

Marshalling Yard Improvements**Saint John Ferry Terminal****Saint John, New Brunswick****Project No. R.090690.001**

Catch Basins

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PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specifications for related information.
- 1.2 Reference Standards .1 ASTM C478, Precast Reinforced Concrete Manhole Sections.
- .2 New Brunswick Department of Transportation and Infrastructure (NBDTI) Standard Specification, Highway Construction & Maintenance (current edition).
- 1.3 Material Certification .1 At least two weeks prior to commencing work, submit manufacturer's test data and certification that materials meet requirements of this section. Include manufacturer's drawings, information and shop drawings where pertinent.
- 1.4 Measurement for Payment .1 Precast concrete catch basins will be measured in accordance with **Section 01 29 00**.

PART 2 - PRODUCTS

- 2.1 Materials .1 Precast catch basins sections: to ASTM C478 and as detailed on the drawings.
- .2 Joints: to be made watertight using rubber rings.
- .3 Adjusting rings: to ASTM C478.
- .4 Cast-in-place concrete to **Section 03 30 00**.
- .5 Frames, gratings, covers to plan dimensions and following requirements:
- .1 Metal gratings and covers to gear evenly on frames. A frame with grating or cover to constitute one unit.

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- .2 Catch basin frames and covers: heavy duty municipal type with a load rating of 7,000 kg for yard tractor loads.

PART 3 - EXECUTION3.1 Excavation
and Backfill

- .1 Excavate and backfill in accordance with **Section 31 23 10**.
- .2 Obtain approval of *Departmental Representative* before installing catch basins.

3.2 Installation

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
 - .2 Complete units as pipe laying progresses.
 - .3 Pump excavation free of standing water and remove soft and foreign material before placing concrete base.
 - .4 Cast bottom slabs directly on 300 mm minimum of well compacted granular sub-base material, 98% standard proctor density.
 - .5 For precast units:
 - .1 Set bottom section of precast unit on 300 mm minimum of compacted granular sub-base. If within tide zone, use substitute clear stone. Make each successive joint watertight with approved rubber ring gaskets.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
 - .6 Installing units in existing systems:
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- .1 Where a new unit is to be installed in an existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
 - .2 Make joints watertight between new unit and existing pipe.
 - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate breakouts, removals and redirection of flows, blocking unused pipes or other necessary work.
 - .7 Place granular backfill material, approved by Departmental Representative, in 300 mm layers to full width, alternately on each side of the catch basin, so as not to displace it laterally or vertically.
 - .8 Compact each layer to 95% maximum density to ASTM D 698.
 - .9 Place frame and cover on top section to elevation indicated. If adjustment is required, use concrete ring.
 - .10 Clean units of debris and foreign materials. Remove fins and sharp projection. Prevent debris from entering system.
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Lift Station Force Mains

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PART 1 - GENERAL

- 1.1 Related Requirements .1 Section 32 32 13.13 - Packaged Lift Station, Wet Well Type.
- 1.2 MEASUREMENT AND PAYMENT .1 Trenching and backfilling is incidental to pipe installation.
- .2 Measure supply and installation of sewage force main including excavating and backfilling and granular bedding and surround in metres of each type and size of pipe installed.
- .1 Measurement will be made of actual length in place, through valves and fittings, after work has been completed.
- 1.3 REFERENCES .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C104/A21.4-[08], Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- .2 ANSI/AWWA C111/A21.11-[06], Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 ANSI/AWWA C151/A21.51-[09], Standard for Ductile-Iron Pipe, Centrifugally Cast.
- .4 ANSI/AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
- .5 AWWA C901-17, Polyethylene (PE) Pressure Pipe and Tubing, ¾" (19 mm) through 3" (76 mm), for water service.
- .6 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4" through 12" (100 mm - 300 mm), for Water Transmission and Distribution.
- .2 ASTM International
- .1 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of

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Soil Using Standard Effort ((12,400 ft-lbf/ft²) (600kN-m/m²)).

- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
 - 1.4 Administrative Requirements
 - .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services.
 - .2 Submit schedule of expected interruptions and adhere to schedule approved by Departmental Representative.
 - .3 Notify Departmental Representative and building manager a minimum of 24 hours in advance of interruption in service.
 - 1.5 Action And Informational Submittals
 - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipe and fittings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
 - .2 Submit shop drawings showing proposed method of installation for sewage force main in undercrossing.
 - .4 Samples:
 - .1 Submit 2 weeks minimum before beginning Work, with proposed source of bedding materials and provide access for sampling.
 - .5 Certification to be marked on pipe.
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- .6 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

 - 1.6 Delivery, Storage And.1 Handling
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

 - .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

 - Part 2 - Products
 - 2.1 Materials
 - .1 Iron pipe:
 - .1 Ductile Iron Pipe: to ANSI/AWWA C151/A21.51.
 - .2 Pipe to be pressure Class 350.
 - .3 Pipe and fittings: cement-mortar lined to ANSI/AWWA C104/A21.4.
 - .4 Pipe joints: to ANSI/AWWA C111/A21.11, push-on type.
 - .5 Rubber gaskets: to ANSI/AWWA C111/A21.11.
 - .6 Joints for fitting: to be mechanical joints.

 - .2 Polyethylene Pressure Pipes to CSA B137:
 - .1 Type: HDPE
 - .2 Series: DR11
 - .3 Joints: to ANSI/AWWA C207 or thermal butt fusion.
 - .4 Polyethylene fittings: to CSA B137 for pipe sizes 4" and less.
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2.2 Pipe Bedding
and Surround
Materials

- .1 Granular material to Section 31 05 17 -
Aggregates General and following
requirements:
- .1 Crushed or screened stone, gravel or
sand.
 - .2 Gradations within limits specified when
tested to ASTM C 136 and ASTM C 117.
Sieve sizes to CAN/CGSB-8.1,
CAN/CGSB-8.2.

.2 Table:

<u>Sieve Designation</u>	% Passing	
	Stone/Gravel	Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	100
25 mm	100	83-100
19 mm	90-100	70-100
12.5 mm	-	55-90
9.5 mm	25-60	45-80
4.75 mm	0-10	30-65
2.00 mm	0-5	20-50
0.425 mm	-	5-20
0.180 mm	-	-
0.075 mm	-	0-8

- .3 Concrete mixes and materials for thrust blocks
to Section 03 30 00 - Cast-in-Place Concrete.

2.3 Backfill Material

- .1 Type 2, in accordance with Section 31 05 17 -
Aggregates General, Item 2.1.4.

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Part 3 - Execution

- 3.1 Examination .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- 3.2 Preparation .1 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .2 Pipes and fittings to be clean and dry.
- .3 Prior to installation, obtain Departmental Representative's approval of pipes and fittings.
- 3.3 Trenching .1 Do trenching Work, in accordance with Section 31 23 10 - Excavating and Backfilling.
- .2 Trench alignment and depth require approval from Departmental Representative prior to placing bedding material or pipe.

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- 3.4 Granular Bedding
- .1 Place granular bedding in unfrozen condition.
 - .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
 - .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .4 Shape transverse depressions as required to suit joints.
 - .5 Compact each layer full width of bed to at least 95% maximum density to ASTM D 698.
 - .6 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.
- 3.5 Installation
- .1 Lay pipes in accordance with ANSI/AWWA C600, for ductile iron pipe.
 - .2 Join pipes in accordance with ANSI/AWWA C600, for ductile iron pipe.
 - .3 Avoid damage to machined ends of pipes in handling and moving pipe.
 - .4 Maintain grade and alignment of pipes.
 - .5 Align pipes carefully before jointing.
 - .6 Joint deflection permitted within limits in accordance with pipe manufacturer's written recommendations.
 - .7 Support pipe firmly over entire length, except for clearance necessary at couplings.
 - .1 Do not use blocks to support pipe.
 - .8 Keep pipe and pipe joints free from foreign material.
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- .9 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.
 - .10 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .11 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.
 - .12 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by Departmental Representative.

3.6 Thrust Blocks

- .1 Restrain bends, tees and fittings using concrete thrust blocks.
- .2 Keep pipe couplings free of concrete.
- .3 Bearing area of thrust blocks to be as indicated.

3.7 Pipe Surround

- .1 Place surround material in unfrozen condition.
 - .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated.
 - .4 Compact each layer from pipe invert to mid-height of pipe to at least 95% maximum density to ASTM D 698.
 - .5 Compact each layer from mid-height of pipe to underside of backfill to at least 90% maximum density to ASTM D 698.
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- 3.8 Backfill
- .1 Place backfill material in unfrozen condition.
 - .2 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.
 - .3 Under paving and walks, compact backfill to at least 95 % maximum density to ASTM D 698. In other areas, compact to at least 90 % maximum density to ASTM D 698.
- 3.9 Field Testing of Force Main
- .1 Testing of force main to be carried out in presence of Departmental Representative.
 - .2 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.
 - .3 Expel air from force main, by slowly filling main with water.
 - .1 Drill and tap high points and install suitable cocks to vent air and to be shut when pressure is applied.
 - .2 Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.
 - .4 Apply hydrostatic test pressure of 1034 kPa based on elevation of lowest point in line and corrected to elevation of test gauge for combined hydrostatic and leakage test.
 - .5 Apply pressure for 2 hours.
 - .6 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.
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- .7 Do not exceed allowable leakage as defined in ANSI/AWWA C600 and calculated by formula:

$$\text{Allowable Leakage} = \frac{ND P^{1/2}}{130,000}$$

N = No. of joints**D** = Nom. Diameter of pipe mm**P** = Ave. test pressure (1034 kPa)

$$= L/h \quad (1034^{1/2} = 32.16)$$

- .8 Locate and repair defects if leakage is greater than amount specified.
- .9 Repeat test until leakage is within specified allowance for full length of force main.
- .10 Complete backfill.
- .11 Repeat test after completing backfill. Locate and repair defects and backfill. Repeat tests, repairs and backfills as needed until leakage is less than amount specified.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

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PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- 1.2 References Standards .1 CSA International
.1 CSA-GA257.2, Standards for Concrete Pipes
.2 New Brunswick Department of Transportation and Infrastructure (NBDTI) Standard Specification, Highway Construction & Maintenance (current edition).
- 1.3 Submittals .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit list of all pipe, indicating location, type, diameter, length and invert elevations for *Departmental Representative Review*, at least 4 weeks prior to ordering of pipe.
.3 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include project characteristics, performance criteria, physical size, finish and limitations.
.4 Samples:
.1 Inform Departmental Representative at least 4 weeks before beginning work, or proposed source of bedding materials and provide access for sampling.
.5 Certifications: to be marked on pipe.
.6 Test and Evaluation Reports:
.1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning work.
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- 1.4 Delivery, Storage and Handling
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and handling requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.
- 1.5 Measurement for Payment
- .1 Measurement for payment will be in accordance with **Section 01 29 00**.

PART 2 - PRODUCTS

- 2.1 Concrete Pipe
- .1 Reinforced concrete pipe: to CSA A257.2 diameter as indicated, strength classification 65-D.
 - .2 Rubber gaskets for joints: to CSA A257.
 - .3 Cement mortar joint filler:
 - .1 Portland cement: to CSA A3000 type 10.
 - .2 Sand: to ASTM C144.
 - .3 Mortar: one part by volume of cement to two parts of clean, sharp sand mixed dry. Add sufficient water after mixing to give optimum consistency for hand application.
- 2.2 Granular Bedding and Backfill
- .1 Material to be in accordance with Section 32 11 02 - Aggregates Base Courses
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PART 3 - EXECUTION

- 3.1 Examination .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable for pipe culvert installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of *Departmental Representative*.
 - .2 Inform *Departmental Representative* of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from *Departmental Representative*.
- 3.2 Preparation .1 Existing Culverts shall be disposed of in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
- .2 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with requirement or authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

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- 3.2 Trenching .1 Do trenching work in accordance with Section 31 23 10 - Excavating and Backfilling.
- .2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.
- 3.3 Bedding .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 For culverts place minimum thickness of 150 mm of approved granular material on bottom of excavation and compact to minimum 95% maximum density to ASTM D 698.
- .3 Bed outlet pipes in embankment material only.
- .4 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.
- .5 Place bedding in unfrozen condition.
- 3.4 Laying Concrete Pipe Culverts .1 Begin at downstream end of culvert with flanged end of first pipe section facing upstream.
- .2 Ensure barrel of each pipe is in contact with shaped bed throughout its length.
- .3 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.
- .4 End sections of pipe to be bevel cut at 1.5 to 1 slope to blend into roadway slope.
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3.5 Joints

- .1 Joints may be made with rubber gaskets, bituminous jointing compound or Portland cement mortar.
 - .1 Rubber gasket joints:
 - .1 Install in accordance with manufacturer's written recommendations.
 - .2 Ensure that tapered ends are fully entered into flanged ends.
 - .2 Bituminous filled joints:
 - .1 Make joint with excess of filler to form continuous bead around outside of pipe and finish smooth on inside.
 - .3 Mortar joints:
 - .1 Prepare mortar as specified herein.
 - .2 Clean pipe ends and wet with water before joint is made.
 - .3 Place mortar in lower half of flanged end of pipe section in place.
 - .4 Apply mortar to upper half of tapered end of pipe section being installed.
 - .5 Join pipe ends and force joint up tight, taking care to ensure inner surfaces of abutting pipe sections are flush and even.
 - .6 Clean inside of pipe and annular space between ends of pipes after each joint is made.
 - .7 Fill joint with mortar and finish smooth and even.
 - .8 For pipes 800 mm or less diameter, fill joints before mortar in joints has set
 - .9 For pipes over 800 mm diameter, postpone filling joint until backfilling has been completed. Re-clean joints before applying mortar.

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- 3.6 Backfilling .1 Backfill around and over culverts as indicated or as directed by Departmental Representative.
- .2 Place granular backfill material, approved by Departmental Representative, in maximum 200 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .3 Compact each layer to 95% maximum density to ASTM D 698 taking special care to obtain required density under haunches.
- .4 Protect installed culvert with minimum 1 metre cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.
- .5 Place backfill in unfrozen condition.

END OF SECTION