

# CITY OF DETROIT

## KWAME M. KILPATRICK – MAYOR

### CITY ENGINEERING DIVISION

#### DEPARTMENT OF PUBLIC WORKS



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## PLANS FOR PROPOSED REPLACEMENT OF THE ASHLAND AVE. BRIDGE OVER FOX CREEK (BW-245), FEDERAL STRUCTURE NO. 0024400B01

THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES MS18 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/1000 OF THE SPAN LENGTH. THE LOAD FACTOR METHOD OF DESIGN WAS USED FOR THIS STRUCTURE.

EXCEPT WHERE OTHERWISE INDICATED ON THESE PLANS, THE PROPOSAL, AND SUPPLEMENTAL SPECIFICATIONS CONTAINED HEREIN, ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION 1996 EDITION.

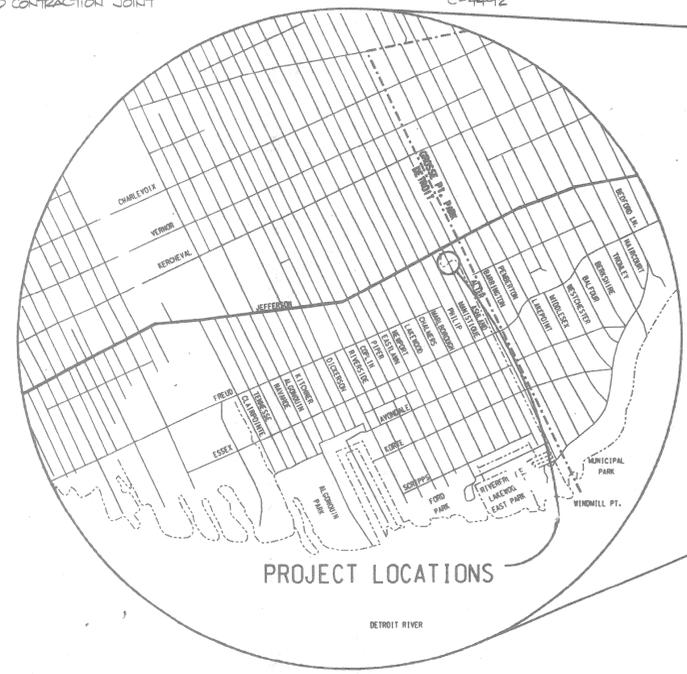
THE STATIONING AS SHOWN ON THESE PLANS FOR THE INTERSECTION OF THE CENTERLINE OF BRIDGE AND ROADWAY CENTERLINE IS BELIEVED TO BE CORRECT. IT SHALL, HOWEVER, BE CHECKED AT THE TIME OF STARTING CONSTRUCTION, AND IF THE STATIONING SHOWN ON THE PLANS IS INCORRECT IT SHALL BE REPORTED TO THE DESIGN OFFICE IN DETROIT, AND THE STRUCTURE SHALL BE STAKED OUT USING THE ACTUAL INTERSECTION OF THE CENTERLINE OF THE BRIDGE AND ROADWAY CENTERLINE AS THE CONTROL POINT.

ALL EXPOSED CONCRETE CORNERS SHOWN SQUARE ON THE PLANS SHALL BE BEVELED WITH 13 mm TRIANGULAR MOLDINGS EXCEPT AS OTHERWISE NOTED.

THE DESIGN OF THE STRUCTURAL MEMBERS IS BASED ON MATERIAL OF THE FOLLOWING GRADES AND STRESSES.

CONCRETE: GRADE S2	f'c = 21 MPa
CONCRETE: GRADE D	f'c = 28 MPa
STEEL REINFORCEMENT:	fy = 400 MPa

ALL DIMENSIONS ON THESE PLANS ARE IN MILLIMETERS EXCEPT AS NOTED.



**PROJECT:** REMOVAL AND REPLACEMENT OF THE STRUCTURES AT

**CONTRACT NO.:**

PLANS PREPARED BY  
SNELL ENVIRONMENTAL GROUP, INC.  
FOR  
CITY ENGINEERING DIVISION



RECOMMENDED FOR APPROVAL	<i>Earl C. Howard</i>	12-16-99
	STRUCTURAL ENGINEER	DATE
RECOMMENDED FOR APPROVAL	<i>William C. Williams</i>	12/16/99
	BUILDINGS AND BRIDGES ENGINEER	DATE
APPROVED	<i>William Tallon</i>	12/15/99
	HEAD ENGINEER	DATE
APPROVED	<i>Dejesimi</i>	12/15/99
	CITY ENGINEER	DATE

DATE	DRWG. NO.
TITLE SHEET	SCALE NOT TO SCALE
PROJECT NO. 9641-5160-01	SHEET NO. A1 OF 22

**METRIC**  
DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METERS. STATIONS ARE IN KILOMETERS + METERS.

REVISIONS				



**SNELL ENVIRONMENTAL GROUP, INC.** A DLZ Company  
151 W. CONGRESS, SUITE 328  
DETROIT, MICHIGAN 48226  
TELEPHONE (313) 961-4040

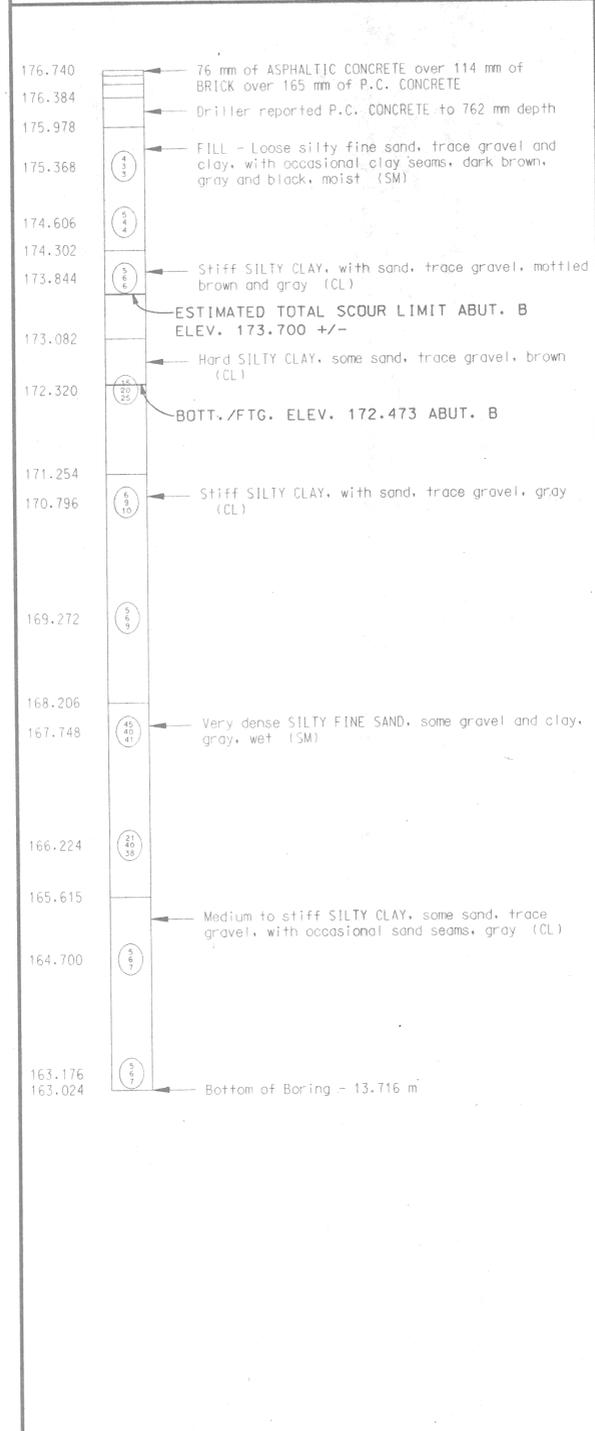


**CITY OF DETROIT MICHIGAN**

ASHLAND AVE. OVER FOX CREEK (BW-245)



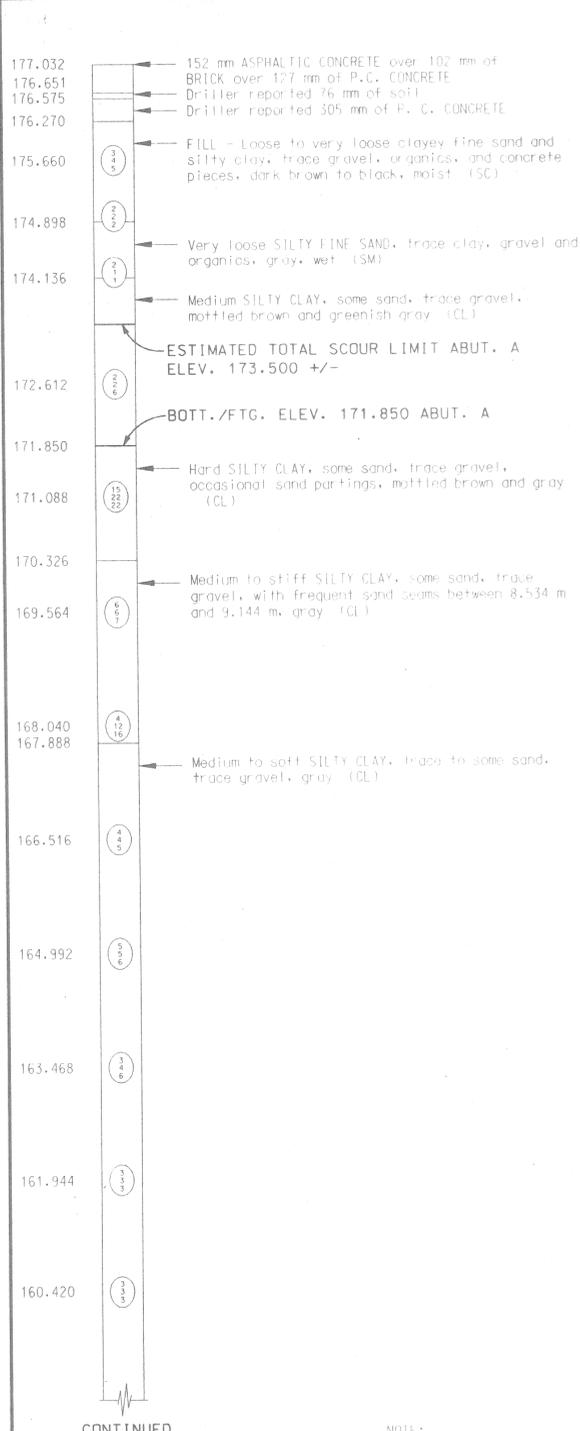
**TEST HOLE TB-#A-1**  
 LOCATION STATION 10+013.344 1746 LT.  
 ASHLAND AVE. OVER THE FOX CREEK  
 ELEV. GROUND SURFACE ELEVATION 176.740



NOTE: WATER LEVEL AT COMPLETION: NONE

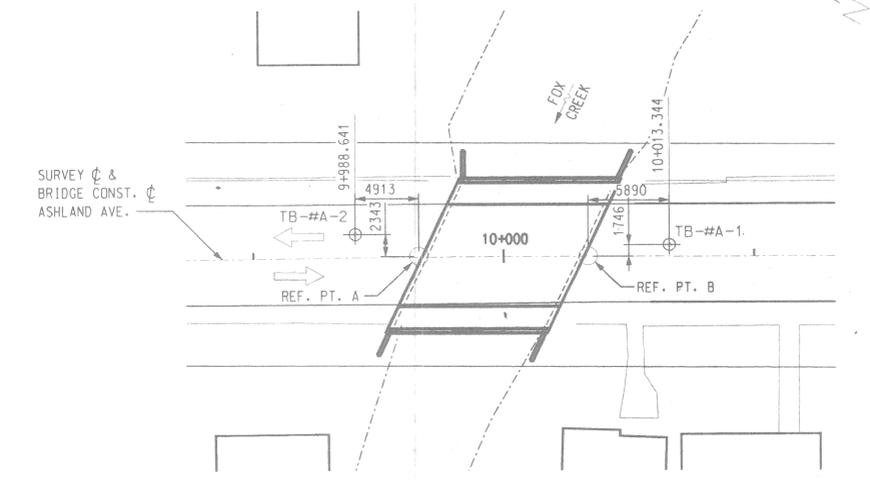
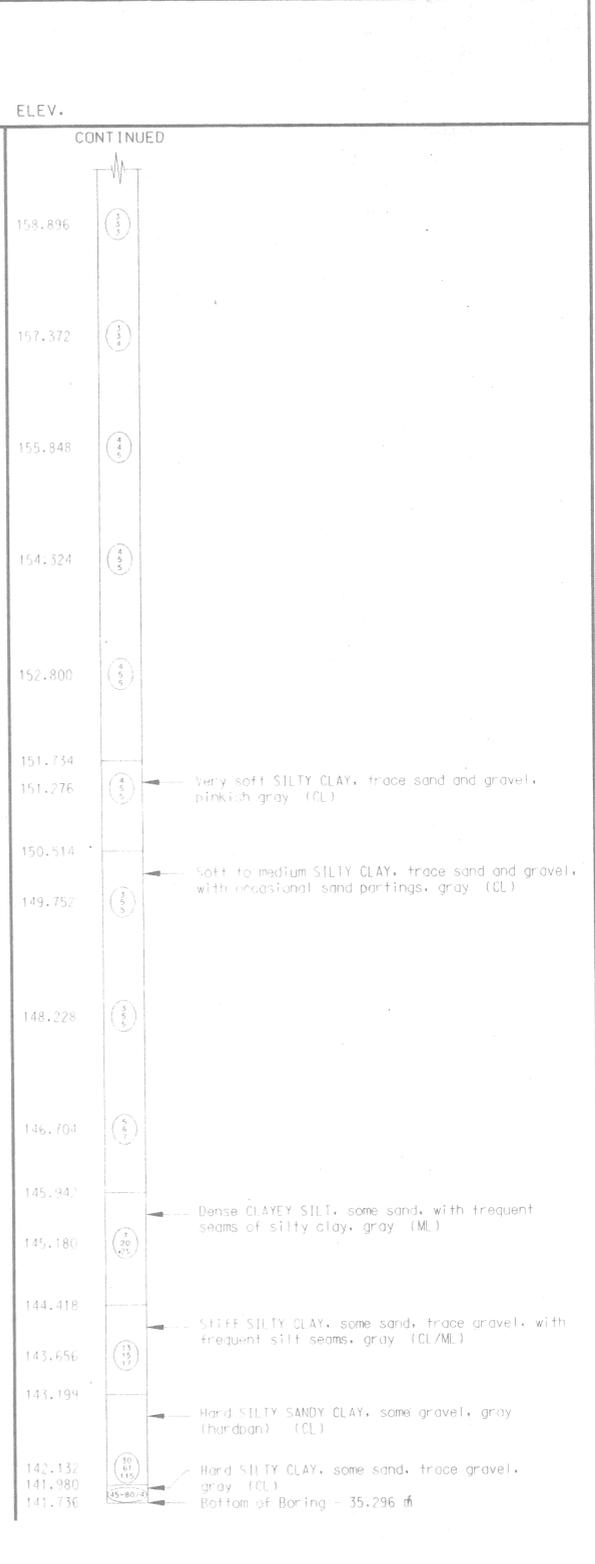
BORING DATE 4/ 3/97

**TEST HOLE TB-#A-2**  
 LOCATION STATION 9+988.641 2343 LT.  
 RIVERSIDE AVE. OVER FOX CREEK  
 ELEV. GROUND SURFACE ELEVATION 177.032



NOTE: WATER LEVEL AT COMPLETION: NONE

BORING DATE 4/ 2/97



**NOTES:**  
 NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 50.8 mm SPLIT SPOON SAMPLER 3 SUCCESSIVE 0.15 m INCREMENTS USING A 63.5 kg HAMMER FALLING 0.76 m. WHERE THE SAMPLER IS DRIVEN DISTANCES OTHER THAN THE 0.15 m INCREMENT, THE DISTANCE IS SHOWN IN PARENTHESES TO THE RIGHT OF THE NUMBER OF BLOWS.

- (X) NUMBER OF BLOWS PER 0.15 m
- (X X) NUMBER OF BLOWS PER 0.15 m
- (X X X) NUMBER OF BLOWS PER 0.15 m
- XX (XX) NUMBER OF BLOWS PER DISTANCE (mm)
- XX (XX) NUMBER OF BLOWS PER DISTANCE (mm)

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.  
 WATER LEVELS MAY BE INFLUENCED BY RESIDUAL BORING WATER.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

SOIL BORINGS WERE PERFORMED ON DATES SHOWN BELOW BORING.

BY: SOMAT ENGINEERING, INC.  
 26445 Northline Rd  
 Taylor, Michigan 48180  
 PHONE: (313) 946-4966

**METRIC**

DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METERS. STATIONS ARE IN KILOMETERS + METERS.

REVISIONS	DSGN BY	C. D. P.	6-97
	DR'N BY	R. J. D.	6-97
	CK'D BY	R. G. W.	6-97
	FINAL CK'D BY	M. D. W.	2-99
	APP'D BY		

DSGN BY	C. D. P.	6-97
DR'N BY	R. J. D.	6-97
CK'D BY	R. G. W.	6-97
FINAL CK'D BY	M. D. W.	2-99
APP'D BY		

**OSEG**  
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 TELEPHONE (313) 961-4040

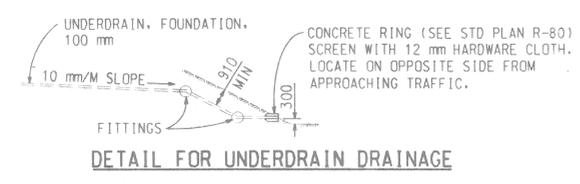
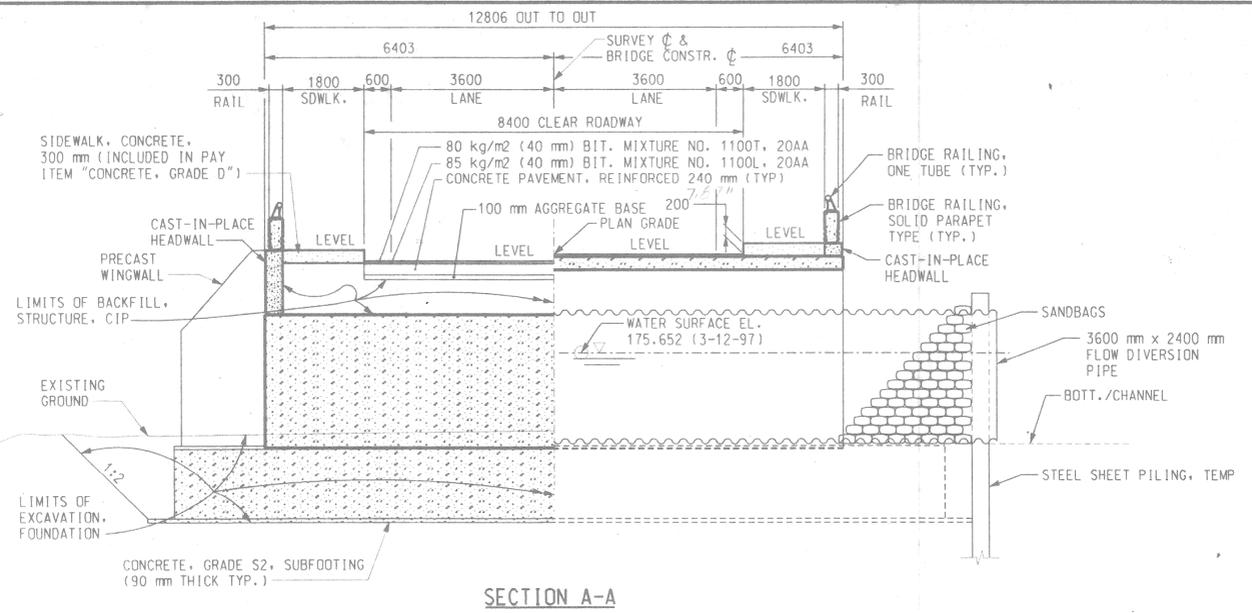
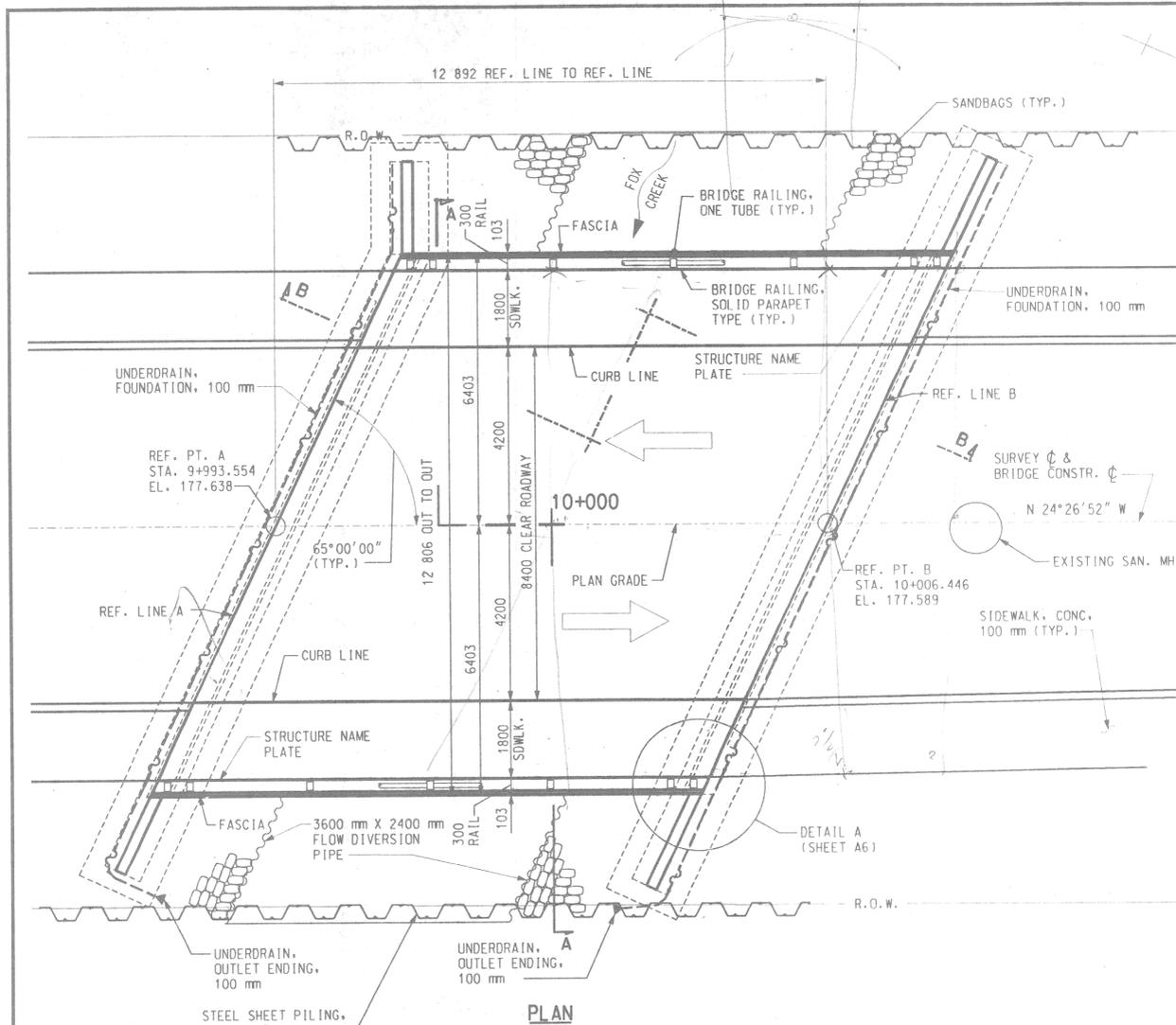


**CITY OF DETROIT MICHIGAN**

**ASHLAND AVE. OVER THE FOX CREEK (BW-245)**

**LOG OF BORINGS**

SCALE	NOT TO SCALE
PROJECT NO.	9641-5160-03
SHEET NO.	A3 OF 22
FILE NAME:	02BORING.DGN



**NOTES:**

THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES MS18 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/1000 OF SPAN LENGTH.

THE TOP OF THE ROADWAY AND TOPS OF SIDEWALKS ARE PARALLEL TO THE VERTICAL CURVE.

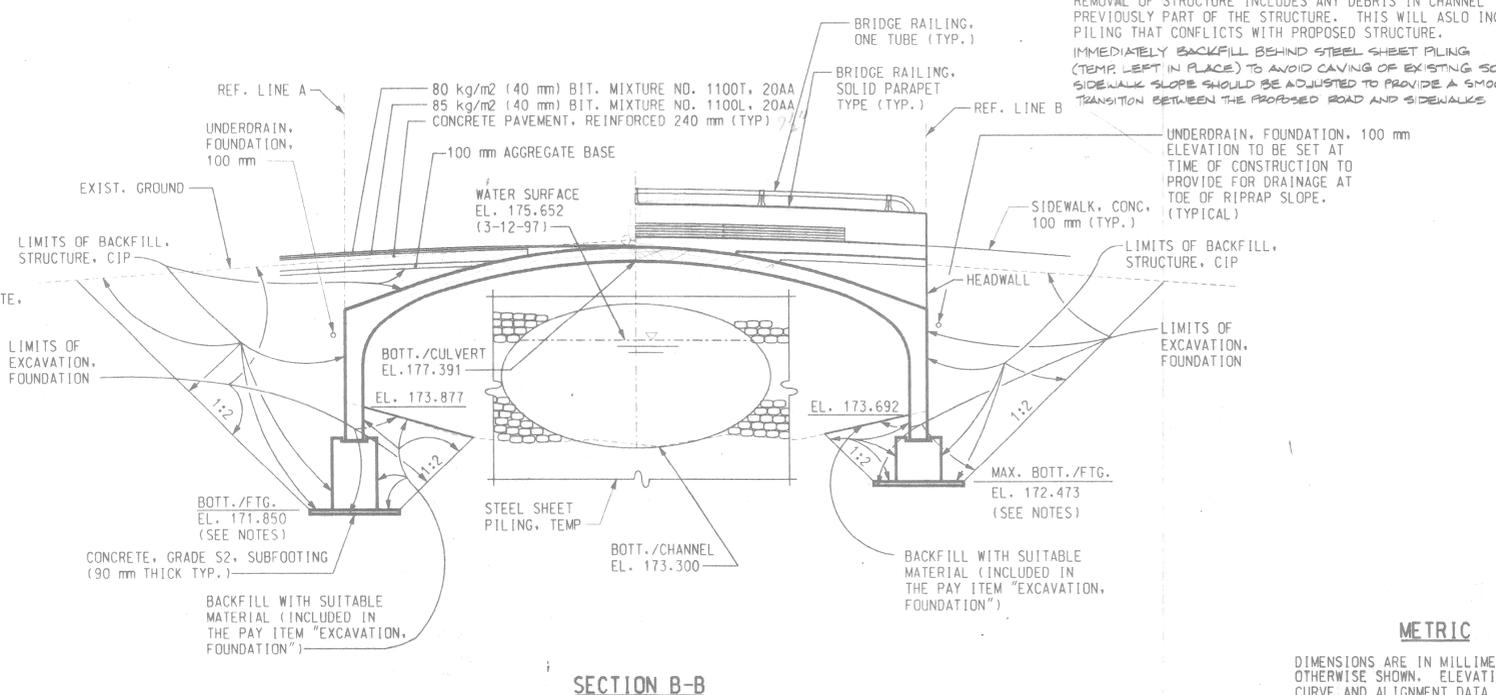
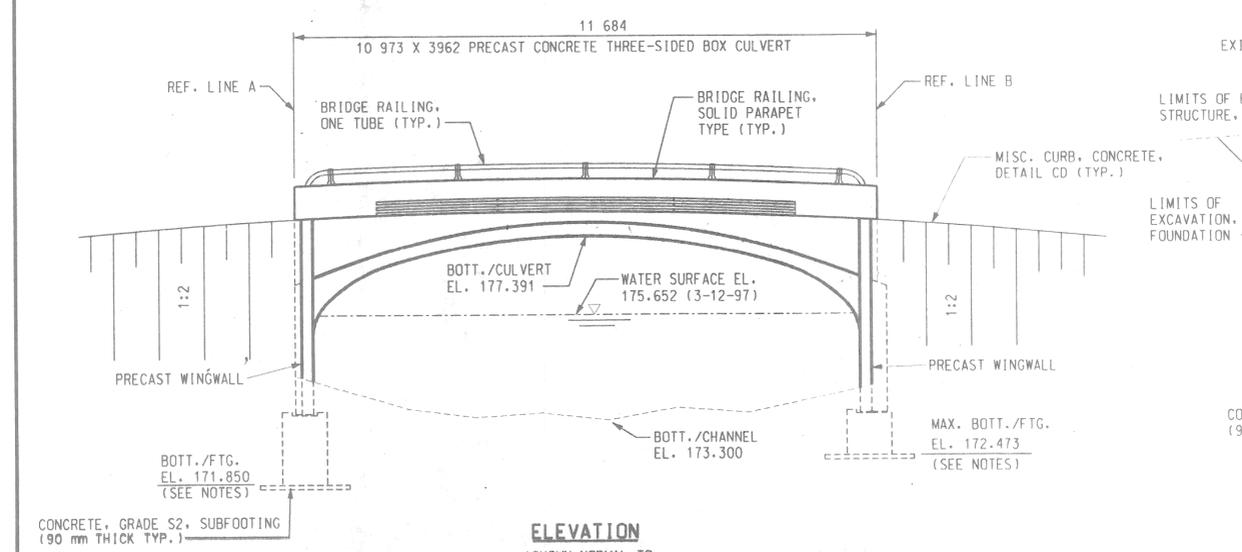
STEEL SHEET PILING, TEMP., FLOW DIVERSION PIPE, SANDBAGS, AND DEWATERING SHALL BE INCLUDED IN THE PAY ITEM "FLOW DIVERSION".

FOOTINGS SHALL BE EMBEDDED IN "HARD SILTY CLAY" AS DIRECTED BY ENGINEER.

REMOVAL OF STRUCTURE INCLUDES ANY DEBRIS IN CHANNEL THAT WAS PREVIOUSLY PART OF THE STRUCTURE. THIS WILL ALSO INCLUDE ANY PILING THAT CONFLICTS WITH PROPOSED STRUCTURE.

IMMEDIATELY BACKFILL BEHIND STEEL SHEET PILING (TEMP LEFT IN PLACE) TO AVOID CAVING OF EXISTING SOIL. SIDEWALK SLOPE SHOULD BE ADJUSTED TO PROVIDE A SMOOTH TRANSITION BETWEEN THE PROPOSED ROAD AND SIDEWALKS.

UNDERDRAIN, FOUNDATION, 100 mm ELEVATION TO BE SET AT TIME OF CONSTRUCTION TO PROVIDE FOR DRAINAGE AT TOE OF RIPRAP SLOPE. (TYPICAL)



**METRIC**

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REVISIONS	DSGN BY	M. A. M.	6-97
	DR'N BY <td>R. J. D. <td>6-97</td> </td>	R. J. D. <td>6-97</td>	6-97
	CK'D BY <td>R. G. W. <td>6-97</td> </td>	R. G. W. <td>6-97</td>	6-97
	FINAL CK'D BY <td>M. D. W. <td>2-99</td> </td>	M. D. W. <td>2-99</td>	2-99
	APP'D BY <td></td> <td></td>		

**SEG**

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TELEPHONE 1313 961-4040



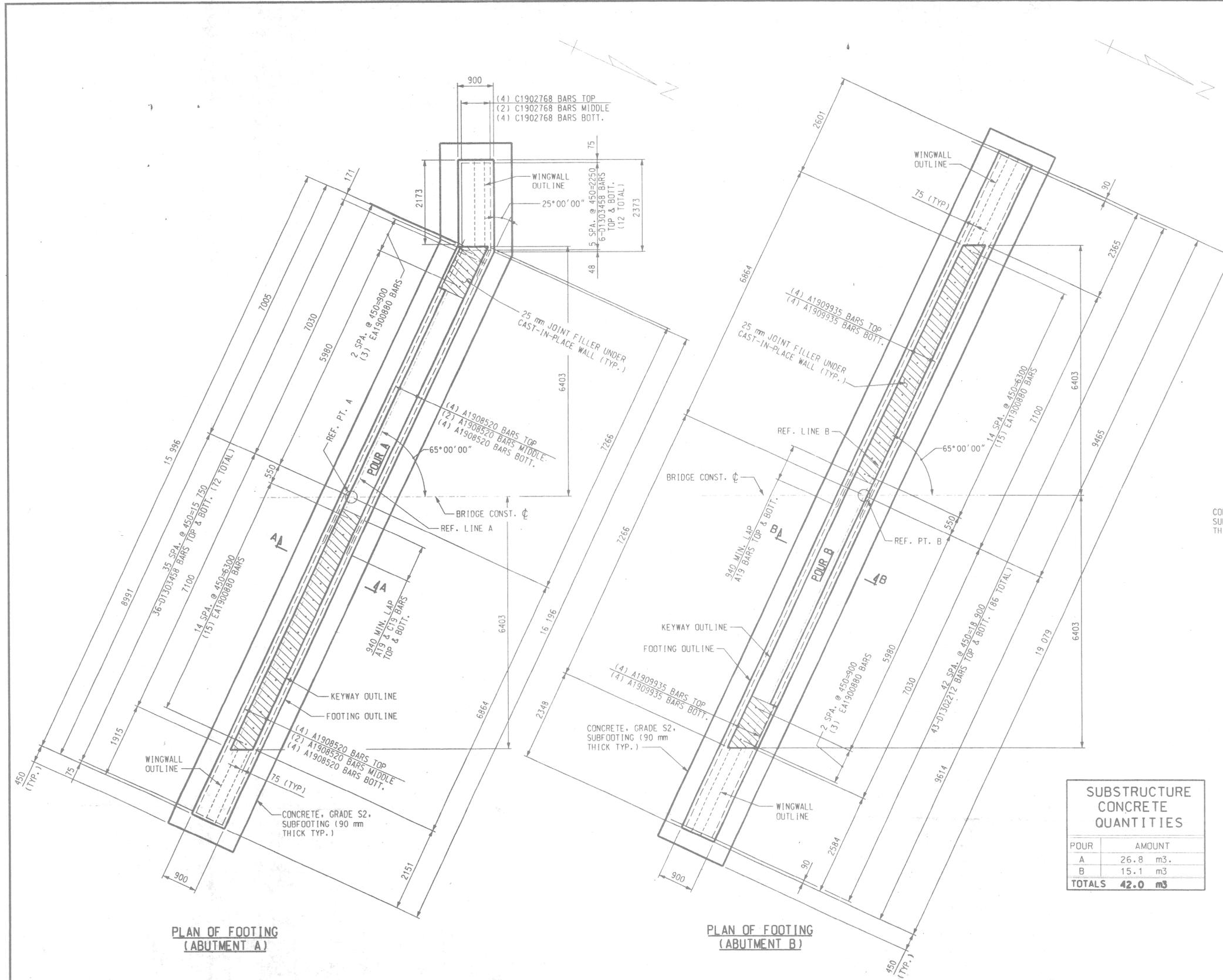
**CITY OF DETROIT MICHIGAN**

**ASHLAND AVE. OVER THE FOX CREEK (BW-245)**

**GENERAL PLAN OF STRUCTURE**

SCALE	NOT TO SCALE
PROJECT NO.	9641-5160-03
SHEET NO.	A4 OF 22

FILE NAME: 040PSTR3.DGN



**SUBSTRUCTURE CONCRETE QUANTITIES**

POUR	AMOUNT
A	26.8 m3.
B	15.1 m3
<b>TOTALS</b>	<b>42.0 m3</b>

NOTES:

FOR ABUTMENTS A AND B THE MAXIMUM FOUNDATION PRESSURE IS CALCULATED TO BE 304 kPa AVERAGE DEAD LOAD PLUS LIVE LOAD PRESSURE.

\* ABUTMENT B BOTTOM OF FOOTING ELEVATION 172.473 IS A MAXIMUM. BOTTOM OF FOOTING MAY BE LOWERED AS DIRECTED BY THE ENGINEER TO ENSURE THAT THE FOOTING IS EMBEDDED IN "HARD SILTY CLAY".

\*\* ABUTMENT A BOTTOM OF FOOTING MAY BE ADJUSTED AS DIRECTED BY THE ENGINEER TO ENSURE THAT THE FOOTING IS EMBEDDED IN "HARD SILTY CLAY". BOTTOM OF FOOTING MAY NOT EXCEED ELEVATION 172.217.

**METRIC**

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**REVISIONS**

NO.	DESCRIPTION	DATE

**SEG**

**SNELL ENVIRONMENTAL GROUP, INC.** A DLZ Company  
 151 W. CONGRESS, SUITE 328  
 DETROIT, MICHIGAN 48226  
 TELEPHONE (313) 961-4040



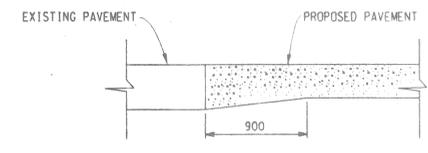
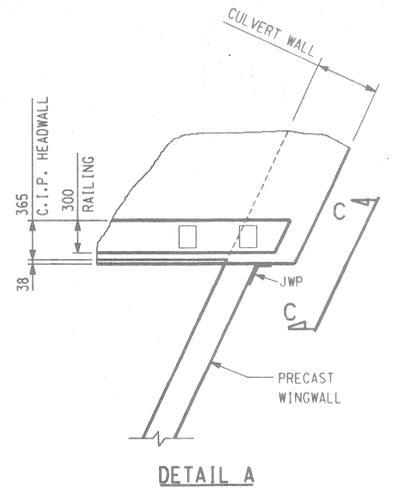
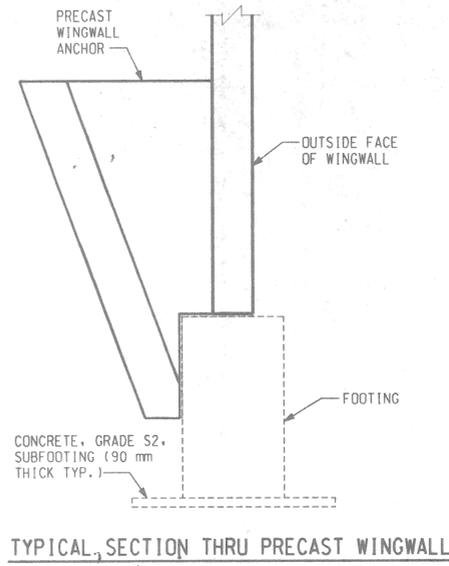
**CITY OF DETROIT MICHIGAN**

**ASHLAND AVE. OVER THE FOX CREEK (BW-245)**

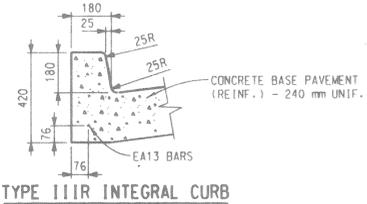
**FOOTING DETAILS**

**SCALE NOT TO SCALE**

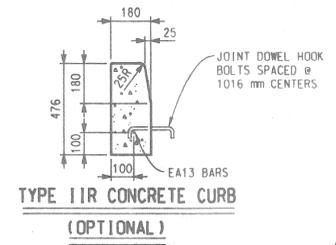
<b>PROJECT NO.</b>	9641-5160-03
<b>SHEET NO.</b>	A5 OF 22



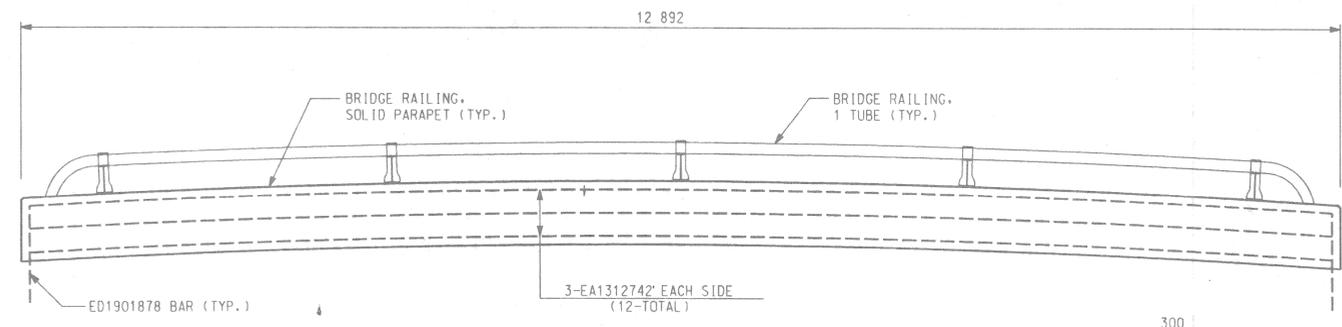
PROVIDE THIS THICKENED EDGE WHERE PROPOSED PAVEMENT MEETS EXIST. PAVEMENT  
**DETAIL OF THICKENED EDGE**



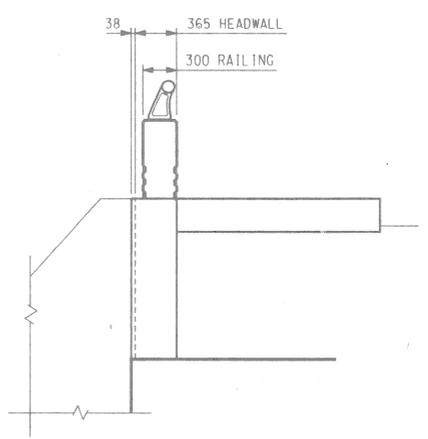
**TYPE I11R INTEGRAL CURB**



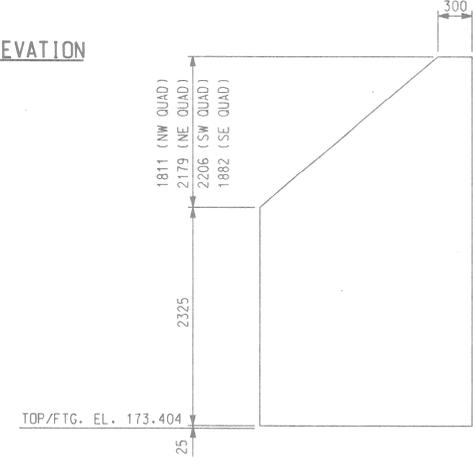
**TYPE I11R CONCRETE CURB (OPTIONAL)**



**BRIDGE RAILING ELEVATION**

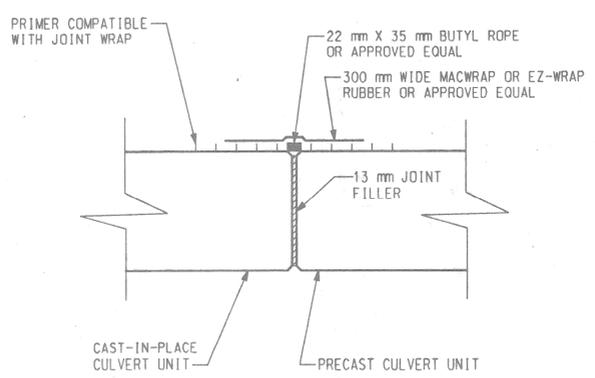


**SECTION C-C**

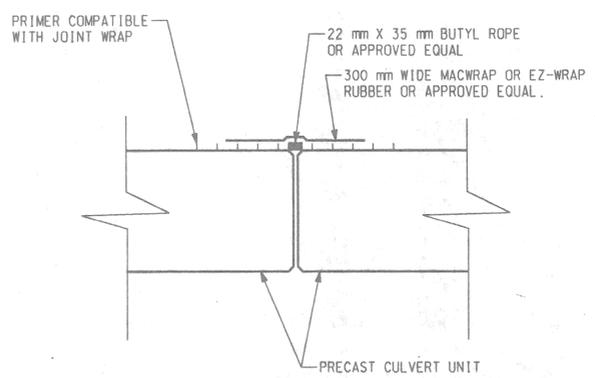


**WINGWALL ELEVATION**

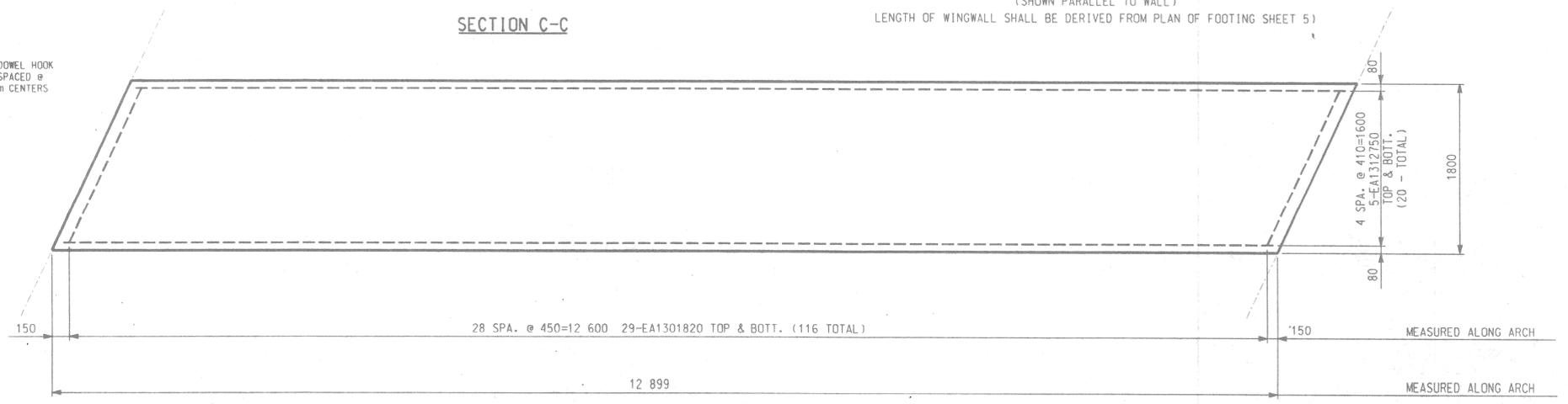
(SHOWN PARALLEL TO WALL)  
LENGTH OF WINGWALL SHALL BE DERIVED FROM PLAN OF FOOTING SHEET 5)



**STANDARD CAST-IN-PLACE/PRECAST JOINT DETAIL**



**STANDARD PRECAST JOINT DETAIL**



**TYPICAL PLAN OF SIDEWALK**

**METRIC**

DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METERS. STATIONS ARE IN KILOMETERS + METERS.

REVISIONS	DSGN BY	C.D.P.	6-97
	DR'N BY	R.J.D.	6-97
	CR'D BY	R.G.W.	6-97
	FINAL CR'D BY	M.D.W.	2-99
	APP'D BY		



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TELEPHONE (313) 961-4040



**CITY OF DETROIT MICHIGAN**

**ASHLAND AVE. OVER THE FOX CREEK (BW-245)**

**MISCELLANEOUS DETAILS**

SCALE	NOT TO SCALE
PROJECT NO.	9641-5160-01
SHEET NO.	A6 OF 22





# SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF PRECAST CULVERT BRIDGE SYSTEMS

## 1. DESCRIPTION

This work shall consist of constructing a Con/Span culvert or approved equal in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or as established by the Engineer.

## 2. TYPES

Precast reinforced concrete Con/Span culverts or approved equal manufactured in accordance with this specification shall be designated by span and rise.

## 3. MATERIALS - CONCRETE

The concrete for the culverts shall be air-entrained when installed in areas subject to freeze-thaw conditions, composed of portland cement, fine and coarse aggregates, admixtures and water. Concrete shall contain 6 ± 2 percent air. The air entraining admixture shall conform to AASHTO M154.

- 3.1 Cement - Portland cement shall conform to the requirements of ASTM Specifications C150-Type I, Type II, or Type III cement.
- 3.2 Course Aggregate - Shall consist of stone having a maximum size of 25 mm. Aggregate shall meet requirements for ASTM C33.
- 3.3 Water Reducing Admixture - The manufacturer may submit for approval by the Engineer, water-reducing admixture for the purpose of increasing workability and reducing the water requirement for the concrete.
- 3.4 Calcium Chloride - The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.

## 4. MATERIALS - STEEL REINFORCEMENT AND HARDWARE

All reinforcing steel for the culverts shall be fabricated and placed in accordance with the detailed shop drawings submitted by the manufacturer.

- 4.1 Steel Reinforcement - Reinforcement shall consist of welded wire fabric conforming to ASTM Specification A 185 or A 497, or deformed billet steelbars conforming to ASTM Specification A 615, Grade 400. Longitudinal distribution reinforcement may consist of welded wire fabric or deformed billet-steelbars.

## 5. MANUFACTURE

- 5.1 Mixture - The aggregates, cement and water shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete meeting the strength requirements of this specification. The proportion of portland cement in the mixture shall not be less than 256 kg (5 sacks) per cubic meter of concrete.

- 5.2 Curing - The precast concrete culvert units shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof shall be used:
  - 5.2.1 Steam Curing - The culverts may be low pressure, steam cured by a system that will maintain a moist atmosphere.
  - 5.2.2 Water Curing - The culverts may be water cured by any method that will keep the sections moist.
  - 5.2.3 Membrane Curing - A sealing membrane conforming to the requirements ASTM Specification C 309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within ± 6 degree C of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.

- 5.3 Forms - The forms used in manufacture shall be sufficiently rigid and accurate to maintain the culvert dimensions within the permissible variations given in Section 7. All casting surfaces shall be of smooth material.
- 5.4 Handling - Handling devices or holes shall be permitted in each culvert for the purpose of handling and setting.
- 5.5 Storage - The culverts shall be stored in such a manner to prevent cracking or damage. The units shall not be stored in an upright position until the compressive strength is a minimum of 28 MPa.

## 6. DESIGN

- 6.1 The culvert dimension and reinforcement details shall be as prescribed in the plan and the shop drawings provided by the manufacturer subject to the provisions of Section 7. The minimum concrete compressive strength shall be 28 MPa. The minimum steel yield strength shall be 400 MPa.

The culverts are designed in accordance with the "Standard Specifications for Highway Bridges" adopted by the American Association of State Highway and Transportation Officials, 1996; and the Alternate Military Loading. A minimum of 300 mm of cover above the crown of the culvert is required in the installed condition. (Unless noted otherwise and designed accordingly.)

- 6.2 Placement of Reinforcement - The cover of concrete over the outside circumferential reinforcement shall be 50 mm minimum. The cover of concrete over the inside circumferential reinforcement shall be 40 mm minimum. The clear distance of the end circumferential wires shall not be less than 25 mm nor more than 50 mm from the ends of the culvert. Reinforcement shall be assembled utilizing single or multiple layers of welded wire fabric, or utilizing a single layer of deformed billet-steelbars. The welded wire fabric shall be composed of circumferential and longitudinal wires meeting the spacing requirements of 6.4 and shall contain sufficient longitudinal wires extending through the culvert to maintain the shape and position of reinforcement. Longitudinal distribution reinforcement may be welded wire fabric or deformed billet-steelbars and shall meet the spacing requirements of 6.4. The ends of the longitudinal distribution reinforcement shall be not more than 75 mm from the ends of the culvert.

- 6.3 Bending of Reinforcement - The outside and inside circumferential reinforcement shall be bent to such an angle that is approximately equal to the configuration of the culvert's outside corner.

- 6.4 Laps, Welds, and Spacing - Tension splices in the circumferential reinforcement shall be made by lapping. Laps may be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of ACI 12.8 and 12.19. For deformed welded wire fabric, the overlap shall meet the requirements of ACI 12.7 and 12.18. For deformed billet-steelbars, the overlap shall meet the requirements of ACI 12.2. For splices other than tension splices, the overlap shall be a minimum of 300 mm for welded wire fabric or deformed billet-steelbars. The spacing center to center of the circumferential wires in a wire fabric sheet shall be not less than 50 mm nor more than 100 mm. For the wire fabric, the spacing center to center of the longitudinal wires shall not be more than 200 mm. The spacing center to center of the longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 400 mm.

## 7. PERMISSIBLE VARIATIONS

- 7.1 Internal Dimensions - The internal dimension shall vary not more than 1% from the design dimensions nor more than 40 mm whichever is less. The haunch dimensions shall vary not more than 20 mm from the design dimension.
- 7.2 Slab and Wall Thickness - The slab and wall thickness shall not be less than that shown in the design by more than 5 mm. A thickness more than that required in the design shall not be cause for rejection.
- 7.3 Length of Opposite Surfaces - Variations in laying lengths of two opposite surfaces of the culvert shall not be more than 16 mm in any culvert section, except where beveled ends for laying of curves are specified by the purchaser.
- 7.4 Length of Section - The underrun in length of a section shall not be more than 13 mm in any culvert.
- 7.5 Position of Reinforcement - The maximum variation in position of the reinforcement shall be ± 13 mm. In no case shall the cover over the reinforcement be less than 40 mm for the outside circumferential steel or be less than 25 mm for the inside circumferential steel as measured to the external or internal surface of the culvert. These tolerances or cover requirements do not apply to mating surfaces of the joints.
- 7.6 Area of Reinforcement - The areas of steel reinforcement shall be the design steel areas as shown in the manufacturer's shop drawings. Steel areas greater than those required shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances

## 8. TESTING AND INSPECTION

- 8.1 Type of Test Specimen - Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing a minimum of 4 cylinders shall be taken during each production run. For core testing, one core shall be cut from a culvert section selected at random from each group of 15 culverts or less of a particular size and production run. For each continuous production run, each group of 15 culverts of a single size or fraction thereof shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than 3 consecutive days.

- 8.2 Compression Testing - Cylinders shall be made and tested as prescribed by the ASTM C 39 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the ASTM C 497 Specification.

- 8.3 Acceptability of Cylinder Tests - Failure of any of the 28 day test cylinders to meet 90 percent of the minimum compressive strength requirement can be cause for rejection.

- 8.4 Acceptability of Core Tests - The Compressive strength of the concrete in each group of culverts as defined in 8.1 is acceptable when the core test strength are equal to or greater than the design concrete strength. When the compressive strength of the core tested is less than the design concrete strength, the culvert from which that core was taken may be rejected. When the compressive strength of the core is equal to or greater than the design concrete strength, the compressive strength of the concrete in that group of culverts is acceptable.

- 8.4.1 When the compressive strength of any core is less than the design concrete strength, the culvert from which that core was taken shall be rejected. Two culverts from the remainder of the group shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of the remainder of that group of culverts is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group of culverts shall be rejected or, at the option of the manufacturer, each culvert of the remainder of the group shall be cored and accepted individually, and any of these culverts that have cores with less than the design concrete strength shall be rejected.

- 8.4.2 Plugging Core Holes - The core holes shall be plugged and sealed by the manufacturer in a manner such that the culvert will meet all of the test requirements of this specification. Culverts so sealed shall be considered satisfactory for use.

- 8.4.3 Test Equipment - Every manufacturer furnishing culverts under this specification shall furnish all facilities and personnel necessary to carryout the test required.

## 9. JOINTS

The culverts shall be produced with flat butt ends. The ends of the culvert shall be such that when the sections are laid together they will make a continuous line of culverts with a smooth interior free of appreciable irregularities, all compatible with the permissible variations in Section 7. The joint width shall not exceed 20 mm.

## 10. WORKMANSHIP AND FINISH

The culverts shall be substantially free of fractures. The ends of the culverts shall be normal to the walls and centerline of the culvert section, within the limits of the variations given in Section 7, except where beveled ends are specified. The surface of the culverts shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth steel form finish.

## 11. REPAIRS

Culverts may be repaired, if necessary, because of imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the purchaser, the repairs are sound, properly finished and cured, and the repaired section conforms to the requirements of this specification.

## 12. INSPECTION

The quality of materials, the process of manufacture, and the finished culverts shall be subject to inspection by the purchaser.

## 13. REJECTION

Culverts shall be subject to rejection on account of any of the specification requirements. Individual culverts may be rejected because of any of the following.

- 13.1 Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall.
- 13.2 Defects that indicate proportioning, mixing, and molding not in compliance with Section 5.
- 13.3 Honeycombed or open texture, and
- 13.4 Damaged ends, where such damage would prevent making a satisfactory joint.

## 14. MARKING

Each culvert shall be clearly marked by waterproof paint. The following shall be shown on the inside of the vertical leg of the culvert section:

Culvert Section Span X Culvert Rise

Date of Manufacture

Name or trademark of the manufacturer

And in the case of headwall sections, east or west face shall also be marked

## 15. CONSTRUCTION REQUIREMENTS

- 15.1 Footings - The culverts shall be installed on either precast or cast-in-place concrete footings. The design size and elevation of the footers shall be as determined by the Engineer. A 75 mm deep keyway shall be formed in the top surface of the footing 75 mm clear of the outside faces of the culvert, unless specified otherwise on the plans. The footings shall be given a smooth float finish and shall reach a compressive strength of 14 MPa before placement of the culvert sections. The completed footing surface shall be constructed in accordance with grades shown on the plans. When tested with a 3000 mm straight edge, the surface shall not vary more than 6 mm in 3000 mm. If a precast concrete footer is used, the contractor shall prepare a 100 mm thick layer of compacted granular material the full width of the footer prior to placing the precast footer.

- 15.2 Placement of the Culverts - The culverts shall be placed as shown on the Engineer's plan drawings. Special care shall be taken in setting the culverts to the true line and grade. The culverts shall be set on 150 mm X 150 mm masonry or steel shims. A minimum of 13 mm gap shall be provided between the footing and the bottom of the culvert's vertical legs. The gap shall be filled with cement grout (portland cement and water or cement mortar composed of one part portland cement and three parts of sand, by volume, and water.

- 15.3 External Protection of Joints - The butt joint made by two adjoining culverts shall be covered with a 22 mm X 35 mm (32 mm round equivalent) piece of butyl rope and a minimum of 230 mm wide joint wrap. The surface shall be free of dirt before applying the joint material. A primer compatible with the joint wrap to be used shall be applied for a minimum width of 230 mm on each side of the joint. The external wrap shall be either EZ-WRAP RUBBER by PRESS-SEAL GASKET CORPORATION, SEAL WRAP by MAR MAC MANUFACTURING CO. INC. or approved equal. The joint shall be covered continuously from the bottom of the culvert leg, across the top of the arch and to the opposite culvert section leg. Any laps that result in the joint wrap shall be a minimum of 150 mm long with the overlap running downhill.

In addition to the joints between units, the joint between the end unit and the headwall shall be sealed. If using precast wingwalls, the joint between the end bridge unit and the wingwall shall be sealed with this type of wrap or at the discretion of the Engineer, filter fabric shall be substituted.

During the backfilling operation, care shall be taken to keep the joint wrap in its proper location over the joint.

- 15.4 Backfill - Backfill shall be considered as all replaced excavation and new embankment adjacent to the Con/Span or approved equal bridge units and wingwalls. The project construction and material specifications which include the specifications for excavation for structures and roadway excavation and embankment construction shall apply except as modified in this section.

Backfill material for a minimum width of 1220 mm on each side of the culvert, from the base of the unit to 300 mm above the outside corner shall be a soil meeting AASHTO classification A1, A2, A3 or A4 unless authorization to use a different material is given in writing by the designer. For heights of fill over 3660 mm, only A1 & A3 materials shall be used. Maximum dry density shall be determined by AASHTO T-99 or other approved methods. Backfill shall be placed and compacted in layers until the density is not less than 95% of maximum dry density. All material outside the backfill zone shall be good quality, well compacted embankment or in situ soil.

No backfill shall be placed against any structural elements until they have been approved by the Engineer.

Backfill against a waterproofed surface shall be placed carefully to avoid damage to the waterproofing material.

Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the culvert and over the top of the culvert until it is covered to a minimum depth of 300 mm. The backfill within 1220 mm of each side of the culvert shall be placed in lifts of 200 mm or less (loose depth). Heavy compaction equipment shall not be operated in this area or over the culvert until it is covered to a depth of 300 mm.

Lightweight dozers and graders may be operated over culverts having one 300 mm of compacted cover, but heavy earth moving equipment (larger than a D-4 Dozer weighing in excess of 107 kN and having track pressures of 55 kPa or greater) shall require 600 mm of cover unless the design cover is less than 600 mm. In no case shall equipment operating in excess of the design load (MS18 or MS23) is to be permitted over the culvert unless approved by Con/Span or approved equal.

Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the project.

As a precaution against introducing unbalanced stresses in the culvert and wingwalls, when placing backfill at no time shall the difference between the heights of fill on opposite sides of the culvert exceed 600 mm.

Backfill in front of wingwalls shall be carried to ground lines shown in the plans.

## 16. MEASUREMENT AND PAYMENT

The completed work as measured for Precast Culvert will be paid for at the contract unit price for the following contract item (pay item).

Pay Item	Pay Unit
10 973 x .3962 Precast Concrete Three - Sided Box Culvert	Meter

Payment for Precast Culvert shall be payment in full for labor, equipment and material necessary to design, manufacture and install the arch elements, including any steel shims needed to level the arch elements, casting holes in the elements as needed for guardrail posts, casting in the anchor assembly per STD. B-18-B, furnishing and placing the grout between the footing and the arch elements, precast headwall units, steel connection plates between units, and furnishing and placing the joint waterproofing.

## METRIC

DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METERS. STATIONS ARE IN KILOMETERS + METERS.

REVISIONS 6/1	DSGN BY M. A. M. 6-97 DR'N BY R. J. D. 6-97 CK'D BY R. G. W. 6-97 FINAL CK'D BY M. D. W. 2-99 APP'D BY	M. A. M. R. J. D. R. G. W. M. D. W.	6-97 6-97 6-97 2-99		SNELL ENVIRONMENTAL GROUP, INC. A DLZ Company 151 W. CONGRESS, SUITE 328 DETROIT, MICHIGAN 48226 TELEPHONE (313) 961-4040		CITY OF DETROIT MICHIGAN	ASHLAND AVE. OVER THE FOX CREEK (BW-245)	PRECAST CULVERT SPECIFICATIONS	SCALE NOT TO SCALE PROJECT NO. 9641-5160-03 SHEET NO. A9 OF 22
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BAR	DIMENSIONS										NO. REQ'D	TOTAL MASS
	e	b	c	d	e	f	g	h	J			
A1908520	8520										20	381
C1902768	444	2278	0	0	0	207	490				10	62
D1303458	1354	750	1354								84	289
<b>SUBTOTAL = 732 kg</b>												
EA1900880	880										18	35
<b>EPOXY SUBTOTAL = 35 kg</b>												
A1909935	9935										16	355
D1302212	731	750	731								86	189
<b>SUBTOTAL = 544 kg</b>												
EA1900880	880										18	35
<b>EPOXY SUBTOTAL = 35 kg</b>												
EA1301022	1022										7	7
EA1301090	1090										4	4
EA1301115	1115										8	9
EA1301345	1345										4	5
EA1301820	1820										116	210
EA1302255	2255										4	9
EA1303012	3012										4	12
EA1303915	3915										4	16
EA1305070	5070										30	151
EA1306500	6500										15	97
EA1312742	12742										12	152
EA1312750	12750										20	253
EA1312786	12786										4	51
EA1313110	13110										4	52
EJ1904097	2159	371	370	524	1414	3098					4	37
EJ1904098	2159	371	370	524	1415	3100					2	18
EJ1904101	2159	371	371	525	1417	3105					4	37
EJ1904103	2159	371	372	525	1419	3115					4	37
EJ1904108	2159	371	373	526	1423	3129					4	37
EJ1904116	2159	372	376	529	1428	3146					2	18
EJ1904124	2159	372	378	531	1434	3167					4	37
EJ1904133	2159	372	381	533	1441	3193					2	18
EJ1904144	2159	373	385	536	1449	3222					4	37
EJ1904156	2159	373	388	539	1458	3255					2	19
EJ1904170	2159	374	393	543	1468	3292					4	37
EJ1904184	2159	374	397	546	1479	3333					2	19
EJ1904199	2159	375	402	550	1490	3378					4	38
EJ1904216	2159	375	407	554	1503	3427					2	19
EJ1904235	2159	376	413	559	1517	3480					4	38
EJ3206888	2776	482	1223	1314	2798	12422					2	88
EJ3206891	2776	482	1223	1315	2800	12433					2	88
EJ3206897	2776	482	1225	1317	2804	12473					2	88
EJ3206907	2776	482	1229	1320	2811	12534					2	88
EJ3206921	2776	482	1233	1324	2821	12635					2	89
EJ3206940	2776	482	1239	1329	2835	12733					2	89
EJ3206963	2776	482	1246	1336	2851	12902					2	89

BAR	DIMENSIONS										NO. REQ'D	TOTAL MASS
	a	b	c	d	e	f	g	h	J			
EJ3206989	2776	482	1254	1344	2869	13030					2	90
EJ3207019	2776	481	1263	1352	2891	13276					2	90
EJ3207027	2695	563	1428	1535	2797	12422					2	90
EJ3207036	2695	563	1431	1538	2803	12473					2	90
EJ3207054	2776	481	1275	1362	2916	13427					2	90
EJ3207062	2695	563	1439	1546	2821	12635					2	90
EJ3207091	2776	481	1286	1373	2942	13760					2	91
EJ3207105	2695	563	1455	1560	2850	12902					2	91
EJ3207133	2777	481	1299	1385	2971	13962					2	91
EJ3207166	2696	562	1475	1579	2891	13276					2	92
EJ3207177	2777	481	1313	1398	3002	14346					2	92
EJ3207225	2777	480	1328	1412	3036	14523					2	93
EJ3207241	2696	562	1502	1604	2941	13760					2	93
EJ3207277	2777	480	1344	1427	3073	15044					2	93
EJ3207331	2696	561	1533	1633	3002	14346					2	94
EJ3207433	2696	561	1570	1667	3070	15044					2	95
EK1901367	436	140	140	215							1	3
EK1901373	439	140	140	215							2	6
EK1901387	446	140	140	215							1	3
EK1901389	447	140	140	215							1	3
EK1901413	459	140	140	215							1	3
EK1901417	461	140	140	215							2	6
EK1901419	462	140	140	215							1	3
EK1901427	466	140	140	215							1	3
EK1901431	468	140	140	215							1	3
EK1901445	475	140	140	215							1	3
EK1901449	477	140	140	215							1	3
EK1901453	479	140	140	215							2	6
EK1901477	491	140	140	215							1	3
EK1901485	495	140	140	215							1	3
EK1901497	501	140	140	215							1	3
EK1901501	503	140	140	215							1	3
EK1901517	511	140	140	215							1	3
EK1901529	517	140	140	215							1	3
EK1901555	530	140	140	215							1	3
EK1901559	532	140	140	215							1	3
EK1901569	537	140	140	215							1	4
EK1901583	544	140	140	215							1	4
EK1901623	564	140	140	215							1	4
EK1901629	567	140	140	215							1	4
EK1901631	568	140	140	215							1	4
EK1901647	576	140	140	215							1	4
EK1901705	605	140	140	215							2	8
EK1901709	607	140	140	215							1	4
EK1901723	614	140	140	215							1	4
EK1901789	647	140	140	215							1	4
EK1901795	650	140	140	215							1	4
EK1901799	652	140	140	215							1	4
EK1901809	657	140	140	215							1	4
EK1901885	695	140	140	215							1	4
EK1901899	702	140	140	215							1	4
EK1901901	703	140	140	215							1	4

BAR	DIMENSIONS										NO. REQ'D	TOTAL MASS
	a	b	c	d	e	f	g	h	J			
EK1901905	705	140	140	215							1	4
EK1901993	749	140	140	215							1	4
EK1902013	759	140	140	215							2	9
EK1902113	809	140	140	215							2	9
EK1902133	819	140	140	215							1	5
EK1902137	821	140	140	215							1	5
EK1902141	823	140	140	215							1	5
EK1902243	874	140	140	215							1	5
EK1902263	884	140	140	215							1	5
EK1902271	888	140	140	215							1	5
EK1902279	892	140	140	215							1	5
EK1902387	946	140	140	215							1	5
EK1902405	955	140	140	215							1	5
EK1902419	962	140	140	215							1	5
EK1902431	968	140	140	215							1	5
EK1902543	1024	140	140	215							1	6
EK1902561	1033	140	140	215							1	6
EK1902577	10											



MISCELLANEOUS QUANTITIES

ITEM	UNIT	AMOUNT
BARRICADE, TYPE III, LIGHTED, OPER	ea	8
BARRICADE, TYPE III, LIGHTED, FURN	ea	8
PLASTIC DRUM, LIGHTED, FURN	ea	20
PLASTIC DRUM, LIGHTED, OPER	ea	20
SIGN, TYPE B, TEMPORARY, PRISMATIC RETROREFLECTIVE SHEETING	m <sup>2</sup>	35.0
PAVT MRKG, REGULAR DRY, 100 mm, WHITE	m	100
PAVT MRKG, REGULAR DRY, 100 mm, YELLOW	m	100
* CONCRETE BARRIER, TEMPORARY, FURNISHED	m	36.5
* CONCRETE BARRIER, TEMPORARY, OPERATED	m	36.5
MINOR TRAFFIC DEVICES	LS	1

\* CONCRETE BARRIER, TEMPORARY IS TO BE PLACED BEHIND TYPE III BARRICADES.

SIGN TYPE LEGEND

- △ SIGN, TYPE B
- ▬ TYPE III BARRICADE

SIGN CHART

J.D. NUMBER	SIGN	SIGN DESIGNATION	SIZE	NUMBER REQUIRED
1		W20-3	1200X1200	2
2		W20-2	1200X1200	2
3		W20-3	1200X1200	2
4		R11-4 M4-10	1500X750 1200X450	1
5		R11-4 M4-10	1500X750 1200X450	1
6		D3-1 M4-9	1200X300 750X600	4
7		D3-1 M4-9	1200X300 750X600	8
8		D3-1 M4-9	1200X300 750X600	2
9		M4-8a	600X450	2
10		R11-2	1200X750	2
11		D3-1 M6-1b	1200X300 525X375	1
12		D3-1 M6-1b	1200X300 525X375	1
13		R11-4	1500 X 750	2
14		R11-4 R11-2	1500 X 750 1200 X 750	2



NOTES:

- THE CONTRACTOR WILL FURNISH AND ERECT THE SIGNS LISTED ON THE SIGN CHART AT THE LOCATIONS SHOWN.
- AS DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ANY ADDITIONAL SIGNS, BARRICADES AND LIGHTS WITHIN THE PROJECT TO PROTECT THE TRAFFIC AND WORK AREA.
- THE CONTRACTOR SHALL PLACE SANDBAGS ON BARRICADES TO PREVENT MOVEMENT OF THE BARRICADES. THE CONTRACTOR SHALL ATTACH AND MAINTAIN THREE (3) STEADY BURN AMBER LIGHTS (TYPE "C") ON EACH OF THE BARRICADES.
- THE CONTRACTOR SHALL ATTACH AND MAINTAIN ONE (1) BATTERY OPERATED AMBER FLASHER LIGHTS (TYPE "A") AND ONE (1) ORANGE FLUORESCENT DAY-GLO FLAG ON EACH ADVANCE CONSTRUCTION SIGN (SIGNS ①, ② & ③).
- TRAFFIC CONTROL SIGNS WHICH ARE REMOVED FROM THE VICINITY OF THE PROJECT DUE TO INTERFERENCE SHALL BE TURNED OVER TO THE CITY. UPON COMPLETION OF THE PROJECT, TRAFFIC CONTROL SIGNS AND STREET NAME SIGNS WILL BE RESET IN THEIR PROPER POSITION BY THE CONTRACTOR.
- THE CONTRACTOR SHALL NOT BEGIN ANY OPERATIONS ON THE PROJECT UNTIL ALL OF THE SIGNS HAVE BEEN POSITIONED AND FLASHER LIGHTS AND FLAGS ARE ATTACHED TO ALL REQUIRED SIGNS AND BARRICADES.
- ANY OTHER SIGNS WHICH THE CONTRACTOR MAY BE REQUIRED TO FURNISH SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
- ALL CONSTRUCTION SIGNS SHALL CONFORM TO MDT 1996 STANDARD SPECIFICATIONS FOR CONSTRUCTION 812-02-B-1.

METRIC

DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METERS. STATIONS ARE IN KILOMETERS + METERS.

REVISIONS	DESCRIPTION	DATE

DSGN BY	C.D.P.	6-97
DR'N BY	R.J.D.	6-97
CK'D BY	R.G.W.	6-97
FINAL CK'D BY	M.D.W.	2-99
APP'D BY		



**SNELL ENVIRONMENTAL GROUP, INC.**  
A DLZ Company  
151 W. CONGRESS, SUITE 328  
DETROIT, MICHIGAN 48226  
TELEPHONE (313) 961-4040



**CITY OF DETROIT MICHIGAN**

**ASHLAND AVE. OVER THE FOX CREEK (BW-245)**

**DETOUR PLAN**

SCALE	NOT TO SCALE
PROJECT NO.	9641-5160-03
SHEET NO.	A12 OF 22