

This specification outlines the requirements for constructing new, and adjusting and sealing over existing, maintenance holes, catch basins structures and outfall structures~~ditch inlets~~ as indicated or as directed.

PART 1 REFERENCES

This specification refers to the following standards, specifications, or publications:

American Association of State Highway and Transportation Officials (AASHTO)

HL-93 Vehicular Live Loading, Truck, Tandem, Design Lane Load

HS-25 Interpretation of HL-93

ASTM International

A48/A48M Standard Specification for Gray Iron Castings

A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

B221 Standard Specification Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

C139 Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

C478/C478M Standard Specification for Precast Reinforced Concrete Manhole Sections

D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension, Die “C” Method

D4412 Standard Test Methods for Sulfate-Reducing Bacteria in Water and Water-Formed Deposits, Die “C” Method

D624 Standard Test Methods for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers, Die “B” Method

D646 Standard Test Method for Mass per Unit of Paper and Paperboard of Aramid Papers (Basic Weight)

D638 Standard Test Method for Tensile Properties of Plastics

<u>D648</u>	<u>Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position</u>
D698	Standard T est M ethods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
<u>D785</u>	<u>Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials</u>
D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
D2240	Standard test Method for Rubber Property—Durometer Hardness

Canadian General Standards Board (CGSB)

<u>8.1</u>	<u>Sieves, Testing, Woven Wire, Inch Series</u>
<u>8.2</u>	<u>Sieves, Testing, Woven Wire, Metric</u>

CSA Group

A23.1/A23.2	Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
<u>A165 Series</u>	<u>CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3)</u>
A3000	Cementitious Materials Compendium <u>(Consists of A3001, A3002, A3003, A3004 and A3005)</u>
G164	Hot Dip Galvanizing of Irregularly Shaped Articles

PART 2 GENERAL

2.1 SUBMITTALS

- .1 Submit in accordance with Section 01340 – Shop Drawings, Samples and Submissions.

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures 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 Newfoundland and Labrador, Canada.

2.2 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01400 – Quality Control & Testing Laboratory Services.

.2 Certifications:

- .1 Submit manufacturer's test data and certification at least four (4) weeks before beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

2.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01015 – Materials & Equipment Delivered to Site and 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 in clean, dry, well-ventilated area.
- .2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.
- .1 Replace defective or damaged materials with new.

PART 3 PRODUCTS

3.1 MATERIALS

.1 Concrete.1 Concrete mix design:

.1 Water/cement ratio to CSA A23.1/A23.2. F2 exposure for maintenance holes and F1 exposure for catch basins and outfall structures.

.2 75 to 100 mm slump at time and point of deposit.

.3 Air entrainment in accordance with CSA A23.1/A23.2

.2 Cast-in-place Concrete:

.1 In accordance with Section 03300 – Cast-in-Place Concrete.

.2 Cement in accordance with CSA A30001, type GU40.

.3 Concrete mix design to produce 25 MPa minimum compressive strength at 28 days and containing 40 mm maximum size coarse aggregate. 30 MPa for pre-cast maintenance holes, catch basins and ditch inlets and 25 MPa for cast-in-place maintenance holes. Maximum size aggregate shall be 40 mm except 28 mm for pre-cast units. The water/cement ratio and air category shall be in accordance with CSA A23.1/A23.2. The exposure condition F1 shall be used for catch basins and ditch inlets and F2 for maintenance holes. Air entrainment in accordance with CSA A23.1/A23.2.

.2.3 Concrete reinforcement in accordance with Section 03200 – Concrete Reinforcement.

.4 Precast maintenance hole sections, circular or oval, precast catch basin sections, and precast outfall sections in accordance with ASTM C478/C478M, circular or oval.

.1 Concrete mix design to produce 30 MPa minimum compressive strength at 28 days and containing 28 mm maximum size coarse aggregate.

.2 The top sections of maintenance holes shall be flat slab top type with opening offset for vertical ladder installation.

.3 All sections shall be cured by the manufacturer not less than 7 calendar days before shipping and date stamped with the casting date.

.2 Precast catch basin sections in accordance with ASTM C139, ASTM C478/C478M.

~~3.2~~ Ribbed waterstops: Extruded PVC of sizes indicated to following properties:

- .1 Tensile strength in accordance with ASTM D412, Die 'C' method, minimum 11.4 MPa.
- .2 Elongation in accordance with ASTM D412, Die 'C' method, minimum 275 %.
- .3 Tear resistance in accordance with ASTM D624, Die 'B' method, minimum 48 kN/m.

~~4.3~~ Precast Joints: ~~to be~~ made watertight using rubber ring gaskets.

~~5.4~~ Non-shrink grout in accordance with Section 03300 – Cast-in-Place Concrete.

~~6.5~~ Mortar:

- .1 Aggregate in accordance with CSA A3000.
- .2 ~~Masonry c~~Gement in accordance with CSA A30020.

~~6~~ Ladder rungs to be galvanized steel or an aluminum alloy.

- .1 Galvanized steel ladder rungs shall conform to the requirements of CSA Standard G30.18, No.25M billet steel deformed bars hot dipped galvanized to ASTM A123/A123M
- .2 ~~A~~luminum alloy rungs in accordance with ASTM B221, Alloy 6351, Temper T6.
- .3 ~~Ladder r~~Rungs to be safety pattern (drop step type).

.7 Safety landings shall be placed in all maintenance holes having a depth greater than 5 metres as measured from the top of cover to the invert of outlet pipe. They shall be constructed and located as specified by the Owner. See Standard Drawings Table of Contents.

~~8~~ Adjusting rings in accordance with ASTM C478/C478M.

~~8.9~~ Concrete brick to CSA A165 Series

~~9.10~~ Drop maintenance hole pipe:

- .1 ~~Outside D~~drop pipe to be same as sewer pipe.
- .2 ~~Inside drop, including force line hood to be as manufactured by Reliner/Duran Inc. or approved equal.~~

~~11~~ Galvanized iron sheet: approximately 2 mm thick or as indicated.

~~10.12~~ Steel gratings, I-beams and fasteners: as indicated.

~~14.13~~ Frames, gratings, covers to plan dimensions and following requirements:

- .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
- .2 Grey iron castings in accordance with ASTM A48/A48M, strength class 30B.
- .3 Castings to be coated with two applications of asphalt varnish, sand blasted, or cleaned and ground to eliminate surface imperfections.
- .4 Maintenance holes frames and covers: Heavy-duty municipal type for road service. Cover cast without perforations and complete with two 25 mm lifting holes. Clear opening to be 580 mm minimum, or such larger size as indicated on the Standard Drawings. 170 kg per set.
- .5 Catch basin frames and covers: Heavy-duty municipal type for road service. Standard catch basin 190 kg per set. Curb and gutter type, 250 kg per set.

~~12.14~~ Maintenance hole inflow protection ~~insert covers~~:

- ~~.1~~ The maintenance hole inflow protection ~~insert cover and its associated valve body~~ and components shall be manufactured from corrosion-
~~2.1~~ proof material suitable for atmospheres containing hydrogen sulphide and dilute sulphuric acid as well as gases associated with wastewater collection systems.
- ~~.3.2~~ The ~~insert cover~~ body shall be made from an acrylonitrile-butadiene-styrene (ABS) ~~acetate, Butyrate, Styrene~~ material that in accordance with test requirements for ASTM D256, D638 ~~412, D648 D2240, D790, D792, and D785, D646~~.
- ~~.4.3~~ The thickness shall not be less than 2.38 mm (3/32 inches) nor greater than 4.763-96 mm (6/32 inches). The ~~insert cover~~ body shall be manufactured to the dimensions as shown on the contact documents to allow for easy installation in the maintenance hole frame.
- ~~.5.4~~ The gasket shall be made of closed cell neoprene. The gasket shall have a pressure sensitive adhesive on one side and be placed under the ~~cover insert~~ rim by the manufacturer. The adhesive shall be compatible with the ~~insert cover~~ material so as to form a long lasting bond in either wet or dry conditions of use.
- ~~.6.5~~ The gas relief valve shall be designed to relieve at a pressure of 0.07030745 kg/cm² (1 psi). The valve body shall be made of medium density polyethylene. The venting tube shall be capable of sealing on dirt and small debris. The valve shall have a leak down rate not exceeding 45 .5 L/24 -hr. (10 imperial gallons/24 hr) to

eliminate the ponding of water over the maintenance hole ~~cover~~ after a rain-storm. The gas relief valve shall have no metal parts.

.7.6 The valve shall be recessed into the bottom centre of the ~~insert~~ designed so that it is flexible so that it is protected and will not be broken by any movement of the cover over the valve ~~proper~~. This valve configuration will allow the shallowest practical ~~cover~~ insert design, eliminating unnecessary water retention or weight accumulation. The valve shall be easily removed for water drainage, should inspection be required immediately after or during a rain-storm.

.7 The inflow protection ~~insert~~ cover shall be manufactured to fit the maintenance hole frame rim ~~upon from~~ which it hangs ~~the maintenance hole cover rests~~.

.15 Granular bedding and backfill in accordance with Sections 02223 – Excavating, Trenching, and Backfill, 02226 – Aggregates for Earthwork and 02233 Selected Granular Base and Subbase.

PART 4 EXECUTION

4.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Owner.

.2 Inform the Owner 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 the Owner.

4.14.2 EXCAVATING AND BACKFILL

.1 Excavate and backfill in accordance with Section 02223 – Excavating, Trenching and Backfilling.

.2 Obtain approval of the Owner before installing outfall structures, maintenance holes, catch basins structures, or valve chambers ~~or ditch inlets~~.

- .3 Do not backfill any maintenance hole or other structure for which a leakage test is required, prior to completion of testing and acceptance of test by the Owner.

- .3.4 For cast-in-place structures: the placing of select bedding materials shall not commence until the structure has cured to the specified design strength at 28 days. Should the Contractor wish to commence the placing of material before 28 days after pouring, then the Contractor will be required to prove that the 28 day specified design strength has been obtained before permission to commence backfilling will be granted.

4.24.3 CONCRETE WORK

- .1 Do concrete work in accordance with Section 03300 – Cast-in-Place Concrete except as may be noted in this section.
- .2 Place concrete reinforcement in accordance with Section 03200 – Concrete Reinforcement.
- .3 Position metal inserts in accordance with dimensions and details indicated.

4.34.4 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.
- .3 Pump excavation free of standing water and remove soft and foreign material before placing base. Fill any excavation below level of bottom of specified bedding as outlined in Section 02223 – Excavating, Trenching and Backfilling.

.4 Placing of Bedding for Catch Basins

- .1 The excavation surrounding the exterior of the catch basin shall be filled with compacted select bedding material up to subgrade elevation. Select backfill to be placed to a minimum of 300 mm on all sides. Care shall be exercised in compacting the material to assure that the structure is not disturbed.

- .5 Cast base directly on undisturbed ground.

- .3.6 ~~or when permitted by the Owner, Set~~ a precast concrete base on 150 mm minimum of granular material compacted in accordance with ASTM D698, ~~Method D~~.

4.7 For precast units:

- .1 Any adjustment of the unit for plumb, alignment, and grade shall be carried out by lifting the unit free of the excavation, levelling the base, and replacing the unit to proper alignment and grade. Should the adjustment involve placing material under the base, then the placed material shall be compacted to a minimum of 95% maximum dry density in accordance with ASTM D698.
- .2 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
- 4.3 Make each successive joint watertight with Owner approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
- .4 Grout shall be thoroughly mixed to a consistency such that the grout will flow evenly. Too liquid a mixture will not be acceptable.
- .5 Grout shall be used in a fresh condition and any grout which has commenced to set shall not be worked up again but shall be removed from the Work.
- .6 Clean surplus grout and joint compounds from interior surface of unit as work progresses.
- 2.7 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound. ~~Each lifting ring hole shall be grouted with non-shrink grout.~~

5.8 For cast-in-place units:

- .1 Place stub outlets and bulkheads at elevations and in positions indicated.
- .2 Bench sanitary maintenance holes to provide a smooth U-shaped channel. Side height of channel to be full diameter of sewer. Slope adjacent floor at 1 on 5. Curve channels smoothly. Slope invert to establish sewer grade.
- .3 Apply two coats of cement rendering to sanitary maintenance hole benching. Cement rendering shall consist of one part cement and two parts sand with sufficient mixing water. Surface to be rendered shall be roughened before concrete has fully set, and immediately before rendering is applied, cleaned of all oil, grease, laitance or foreign matter. Keep surface moist. Roughen between coats. Work into surface and give last coat smooth, steel trowel finish.

.9 Pipe Connections

- .1 When constructing cast-in place units, pipes may be built-in, or holes may be kept in the walls at the required grades and locations so that the pipes can be placed later.

- .2 For precast units, the Contractor shall cut holes into the side of the structure at required locations.
- .3 Pipes shall not extend out from interior walls more than 0.3 m unless specifically directed by the Owner's Representative.
- .3.4 These pipes that are placed in a prepared or cut hole in the wall shall be securely sealed into place using grout or pipe seals. Grout shall be well and truly worked into all holes and spaces between the pipe and wall so as to completely fill the spaces and form a strong watertight bond. Seals shall be installed according to the manufacturer's directions.
- .10 Compact granular backfill to 95 % corrected maximum dry density, where the maximum dry density is determined in accordance with ~~to~~ ASTM D698 and corrected as specified in Section 02501 – Corrected Maximum Dry Density.
- .11 Place unshrinkable backfill in accordance with Section 02223 – Excavating, Trenching and Backfilling.
- .6.12 Installing units in existing systems:
- .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 are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .13 Place frame and cover on top section to required elevation on no more than four (4) courses of brick. Make brick joints and join brick to frame with cement mortar. Parge and make smooth and watertight.
- .7.14 ~~If adjustment required in frame or cover, use concrete, concrete ring, HDPE adjustment rings or rubber risers in accordance with subsection Adjusting Tops of Existing Units, 4.4.4 .4 Frame and cover adjustments of this specification, or rubber risers in accordance with subsection 4.4.4 of this specification.~~
- .8.15 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- .9.16 Install safety platforms in maintenance holes having a depth of 5 m or greater, as indicated.

4.44.5 ADJUSTING TOPS OF EXISTING UNITS

- .1 Remove existing gratings, frames and I-beams and store for re-use at locations designated by the Owner.
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
 - .1 -When the amount of raise is less than 300 mm use grade rings or cast-in-place concrete.
- .3 Cast-in-place:
 - .1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
 - .2 Lower cast-in-place units with straight wall by removing concrete to elevation indicated for rebuilding.
 - .3 When monolithic units with tapered upper section are to be lowered more than 1500 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
 - .4 Install additional maintenance hole ladder rungs in adjusted portion of units as required.
 - .5 Bring maintenance holes to required elevation using cast-in-place concrete.
 - .6 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.
- .4 Frame and cover adjustments:
 - .1 High Density Polyethylene frame adjustment rings injection molded to ASTM D1248 designed and tested to withstand loading in excess of AASHTO HL-93 and HS-25 and sealed with a sealant approved by the manufacturer and installed in accordance with the manufacturer's instructions.
 - .2 Rubber Adjustment Frame Risers density $1.098 \pm 0.05 \text{ gm/cm}^3$, compression deformation under 1 MPa $6 \pm 2 \%$, and tested to withstand loading in excess of AASHTO HL-93 and HS-25, and sealed with a sealant approved by the manufacturer and installed in accordance with the manufacturer's instructions.
 - .3 Cover adjustment rings must be cast iron.

4.54.6 MAINTENANCE HOLE INFLOW PROTECTION ~~INSERT COVER~~

- .1 The maintenance hole frame shall be cleaned of all dirt or debris before placing the inflow protection ~~insert cover~~ upon the rim.
- .2 The inflow protection ~~insert cover~~ shall be fully seated around the maintenance hole frame rim to retard water from seeping between the ~~insert cover~~ and the maintenance hole frame rim.
- .3 After installation, the inflow protection ~~insert cover~~ shall not infiltrate more than 45.5 L (10 ~~imperial~~ gallons) in a 24-hr period.

4.64.7 ~~LEAKAGE INFILTRATION AND EXFILTRATION TESTING~~

- .1 ~~For rehabilitation projects where sanitary sewers are being installed and immediately put into use, i.e. existing services are being connected as the sewer is being laid, infiltration and/or exfiltration testing is not required.~~
- .2 Install watertight plugs or seals on inlets and outlets of each new ~~sanitary sewer~~ maintenance hole and fill maintenance hole with water. Keep maintenance hole full for 24 hours to allow maximum absorption. ~~Permissible~~ Leakage not to exceed 0.3 % per hour of volume of maintenance hole.
- .3 ~~Observe and record results of each test and any required repeated testing.~~
- .4 If permissible leakage is exceeded:
 - .1 By up to 0.03 % per hour of the volume of the maintenance hole, defects may be corrected on site by the manufacturer's representative using injected polyurethane. Concrete mortar grouting is not acceptable. Repeat testing until acceptable.
 - .2 By more than 0.03 % per hour of the volume of the maintenance hole, the maintenance hole must be replaced at the Contractor's expense at the discretion of the Owner.
- .5 In areas of high ground water the allowable infiltration shall not exceed 0.3 % per hour of the volume of the maintenance hole.
- .6 Test any water retaining structure or special maintenance hole in accordance with this specification, as directed by the Owner.
- .7 Owner will issue a Test Certificate for maintenance holes passing test.

PART 5 PAYMENT

5.1 MEASUREMENT FOR PAYMENT

- .1 ~~Pre-cast m~~Maintenance holes for sanitary systems, including cover, and benching, will be measured in units within depth classification as follows, measured from top of cover or grating to the lowest invert:
- .1 2 m or less
 - .2 Greater than 2 m but not more than 2.5 m.
 - .3 Greater than 2.5 m but not more than 3 m.
 - .4 Greater than 3 m but not more than 3.5 m.
 - .5 Greater than 3.5 m but not more than 4 m.
 - .6 Greater than 4 m but not more than 4.5 m.
 - .7 Greater than 4.5 m but not more than 5 m.
 - .8 Greater than 5 m but not more than 5.5 m.
 - .9 Greater than 5.5 m but not more than 6 m
 - .10 Greater than 6 m but not more than 6.5 m
- .2 Maintenance hole inflow protectors inserts shall be paid by the number of units installed each.
- ~~.3~~ Pre-cast maintenance holes for storm systems, including cover and sump, will be measured in units within depth classification as follows, measured from top of cover or grating to the bottom of the sump depth:
- .1 Greater than 2.5 m but not more than 3 m.
 - .2 Greater than 3 m but not more than 3.5 m.
 - .3 Greater than 3.5 m but not more than 4 m.
 - .4 Greater than 4 m but not more than 4.5 m.
 - .5 Greater than 4.5 m but not more than 5 m.
 - .6 Greater than 5 m but not more than 5.5 m.
 - .7 Greater than 5.5 m but not more than 6 m
 - .8 Greater than 6 m but not more than 6.5 m
- ~~.3.4~~ Outfall structures, drop maintenance holes, special maintenance holes, catch basins including cover, and cast-in-place maintenance holes will be measured in by the number of units for each unit installed including covers.
- ~~.4.5~~ Adjusting tops of existing maintenance holes or catch basins will be measured in units adjusted.
- ~~.6~~ Sealing over existing maintenance holes or catch basins will be measured in units sealed.

5.2 BASIS OF PAYMENT

- .1 All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted as outlined in the Measurement for Payment subsection of this section and as included in the MERX Schedule of Quantities and Prices.
- .2 Prices quoted in the MERX Schedule of Quantities and Prices for maintenance holes, drop maintenance holes, catch basins, or other structures will be deemed to include benching, miscellaneous metals, ladder rungs, frames and covers, sewer backdrop (See Standard Drawings Table of Contents for appropriate Sewer Backdrop drawings), and any extra excavation and backfill required for construction space over and above that measured and paid for in accordance with Section 02223 – Excavating, Trenching and Backfilling.
- .3 Payment for maintenance holes and catch basins will be at the quoted price after construction, pouring, stripping, and cement finishing and the frame and cover is installed and the maintenance hole is tested and ready for use in the system.
- .4 For all maintenance holes or structures requiring leakage ~~an infiltration/exfiltration~~ test, payment will be made to the maximum of 95 % of the value of the structure until the leakage testing is completed and accepted by the Owner.
- .5 Excavation and backfill will be measured in accordance with Section 02223 – Excavating, Trenching and Backfilling.