

FORM 470



GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 470

CONSTRUCTION AND ADJUSTMENT OF MANHOLES, CATCH BASINS AND DITCH INLETS

INDEX

470.01 SCOPE

470.02 MATERIALS

470.02.01 Concrete

470.02.02 Mortar

470.02.03 Grout

470.02.04 Bricks

470.02.05 Reinforcing Steel

470.02.06 Manhole and Catch Basin Steps

470.02.07 Weep Hole Pipes

470.02.08 Precast Reinforced Concrete Manhole, Catch Basin and Ditch Inlet Components and
Precast Concrete Adjustment Units

470.02.09 Pipe Seals

470.02.10 Manhole and Catch Basin Frames, Grates, Covers and Lift Rings

470.02.11 Ditch Inlet Grating and Hardware

470.03 OPTIONS

470.04 CONSTRUCTION OF MANHOLES, CATCH BASINS AND DITCH INLETS

470.04.01 Excavation

470.04.02 Poured in Place Construction

470.04.03 Precast Construction

470.04.04 Pipe Connections

470.04.05 Installation of Manhole and Catch Basin Frames, Grates and Covers

470.04.06 Installation of Grating for Ditch Inlets

470.04.07 Backfilling

470.05 ADJUSTMENT AND REBUILDING OF MANHOLES, CATCH BASINS AND DITCH INLETS

470.05.01 Scope

470.05.02 Excavation

470.05.03 General Adjustment and Rebuilding Work

470.05.03.01 Adjustment

470.05.03.02 Rebuilding

470.05.04 Backfilling

470.06 BREAKING INTO MANHOLES, CATCH BASINS AND DITCH INLETS

470.06.01 Scope

470.06.02 Excavation

470.06.03 Construction

March 2011

FORM 470

470.06.04 Backfilling

470.07 CLEAN-OUT

470.08 MEASUREMENT FOR PAYMENT

470.08.01 Measurement for Payment for Construction of Manholes, Catch Basins and Ditch Inlets

470.08.02 Measurement for Payment for Adjustment and Rebuilding of Manholes, Catch Basins and Ditch Inlets

470.08.03 Measurement for Payment for Supply of Frames, Grates, Covers and Gratings

470.08.04 Measurement for Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

470.09 BASIS OF PAYMENT

470.09.01 Basis of Payment for the Construction of Manholes, Catch Basins and Ditch Inlets

470.09.02 Basis of Payment for the Adjusting and Rebuilding of Manholes, Catch Basins and Ditch Inlets

470.09.03 Basis of Payment for Supply of Frames, Grates, Covers and Gratings

470.09.04 Basis of Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

470.01 SCOPE

This specification covers the requirements for constructing, rebuilding, adjusting and breaking into manholes, catch basins and ditch inlets.

470.02 MATERIALS

470.02.01 Concrete

Concrete shall have the following specific requirements:

CLASS OF CONCRETE	35MPa AT 28 DAYS
AGGREGATE	20mm MAXIMUM SIZE
AIR CONTENT	5% TO 8%
SLUMP	20mm TO 80mm

All concrete shall conform with the requirements of Section 904 "Concrete Structures".

470.02.02 Mortar

Mortar shall have the following proportions by weight:

1 PART PORTLAND CEMENT	2 PARTS CLEAN SHARP SAND
------------------------	--------------------------

Mortar shall be thoroughly mixed in a mechanical mixer of approved type or by hand on an impervious stage with only sufficient water to make the mixture plastic. Only clean water shall be used in mortar.

Mortar shall be applied in a fresh condition before any setting has commenced.

470.02.03 Grout

Grout shall have the following proportions by volume:

1 PART PORTLAND CEMENT	3 PARTS CLEAN SHARP SAND
------------------------	--------------------------

FORM 470

Grout shall be thoroughly mixed to a consistency such that the grout will just flow evenly; too liquid a mixture will not be acceptable.

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 works.

470.02.04 Bricks

Bricks shall be construction grade bricks.

470.02.05 Reinforcing Steel

Reinforcing steel shall conform to CSA CAN-A23.1-M77 "Concrete Materials and Methods of Concrete Construction". Yield point shall be not less than 400 MPa and size and type of bars shall be as stated on the drawings.

470.02.06 Manhole and Catch Basin Steps

Manhole and catch basin steps shall be ladder rungs of the approximate dimensions as shown on the drawings for catch basins.

The materials of the ladder rungs shall be galvanized steel or an aluminum alloy.

Galvanized steel ladder rungs shall conform to the requirements of CSA Standard G30.12M or G30.16N, and shall be hot dip galvanized according to CSA Standard G164 to provide a zinc coating of not less than 0.6 kg per square metre. The carbon content of the steel shall not exceed 0.25%.

Aluminum alloy rungs shall conform to the requirements of CSA Standard HA5.

470.02.07 Weep Hole Pipes

Weep hole pipes shall be of the diameters as shown on the drawings and shall consist of galvanized steel, aluminum, clay or plastic pipe.

470.02.08 Precast Reinforced Concrete Manhole, Catch Basin and Ditch Inlet Components and Precast Concrete Adjustment Units

Precast units shall conform to design approved by the Engineer. Materials used in the units shall conform to the requirements of this specification.

470.02.09 Pipe Seals

Pipe seals used in connecting pipes to manholes, catch basins and ditch inlets shall be of types approved by the Engineer.

470.02.10 Manhole and Catch Basin Frames, Grates, Covers and Lift Rings

All frames, grates and covers shall conform to the size and configuration indicated on the drawings for the particular type specified on the contract unit price table.

Castings shall conform to the requirements of Class No. 30C as specified in ASTM A48-74.

Castings shall be sound, free from pouring faults, sponginess, cracks, blow holes and other defects. Bearing surfaces shall be machined if necessary so that the grates and covers sit firmly on the frames without rocking.

Castings shall be thoroughly cleaned and coated with a commercial quality asphaltic paint of a type suitable as a protective coating for iron castings.

Lift rings shall be of a type approved by the Engineer.

FORM 470

470.02.11 Ditch Inlet Grating and Hardware

Ditch inlet grating, I-beam, anchor bolts, nuts and washers shall be as shown in the appropriate drawing for the required size of ditch inlet manhole, and Section 1260 "Typical Ditch Inlet Grating Detail".

The Contractor shall construct each grating so that it is of the required dimensions to fit the ditch inlet for which it is required. The inlet grates shall be composed of materials conforming with Metal Grating Institute #RF-37-5, or approved equal. The end bearing bar shall be welded to the angle bar along both legs with a 5 mm fillet weld.

When fabrication of the grating is complete, the grating and the I-beam shall be shop painted with asphalt having a softening point not lower than 70°C. Alternatively a tar base black paint shall be used.

Anchor bolts, together with accompanying nuts and washers shall be galvanized.

470.03 OPTIONS

The Contractor may choose between poured in place or approved precast construction.

Should the Contractor wish to use precast units, then he shall submit plans and specifications to the Engineer for a review of their suitability for use in the type of structure required. Only precast units which conform to designs approved by the Engineer shall be used.

470.04 CONSTRUCTION OF MANHOLES, CATCH BASINS AND DITCH INLETS

Manholes, catch basins or ditch inlets of the type specified shall be excavated for and constructed to conform to the requirements of the contract drawings, or the approved precast structure, and shall be located at the points and elevations as staked by the Engineer.

470.04.01 Excavation

The Contractor shall carry out, and be paid for excavations in accordance with the requirements of Section 404 "Trenching and Excavation for Catch Basin".

470.04.02 Poured in Place Construction

The Contractor shall form and pour the specified unit plumb and true to alignment and grade as set by the Engineer.

Formwork shall be supplied by the Contractor and shall conform to the requirements of Section 907 "Formwork and Falsework".

Concrete shall be placed in accordance with the requirements of Section 904 "Concrete Structures".

The Contractor shall incorporate all built-in hardware as is shown on the appropriate drawings for the particular type of structure being built.

Once forms have been stripped the Contractor shall remove all inside wall protuberances.

Concrete shall be cured in conformity with the requirements of Section 904 "Concrete Structures".

470.04.03 Precast Construction

The precast unit shall be placed plumb and true to alignment and grade as set by the Engineer.

Precast bases shall be set to the grade as staked, shall be level, and shall have uniform overall contact with the underlying ground.

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

FORM 470

involve placing material under the base, then the placed materials shall be compacted to at least 95% of the Standard Proctor Density.

470.04.04 Pipe Connections

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.

For precast units, the Contractor shall cut holes into the side of the structure at required locations.

Pipes shall not extend out from interior walls more than 0.3 m unless specifically directed by the Engineer.

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.

470.04.05 Installation of Manhole and Catch Basin Frames, Grates and Covers

The manholes and catch basins shall be constructed or installed so that the surface on which the mortar bed is to be placed is at least 20 mm but not more than 150 mm below the bottom of the frame and grate or frame and cover assembly.

Before application of mortar to the manhole or catch basin, the Contractor shall thoroughly clean the surface to which mortar is to be applied.

Frames for grates or covers on manholes and catch basins shall be set in a full mortar bed.

Bricks or precast concrete adjustment units may be used to set the frame and grate or frame and cover at the required position and elevation. Bricks shall be laid in double width using a Flemish bond. The inside and outside surfaces of the brick shall be plastered with a 10 mm thick mortar coat.

The frames and grates or frames and covers shall be set to the lines and grades as staked by the Engineer.

470.04.06 Installation of Grating for Ditch Inlet

Gratings for ditch inlets shall be installed and securely fastened down with a washer and nut as indicated in the contract drawings.

470.04.07 Backfilling

Backfilling shall be carried out using select bedding material which shall be placed and paid for according to the requirements of Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

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.

470.05 ADJUSTMENT AND REBUILDING OF MANHOLES, CATCH BASINS AND DITCH INLETS

470.05.01 Scope

The work to be carried out shall include change of elevation of either a manhole, catch basin or ditch inlet, regardless of type or size.

Adjustment of manholes, catch basins or ditch inlets will apply where the top of the structure is to be raised or lowered 1.0 m or less.

FORM 470

Rebuilding of manholes, catch basins or ditch inlets will apply to where the top of the structure is to be lowered or is to be raised more than 1.0 m.

470.05.02 Excavation

Where bituminous pavement must be removed to adjust or rebuild a structure the pavement shall be cut and excavated.

When concrete curb and gutter or concrete sidewalk must be removed to adjust or rebuild a structure, the curb and gutter or sidewalk shall be cut and excavated. This work of cutting and excavating shall be carried out and paid for in accordance with Section 511 "Cutting Concrete Slabs and Curb and Gutter" and Section 521 "Demolition and Removal of Sidewalks, Curb and Gutter, Manholes, Catch Basins, Ditch Inlets, Fences, Guide Rails and Guide Posts".

The Contractor shall excavate such granular base course materials together with catch basin backfill materials that it is necessary to excavate in order to carry out the adjustment or rebuilding. These materials shall be piled in a manner that will not endanger the work or obstruct traffic or pedestrians, but will permit the materials future use as backfill for the completed structure.

Prior to adjustment or rebuilding, the existing frame and grate or cover shall be carefully removed and salvaged in order that it may be re-used.

470.05.03 General Adjustment and Rebuilding Work

All existing mortar and brickwork shall be removed from the top of the existing structures prior to adjustment or rebuilding with precast adjustment units.

Where the work involves adjusting or rebuilding a ditch inlet, then the Contractor shall supply and place such new anchor bolts, nuts and washers as are required to carry out the work.

Where the work involves poured in place concrete or placing pre-cast units, then the work shall conform to the requirements of Section 470.04.02 "Poured in Place Construction" or Section 470.04.03 "Precast Construction" as the case may be.

Once a manhole, catch basin, or ditch inlet has been adjusted or rebuilt the salvaged or a new frame and grate or frame and cover, as required, shall be set to the correct elevation on the adjusted or rebuilt structure. This shall be done in accordance with the requirements of Section 470.04.05 "Installation of Manhole and Catch Basin Frames, Grates and Covers" or Section 470.04.06 "Installation of Grating for Ditch Inlet" as the case may be.

All construction debris resulting from adjustment or rebuilding of the structures shall be kept separate from excavated backfill materials.

470.05.03.01 Adjustment

When manhole or catch basin covers are to be raised only to accommodate re-surfacing of the adjacent pavement, the Contractor may use manhole cover lift rings to raise the cover a sufficient height to accommodate the thickness of re-surfacing material.

Bricks may be used to raise structures up to 0.3 m. Precast concrete adjustment units may be used to raise structures up to 1.0 m. Where bricks are used, they shall be plastered inside and outside with a 10 mm thick mortar coat.

Where structures have already been extended using bricks and they are further adjusted upward with bricks, the total height of adjustment shall not exceed 0.3 m.

Where structures have already been extended using concrete adjustment units and they require further upward adjustment, the total height of adjustment shall not exceed 1.0 m.

FORM 470

Where the top of units are to be raised, including structures with a domed upper section, concrete adjustment units, manhole cover lift rings or bricks shall be removed or added as required to adjust the structure to the proper elevation.

470.05.03.02 Rebuilding

To lower the top of cast-in-place structures with a domed upper section the concrete in the structure shall be removed for the entire depth of the doming plus as much of the straight wall section as is necessary. The upper section of the structure shall then be rebuilt with a standard dome.

To lower the top of straight walled cast-in-place structures, the upper section of concrete shall be removed.

To raise the top of cast-in-place structures with a domed upper section, the concrete in the structure shall be removed for the entire depth of the doming. The upper section, including straight walls and dome shall then be rebuilt.

To raise the top of straight walled cast-in-place structures, the existing walls shall be extended upward in concrete.

Where poured-in place units are to be raised with poured-in-place concrete, the top surface of all existing walls shall be roughened before the walls are extended upwards.

Where the top of a precast structure is to be lowered or raised, the cone section shall be removed and riser sections of suitable height shall be removed, substituted for, or added to the existing riser sections. The cone section shall then be replaced.

470.05.04 Backfilling

Backfilling shall be carried out using excavated granular base course materials and excavated catch basin backfill materials. The backfill shall be placed and compacted in accordance with the requirements for placing and compacting bedding material as given in Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

Backfilling shall be placed up to subgrade elevation.

Where poured-in-place construction has been used to carry out the adjustment or rebuilding, then the placing of backfilling material 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.

470.06 BREAKING INTO MANHOLES, CATCH BASINS AND DITCH INLETS

470.06.01 Scope

This specification concerns the connection of a storm sewer or sub-drain to a catch basin, manhole or ditch inlet, which was not built as part of this contract.

470.06.02 Excavation

Excavation shall be carried out and paid for as part of the excavation for the storm sewer or sub-drain in accordance with Section 404 "Trenching, and Excavation for Catch Basins and Storm Sewers".

470.06.03 Construction

The Contractor shall cut a hole into the side of the structure at the location and grade as staked by the Engineer. The pipe shall be securely and neatly grouted in place at the required grade. The 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.

FORM 470

470.06.04 Backfilling

The grout shall be allowed to cure for at least 7 days before any backfill may be placed next to the connection.

Backfilling shall consist of the placing of select bedding and backfill for the pipe. Backfill shall be placed, compacted and paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins" and Section 404 "Trenching and Excavation for Catch Basins and Storm Sewers" respectively.

470.07 CLEAN-OUT

During the progress of the work and until the completion and final acceptance, manholes, catch basins and ditch inlets shall be kept clean and free of all foreign material.

The Contractor shall dispose of debris and surplus materials at his own expense.

470.08 MEASUREMENT FOR PAYMENT

Dependent on the items specified, measurement will be made by one of the following methods:

470.08.01 Measurement for Payment for Construction of Manholes, Catch Basins and Ditch Inlets

Measurements will be based on the number of each type of required manhole, catch basin, or ditch inlet placed at the required locations and grades.

470.08.02 Measurement for Payment for Adjustment and Rebuilding of Manholes, Catch Basins and Ditch Inlets

The alteration to each structure will be measured in metres, rounded to one decimal place. Measurement for payment will be made by taking the difference in elevation of the top of grate or cover at the centre prior to and after the adjustment with the following exceptions:

- (a) When rebuilding domed structures, the actual measured adjustment will be increased by the height of the dome portion.
- (b) Where the measured adjustment is less than 0.3 m, the measurement for payment will be taken to be 0.3 m.

470.08.03 Measurement for Payment for Supply of Frames, Grates, Covers and Gratings

Measurement for payment for the supply of frame and grate, frame and cover or grating will be based on the number of each type of frame and cover, frame and grate or grating supplied for incorporation into the adjustment or rebuilding of manholes, catch basins and ditch inlets.

470.08.04 Measurement for Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

Measurement will be based on the number of connections made at the required locations of the grades.

470.09 BASIS OF PAYMENT

470.09.01 Basis of Payment for the Construction of Manholes, Catch Basins and Ditch Inlets

Payment of the contract price for each of the required type of manhole, catch basin, or ditch inlet placed shall be full compensation for all labour, materials and equipment-use to supply all materials (including required grating, frame and cover, frame and grate, or frames and grates, as the case may be) required to construct the structure as shown on the drawings, construct and cure a cast-in-place unit or install a precast unit, carry out such required preparation and compaction of a bed as may be necessary for the base of a precast unit, install such reinforcement steel, anchor bolts, I-beams, ladder rungs, pipe for weeping holes and such other required hardware, install pipes in the walls, install the required type of grating, frame and cover, frame and grate or frames and grates, place anchor bolts or full mortar bed as appropriate, place and parge bricks or place precast concrete adjustment units as required, provide any required unwatering and shearing and

FORM 470

shoring, and to carry out any necessary work to complete the structure in accordance with the contract requirements.

Excavation required prior to manhole, catch basin, or ditch inlet construction shall be paid for in accordance with Section 404 "Trenching and Excavation for Catch Basins and Storm Sewers".

Backfilling of new manholes, catch basins, or ditch inlets shall be paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".

470.09.02 Basis of Payment for the Adjustment and Rebuilding of Manholes, Catch Basins and Ditch Inlets

Payment at the contract price per metre for adjustment and rebuilding of manholes, catch basins and ditch inlets shall be full compensation for all labour, materials and equipment-use to supply all materials (except frame and grate, frame and cover or grating) required to carry out the alteration regardless of size or type, cut, remove and dispose of existing asphalt, carry out all necessary excavation after pavement, sidewalk and curb and gutter have been removed, remove and dispose of concrete and bricks in the structure, salvage the grating, frame and cover, frame and covers or frames and grates, place and cure cast-in-place concrete, place precast concrete adjustment units, place and parge bricks, place such additional ladder rungs as may be required, place any required manhole rings, place anchor bolts or full mortar bed as appropriate, re-install salvaged frame and cover, frame and grate, frames and grates or grating or install new frame and cover as required, provide any required unwatering and shearing and shoring, place and compact backfill, and supply, place and compact Granular "A", Granular "B" and asphalt including liquid and blending sand, together with all other items of work necessary for the satisfactory completion of the work, except for the cutting and removal, curb and gutter and sidewalk which will be paid for under separate contract items.

470.09.03 Basis of Payment for Supply of Frames and Covers, Frames and Grates and Gratings

Payment at the contract price for each type and set of frame and grate, frame and cover and grating supplied shall be full compensation for all labour, materials and equipment-use to supply and deliver the required type of frame and grate, frame and cover, or grating to the location where the hardware is to be incorporated into the manhole, catch basin, or ditch inlet adjustment or rebuilding.

470.09.04 Basis of Payment for Breaking into Manholes, Catch Basins and Ditch Inlets

Payment at the contract price for each connection made shall be full compensation for all labour, materials and equipment-use to provide openings in existing structures and grout in the pipe to be connected, regardless of the size of the pipe.

Excavation and backfilling shall be paid for in accordance with Section 404 "Trenching and Excavation of Catch Basins and Storm Sewers" and bedding shall be paid for in accordance with Section 410 "Select Bedding for Storm Sewers, Sub-Drains and Catch Basins".