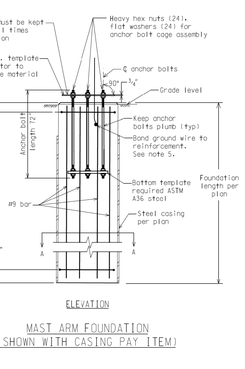
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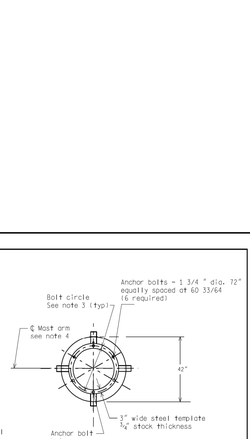
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NOTES:

1. Anchor bolts shall be set and held vertical at the correct location and at the proper elevation with a 3/4" steel (or approved equal) template a minimum of 24 hours after the concrete placement has been completed.
2. (6) 1 3/4" - 12" Anchor bolts with (4) Hex nuts and (4) washers per bolt.
3. 24" dia bolt circle for Category I, Category II, and Category III Mast Arms.
4. Mast arm orientation is not dependent on anchor bolt position.
5. Use #4 AWG or larger standard bare ground wire bonded by mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.
6. Galvanize all exposed nuts, bolts, and washers according to ASTM F2329. Galvanize all other steel items according to ASTM A123. Embedded nuts, bolts, washers, and steel ring need not be galvanized.





MAST ARM FOUNDATION (SHOWN WITH CASING PAY ITEM)

NOT TO SCALE

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Foundation Notes:

1. Refer to the following special provisions related to 6 anchor bolt mast arm poles:
   Traffic Signal Mast Arm Poles and Mast Arms
   Mast Arm Pole Foundation and Anchor Bolts
   Casing Used With Strain Poles and Mast Arm Poles
2. Templates shall be shop fabricated and assembled prior to being approved by MDOT for shipping.
3. Diameter of bolt holes in template shall be 1/16 " larger than anchor bolt diameter.
4. Conduits and anchor bolts shall be rigidly installed before concrete is placed. The center of the template shall coincide with the center of the foundation. The template and handles shall be well supported, horizontally level and firmly anchored in place a minimum of 24 hours after the concrete placement is completed.
5. Due care shall be taken during the concrete placement to avoid displacing the anchor bolts.
6. No hammering on the anchor bolts or template will be allowed.
7. After template is removed, thread nuts on to the bolt flush with the bolt and to protect threads until signal support is erected.
8. For anchor bolt material refer to section 908.14 A and B of the Michigan Standard Specifications for Construction. For anchor bolt installation and tightening refer to section 810.03 N.
9. Dewatering of wet shafts is not allowed. A wet shaft is defined as having more than 3 inches of standing water or as having water infiltrating at a rate equal to or exceeding 12 inches per hour. For wet shafts, Concrete is to be placed in accordance with section 718.03. (wet construction method) with a tremie tube or concrete pump beginning at the shaft bottom. Grade T concrete must be used for underwater placement. Grade S2 may be used in dry excavations only. See MDOT standard specifications Tables 701-1A and 701-1B (Concrete Structure Mixtures).
10. Per MDOT standard specifications 718.02, the Grade S2 acceptable slump range is 6-8 inches. The Grade T acceptable slump range is 7-9 inches.
11. If soil conditions indicate there is no need for a casing pay item as shown on the plans, the contractor should request permission of the engineer to install the foundation without casing.
12. When the casing pay item is included on the plans for a foundation (due to granular soils or a wet hole), steel casing (smooth walled) is to be installed to enable the foundation to be poured. The thickness of the steel is to be determined by the contractor. The steel casing shall be left in place. A suitable method of compaction must be employed to ensure the soil immediately outside the casing is compacted properly.
13. When the casing pay item is called for on the plans, the steel casing may stop at the conduit entrance to foundation. Top of foundation must then be formed separately. The casing pay item quantity will be paid for based on actual linear feet installed.
14. Construct mast arm foundations, according to subsections 718.03 of the Standard Specifications for Construction. All work and materials shall be in accordance with the MDOT Standard Specifications.
15. Steel reinforcement shall be ASTM A615 grade 60 without epoxy coating.
16. Exposed concrete surfaces shall be cast in forms. Exposed concrete edges shall be beveled 3/4".
17. Steel reinforcement shall have a clear cover of 3 inches unless noted otherwise. Steel Reinforcement may be adjusted to ensure proper clear cover.
18. Grounding of pole includes adding #4 bare copper ground wire bonded by mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE

File: RefDoc/TR/Signals/Web/Sp Det/FInSIG040A.dgn Rev. 02/16/17

PLAN DATE | SIG-040-A | SHEET 4 of 4

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

DATE:
21 December 2018

REVISION

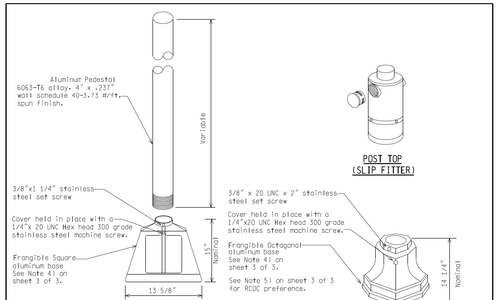
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SIGNAL DETAILS

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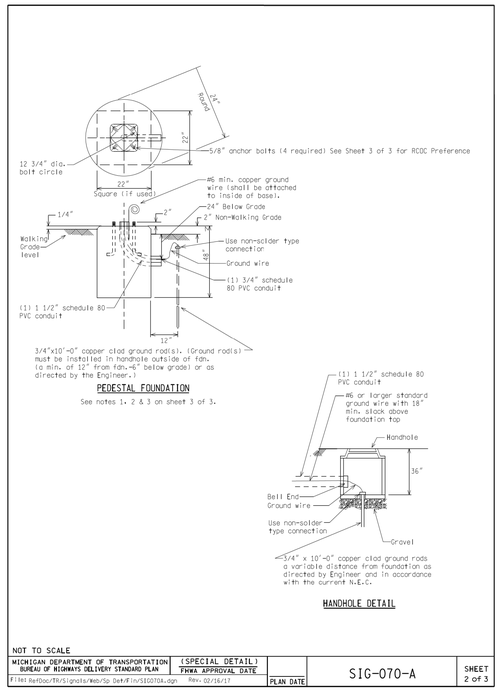
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NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/FInSIGOTOA.dgn Rev. 02/16/17

MDOT Michigan Department of Transportation	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR	
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT	PEDESTAL FOUNDATION	
DRAWN BY:	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-070-A	SHEET 1 of 3
CHECKED BY:			

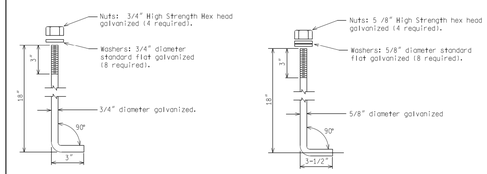


NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		
File: RefDoc/TR/Signals/Web/Sp Det/FInSIGOTOA.dgn Rev. 02/16/17	PLAN DATE:	SIG-070-A	SHEET 2 of 3

AS-LET PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation	DATE:	CS:	DRAWING	SHEET
	DESIGN UNIT:	JN:		
FILE:	TSC:			



ANCHOR BOLT DETAIL

NOTE: Anchor bolts are to be ASTM-A307 steel (4-required)

NOTES:

1) Alternate foundation may be constructed 22"X22" square - 48" deep.

2) Grounding system shall measure 10 ohm or less to ground.

3) Construction joints not permitted in foundation.

4) Pedestal base must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH) and have Federal Highway Administration (FHWA) acceptance. Pedestal base must also be certified to have a 4-inch maximum stub height after the support has broken away from its base, as specified in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals and the AASHTO Roadside Design Guide.

5) Use the Octagonal Base as a preference by the Road Commission for Oakland County (RCOC), for use on Oakland County roads only.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		
File: RefDoc/TR/Signals/Web/Sp Det/FInSIGOTOA.dgn Rev. 02/16/17	PLAN DATE:	SIG-070-A	SHEET 3 of 3

AS-LET PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation	DATE:	CS:	DRAWING	SHEET
	DESIGN UNIT:	JN:		
FILE:	TSC:			

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

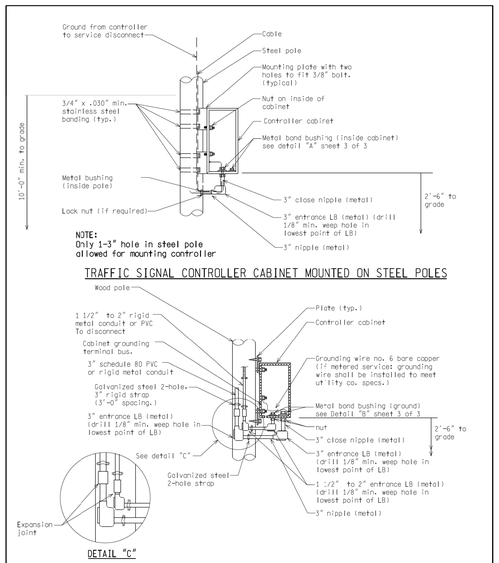
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SIGNAL DETAILS

Sheet No: T908



TRAFFIC SIGNAL CONTROLLER CABINET MOUNTED ON STEEL POLES

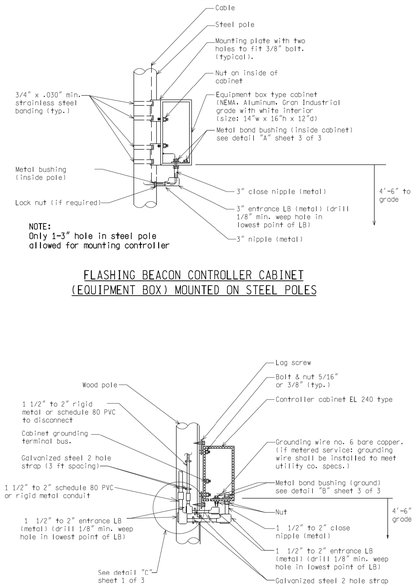
DETAIL "C"

TRAFFIC SIGNAL CONTROLLER CABINET MOUNTED ON WOOD POLES

NOT TO SCALE

File: RerDoc/TR/Signals/Web/Sp Det/FinVSIG100A.dgn Rev. 02/16/17

MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR CONTROLLER CABINET MOUNTED ON STEEL OR WOOD POLES
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	
DRAWN BY: DJF		PLAN DATE: SIG-100-A SHEET 1 of 3
CHECKED BY:		



FLASHING BEACON CONTROLLER CABINET (EQUIPMENT BOX) MOUNTED ON STEEL POLES

FLASHING BEACON CONTROLLER CABINET (EL 240 TYPE OR EQUIVALENT) MOUNTED ON WOOD POLES

NOT TO SCALE

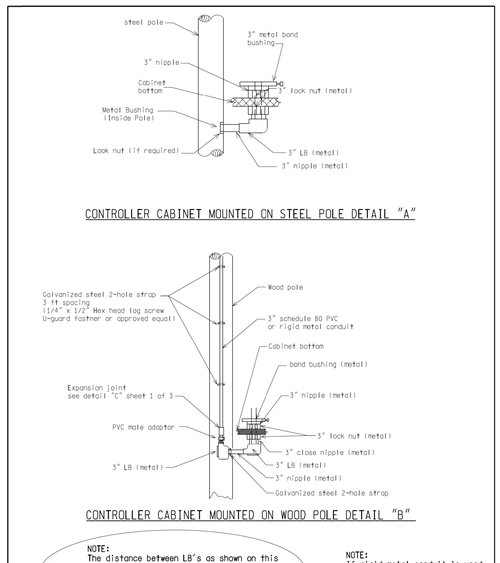
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File: RerDoc/TR/Signals/Web/Sp Det/FinVSIG100A.dgn Rev. 02/16/17

AS-LET PLAN REVISIONS							
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CONTROLLER CABINET MOUNTED ON STEEL POLE DETAIL "A"

CONTROLLER CABINET MOUNTED ON WOOD POLE DETAIL "B"

NOTE:
The distance between LB's as shown on this detail is for clarity of the drawing only. Actual distance between LB's shall be minimized as is practical to the installation.

NOTE:
If rigid metal conduit is used, the conduit must be bonded according to the current N.E.C.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		PLAN DATE: SIG-100-A	SHEET 3 of 3

File: RerDoc/TR/Signals/Web/Sp Det/FinVSIG100A.dgn Rev. 02/16/17

AS-LET PLAN REVISIONS							
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	DESIGN UNIT:	JN:	SHEET
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

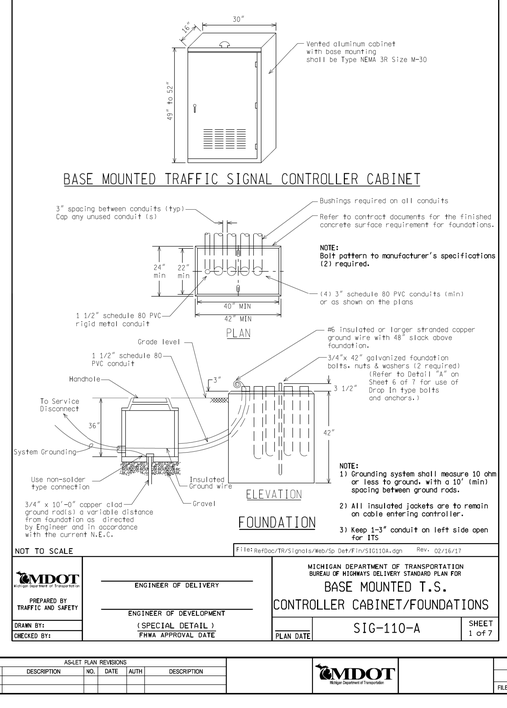
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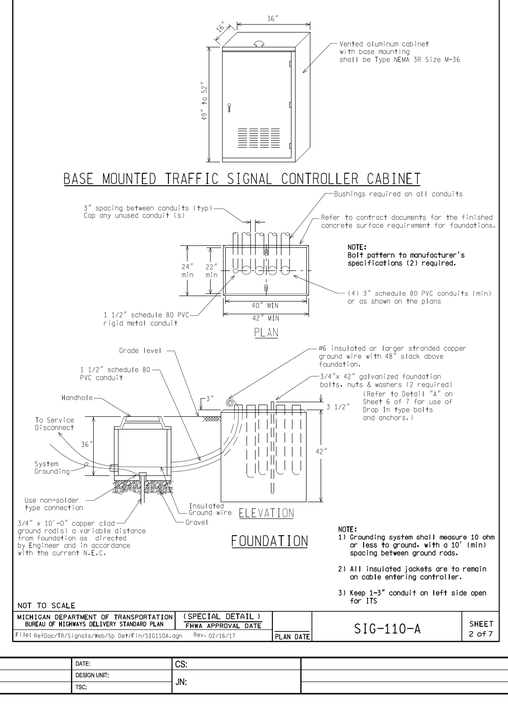
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Sheet Title: SIGNAL DETAILS

Sheet No: T909



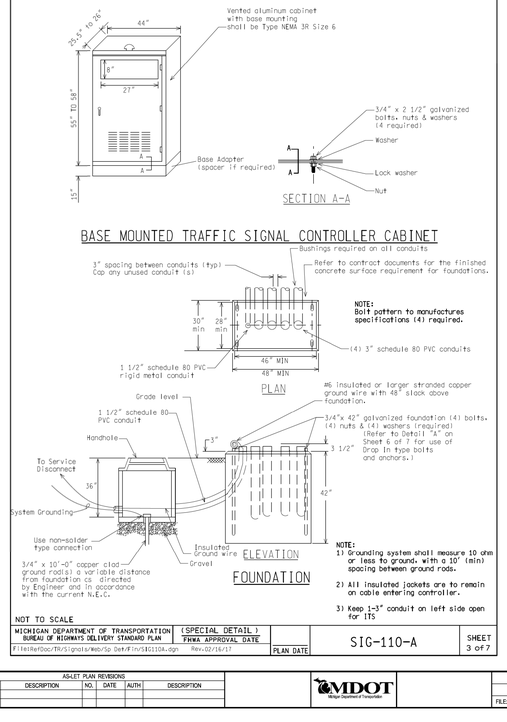


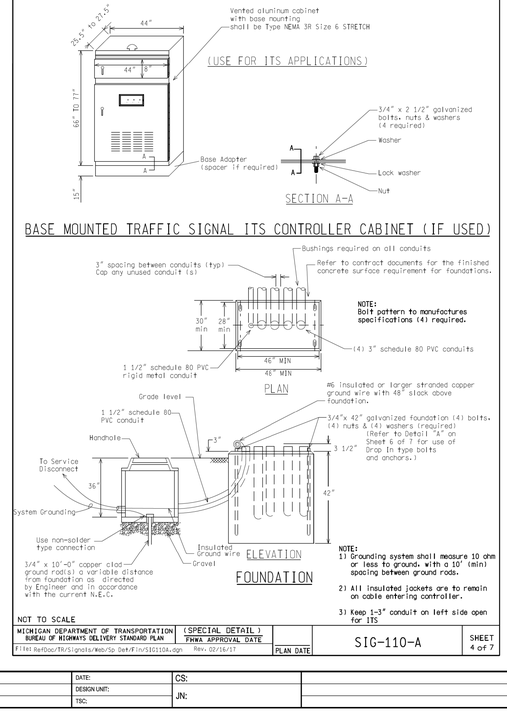
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

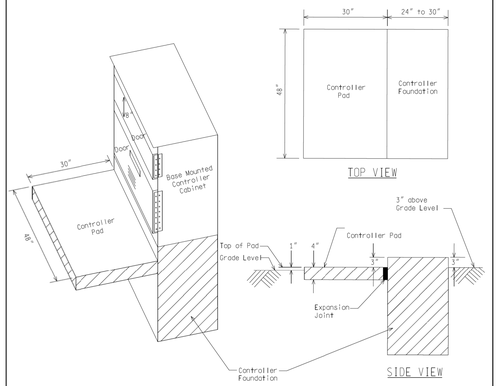
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REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T910

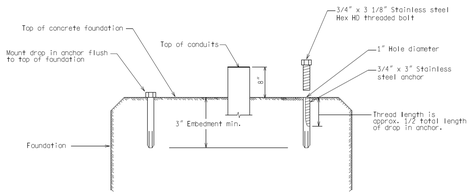


BASE MOUNTED CONTROLLER PAD

NOTE:
Payment for controller pad to be included in controller foundation pay item.
Controller cabinet door to open toward pad.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-110-A	SHEET 5 of 7
File: RefDocs/TR/Signals/WebSp Det/Fin/SIG110A.dgn Rev. 02/16/17		PLAN DATE		



Notes:
1. Use AISI 300 Series Stainless Steel for all bolts and anchors.
2. Use Drop In foundation bolts and anchors as directed by the Engineer.

ALTERNATIVE DETAIL "A": DROP IN FOUNDATION BOLTS & ANCHORS

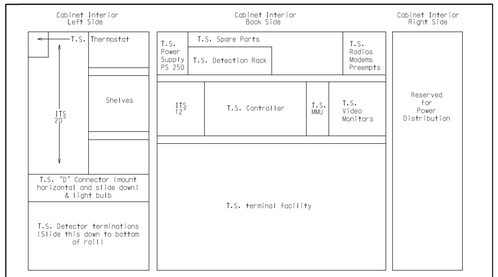
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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-110-A	SHEET 6 of 7
File: RefDocs/TR/Signals/WebSp Det/Fin/SIG110A.dgn Rev. 02/16/17		PLAN DATE		

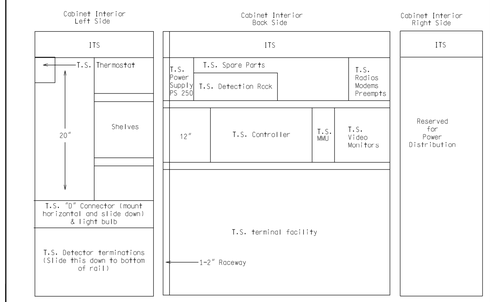
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NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION		

MDOT Michigan Department of Transportation

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	DESIGN UNIT:	JN:		
	TSC:			



TRAFFIC SIGNAL NEMA 3R SIZE 6 CABINET REQUIREMENTS



TRAFFIC SIGNAL NEMA 3R SIZE 6 STRETCH CABINET REQUIREMENTS
FOR
ITS APPLICATIONS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-110-A	SHEET 7 of 7
File: RefDocs/TR/Signals/WebSp Det/Fin/SIG110A.dgn Rev. 02/16/17		PLAN DATE		

AS-LET PLAN REVISIONS								DRAWING	SHEET
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	DESIGN UNIT:	JN:		
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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

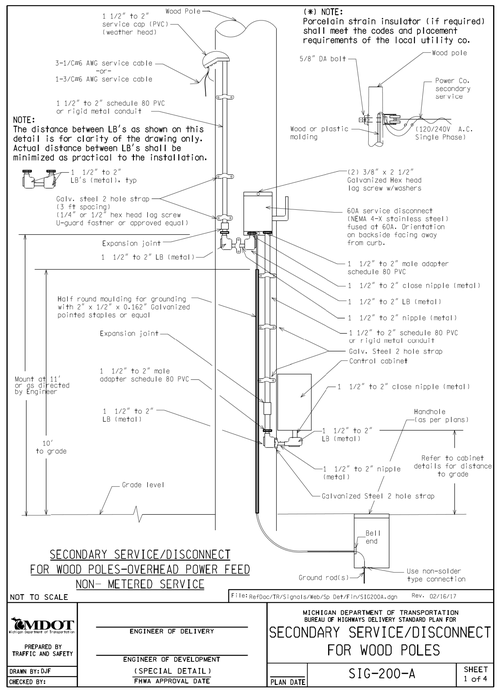
DATE:
21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T911

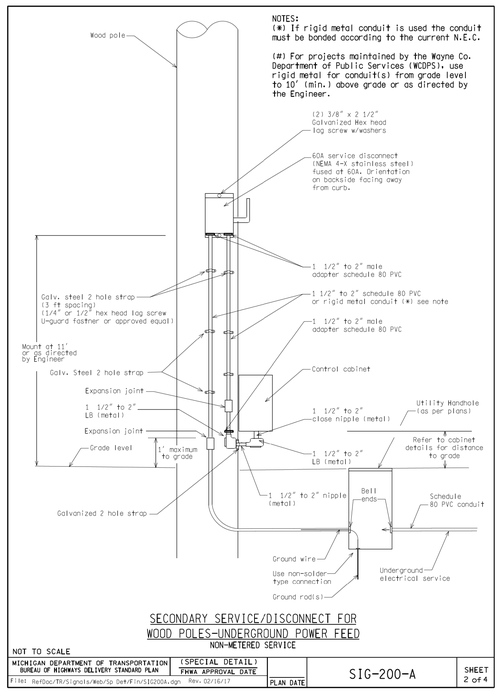


SECONDARY SERVICE/DISCONNECT
FOR WOOD POLES-OVERHEAD POWER FEED
NON- METERED SERVICE

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/Flnr/S102004.dgn Rev. 02/16/17

MDOT Michigan Department of Transportation PREPARED BY TRAFFIC AND SAFETY DRAWN BY: DJF CHECKED BY:	ENGINEER OF DELIVERY ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR SECONDARY SERVICE/DISCONNECT FOR WOOD POLES PLAN DATE: SIG-200-A SHEET: 1 of 4

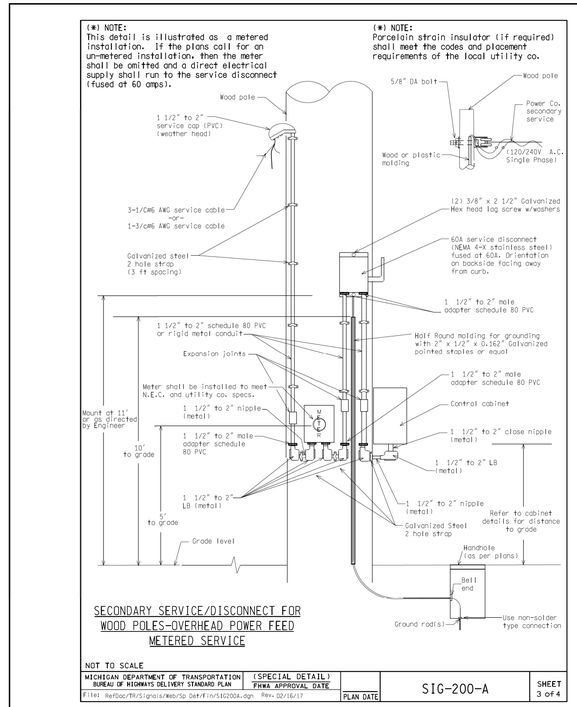


SECONDARY SERVICE/DISCONNECT FOR
WOOD POLES-UNDERGROUND POWER FEED
NON-METERED SERVICE

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/Flnr/S102004.dgn Rev. 02/16/17

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-200-A SHEET: 2 of 4

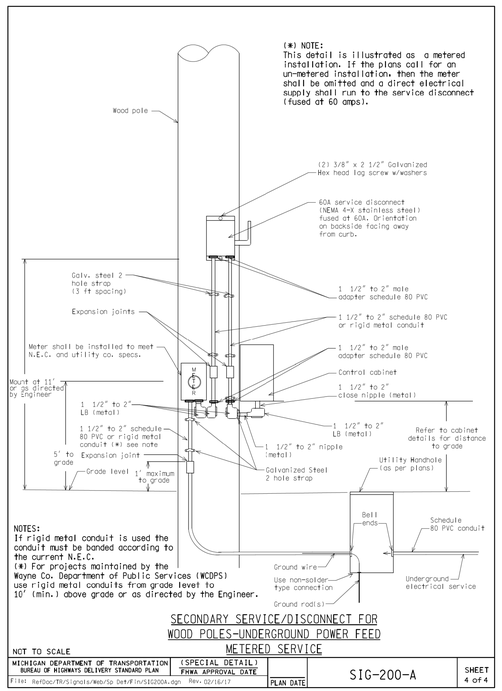


SECONDARY SERVICE/DISCONNECT FOR
WOOD POLES-OVERHEAD POWER FEED
METERED SERVICE

NOT TO SCALE

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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-200-A SHEET: 3 of 4



SECONDARY SERVICE/DISCONNECT FOR
WOOD POLES-UNDERGROUND POWER FEED
METERED SERVICE

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/Flnr/S102004.dgn Rev. 02/16/17

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-200-A SHEET: 4 of 4

AS-LET PLAN REVISIONS

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MDOT Michigan Department of Transportation

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

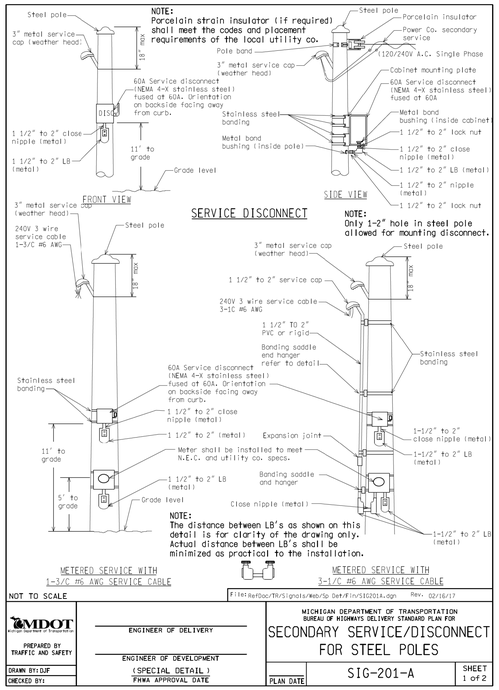
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

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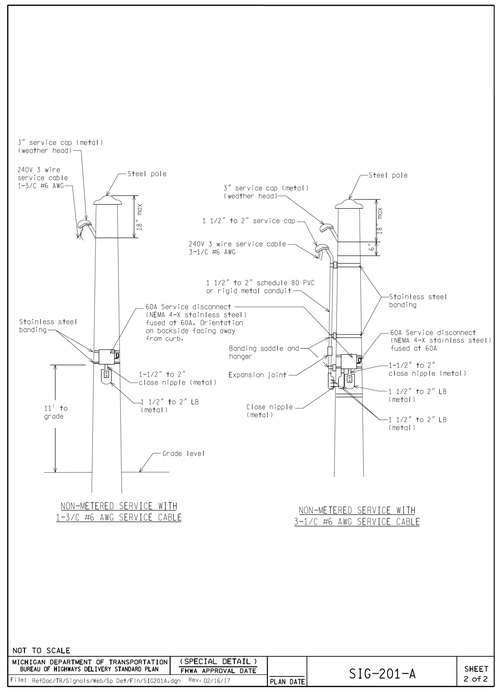
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MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR	
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	SECONDARY SERVICE/DISCONNECT FOR STEEL POLES	
DRAWN BY: DJF		PLAN DATE:	SIG-201-A
CHECKED BY:			SHEET 1 of 2



NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Def/Fin/SIG201A.dgn Rev- 02/16/17

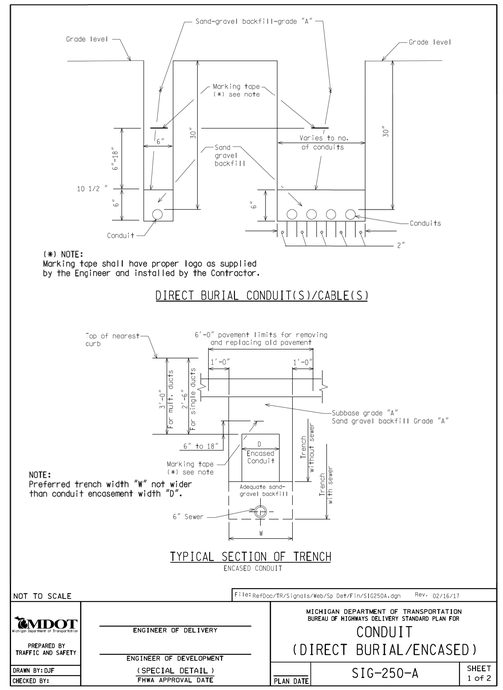
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			SHEET 2 of 2

AS-LET PLAN REVISIONS

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NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Def/Fin/SIG250A.dgn Rev- 02/16/17

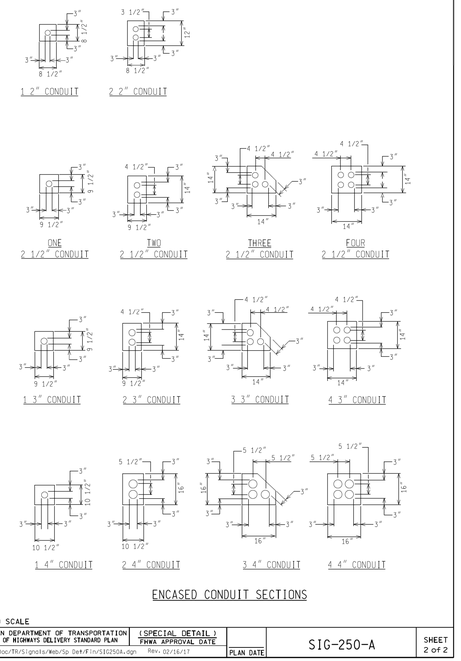
MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR	
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	CONDUIT (DIRECT BURIAL/ENCASED)	
DRAWN BY: DJF		PLAN DATE:	SIG-250-A
CHECKED BY:			SHEET 1 of 2

AS-LET PLAN REVISIONS

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MDOT

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	TSC:			



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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE:	SIG-250-A
			SHEET 2 of 2

PRIME CONSULTANT

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CONSULTANT

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

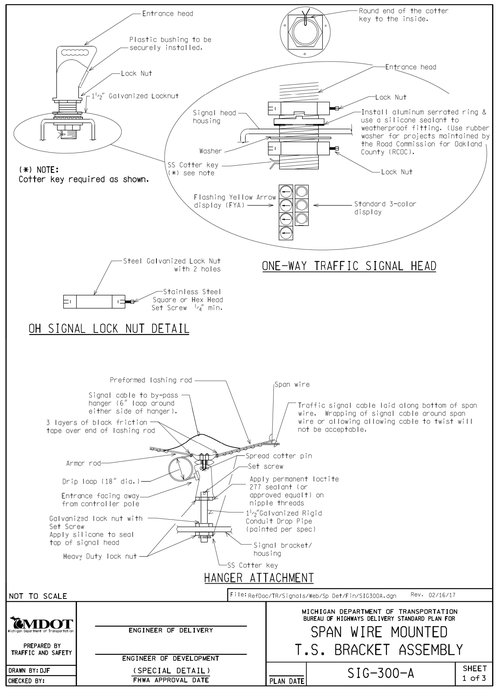
DATE:
21 December 2018

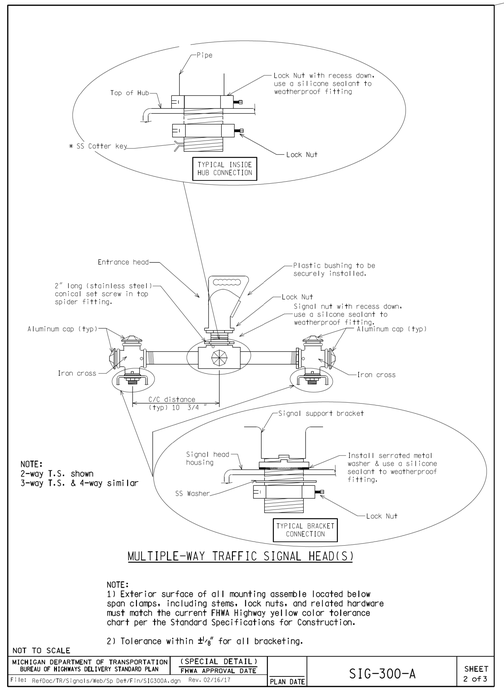
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T913



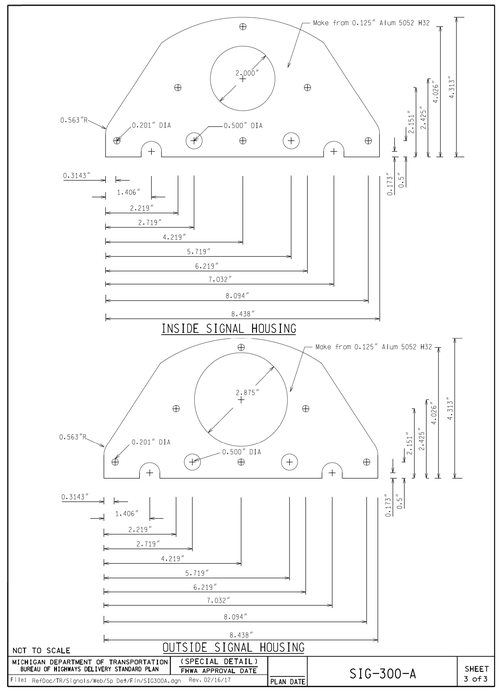


AS-LET PLAN REVISIONS

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MDOT Michigan Department of Transportation

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	DESIGN UNIT:	JN:	
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PRIME CONSULTANT

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

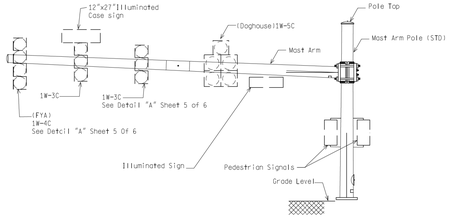
DATE:
21 December 2018

REVISION

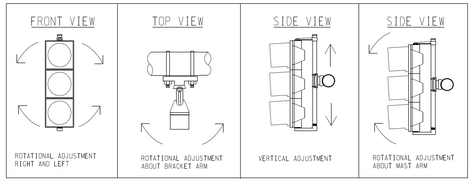
NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T914



TYPICAL SIGNAL DISPLAYS



SIGNAL HEAD BRACKET ADJUSTMENT

NOT TO SCALE

File: ReDoc/TR/Signals/Web/Sp Det/Fin/SIG301A.dgn Rev- 02/16/17

MDOT Michigan Department of Transportation

PREPARED BY TRAFFIC AND SAFETY

DRAWN BY: JEV

CHECKED BY:

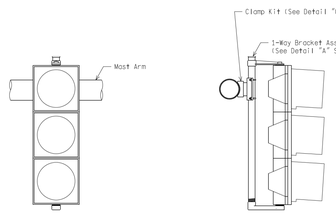
ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

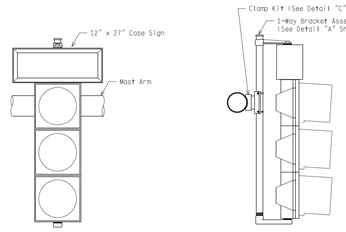
MAST ARM MOUNTED T.S. BRACKET ASSEMBLY

PLAN DATE | SIG-301-A | SHEET 1 of 7



FRONT VIEW SIDE VIEW

1W-3C



FRONT VIEW SIDE VIEW

1W-3C With 12" x 27" Case Sign

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE

File: ReDoc/TR/Signals/Web/Sp Det/Fin/SIG301A.dgn Rev- 02/16/17

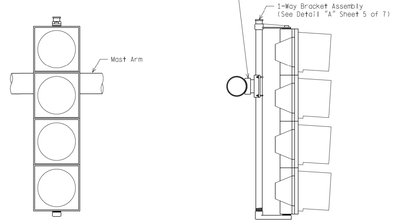
PLAN DATE | SIG-301-A | SHEET 2 of 7

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

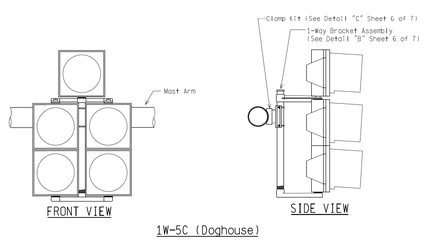
MDOT Michigan Department of Transportation

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FRONT VIEW SIDE VIEW

1W-4C (FYA)



FRONT VIEW SIDE VIEW

1W-5C (Doghouse)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE

File: ReDoc/TR/Signals/Web/Sp Det/Fin/SIG301A.dgn Rev- 02/16/17

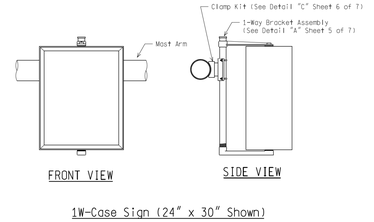
PLAN DATE | SIG-301-A | SHEET 3 of 7

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

FILE: | DATE: | DESIGN UNIT: | TSC: | CS: | JN: | DRAWING | SHEET



FRONT VIEW SIDE VIEW

1W-Case Sign (24" x 30" Shown)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE

File: ReDoc/TR/Signals/Web/Sp Det/Fin/SIG301A.dgn Rev- 02/16/17

PLAN DATE | SIG-301-A | SHEET 4 of 7

PRIME CONSULTANT

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: I7081

STATUS: 60% Construction Documents

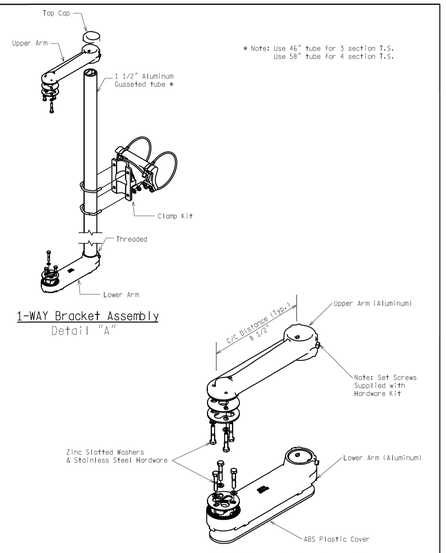
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

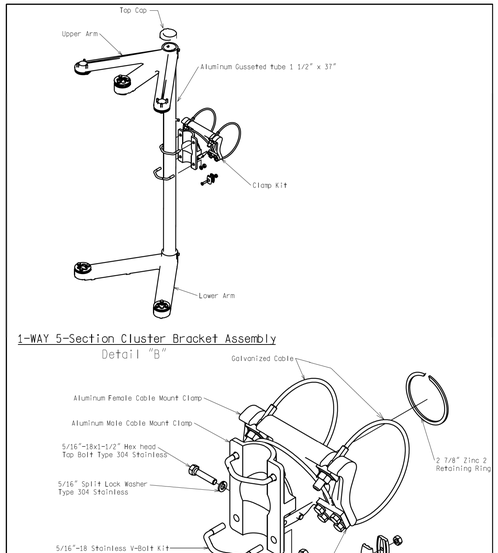
Sheet Title: SIGNAL DETAILS

Sheet No: T915



1-WAY Bracket Assembly
Detail "A"

1-WAY Bracket Arm Assembly



1-WAY 5-Section Cluster Bracket Assembly
Detail "B"

Aluminum Clamp With Galvanized Cable
Detail "C"

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-301-A	SHEET 5 of 7
File: RefDoc/TR/Signals/Web/Sp Det/FIn/SIG301A.dgn Rev: 02/16/17		PLAN DATE		

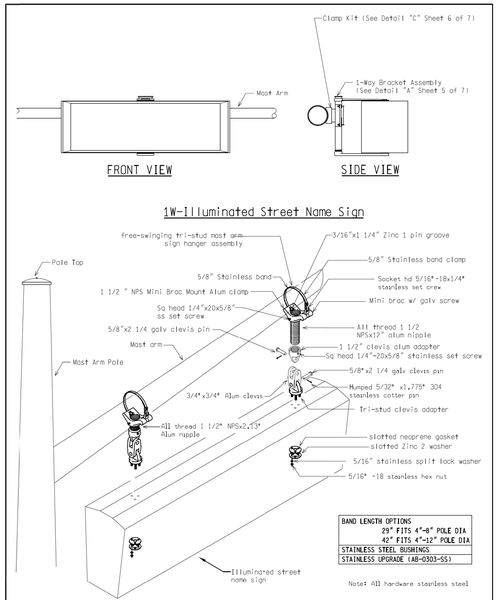
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File: RefDoc/TR/Signals/Web/Sp Det/FIn/SIG301A.dgn Rev: 02/16/17		PLAN DATE		

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

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	DESIGN UNIT:	JN:		
	TSC:			



1W-Illuminated Street Name Sign

2W-Illuminated Street Name Sign

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		SIG-301-A	SHEET 7 of 7
File: RefDoc/TR/Signals/Web/Sp Det/FIn/SIG301A.dgn Rev: 02/16/17		PLAN DATE		

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

FILE:	DATE:	CS:	DRAWING	SHEET
	DESIGN UNIT:	JN:		
	TSC:			

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

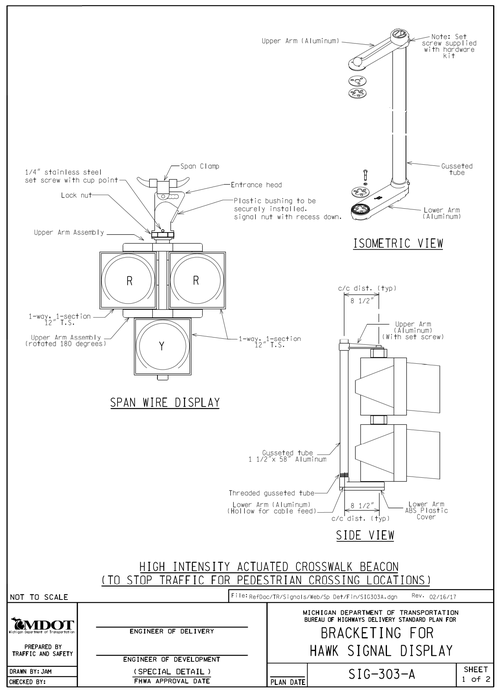
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SIGNAL DETAILS

Sheet No: T916



HIGH INTENSITY ACTUATED CROSSWALK BEACON
(TO STOP TRAFFIC FOR PEDESTRIAN CROSSING LOCATIONS)

NOT TO SCALE

File:\ReDoc/TR/Signals/Web/Sp Det/FInr/SIG303A.dgn Rev- 02/16/17

MDOT — PREPARED BY TRAFFIC AND SAFETY

DRAWN BY: JAM

CHECKED BY:

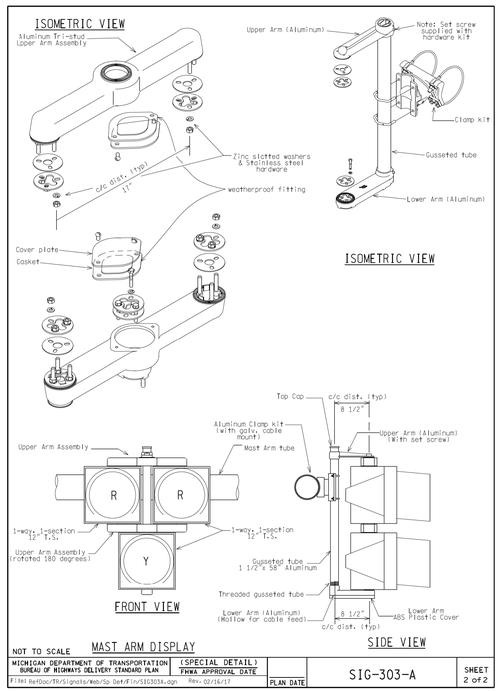
ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT
(SPECIAL DETAIL)
FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

BRACKETING FOR HAWK SIGNAL DISPLAY

PLAN DATE | SIG-303-A | SHEET 1 of 2



MAST ARM DISPLAY

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)
FHWA APPROVAL DATE

File:\ReDoc/TR/Signals/Web/Sp Det/FInr/SIG303A.dgn Rev- 02/16/17

PLAN DATE | SIG-303-A | SHEET 2 of 2

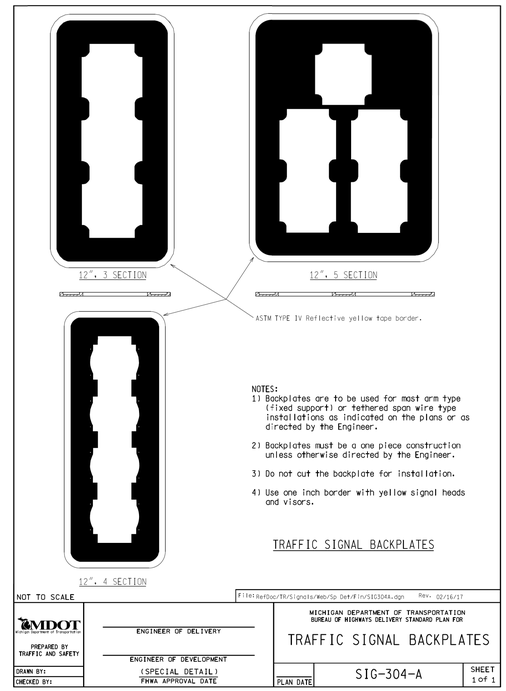
AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT

DATE:
DESIGN UNIT:
FILE:
TSC:
CS:
JN:

DRAWING	SHEET



NOTES:
1) Backplates are to be used for mast arm type (fixed support) or tethered span wire type installations as indicated on the plans or as directed by the Engineer.

2) Backplates must be a one piece construction unless otherwise directed by the Engineer.

3) Do not cut the backplate for installation.

4) Use one inch border with yellow signal heads and visors.

TRAFFIC SIGNAL BACKPLATES

NOT TO SCALE

File:\ReDoc/TR/Signals/Web/Sp Det/FInr/SIG304A.dgn Rev- 02/16/17

MDOT — PREPARED BY TRAFFIC AND SAFETY

DRAWN BY:

CHECKED BY:

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT
(SPECIAL DETAIL)
FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

TRAFFIC SIGNAL BACKPLATES

PLAN DATE | SIG-304-A | SHEET 1 of 1

AS-LET PLAN REVISIONS

NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT

DATE:
DESIGN UNIT:
FILE:
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JN:

DRAWING	SHEET

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

DATE:
21 December 2018

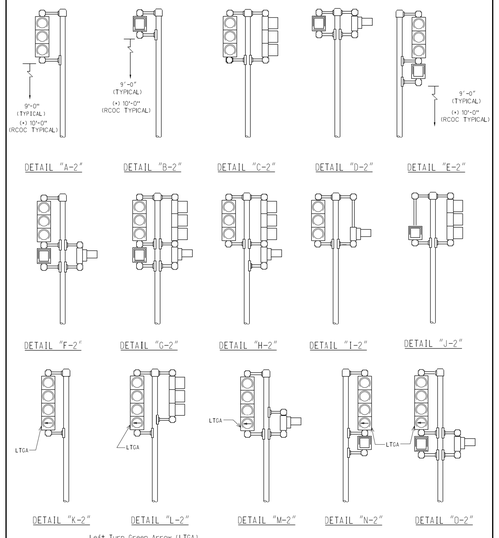
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

Sheet No:
T917

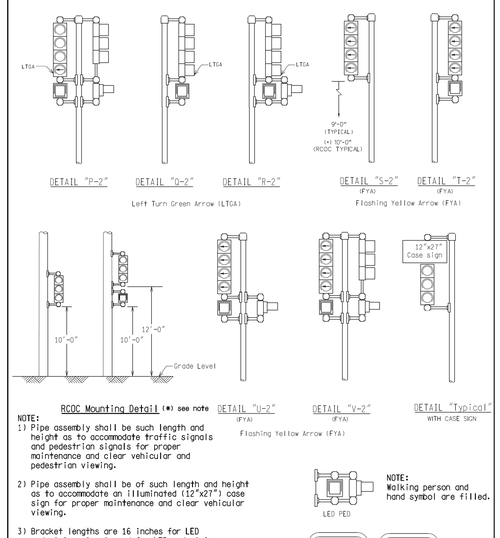
(*) Refer to Note 4 on Sheet 2 of 2.



NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/FinSIG330A.dgn Rev. 02/16/17

PREPARED BY TRAFFIC AND SAFETY DRAWN BY: CHECKED BY:	ENGINEER OF DELIVERY ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR PEDESTAL MOUNTED SIGNAL DISPLAYS PLAN DATE: SIG-330-A SHEET 1 of 2



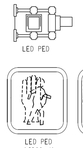
NOTE:
1) Pipe assembly shall be such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

3) Bracket lengths are 16 inches for LED pedestrian signals and for LED pedestrian countdown signals.

4) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCOC mounting detail.



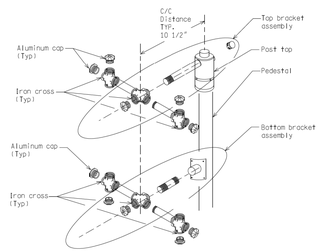
NOTE:
Walking person and hand symbol are filled.

NOT TO SCALE

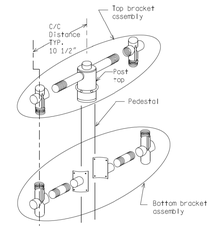
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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-330-A SHEET 2 of 2

AS-LET PLAN REVISIONS								DATE:	CS:	DRAWING	
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION	DESIGN UNIT:	JN:	SHEET	
								FILE:	TSC:		



SIGNAL MOUNTING HARDWARE FOR BACKSIDE BRACKET



SIGNAL MOUNTING HARDWARE - STANDARD BRACKET

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/FinSIG331A.dgn Rev.

PREPARED BY TRAFFIC AND SAFETY DRAWN BY: DSP CHECKED BY:	ENGINEER OF DELIVERY ENGINEER OF DEVELOPMENT FHWA APPROVAL DATE	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR PEDESTAL MOUNTING FOR SIGNALS 02/16/17 PLAN DATE: SIG-331-A SHEET 1 of 1

AS-LET PLAN REVISIONS								DATE:	CS:	DRAWING	
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION	DESIGN UNIT:	JN:	SHEET	
								FILE:	TSC:		

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

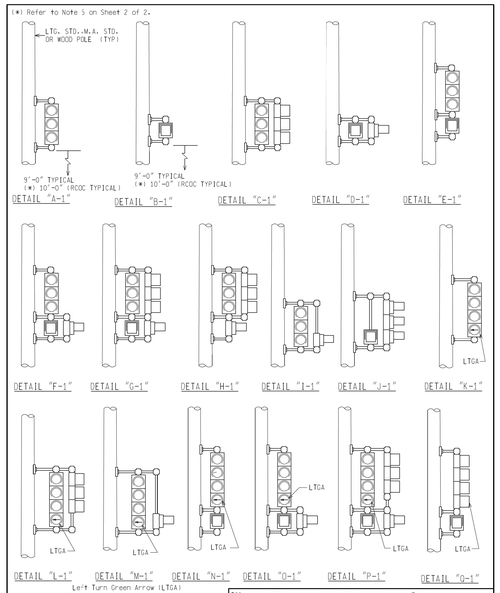
DATE:
21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title
SIGNAL DETAILS

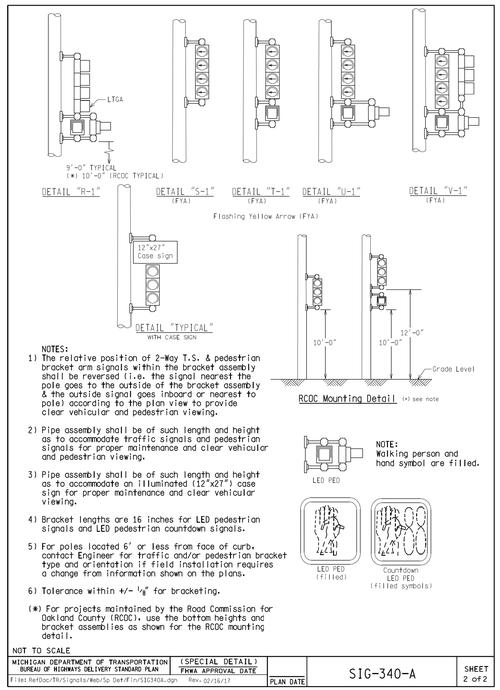
Sheet No:
T918



NOT TO SCALE

File: RwDocs/TR/Signals/WebSp Det/FIn/SIG340A.dgn Rev. 02/16/17

MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR POLE MOUNTED SIGNAL DISPLAYS
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-340-A SHEET 1 of 2
DRAWN BY: CHECKED BY:		



NOTES:

1) The relative position of 2-Way T.S. & pedestrian bracket arm signals within the bracket assembly shall be reversed (i.e. the signal nearest the pole goes to the outside of the bracket assembly & the outside signal goes inboard or nearest to pole) according to the plan view to provide clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

3) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

4) Bracket lengths are 16 inches for LED pedestrian signals and LED pedestrian countdown signals.

5) For poles located 6' or less from face of curb, contact Engineer for traffic and/or pedestrian bracket type and orientation if field installation requires a change from information shown on the plans.

6) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCOC mounting detail.

NOT TO SCALE

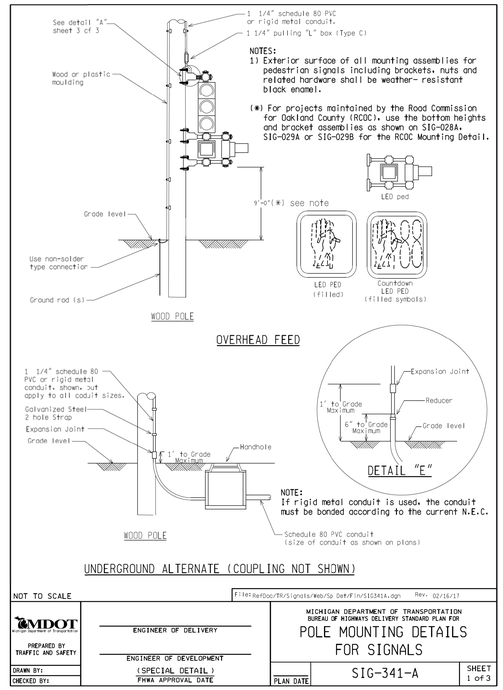
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-340-A SHEET 2 of 2

File: RwDocs/TR/Signals/WebSp Det/FIn/SIG340A.dgn Rev. 02/16/17

AS-LET PLAN REVISIONS								DRAWING	SHEET
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MDOT

FILE:	DESIGN UNIT: TSC:	CS: JN:	



NOTES:

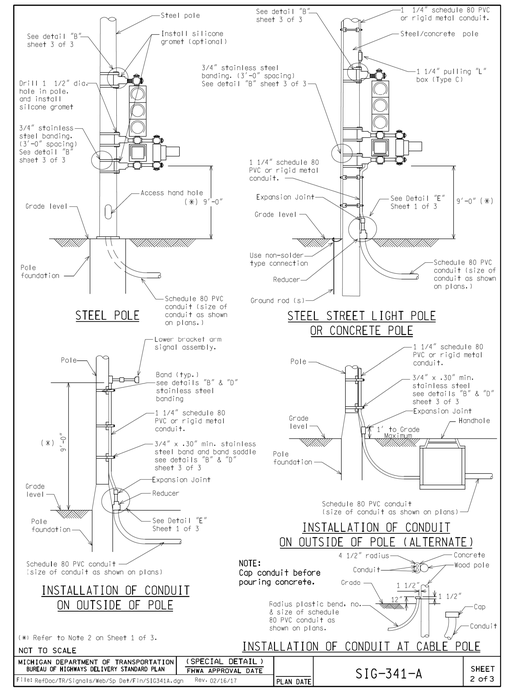
1) Exterior surface of all mounting assemblies for pedestrian signals including brackets, nuts and related hardware shall be weather- resistant black enamel.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown on SIG-028A, SIG-029A or SIG-029B for the RCOC Mounting Detail.

NOT TO SCALE

File: RwDocs/TR/Signals/WebSp Det/FIn/SIG341A.dgn Rev. 02/16/17

MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR POLE MOUNTING DETAILS FOR SIGNALS
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-341-A SHEET 1 of 3
DRAWN BY: CHECKED BY:		



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MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE: SIG-341-A SHEET 2 of 3

AS-LET PLAN REVISIONS								DRAWING	SHEET
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION		

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

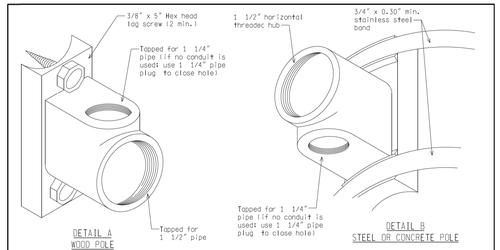
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

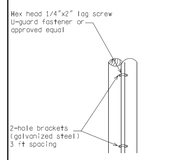
Sheet Title: SIGNAL DETAILS

Sheet No: T919

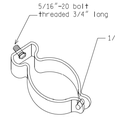


DETAIL A
WOOD POLE

DETAIL B
STEEL OR CONCRETE POLE



DETAIL C
TYPICAL CONDUIT ATTACHMENT
TO WOOD POLE



HANGER
To fit conduit size hanger as called for on plans. (zinc plated)



BANDING SADDLE

DETAIL D
TYPICAL CONDUIT ATTACHMENT
TO STEEL OR CONCRETE POLE.

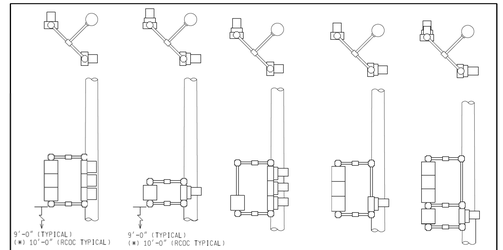
NOTES:
1) Install 3/4" x 10'-0" copper clad ground rod (s) as required to provide less than 10 ohm resistance to ground. Install #6 min. copper wires from ground rod (s) to span wire at each supporting pole using non-solder type connections for span wire ground.

2) Use conduit size specified (min.) unless current N.E.C. indicates a larger size is required.

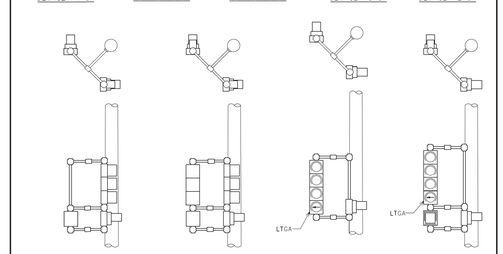
NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		PLAN DATE	SIG-341-A	SHEET 3 of 3

File: RefDoc/TR/Signals/Web/Sp Det/Fin/SIG341A.dgn Rev: 02/16/17



DETAIL "A-3" | DETAIL "B-3" | DETAIL "C-3" | DETAIL "D-3" | DETAIL "E-3"



DETAIL "F-3" | DETAIL "G-3" | DETAIL "H-3" | DETAIL "I-3"

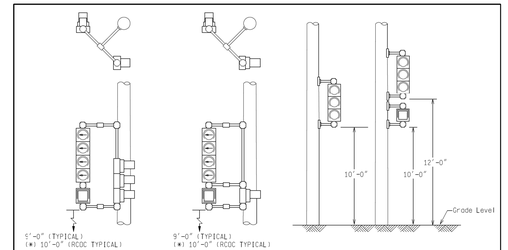
Left Turn Green Arrow (LTGA)

(*) Refer to Note 5 on Sheet 2 of 2.

NOT TO SCALE

File: RefDoc/TR/Signals/Web/Sp Det/Fin/SIG342A.dgn Rev: 02/16/17

MDOT	ENGINEER OF DELIVERY	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR BACK BRACKET SIGNAL DISPLAYS	
PREPARED BY TRAFFIC AND SAFETY	ENGINEER OF DEVELOPMENT (SPECIAL DETAIL) FHWA APPROVAL DATE	PLAN DATE	SIG-342-A	SHEET 1 of 2
DRAWN BY:				
CHECKED BY:				



DETAIL "J-3" (FYA) | DETAIL "K-3" (FYA)

RCOC Mounting Detail (*) see note

Flashing Yellow Arrow (FYA)



LED PED

NOTES: Walking person and hand symbol are filled.



LED PED (filled)



Countdown LED PED (filled symbols)

NOTES:
1) The relative position of 2-Way T.S. & pedestrian bracket arm signals within the bracket assembly shall be reversed (i.e. the signal nearest the pole goes to the outside of the bracket assembly & the outside signal goes inboard or nearest to pole) according to the plan view to provide clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

3) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

4) Bracket lengths are 16 inches for LED pedestrian signals and LED pedestrian countdown signals.

6) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCOC mounting detail.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE		PLAN DATE	SIG-342-A	SHEET 2 of 2

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

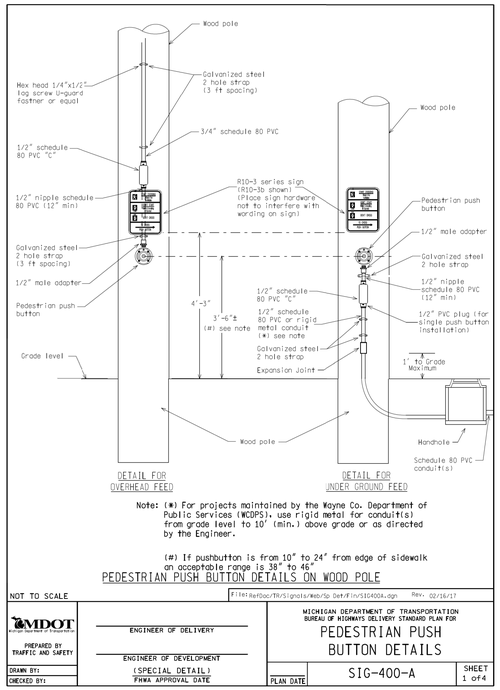
DATE: 21 December 2018

REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SIGNAL DETAILS

Sheet No: T920



Note: (*) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

(#) If pushbutton is from 10" to 24" from edge of sidewalk an acceptable range is 38" to 46"

PEDESTRIAN PUSH BUTTON DETAILS ON WOOD POLE

NOT TO SCALE

File: RefDoc/TR/Signals/Mod/Sp Det/F/n/S1C400A.dgn Rev. 02/16/17

MDOT Michigan State Department of Transportation

PREPARED BY TRAFFIC AND SAFETY

DRAWN BY:

CHECKED BY:

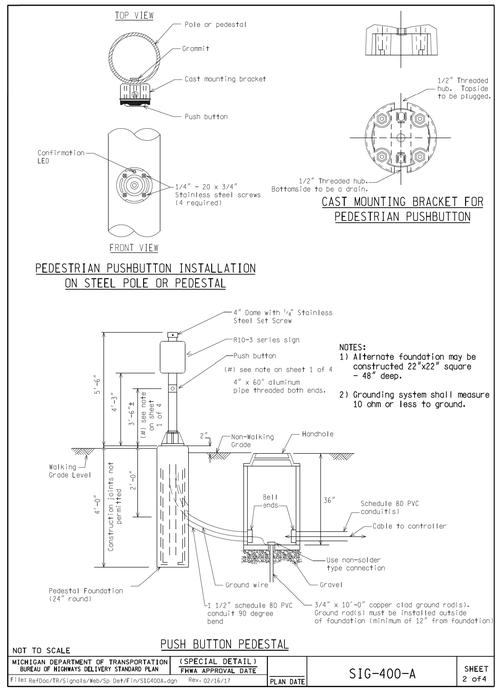
ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL) FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
PEDESTRIAN PUSH BUTTON DETAILS

PLAN DATE | SIG-400-A | SHEET 1 of 4



CAST MOUNTING BRACKET FOR PEDESTRIAN PUSHBUTTON

PEDESTRIAN PUSHBUTTON INSTALLATION ON STEEL POLE OR PEDESTAL

NOTES:
1) Alternate foundation may be constructed 22"x22" square - 48" deep.
2) Grounding system shall measure 10 ohm or less to ground.

PUSH BUTTON PEDESTAL

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-400-A | SHEET 2 of 4

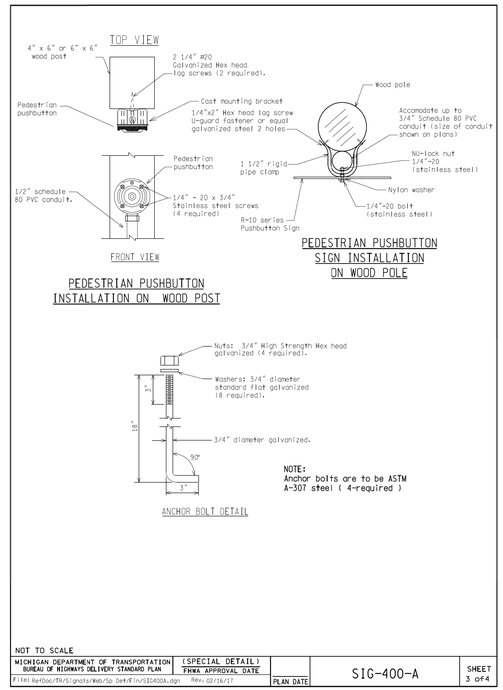
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PEDESTRIAN PUSHBUTTON INSTALLATION ON WOOD POST

PEDESTRIAN PUSHBUTTON SIGN INSTALLATION ON WOOD POLE

NOTE:
Anchor bolts are to be ASTM A-307 steel (4-required)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-400-A | SHEET 3 of 4

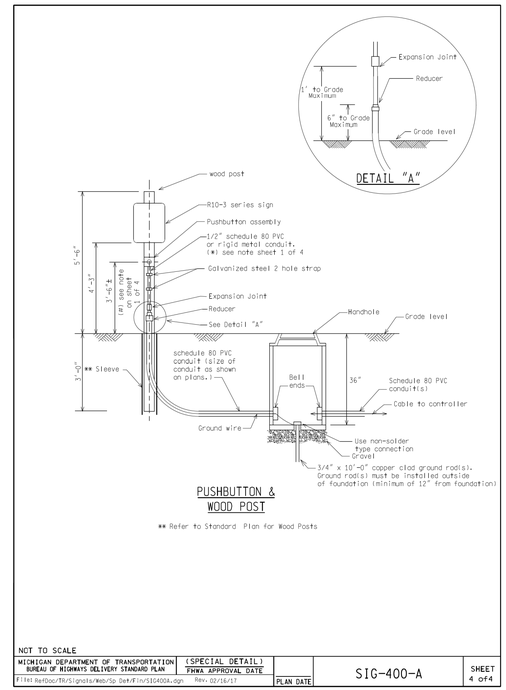
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PUSHBUTTON & WOOD POST

** Refer to Standard Plan for Wood Posts

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE | PLAN DATE | SIG-400-A | SHEET 4 of 4

File: RefDoc/TR/Signals/Mod/Sp Det/F/n/S1C400A.dgn Rev. 02/16/17

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 60% Construction Documents

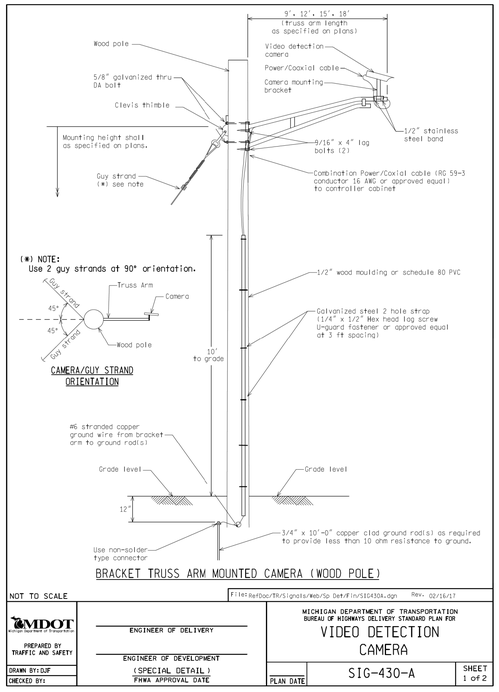
DATE: 21 December 2018

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NO.	DESCRIPTION	BY	APPV'D	DATE

Sheet Title: SIGNAL DETAILS

Sheet No: T921



BRACKET TRUSS ARM MOUNTED CAMERA (WOOD POLE)

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MDOT — PREPARED BY TRAFFIC AND SAFETY

DRAWN BY: DJF

CHECKED BY:

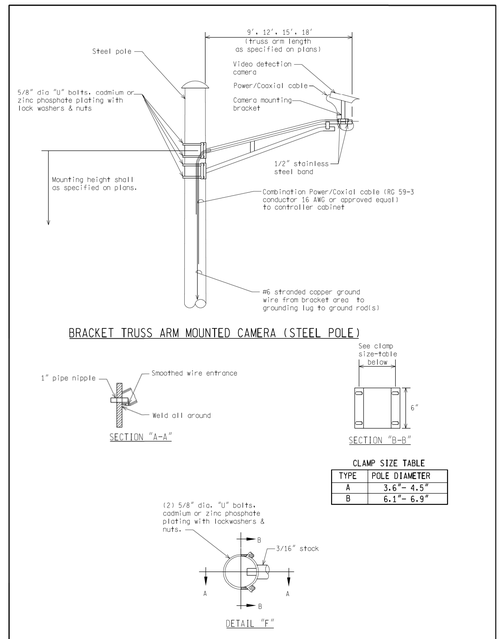
ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)
FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
VIDEO DETECTION
CAMERA

PLAN DATE | SIG-430-A | SHEET 1 of 2



BRACKET TRUSS ARM MOUNTED CAMERA (STEEL POLE)

CLAMP SIZE TABLE

TYPE	POLE DIAMETER
A	3.6" - 4.5"
B	6.1" - 6.9"

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN | (SPECIAL DETAIL) FHWA APPROVAL DATE

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PLAN DATE | SIG-430-A | SHEET 2 of 2

AS-LET PLAN REVISIONS

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PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT, MI

NOT FOR CONSTRUCTION

SMM PROJECT No:
17081

STATUS:
60% Construction Documents

DATE:
21 December 2018

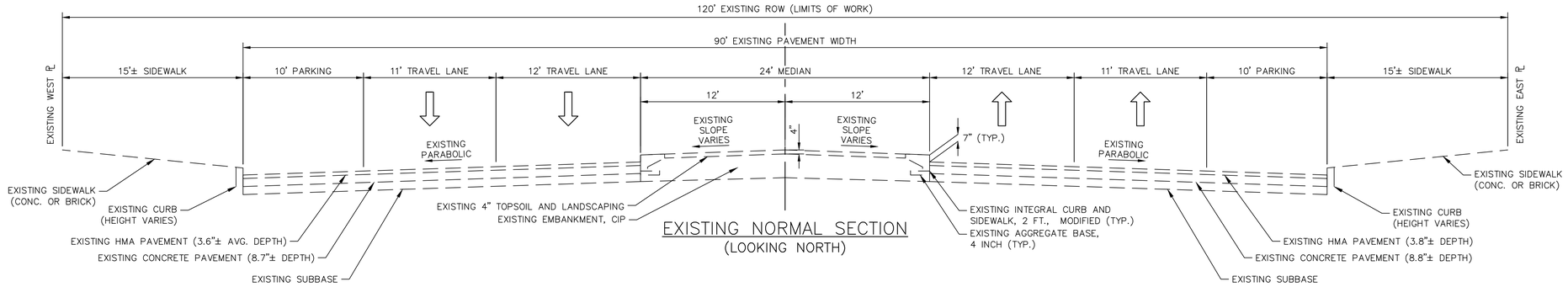
REVISION

NO.	DESCRIPTION	BY	APPV'D	DATE

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SIGNAL DETAILS

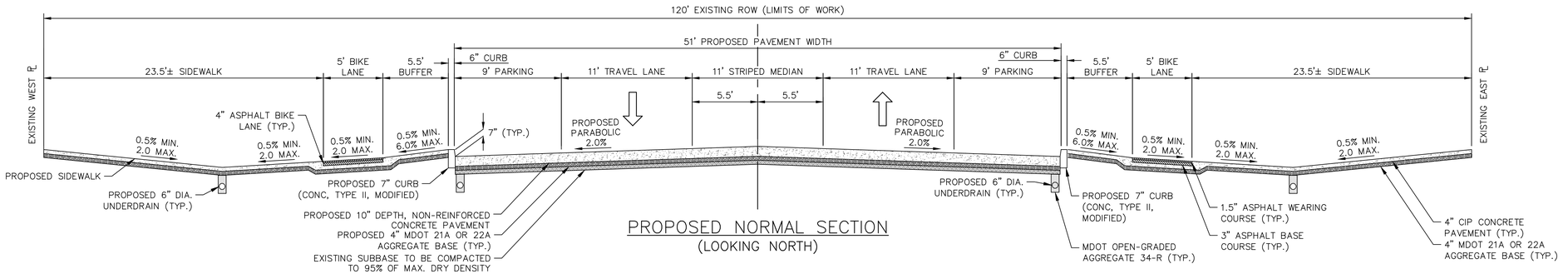
Sheet No:
T922

LIVERNOIS AVE CONSTRUCTION ℄



EXISTING NORMAL SECTION
(LOOKING NORTH)

LIVERNOIS AVE CONSTRUCTION ℄



PROPOSED NORMAL SECTION
(LOOKING NORTH)

NOTES

1. EXISTING RIGHT-OF-WAY (ROW) WIDTH ACROSS LIVERNOIS AVENUE IS 120' THROUGHOUT AREA OF PROJECT SCOPE
2. FOR CURB AND JOINT DETAILS, SEE SHEETS C007-C008.
3. SEE LANDSCAPE PLANS FOR SIDEWALK DETAILS

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NTH Project No.
61-170118

PROJECT

LIVERNOIS STREETSCAPE

LIVERNOIS AVENUE, DETROIT

NOT FOR CONSTRUCTION

SMM PROJECT No: 17081

STATUS: 90% Design

DATE: 26 February 2019

REVISION

NO.	DESCRIPTION	DATE

Sheet Title

GENERAL PAVEMENT CROSS-SECTIONS

Sheet No:

C002

J:\2017\61\170118\production sets\livernois streetscape\170118--roadway_sections.dwg Plotted: 2/21/2019 10:50 AM by bbostock

NTH Consultants, Ltd.

Infrastructure Engineering
and Environmental Services

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Mr. Wes Michaels
Spackman Mossop Michaels, LLC
440 Burroughs Street Suite 696
Detroit, MI 48202

December 4, 2018
NTH Project No. 61-170118-04

Re: Report on Geotechnical Investigation
Livernois Avenue Streetscape
Detroit, Michigan

Dear Mr. Michaels:

NTH Consultants, Ltd. (NTH) is pleased to submit this geotechnical investigation report for the proposed streetscape project on Livernois Avenue extending between 8 Mile Road and Margareta Avenue in Detroit, Michigan. The purpose of the investigation was to measure the existing pavement thicknesses and evaluate the subgrade soil conditions along the existing roadway and under the existing median. This investigation was performed in accordance with our approved geotechnical scope of services revised September 26, 2018.

PROJECT DESCRIPTION AND SITE DESCRIPTION

Livernois Avenue through the project area consists of two travel lanes and a parking lane both northbound and southbound separated by a center median. The existing median is enclosed by a raised curb and is generally grass-covered with isolated planting beds. Water, sewer, traffic control, and landscape irrigation utilities are located within the median footprint. The existing pavement surface is gently sloped for drainage.

The streetscape project includes removal of the existing median, installation of two travel lanes and a center left turn/emergency passing lane in the previous median area and adjacent driving lanes, removal of the existing curb/parking lane, and expansion of the sidewalk into the previous curb/parking lane.

FIELD INVESTIGATION

Field work for the geotechnical exploration was conducted between November 5 and 9, 2018. Prior to performing the exploration, Right of Entry and Right of Way permit applications were filed with the appropriate City of Detroit Departments. Following receipt of the permits, underground utility clearances were obtained through the Michigan one-call utility locating center (MISS DIG). A mobile lane closure was set up on a daily basis in accordance with the 2005 Michigan Manual of Uniform Traffic Control Devices (MMUTCD) as well as the most recent Maintaining Traffic Typicals (2011 version with 2013 updates) by MDOT. One lane of traffic was maintained at all times during the investigation.

The field investigation was conducted at six separate cross sections numbered from one to six from north to south along the alignment. At each cross section, pavement cores and DCP tests were performed in the inner northbound and southbound travel lanes adjacent to the median. Additional cores were obtained in the outer travel lanes alternating northbound and southbound. As such, subsurface conditions beneath the existing pavement was explored by coring eighteen (18) 6-inch pavement cores at locations designated as TB-1A through TB-6A (southbound), TB-1B through TB-6B (northbound), and TB-1C through TB-6C (alternating). Twelve dynamic cone penetrometer (DCP) tests were performed at TB-1A through TB-6A and TB-1B through TB-6B to determine the consistency of the subgrade directly under the pavement. Proposed pavement subgrade conditions at the proposed location of the new travel lanes were investigated by the drilling of six soil borings (TB-1 through TB-6) extending to 5 feet below existing grade in the center median. Approximate test locations are indicated on Figure No. 1, Geotechnical Investigation Plan. General Notes defining the nomenclature used to describe the encountered soil materials and testing procedures are presented as Figure No. 2.

Within the test borings, soil samples were taken at intervals of 2.5 ft and at 5 ft. These samples were obtained using a 1⅜-inch inside-diameter, split-barrel sampler and the Standard Penetration Test (SPT) method (ASTM D 1586). The SPT method (ASTM D 1586) consists of driving a 2-inch outside-diameter split-spoon sampler into the soil with a 140-lb weight falling freely through a distance of 30 inches. The sampler is generally driven three successive 6-inch increments, with the number of blows for each increment being recorded. The number of blows required to advance the sampler the second and third increments is termed the Standard Penetration Resistance (N-value). As added information, the blow counts for each 6-inch increment are presented on the test boring logs. The split barrel sampler used to procure the samples generally contains a 1 3/8-inch inside-diameter, 3-inch long liner insert. Soil borings within the median were backfilled with soil cuttings from the drill holes.

The soil samples recovered from the test borings were sealed in containers and transported to our laboratory for further classification and testing. We will retain the soil samples for a period of 60 days after the date of this report. At that time, we will dispose of the samples unless we are otherwise instructed.

Soil and groundwater conditions encountered in the test borings have been evaluated and are shown on the individual Logs of Test Boring, attached as Figure Nos. 3 through 8. The stratification shown on the test boring logs represents the subsurface conditions at the actual boring locations. Variations may occur between and away from the borings. Additionally, the stratigraphic lines represent the approximate boundary between soil types; however, the transition may be more gradual than what is shown. We have prepared the logs included with this report on the basis of field classification supplemented by laboratory testing.

A 6-inch diameter core barrel was used to obtain the pavement cores. Following removal of cores, we performed a Dynamic Cone Penetration test in general accordance with ASTM

D6951 in areas where existing pavement is to be maintained. Each core was photographed and measurement taken. Upon completion of the coring and DCP testing, the core holes were backfilled with the pavement core and capped with fast-setting concrete mix. Pavement Core Log and Photographs are provided in Figure No. 9. The DCP results are provided as Figure Nos. 10 through 21.

LABORATORY TESTING

Representative soil samples obtained during the field investigation were subjected to laboratory testing to evaluate pertinent engineering characteristics of the subsoils. Mechanical sieve analysis was performed on selected soil samples to determine the grain size distribution. The results of these tests are presented on the Grain Size Distribution curves, Figure Nos. 22 through 25.

EXISTING PAVEMENT THICKNESS

The existing pavement sections generally consist of 2.75 inches to 5.0 inches of hot mix asphalt (HMA) underlain by 5.75 inches to 10.5 inches of concrete base. The total pavement section ranged from 10.5 to 14.25 inches in thickness. No reinforcement was found in the concrete pavement during the investigation. Figure No. 26, Pavement Thickness Summary, summarizes the thickness measurements at each core location and provides an average thickness for the inner and outer lanes.

SUBGRADE CONDITIONS

The materials encountered in the median soil borings are generally consisted of topsoil underlain by brown sand with minor amounts of silt and gravel. The densities range from very loose to medium compact. A review of the Grain Size Distribution curves indicates the granular soil at the proposed new pavement sub-base elevation contains from 10% to 30% fines. Using the Michigan Department of Transportation (MDOT) classification system, these materials would be designated as Class III material would not be used for structural backfill of utility trenches under roadways. A review of the USGS map of Wayne County, circa 1911, the surficial soils in the project vicinity are noted to potentially consist of glacial moraine material covered by thin lake sediments with localized beach sand deposits. Therefore, it appears the granular subgrade is native soil and not utility trench backfill. No groundwater was encountered in this investigation.

As indicated in Figure Nos. 10 through 21, CBR values varies from approximately 2 in TB-2B and TB-5B, to 100 in TB-2A and TB-1B.

SITE PREPARATION

The proposed streetscape includes removal of the existing median and a portion of the adjacent driving lane pavement. All excavated topsoil shall be removed and may be stockpiled for later use in the project in landscape areas. All excavated concrete and pavement demolition materials are not suitable for reuse in the project. Following excavation necessary for the grading of the new roadway, excavated native granular materials may be suitable for use as fill material in adjacent areas.

Any areas of exposed subgrade consisting of granular soils should be thoroughly proof compacted prior to any fill placement activities, using a heavy vibratory roller of not less than 20 tons rated weight, making a minimum of ten passes in each of two perpendicular directions. In addition to detecting unstable areas, the compaction operation will serve to densify the near surface granular deposits, thereby improving their supporting characteristics. Any areas of the subgrade that exhibit excessive pumping and yielding during the proof compaction operation should also be stabilized by aeration, drying and re-compaction (if weather conditions are favorable) or by removal of the yielding soils and their replacement with engineered fill.

PAVEMENT RECOMMENDATIONS

The construction of the new travel lanes and center lane should follow the City of Detroit Standard Specification for Paving and Related Construction dated March 2009. The granular materials found beneath the median that are free of organics and debris may be used as the pavement subbase following proof compaction.

The subgrade resulting from the satisfactory completion of backfilling and subgrade preparation can be used for the support of conventional flexible (asphalt) and concrete pavements. Assuming MDOT Class II sand is used for backfilling, a CBR value of 5 is recommended. The underlying subgrade and pavement should be properly crowned and shaped in order to provide effective surface drainage and prevent ponding. We recommend a minimum slope of 1-½ percent. In addition, we recommend that edge drains be installed along the edge of the pavement and finger drains be installed at catch basins to prevent water from infiltrating the subgrade.

Bituminous mixtures, if used, should be compacted with a machine vibrator or approved roller with each lift of base not to exceed 3 inches and the top wearing course thickness not to exceed 2 inches. The aggregate base should be a minimum of 8 inches thick and compacted to achieve a density of at least 95 percent of the maximum dry density as determined according to ASTM D1557. We recommend that a qualified representative of the Owner or Engineer be onsite during construction to test and verify conformance of the density of bedding material, backfill material and asphalt, if applicable.

We appreciate the opportunity to be of service to you. If you have any questions or require further assistance now or during the construction phase of this project, please call.

Sincerely,

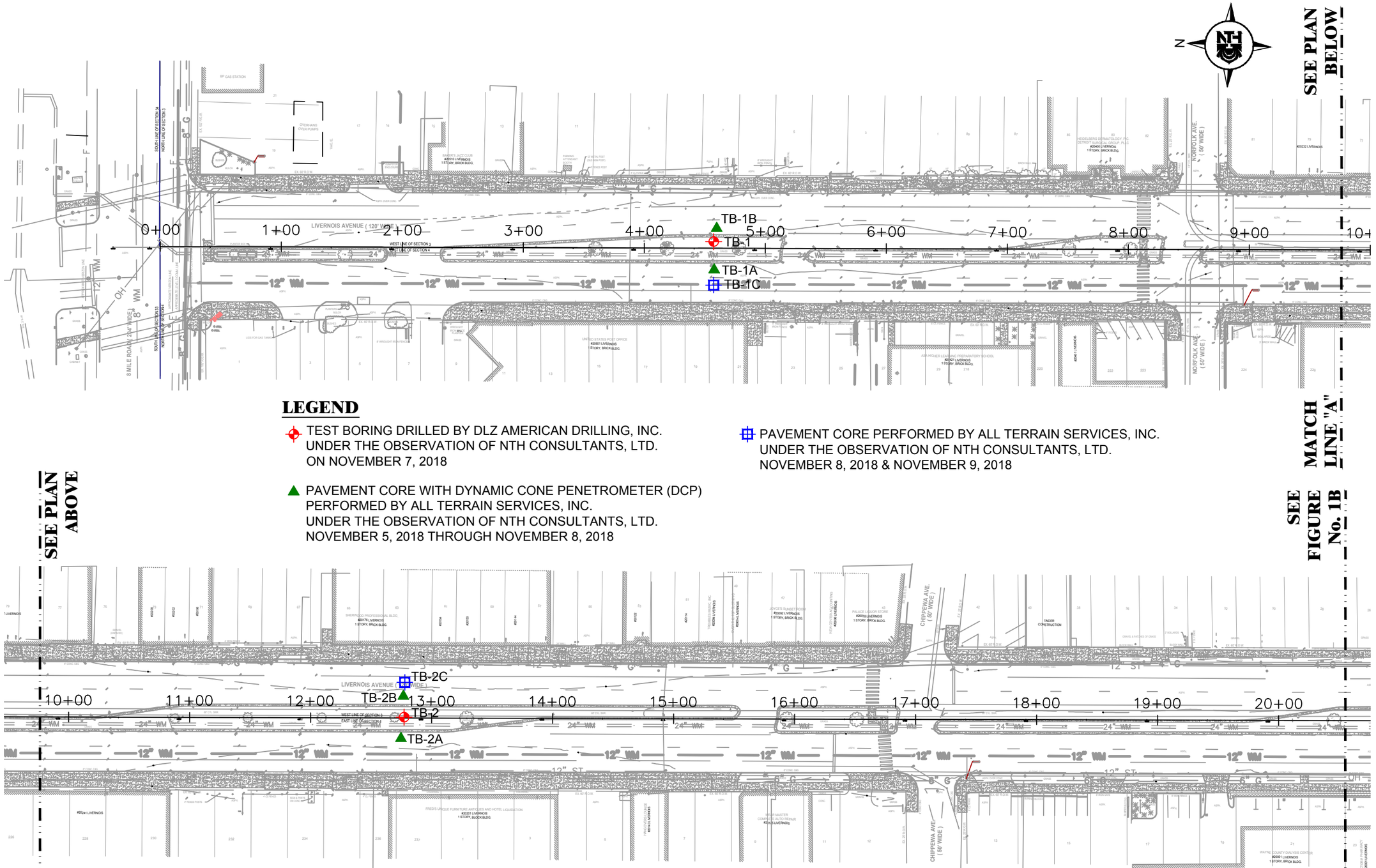
NTH Consultants, Ltd.

Linna Duan, EIT
Staff Engineer

Charles J. Roarty, Jr., P.E.
Project Manager

LD/CJR/aer

Attachments



LEGEND

- TEST BORING DRILLED BY DLZ AMERICAN DRILLING, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. ON NOVEMBER 7, 2018
- PAVEMENT CORE WITH DYNAMIC CONE PENETROMETER (DCP) PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 5, 2018 THROUGH NOVEMBER 8, 2018
- PAVEMENT CORE PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 8, 2018 & NOVEMBER 9, 2018

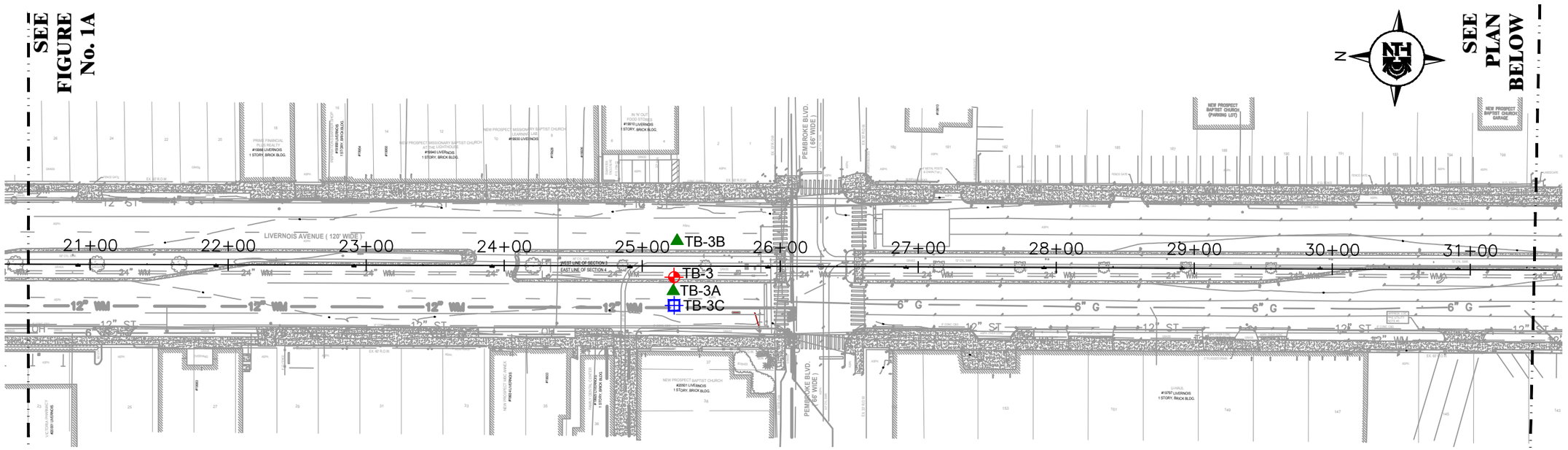
NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No.	61-170118-00
DESIGNED BY:	CJR
CAD FILE NAME:	D17011802
INCEP DATE:	26 SEP 2018
DRAWN BY:	DET
DRAWING SCALE:	1" = 80'
CHECKED BY:	CJR
PLOT DATE:	03 Dec 2018

GEOTECHNICAL INVESTIGATION PLAN (1 OF 4)

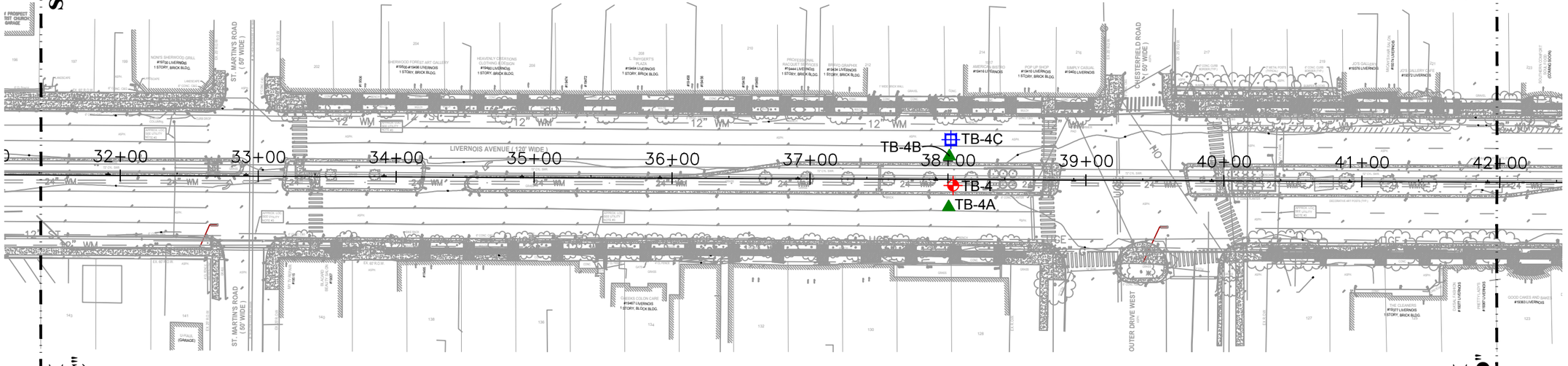
LIVERNOIS STREETSCAPE IMPROVEMENTS
DETROIT, MICHIGAN

FIGURE No.
1A



LEGEND

- TEST BORING DRILLED BY DLZ AMERICAN DRILLING, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. ON NOVEMBER 7, 2018
- PAVEMENT CORE WITH DYNAMIC CONE PENETROMETER (DCP) PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 5, 2018 THROUGH NOVEMBER 8, 2018
- PAVEMENT CORE PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 8, 2018 & NOVEMBER 9, 2018



GRAPHIC SCALE
80 0 80
1" = 80'

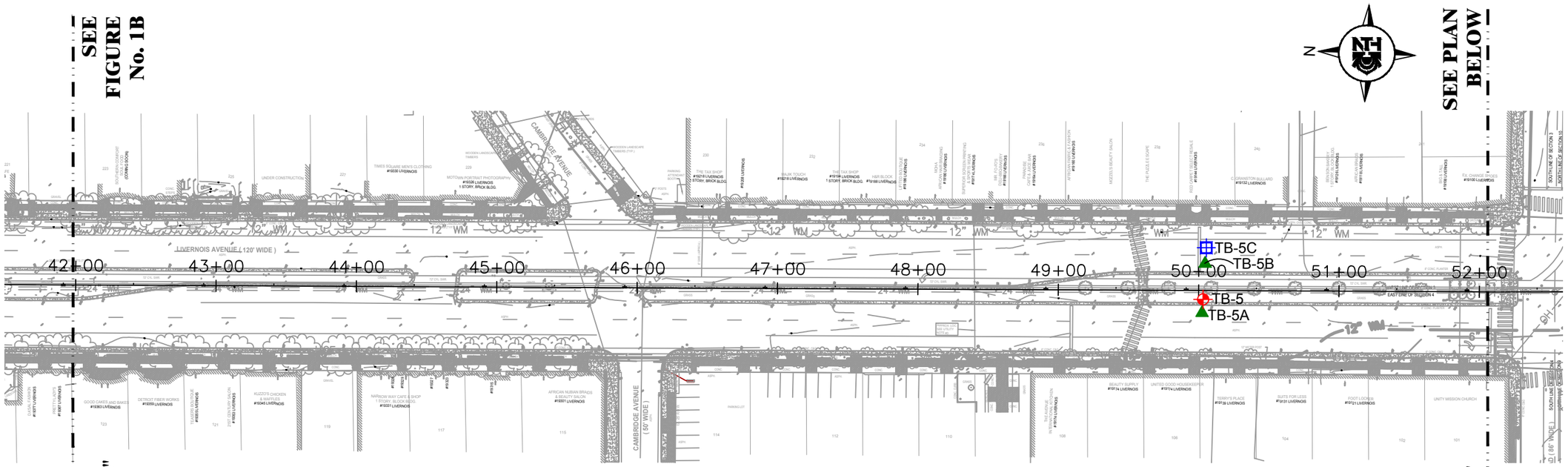
NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No:	61-170118-00
DESIGNED BY:	CJR
DRAWN BY:	DET
CHECKED BY:	CJR
CAD FILE NAME:	D17011802
INCEP DATE:	26 SEP 2018
DRAWING SCALE:	1" = 80'
PLOT DATE:	03 Dec 2018

GEOTECHNICAL INVESTIGATION PLAN (2 OF 4)

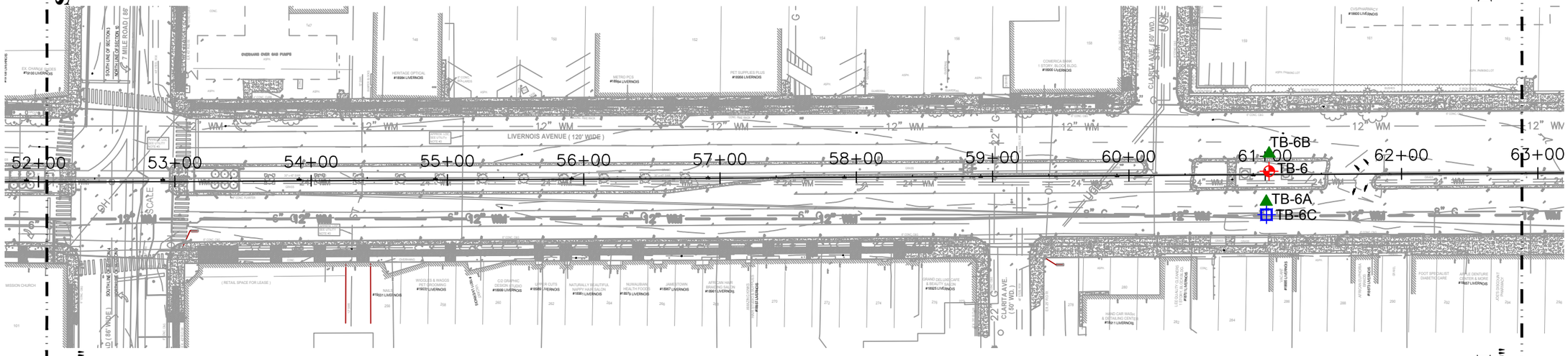
LIVERNOIS STREETSCAPE IMPROVEMENTS
DETROIT, MICHIGAN

FIGURE No.
1B



LEGEND

- TEST BORING DRILLED BY DLZ AMERICAN DRILLING, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. ON NOVEMBER 7, 2018
- PAVEMENT CORE WITH DYNAMIC CONE PENETROMETER (DCP) PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 5, 2018 THROUGH NOVEMBER 8, 2018
- PAVEMENT CORE PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 8, 2018 & NOVEMBER 9, 2018



GRAPHIC SCALE
80 0 80
1" = 80'

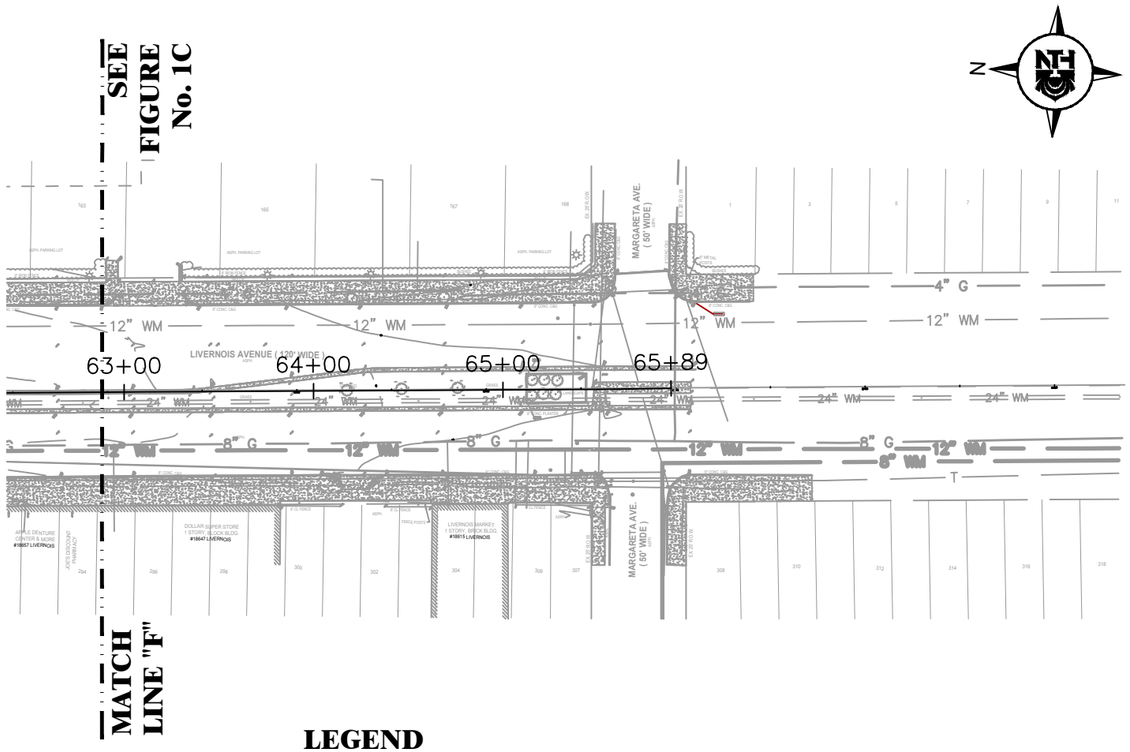
NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No.	61-170118-00
CAD FILE NAME:	D17011802
DESIGNED BY:	CJR
INCEP DATE:	26 SEP 2018
DRAWN BY:	DET
DRAWING SCALE:	1" = 80'
CHECKED BY:	CJR
PLOT DATE:	03 Dec 2018

GEOTECHNICAL INVESTIGATION PLAN (3 OF 4)

LIVERNOIS STREETSCAPE IMPROVEMENTS
DETROIT, MICHIGAN

FIGURE No.
1C



LEGEND

- TEST BORING DRILLED BY DLZ AMERICAN DRILLING, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. ON NOVEMBER 7, 2018
- PAVEMENT CORE WITH DYNAMIC CONE PENETROMETER (DCP) PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 5, 2018 THROUGH NOVEMBER 8, 2018
- PAVEMENT CORE PERFORMED BY ALL TERRAIN SERVICES, INC. UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. NOVEMBER 8, 2018 & NOVEMBER 9, 2018

GRAPHIC SCALE
80 0 80
1" = 80'

NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No:	61-170118-00
DESIGNED BY:	CJR
DRAWN BY:	DET
CHECKED BY:	CJR
CAD FILE NAME:	D17011802
INCEP DATE:	26 SEP 2018
DRAWING SCALE:	1" = 80'
PLOT DATE:	03 Dec 2018

GEOTECHNICAL INVESTIGATION PLAN
(4 OF 4)

LIVERNOIS STREETSCAPE IMPROVEMENTS
DETROIT, MICHIGAN

FIGURE No.
1D

NTH Consultants, Ltd.

GENERAL NOTES

TERMINOLOGY

Unless otherwise noted, all terms utilized herein refer to the Standard Definitions presented in ASTM D 653.

PARTICLE SIZES

Boulders	-	Greater than 12 inches (305mm)
Cobble	-	3 inches (76.2mm) to 12 inches (305mm)
Gravel - Coarse	-	3/4 inches (19.05mm) to 3 inches (76.2mm)
Fine	-	No. 4 - 3/16 inches (4.75) to 3/4 inches (19.05mm)
Sand - Coarse	-	No. 10 (2.00mm) to No. 4 (4.75mm)
Medium	-	No. 40 (0.425mm) to No. 10 (2.00mm)
Fine	-	No. 200 (0.074mm) to No. 40 (0.425mm)
Silt	-	0.005mm to 0.074mm
Clay	-	Less than 0.005mm

CLASSIFICATION

The major soil constituents is the principal noun, i.e., clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituents (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35% (clayey, silty, etc.)	Little - 12 to 23%
And - Over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modified; i.e., silty clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils; i.e., silty clay, trace of sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1000	3 - 4
Medium	1000 - 2000	5 - 8
Stiff	2000 - 4000	9 - 15
Very Stiff	4000 - 8000	16 - 30
Hard	8000 - 16000	31 - 50
Very Hard	Over 16000	Over - 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS	-	Auger Sample - directly from auger flight
BS	-	Miscellaneous Sample - bottle or bag
S	-	Split Spoon Sample - ASTM D 1586
LS	-	Split Spoon Sample S with Liner Insert 3 inches in length
ST	-	Shelby Tube Sample - 3 inch diameter unless otherwise noted
PS	-	Piston Sample - 3 inch diameter unless otherwise noted
RC	-	Rock Core - NX core unless otherwise noted
CS	-	Continuous Sample - from rock core barrel or continuous sampling device

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0" outside-diameter, 1-3/8" inside-diameter, split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

LOG OF TEST BORING NO: TB-1

NTH Consultants, Ltd.

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan
NTH Proj. No.: 61-170118-04
Checked By: CDN

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 175.4	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
175		174.4	TOPSOIL	1.0									
			Medium Compact Brown SAND, Trace Silt			LS-1	3 7 6	13	9				
		172.4		3.0									
			Very Loose Brown SAND, Trace Silt			LS-2	3 2 2	4	9				
		170.4		5.0	5								
170			END OF BORING AT 5.0 FEET.										
165													
160													
155													
150													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 3

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

LOG OF TEST BORING NO: TB-2

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-170118-04
Checked By: CDN

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 173.9	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		172.7	TOPSOIL	1.2									
			Loose to Medium Compact Brown SAND, Trace Silt and Gravel			LS-1	4 6 7	13	10				
170													
		168.9		5.0	5	LS-2	2 3 4	7	9				
			END OF BORING AT 5.0 FEET.										
165													
160													
155													
150													
145													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 4

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

LOG OF TEST BORING NO: TB-3

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-170118-04
Checked By: CDN

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 175.1	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
175		174.1	TOPSOIL	1.0									
			Very Loose Brown SAND, Trace Silt and Gravel			LS-1	2 3 2	5	11				
170		170.1		5.0	5	LS-2	1 WOH 2	2	12				
			END OF BORING AT 5.0 FEET.										
165													
160													
155													
150													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 5

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

LOG OF TEST BORING NO: TB-4

NTH Consultants, Ltd.

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan
NTH Proj. No.: 61-170118-04
Checked By: CDM

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 175.5	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
175		174.3	TOPSOIL	1.2									
			Loose to Medium Compact Brown SAND, Trace Silt and Gravel			LS-1	5 8 7	15	11				
		170.5		5.0	5	LS-2	2 3 4	7	9				
170			END OF BORING AT 5.0 FEET.										
165													
160													
155													
150													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 6

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

LOG OF TEST BORING NO: TB-5

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-170118-04
Checked By: CDR

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 177.3	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
175		176.0	TOPSOIL	1.3		LS-1	5 5 5	10	9.5				
			Very Loose to Loose Brown SAND, Trace Silt and Gravel										
		172.3		5.0	5	LS-2	2 2 2	4	8				
			END OF BORING AT 5.0 FEET.										
170													
165													
160													
155													
150													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 7

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

LOG OF TEST BORING NO: TB-6

NTH Consultants, Ltd.

Project Name: Livernois Avenue Streetscape
Project Location: Detroit, Michigan
NTH Proj. No.: 61-170118-04
Checked By: CDR

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 178.2	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		176.9	TOPSOIL	1.3									
175			Loose Brown and Yellow SAND, Trace Silt			LS-1	2 5 5	10	9				
		173.2		5.0	5	LS-2	2 4 6	10	9.5				
			END OF BORING AT 5.0 FEET.										
170													
165													
160													
155													
150													

Total Depth: *5 FT*
Drilling Start Date: *11/7/18*
Drilling End Date: *11/7/18*
Inspector: *L. Duan*
Contractor: *DLZ-American Drilling Company*
Driller: *M. Schmidt*
Drilling Method:
CME-45 truck-mounted drill rig with 2-1/4" HSA to EOB

Plugging Procedure:
Borehole backfilled with soil cuttings to ground surface.

Water Level Observation:
No groundwater encountered during drilling and upon completion.

Notes:
** = pocket penetrometer value*

Approximate GPS Coordinates:

Figure No. 8

LOG OF TEST BORING 61-170118-04.GPJ NTH CORPORATE.GDT 12/4/18

Core Log

Pavement Core TB-1A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	1.5 Inches Asphalt Top Course 2.0 Inches Asphalt Leveling Course 9.75 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None

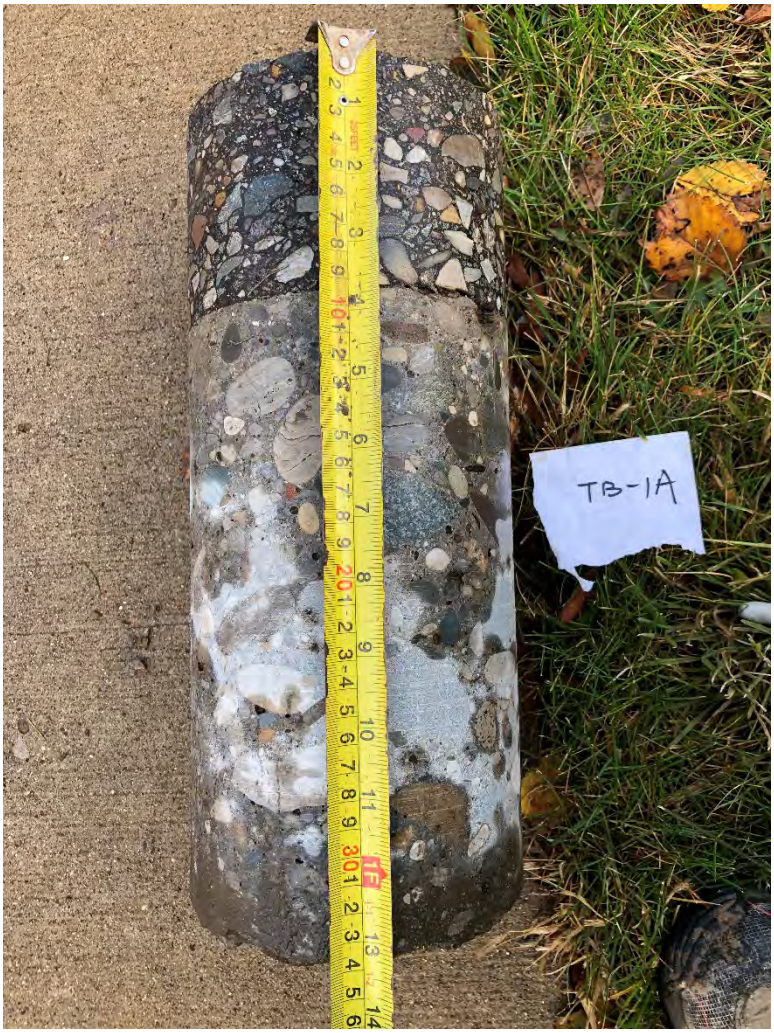


FIGURE No. 9

Core Log

Pavement Core TB-2A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	3.0 Inches Asphalt Top Course 9.0 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-3A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	1.0 Inches Asphalt Top Course 1.75 Inches Asphalt Leveling Course 1.25 Inches Asphalt Base Course 8.0 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-4A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	0.75 Inches Asphalt Top Course 2.25 Inches Asphalt Leveling Course 7.75 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-5A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	3.25 Inches Asphalt Top Course 7.25 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-6A	
Pavement Type:	Concrete
Location:	Inner lane SB Livernois Avenue
Pavement Thickness:	3.0 Inches Asphalt Top Course 2.0 Inches Asphalt Leveling Course 5.75 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	Crack in the direction along Livernois Ave in the concrete base course



FIGURE No. 9

Core Log

Pavement Core TB-6B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	1.25 Inches Asphalt Top Course 2.375 Inches Asphalt Leveling Course 8.125 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-5B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	3.75 Inches Asphalt Top Course 7.5 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-4B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	3.25 Inches Asphalt Top Course 1.5 Inches Asphalt Leveling Course 8.25 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-3B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	3.5 Inches Asphalt Top Course 1.0 Inches Asphalt Leveling Course 7.0 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None

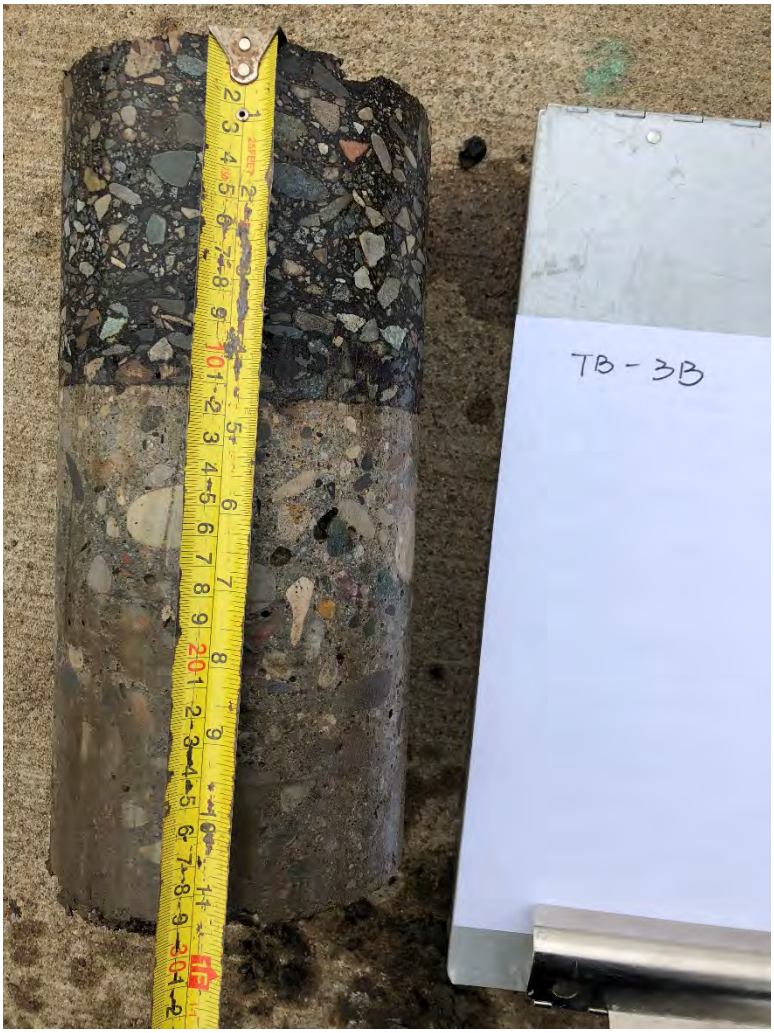


FIGURE No. 9

Core Log

Pavement Core TB-2B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	3.0 Inches Asphalt Top Course 8.0 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	Asphalt separated from concrete

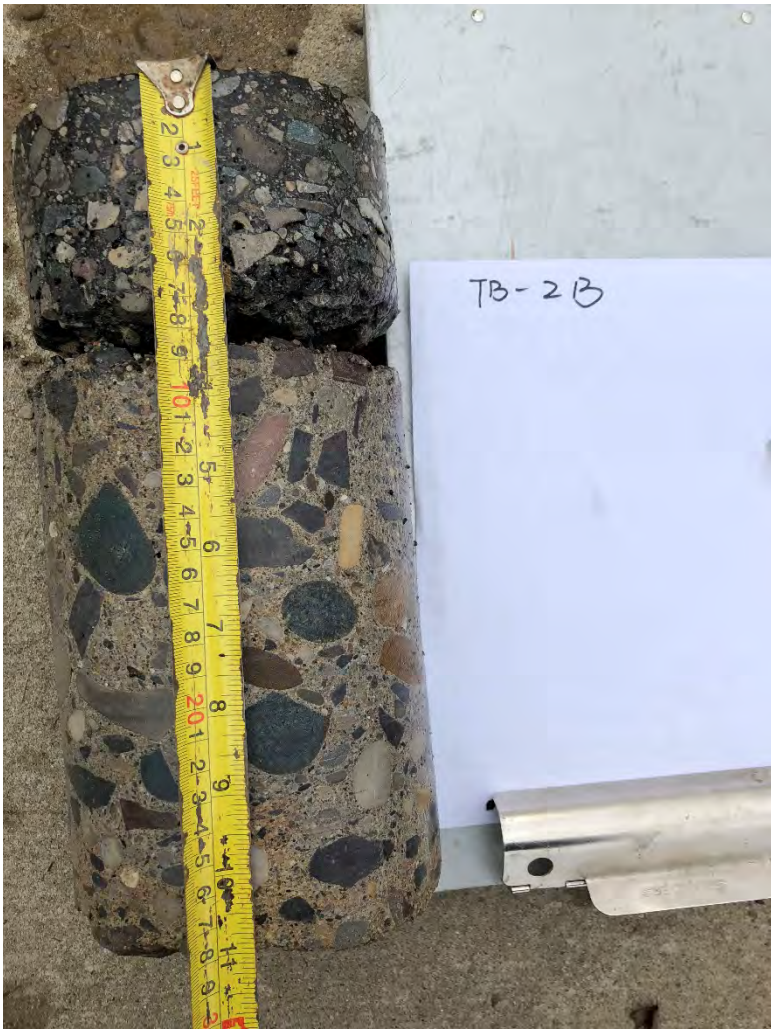


FIGURE No. 9

Core Log

Pavement Core TB-1B	
Pavement Type:	Concrete
Location:	Inner lane NB Livernois Avenue
Pavement Thickness:	3.5 Inches Asphalt Top Course 10.5 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	Concrete broke due to operation to get it out of the hole, total length were taken from the hole



FIGURE No. 9

Core Log

Pavement Core TB-1C	
Pavement Type:	Concrete
Location:	Outer lane SB Livernois Avenue
Pavement Thickness:	3.5 Inches Asphalt Top Course 10.5 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-2C	
Pavement Type:	Concrete
Location:	Outer lane NB Livernois Avenue
Pavement Thickness:	0.75 Inches Asphalt Top Course 2.0 Inches Asphalt Leveling Course 10.5 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-3C	
Pavement Type:	Concrete
Location:	Outer lane SB Livernois Avenue
Pavement Thickness:	2.75 Inches Asphalt Top Course 0.5 Inches Asphalt Leveling Course 10 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-4C	
Pavement Type:	Concrete
Location:	Outer lane NB Livernois Avenue
Pavement Thickness:	4.25 Inches Asphalt Top Course 9.75 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

Core Log

Pavement Core TB-5C	
Pavement Type:	Concrete
Location:	Outer lane NB Livernois Avenue
Pavement Thickness:	1.625 Inches Asphalt Top Course 2.75 Inches Asphalt Leveling Course 9.625 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None

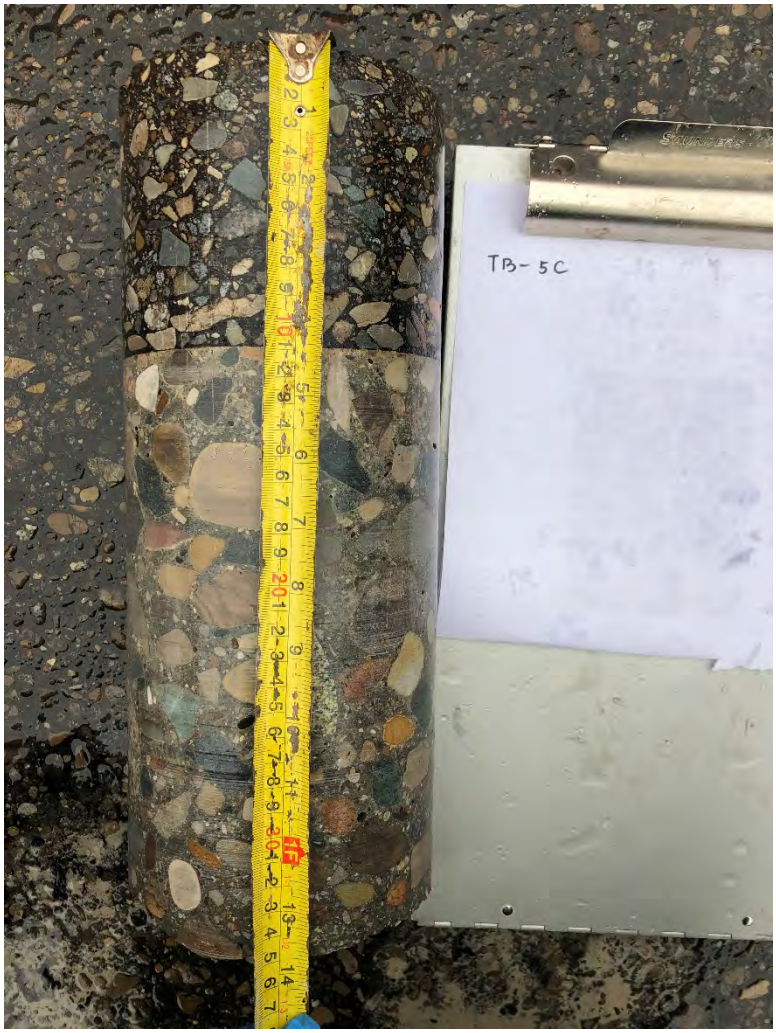


FIGURE No. 9

Core Log

Pavement Core TB-6C	
Pavement Type:	Concrete
Location:	Outer lane NB Livernois Avenue
Pavement Thickness:	3.75 Inches Asphalt Top Course 10.5 Inches Concrete Base Course
Aggregate Type:	Natural and crushed stone.
Depth of Reinforcement:	-
Pavement Deterioration:	None
Other Comments:	None



FIGURE No. 9

DCP 1A DCP TEST DATA

El. 174.6

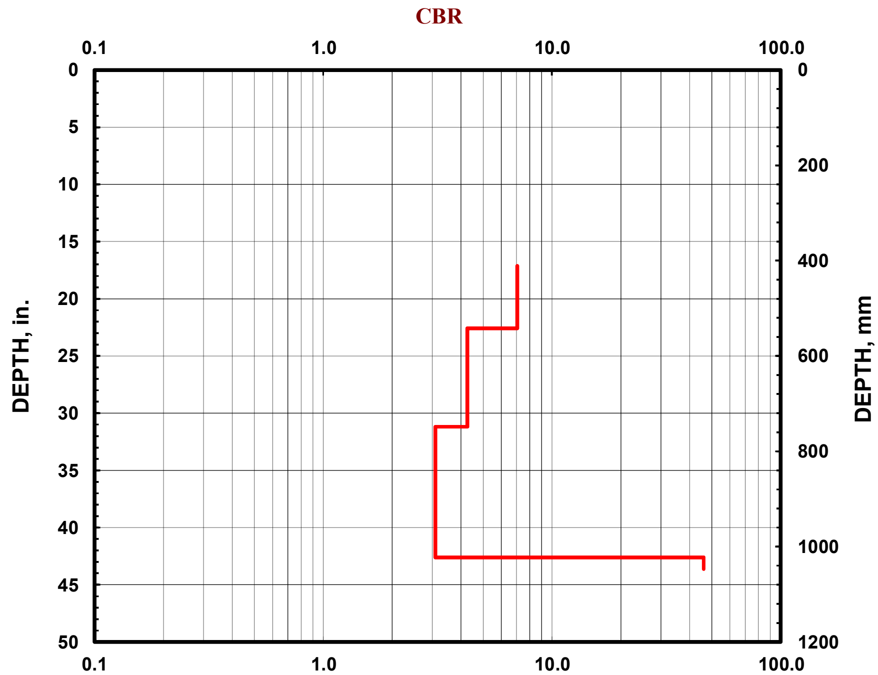
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

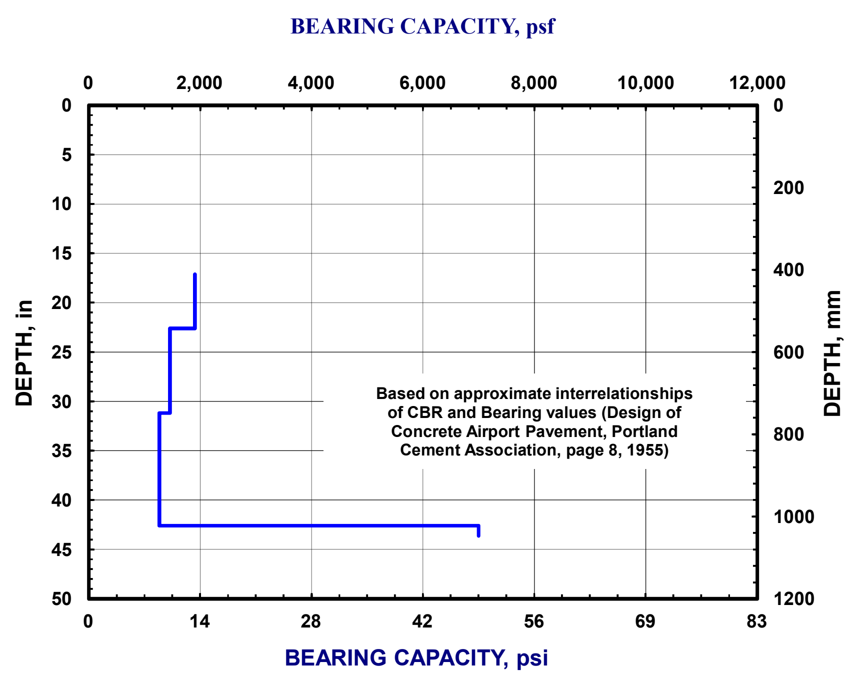
Date: 5-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
- ◯ 10.1 lbs.
- ◉ 17.6 lbs.
- ◯ Both hammers used

Soil Type
- ◯ CH
- ◯ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	435	1
5	574	1
5	792	1
5	1082	1
5	1108	1
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DCP 3A DCP TEST DATA

El. 174.8

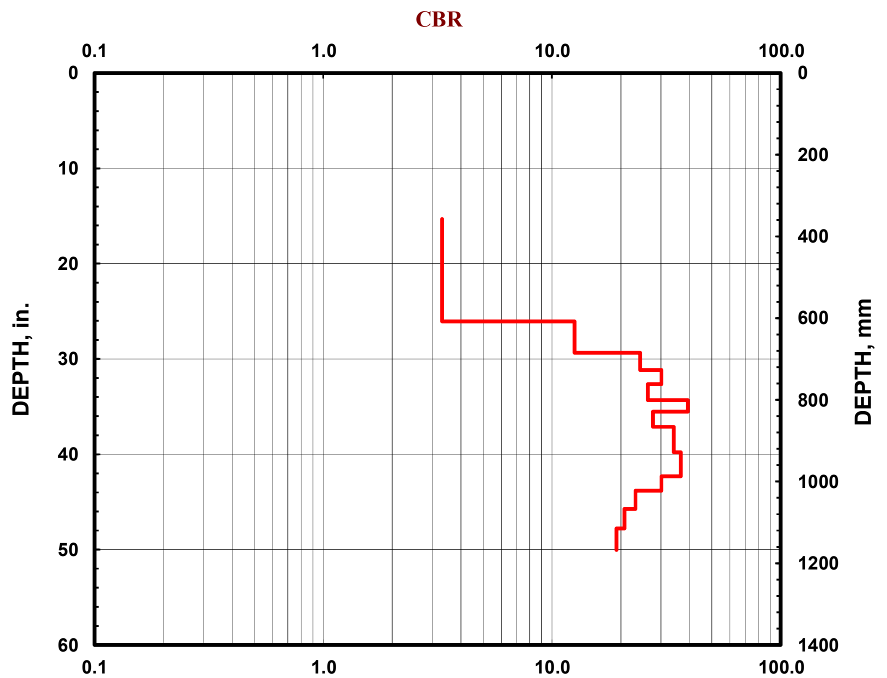
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

Date: 5-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
○ 10.1 lbs.
◉ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	389	1
5	662	1
5	745	1
5	791	1
5	829	1
5	872	1
5	902	1
5	943	1
5	977	1
5	1011	1
5	1043	1
5	1075	1
5	1113	1
5	1161	1
5	1214	1
5	1271	1
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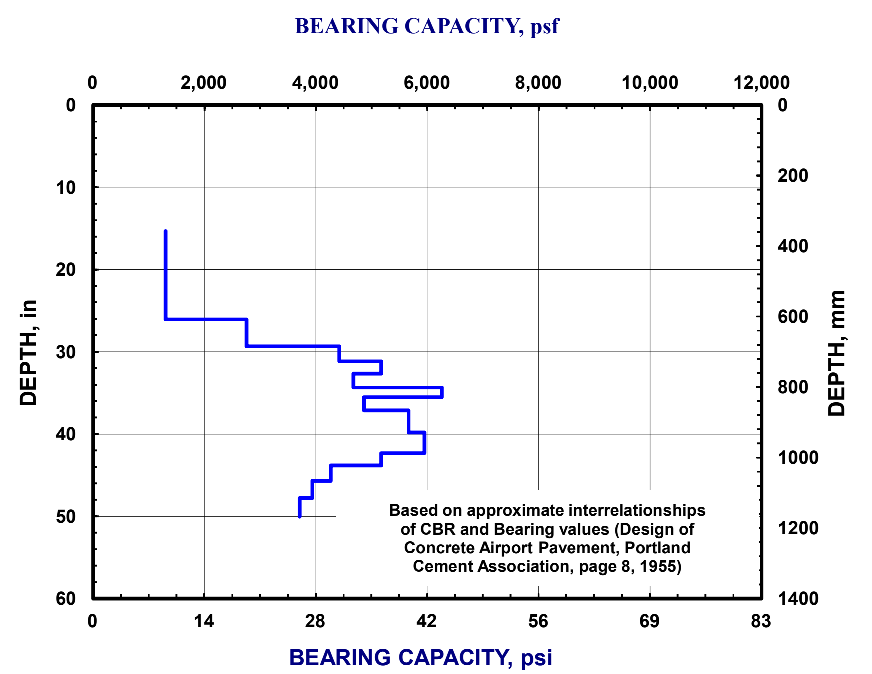


FIGURE No. 12

DCP 4A DCP TEST DATA

El. 174.5

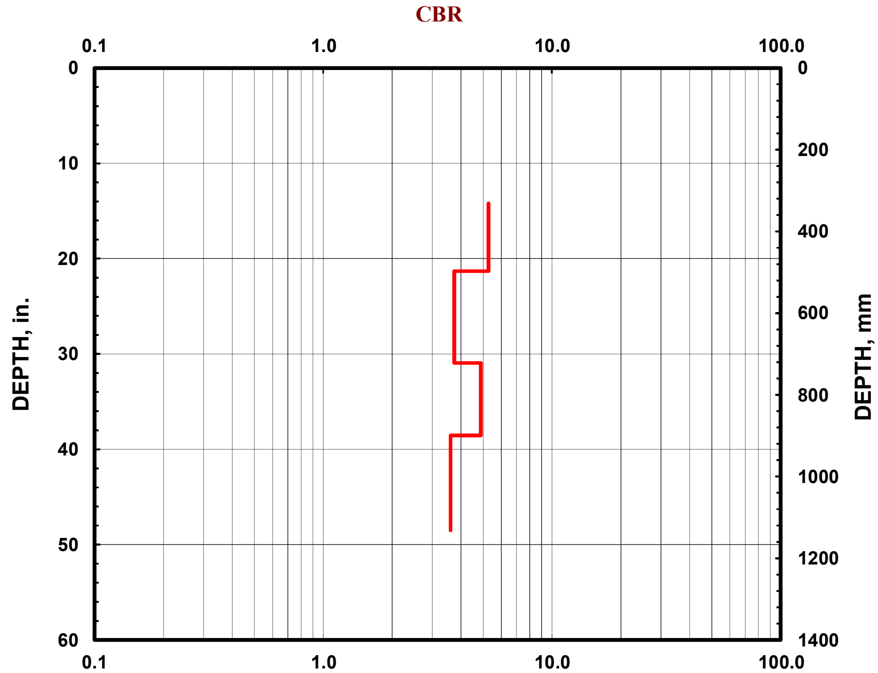
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

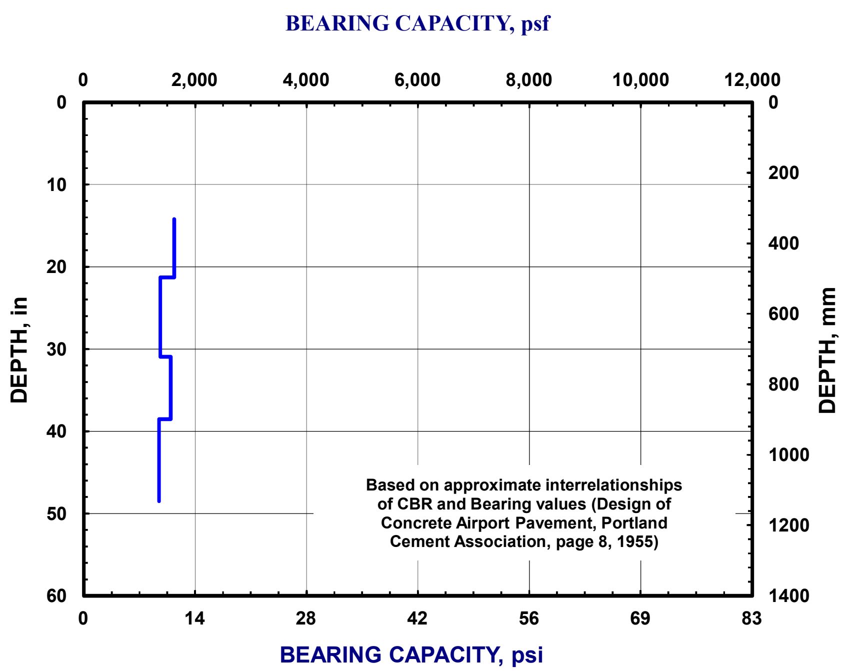
Date: 5-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
○ 10.1 lbs.
◉ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	361	1
5	541	1
5	786	1
5	979	1
5	1232	1
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DCP 5A DCP TEST DATA

El. 176.5

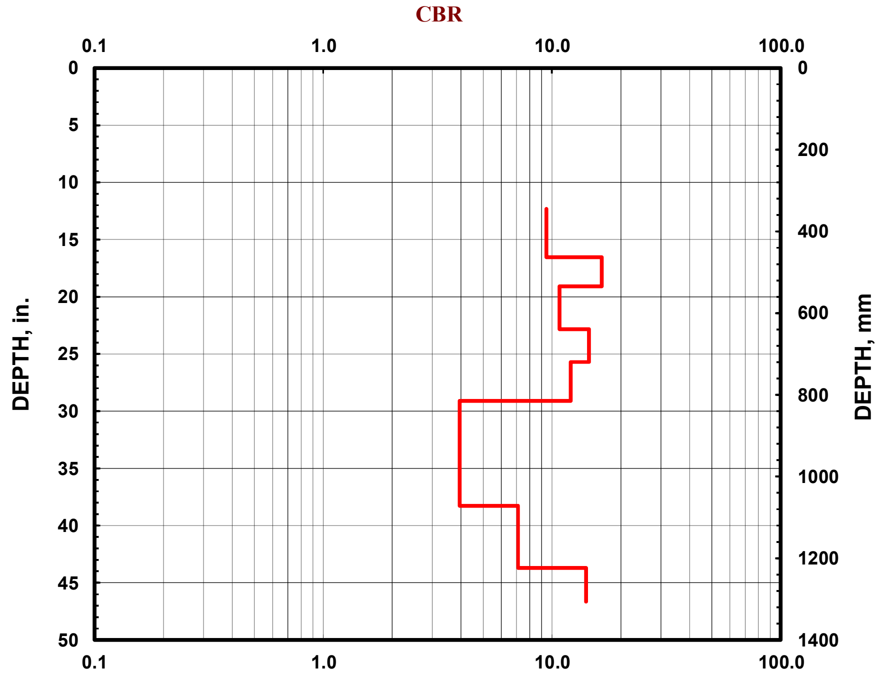
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	313	1
5	420	1
5	485	1
5	580	1
5	653	1
5	739	1
5	972	1
5	1110	1
5	1185	1
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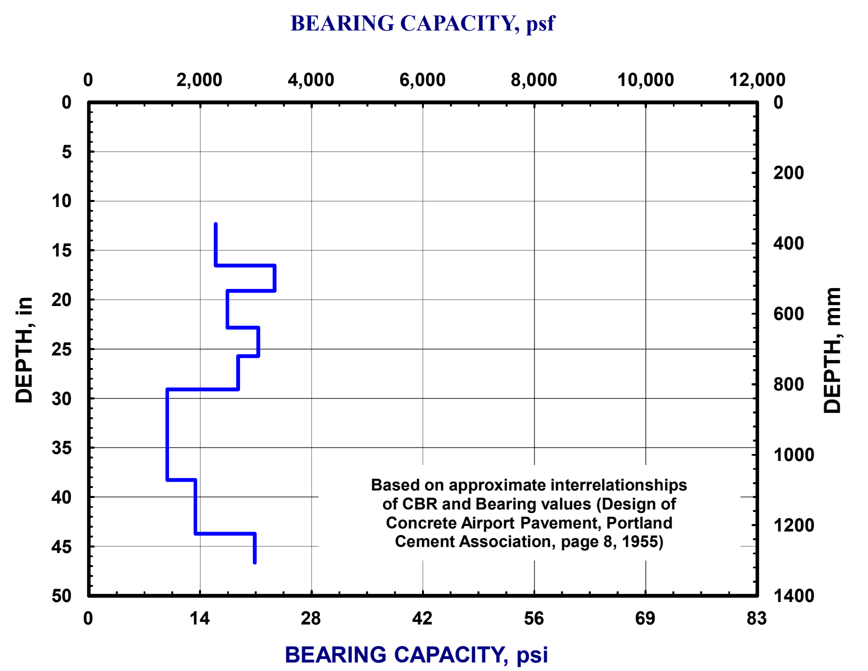


FIGURE No. 14

DCP 6A DCP TEST DATA

El. 177.3

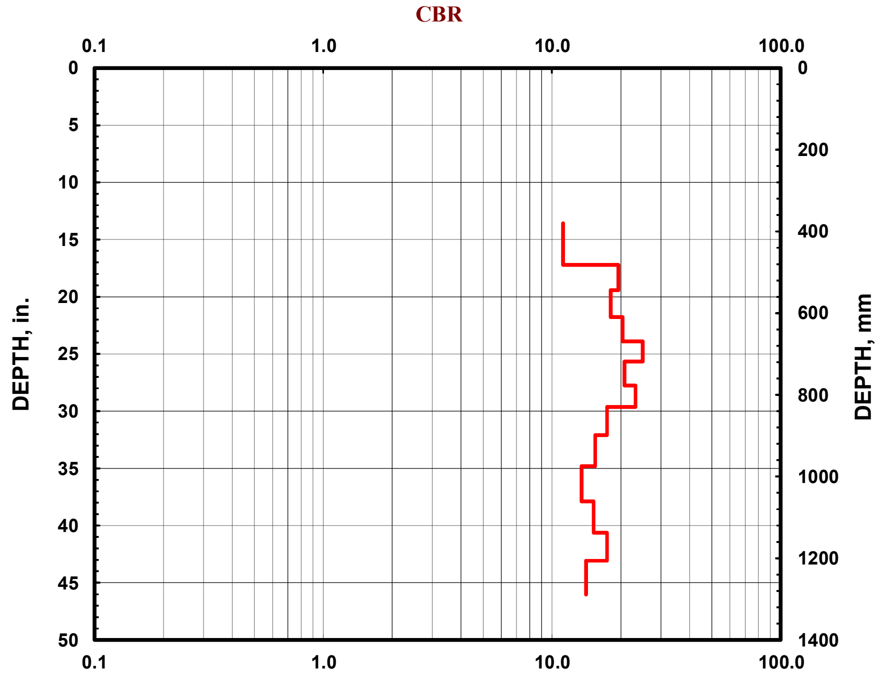
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

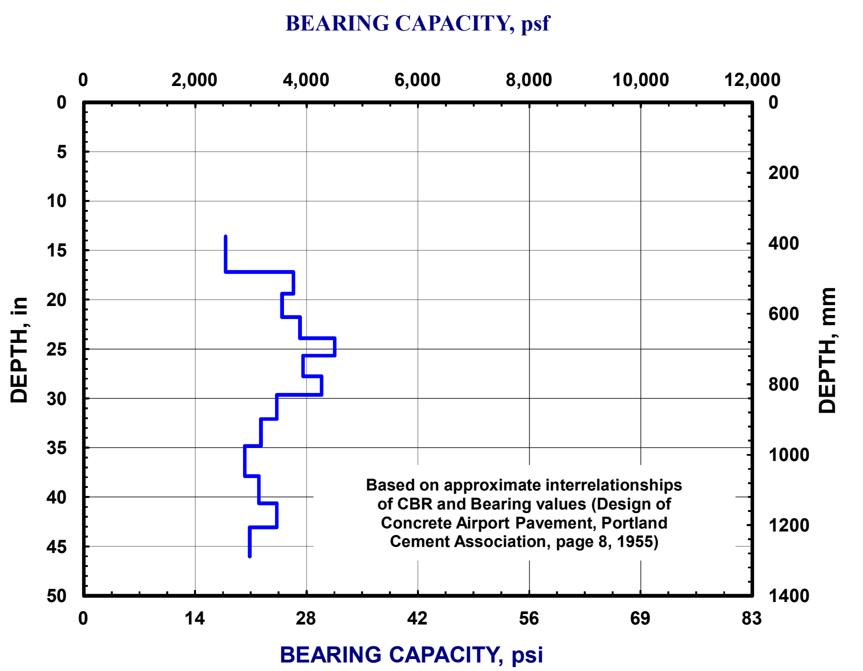
Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
○ 10.1 lbs.
◉ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	345	1
5	437	1
5	493	1
5	553	1
5	607	1
5	652	1
5	705	1
5	753	1
5	815	1
5	884	1
5	962	1
5	1032	1
5	1094	1
5	1169	1
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DCP 6B DCP TEST DATA

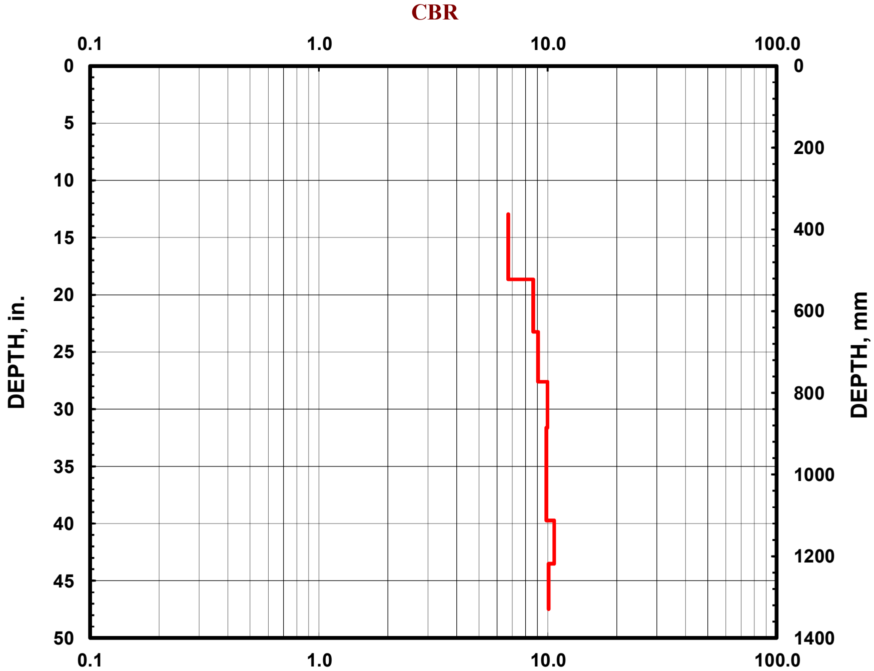
El. 177.2

Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI
Date: 6-Nov-18
Soil Type(s): Silty sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	329	1
5	474	1
5	590	1
5	701	1
5	803	1
5	906	1
5	1009	1
5	1105	1
5	1206	1
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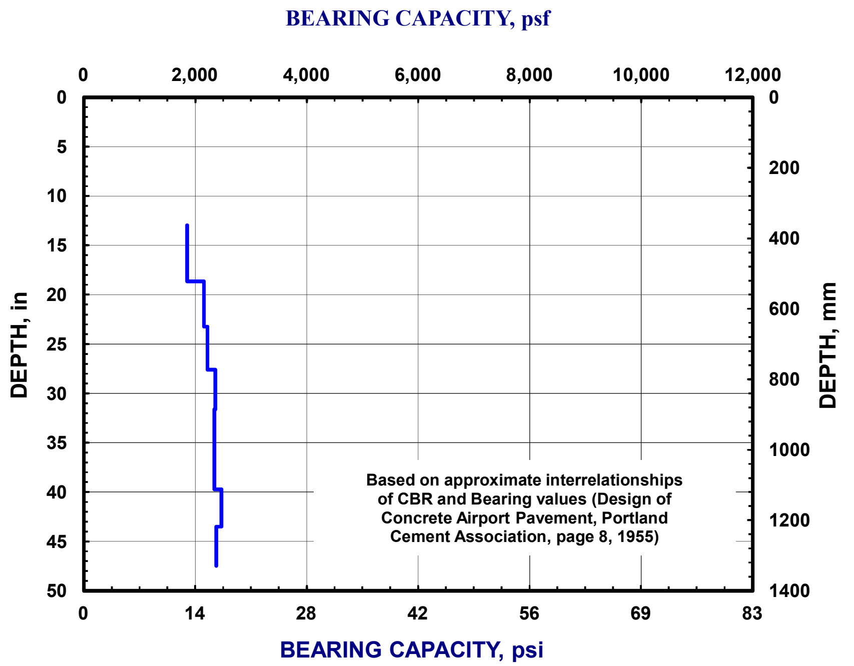


FIGURE No. 16

DCP 5B DCP TEST DATA

El. 176.8

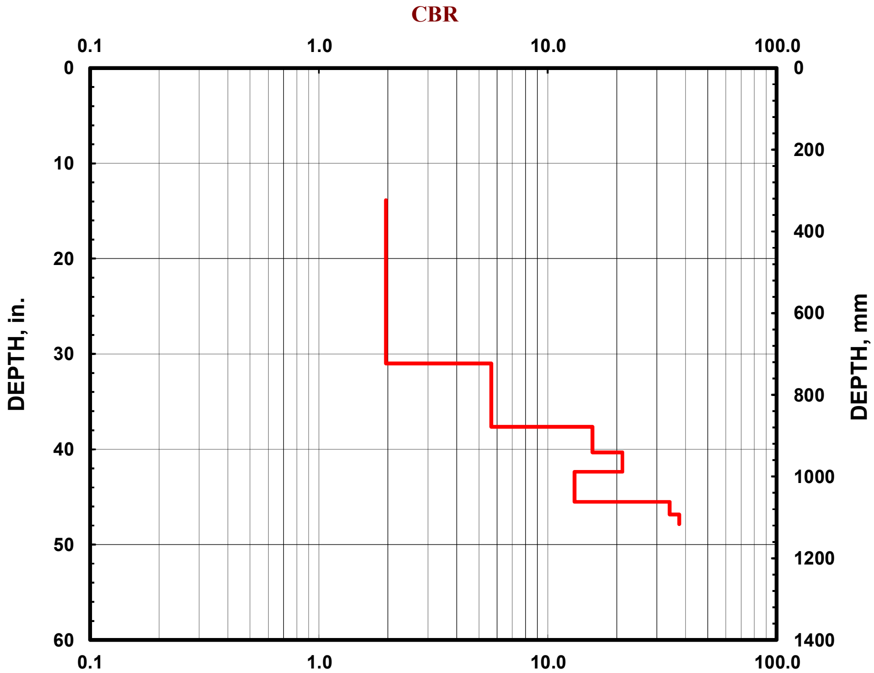
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Location: Livernois Ave., Detroit, MI

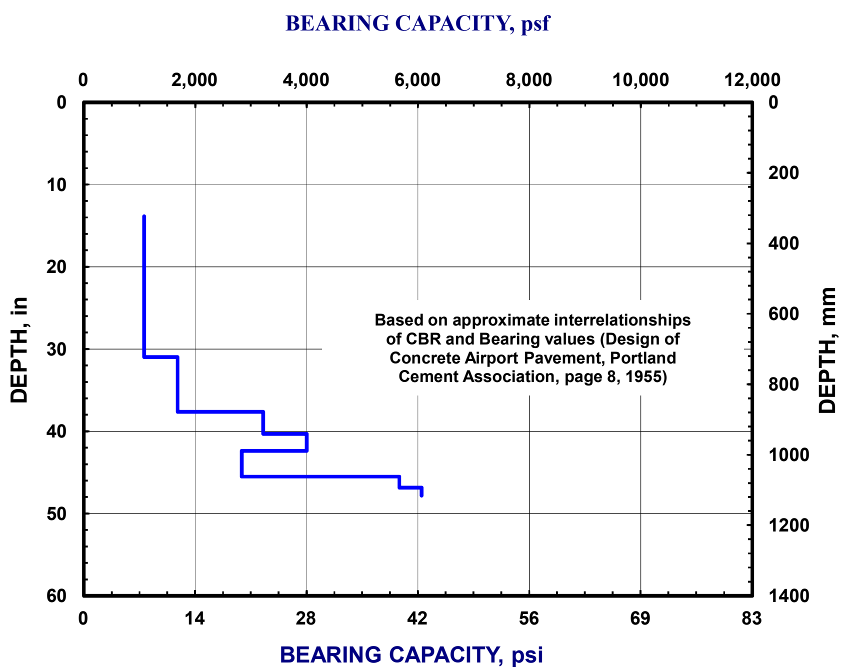
Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
○ 10.1 lbs.
◉ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	352	1
5	787	1
5	956	1
5	1024	1
5	1076	1
5	1156	1
5	1190	1
4	1215	1
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DCP 4B DCP TEST DATA

El. 174.9

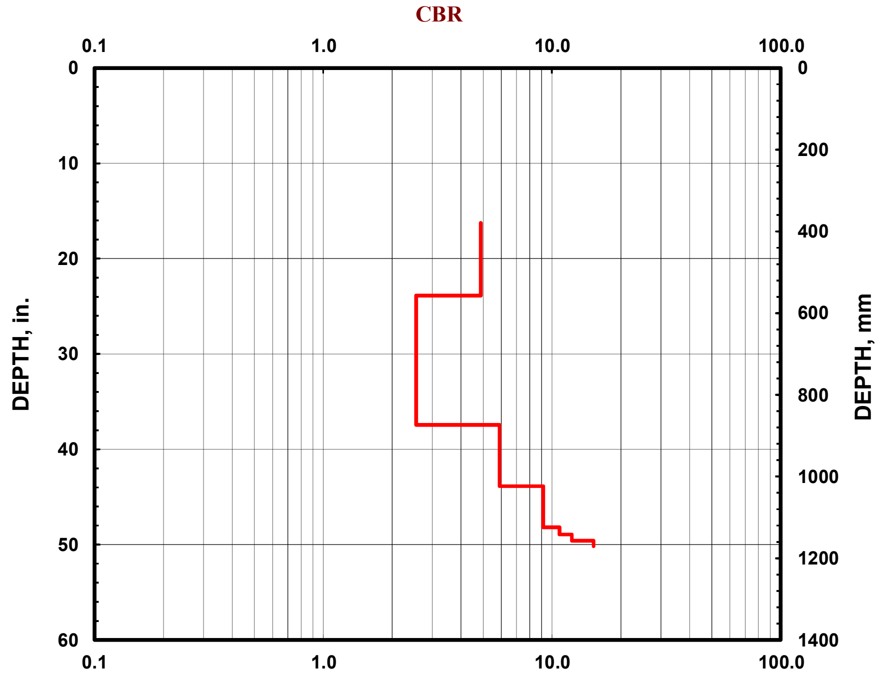
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

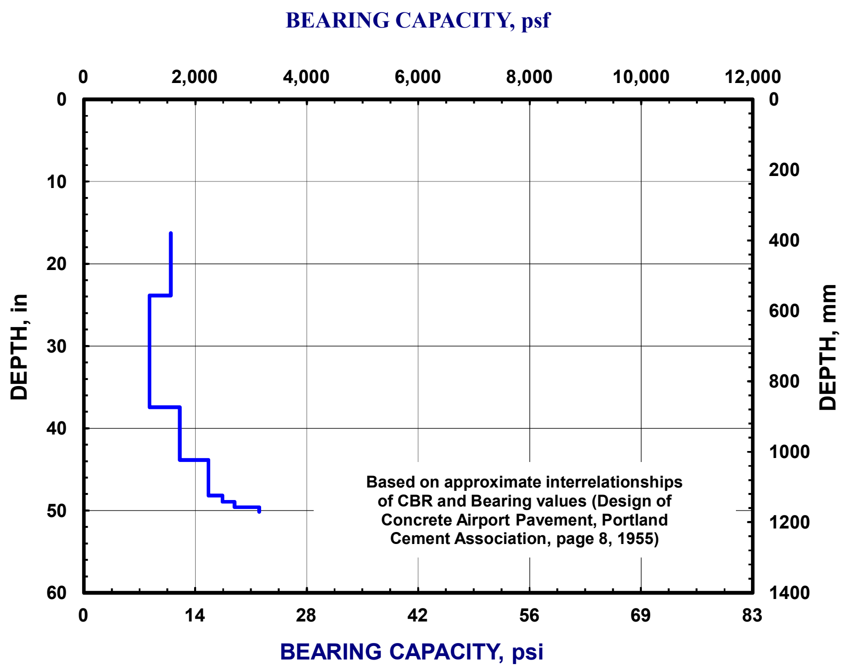
Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	413	1
5	606	1
5	951	1
5	1114	1
5	1224	1
1	1243	1
1	1260	1
1	1274	1
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DCP 3B DCP TEST DATA El. 174.5

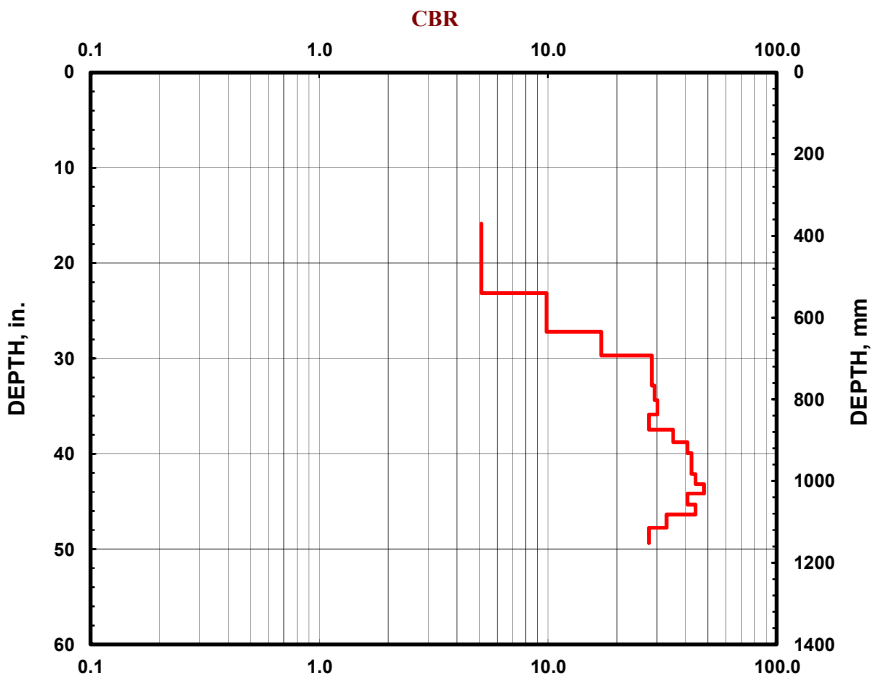
Project: *61-170118-04* **Date:** 6-Nov-18

Location: Livernois Ave., Detroit, MI **Soil Type(s):** Gravelly Sand and Clayey Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	403	1
5	588	1
5	691	1
5	754	1
5	794	1
5	834	1
5	873	1
5	911	1
5	952	1
5	985	1
5	1014	1
5	1042	1
5	1070	1
5	1097	1
5	1122	1
5	1151	1
5	1178	1
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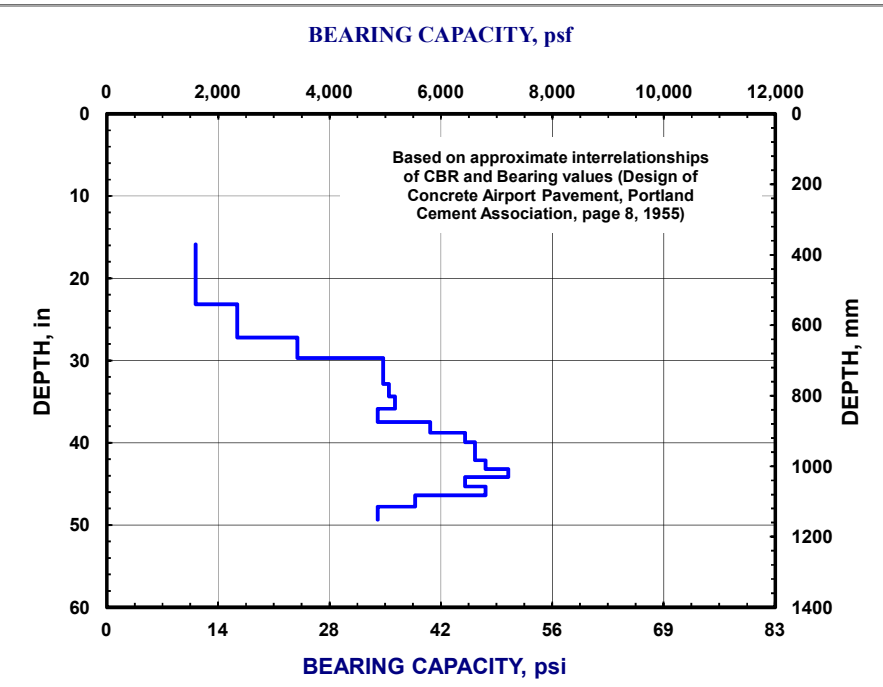


FIGURE No. 19

DCP 2B DCP TEST DATA

El. 173.1

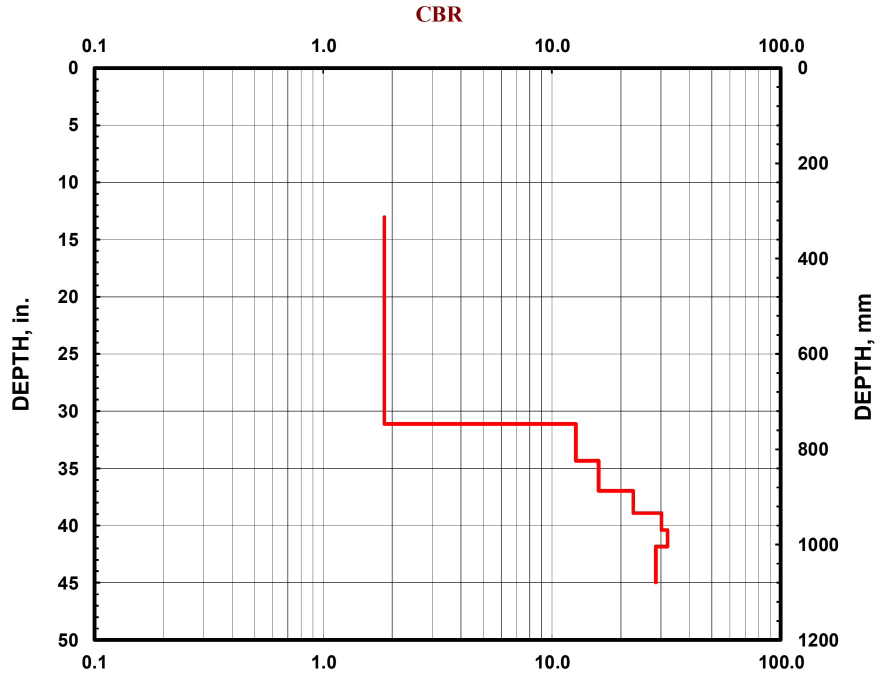
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI

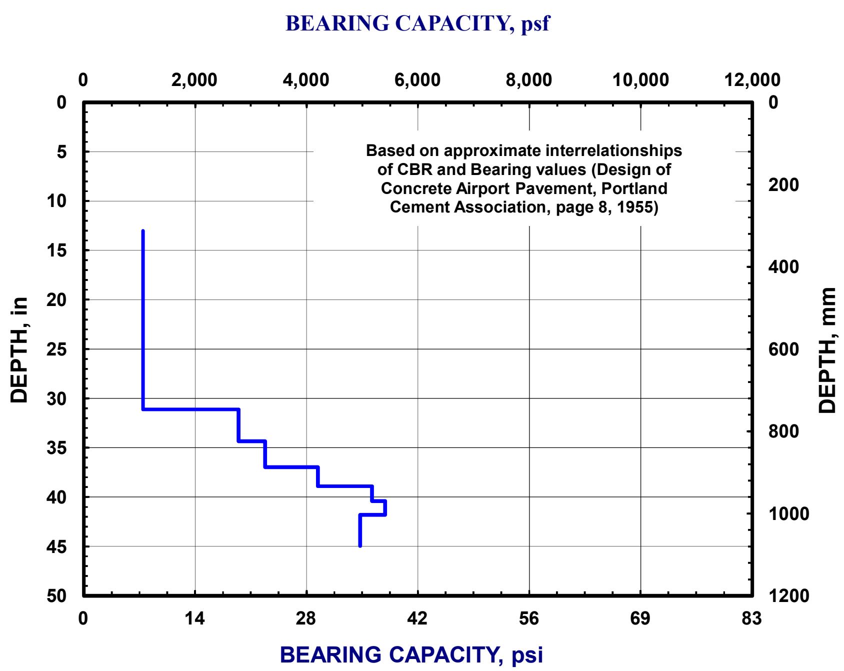
Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	331	1
5	790	1
5	872	1
5	939	1
5	988	1
5	1026	1
5	1062	1
5	1102	1
5	1142	1
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DCP 1B DCP TEST DATA

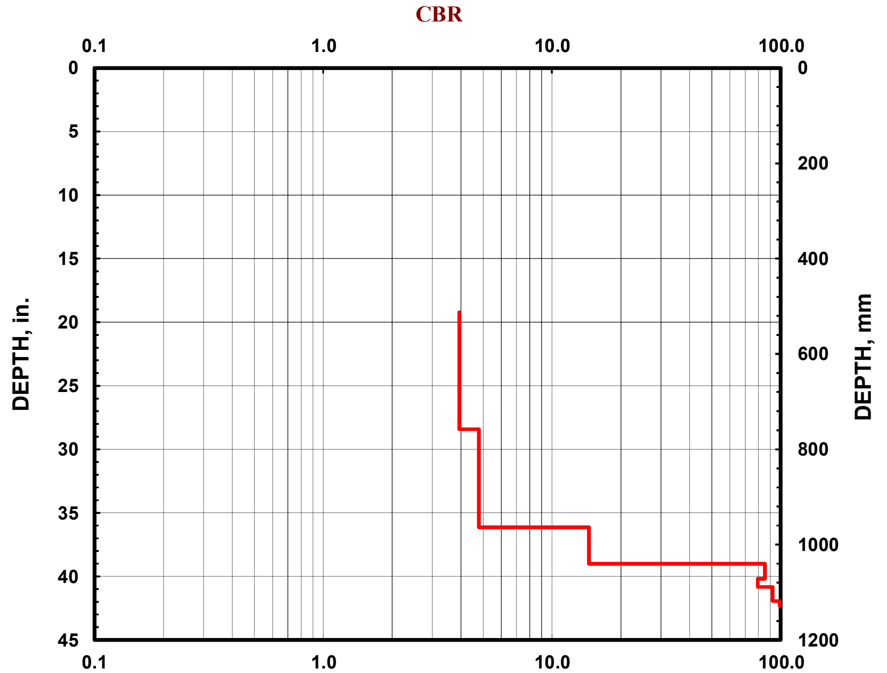
El. 174.5

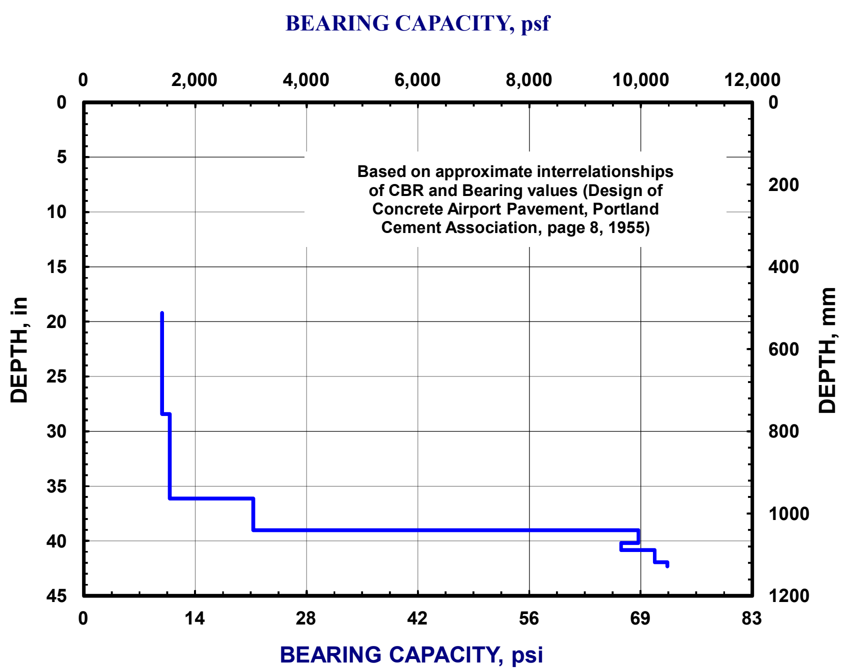
Project: *61-170118-04*
Location: Livernois Ave., Detroit, MI
Date: 6-Nov-18
Soil Type(s): Gravelly Sand and Clayey Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	488	1
5	722	1
5	918	1
5	991	1
5	1006	1
5	1021	1
5	1037	1
5	1051	1
5	1065	1
5	1075	1
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NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

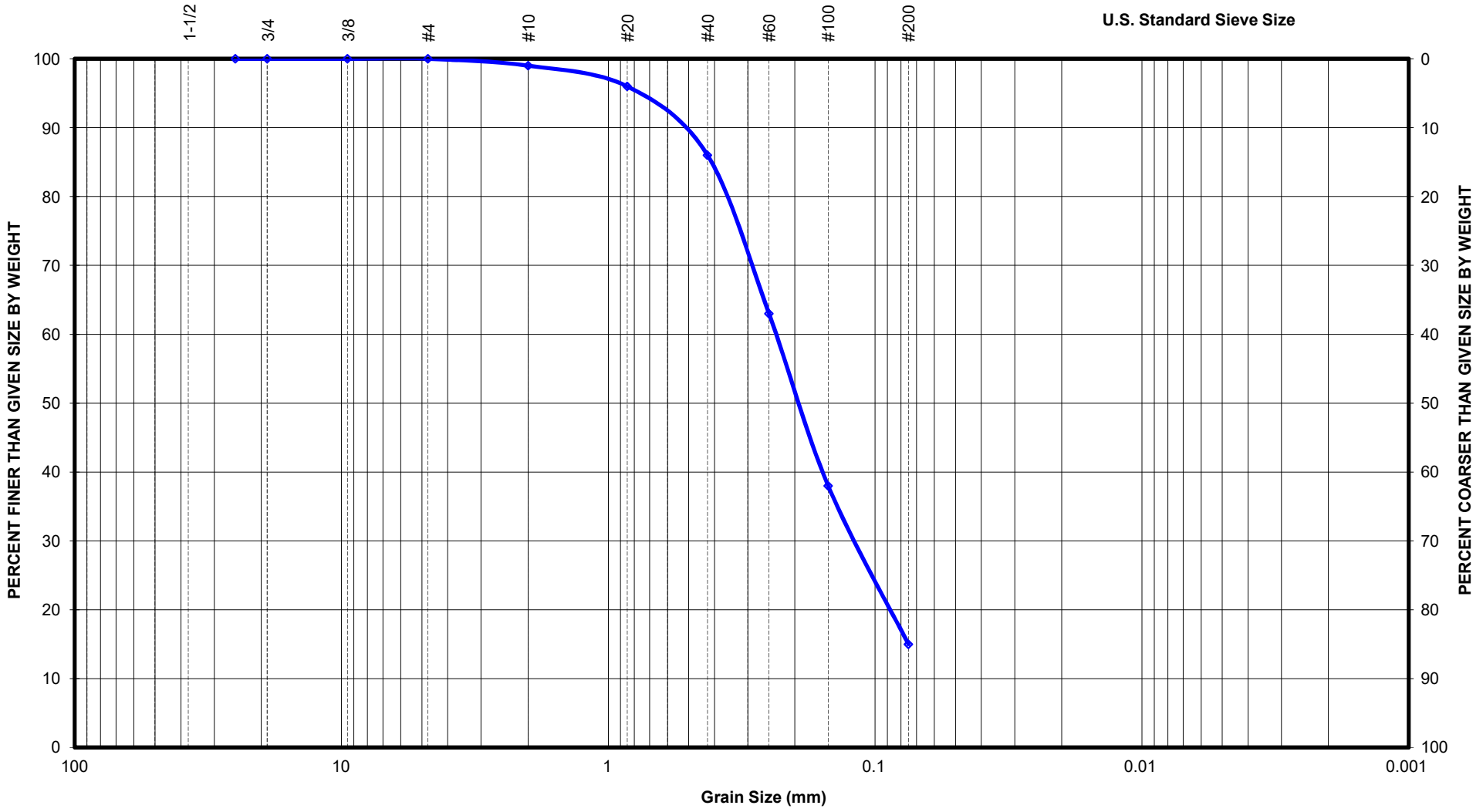
Project No. 61-170118-04 **Project Name** Livernois Ave Streetscape

Project Location Detroit, MI **Source** 0

Boring No. TB-2 **Sample No.** LS-2 **Sample Depth** 5.0 **Sample Elev. (Tip)** 0

Sample Description brwon sand with pieces of clay, trace gravel

Sampled By L. Duan **Date** 11/07/2018 **Tested By** E. Chapman **Date** 11/14/2018 **LWO No.** 001596



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 22

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

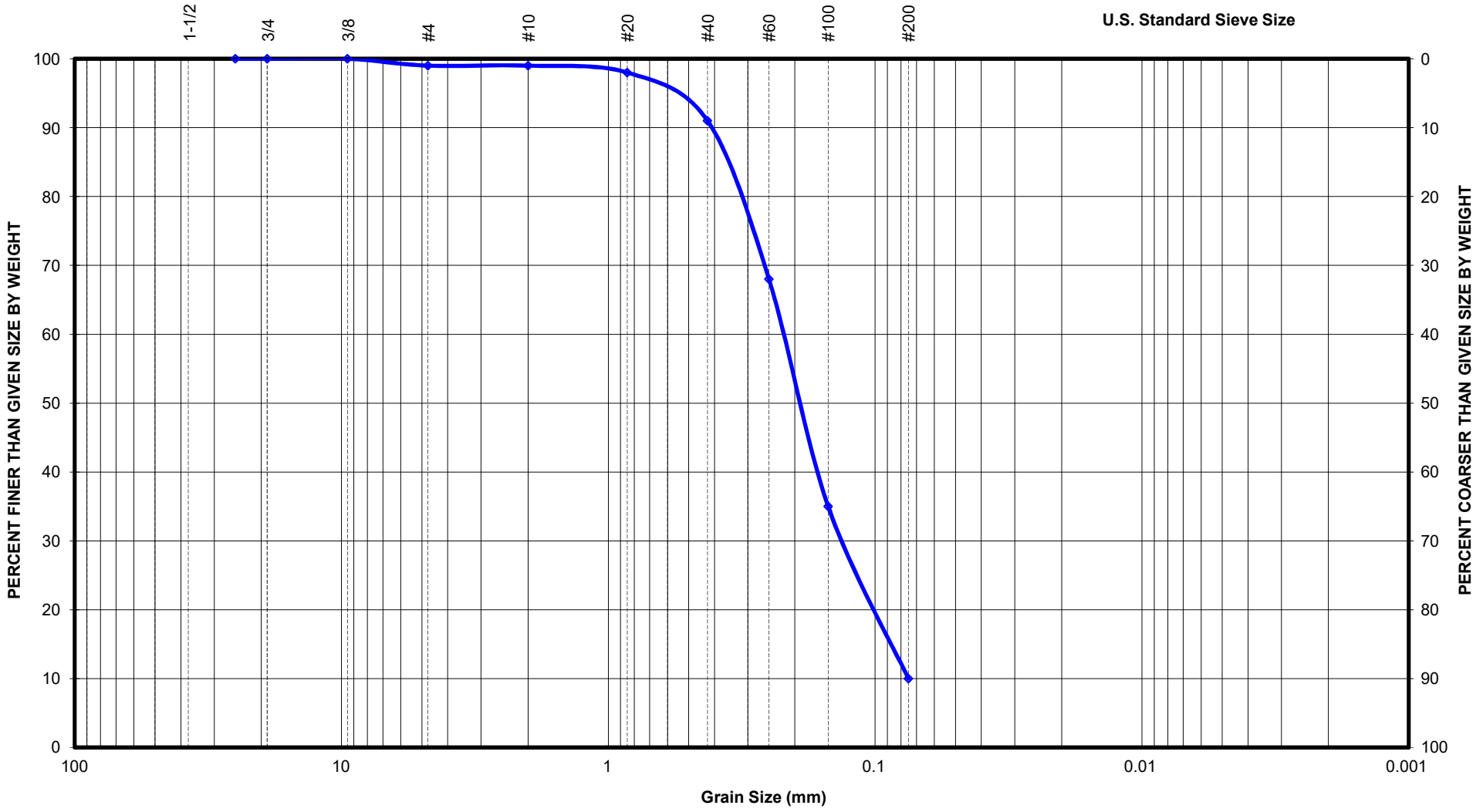
Project No. 61-170118-04 **Project Name** Livernois Ave Streetscape

Project Location Detroit, MI **Source** 0

Boring No. TB-3 **Sample No.** LS-2 **Sample Depth** 5.0 **Sample Elev. (Tip)** 0

Sample Description brwon sand with trace silt

Sampled By L. Duan **Date** 11/07/2018 **Tested By** E. Chapman **Date** 11/14/2018 **LWO No.** 001596

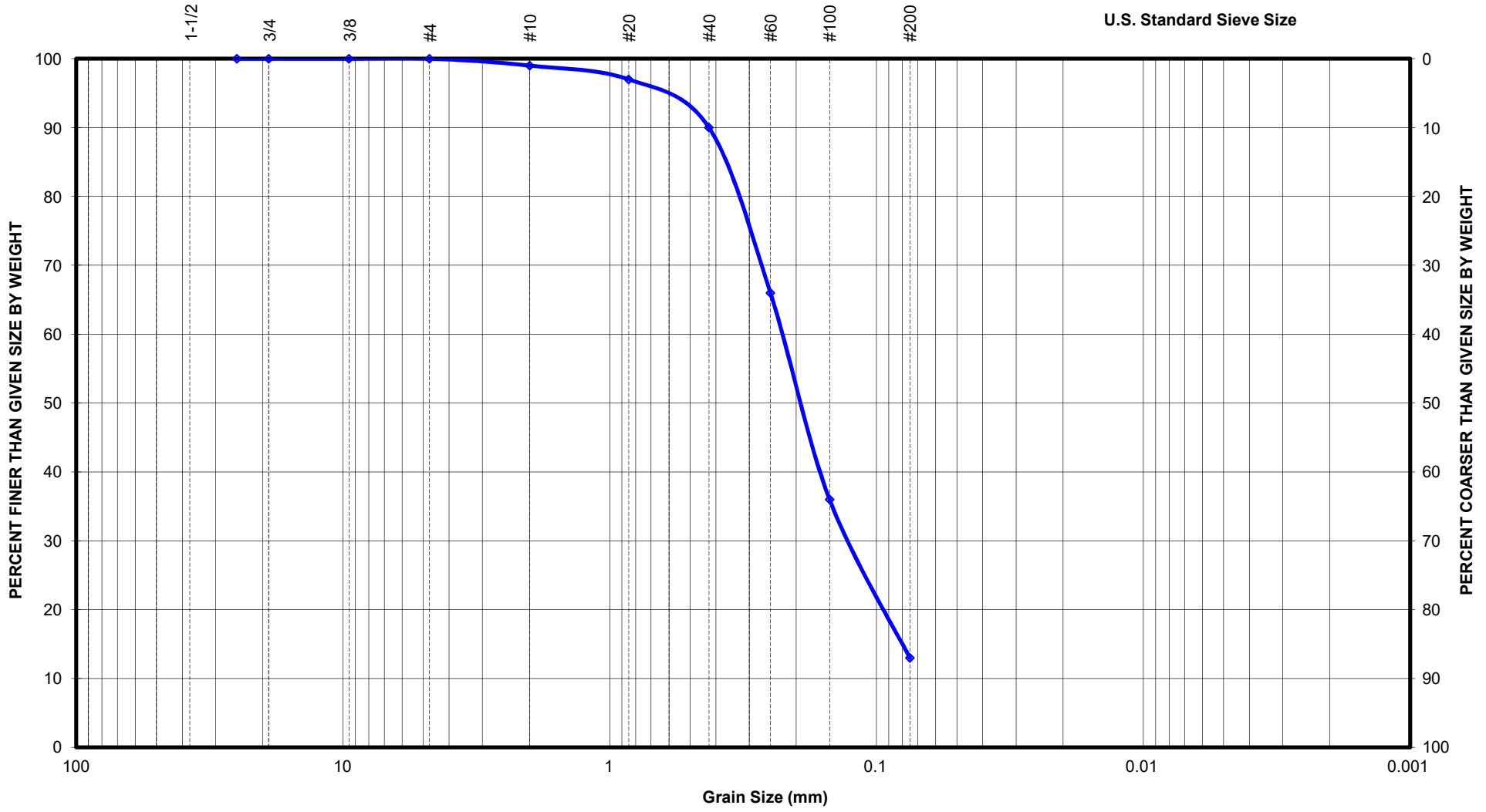


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 23

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-170118-04	**Project Name**	Livernois Ave Streetscape				
Project Location	Detroit, MI					**Source**	0
Boring No.	TB-4	**Sample No.**	LS-2	**Sample Depth**	5.0	**Sample Elev. (Tip)**	0
Sample Description	Brown sand with trace silt						
Sampled By	L. Duan	**Date**	11/07/2018	**Tested By**	E. Chapman	**Date**	11/14/2018	**LWO No.**	001596



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 24

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

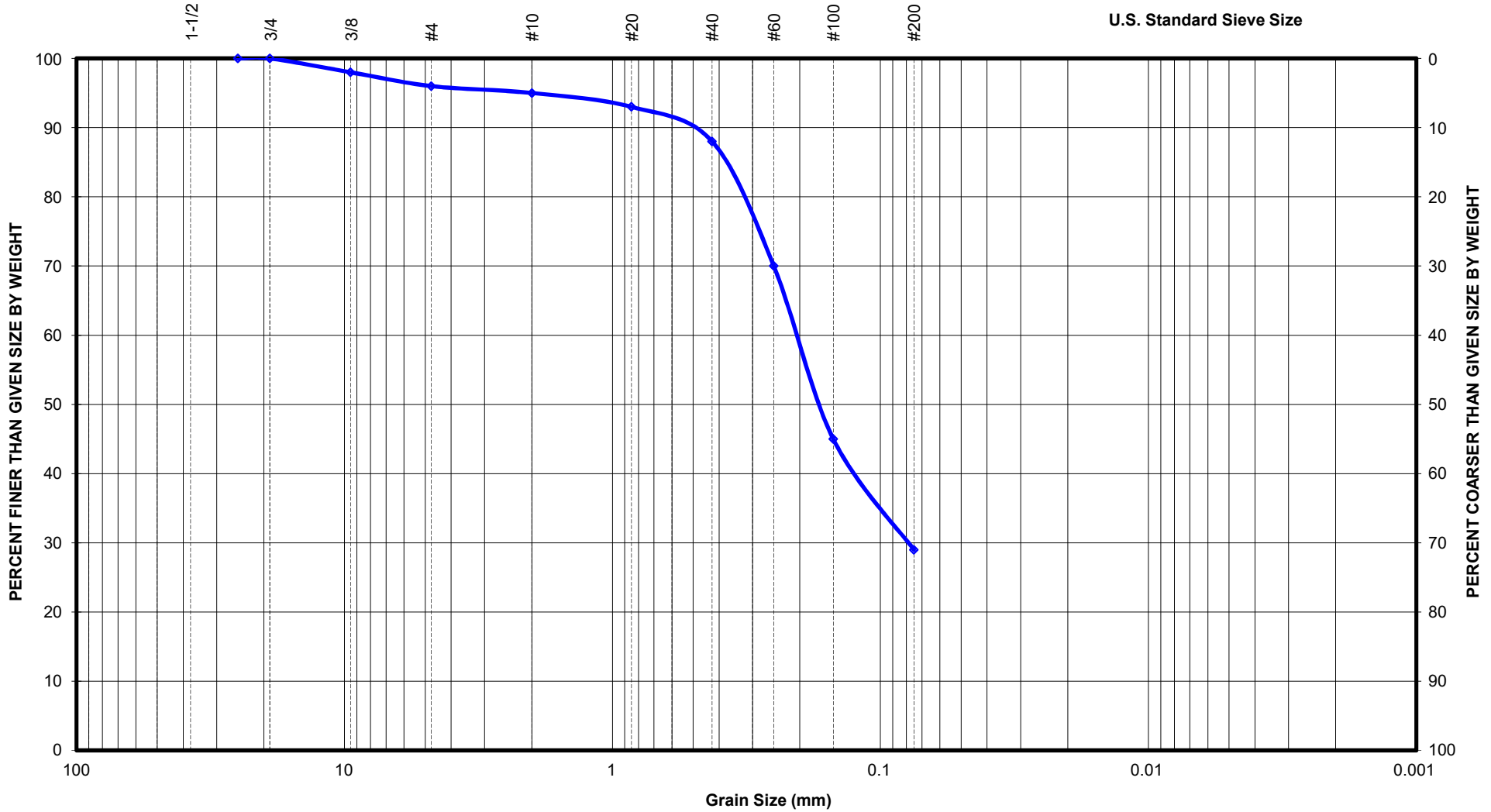
Project No. 61-170118-04 **Project Name** Livernois Ave Streetscape

Project Location Detroit, MI **Source** 0

Boring No. TB-5 **Sample No.** LS-2 **Sample Depth** 5.0 **Sample Elev. (Tip)** 0

Sample Description brwon sand with pieces of clay

Sampled By L. Duan **Date** 11/07/2018 **Tested By** E. Chapman **Date** 11/14/2018 **LWO No.** 001596



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 25

Pavement thickness summary

	Station	Southbound (inches)							Northbound (inches)							Average (inches)	
		Boring No.	Asphalt				Concrete	Total	Boring No.	Asphalt				Concrete	Total		
			Top	Leveling	Base	Total				Top	Leveling	Base	Total			Asphalt	Concrete
Inner Lane	4+50	**1A**	1.5	2	-	3.5	9.75	13.25	**1B**	3.5	-	-	3.5	10.5	14	3.74	8.07
	13+00	**2A**	3	-	-	3	9	12	**2B**	3	-	-	3	8	11		
	25+50	**3A**	1	1.75	1.25	4	8	12	**3B**	3.5	1	-	4.5	7	11.5		
	38+00	**4A**	0.75	2.25	-	3	7.75	10.75	**4B**	3.25	1.5	-	4.75	8.25	13		
	50+00	**5A**	3.25	-	-	3.25	7.25	10.5	**5B**	3.75	-	-	3.75	7.5	11.25		
	61+00	**6A**	3	2	-	5	5.75	10.75	**6B**	1.25	2.375	-	3.625	8.125	11.75		
Outer Lane	4+50	**1C**	3.5	-	-	3.5	10.5	14	-	-	-	-	-	-	-	3.65	10.15
	13+00	-	-	-	-	-	-	-	**2C**	0.75	2	-	2.75	10.5	13.25		
	25+50	**3C**	2.75	0.5	-	3.25	10	13.25	-	-	-	-	-	-	-		
	38+00	-	-	-	-	-	-	-	**4C**	4.25	-	-	4.25	9.75	14		
	50+00	-	-	-	-	-	-	-	**5C**	1.625	2.75	-	4.375	9.625	14		
	61+00	**6C**	3.75	-	-	3.75	10.5	14.25	-	-	-	-	-	-	-		
														Average (inches)		3.69	9.11