

DIVISION 16

MANHOLES, CATCH BASINS, VALVE CHAMBERS AND SIMILAR STRUCTURES

16.01 Description:

The work shall consist of:

- (1) Constructing manholes, catch basins, valve chambers, meter pits, and similar structures, according to the Standard Plans or Special Details pertaining thereto;
- (2) Rebuilding the top portion of existing manholes, catch basins, valve chambers, meter pits, and similar structures,
- (3) Adjusting existing castings, including curb boxes and other valve boxes, to fit the new grade.

16.02 Materials:

16.02.01 Concrete

- (a) Portland Cement – shall conform to the requirements of the current A.S.T.M. Specifications for Air-Entraining Portland Cement.
- (b) Fine Aggregate – shall conform to the requirements for “Natural Sand, 2NS,” of the current Standard Specifications of the Michigan Department of Transportation.
- (c) Coarse Aggregate – shall conform to the requirements for “Coarse Aggregate, 6A” of the current Standard Specifications of the Michigan Department of Transportation.
- (d) Water – for mixing and curing the concrete shall be taken from a potable water source unless otherwise specified.

16.02.02 Masonry Sand – for mortar shall conform to the requirements of “Masonry Sand, 2MS,” of the current Standard Specifications of the Michigan Department of Transportation

16.02.03 Steel Reinforcement for Structures – shall conform to the current Standard Specifications of the Michigan Department of Transportation.

16.02.04 All Iron Castings – including manhole steps, shall be made of soft gray iron without any admixtures of inferior metal and shall be whole and free from sand holes, blow holes, cuts, scabs, washes, cold shuts, and other defects, and shall have a smooth surface without lumps or rough areas.

The manhole cover and ring, valve chamber cover and ring, catch basin grate and frame, and other similar combinations of castings shall be machined to fit and to the dimensions shown on the Standard Detail so that there will be an even bearing.

The chemical composition of the gray iron shall comply with the AASHTO specification for Drainage Structure Casting M306-89 or latest revision thereof.

- 16.02.05 Plastic Manhole Steps – may be used in lieu of cast iron steps. Plastic manhole steps must have three-eighths (3/8”) inch minimum steel reinforcement rod encapsulated in a polypropylene plastic. Plastic steps shall be M.A. Industries, Inc. Step #PS1 or PS1-45, or approved equal. The Contractor shall provide design data to the Engineer on any other plastic manhole step for approval before using said steps.
- 16.02.06 Brick or Block Masonry – units shall conform to the A.S.T.M. Specification as follows:
- (a) Concrete Brick – shall conform to the requirements for Grade A of the current Specifications for Concrete Building Brick, A.S.T.M., Designation C-55.
 - (b) Concrete Blocks – shall conform to the requirements of the current Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes, A.S.T.M., Designation C-139.
 - (c) Precast Masonry – units such as; manhole pipe, catch basins, and precast reinforced concrete manhole cone sections shall conform to the requirements for Reinforced Concrete Sewer Pipe, A.S.T.M., Designation C-478.
- 16.02.07 Precast Structure Marking – In addition to the markings which are required by the governing standard specification, each structure section shall have plainly and permanently marked thereon:
- (a) Date of manufacture
 - (b) Manufacturers name or trademark
- 16.03 Construction Methods:
- 16.03.01 The Excavation – shall be of sufficient dimensions to provide ample space for sheathing and bracing where sheathing and bracing is required, and ample space for the workmen to perform their work in a satisfactory manner.

When the earth at the normal depth of the structure is unsuitable for a foundation for the structure, such unsuitable material shall be removed as directed by the Engineer and

replaced with approved granular material, and shall be paid for separately in cubic yards of trench undercut.

- 16.03.02 Concrete Masonry – shall be of the grade of concrete indicated on the Standard Plans or Special Details governing the work. The handling and storing of aggregates, the mixing, consistency, proportioning and strength of the concrete shall be as specified in Division 7.

The forms shall be of wood or metal, free from distortion and of sufficient strength to resist springing during the process of depositing and puddling or vibrating the concrete against them. They shall be well built, substantial, unyielding, adequately braced to remain in the required position, and tight enough to prevent leakage of mortar. The inside surface of the forms shall be oiled with a light, clear paraffin-base oil which will not discolor or otherwise injuriously affect the concrete.

- 16.03.03 Mortar – for brick or block masonry, for joints in precast units, for plaster-coat on manholes and catch basins when required, and as a mortar bed for castings, shall consist of one part Portland Cement or Air-Entraining Cement and two parts masonry sand, measured by volume.

Measured quantities of sand and cement shall be mixed dry in a clean tight box until a mixture of uniform color is produced, after which water shall be added until the required consistency is obtained. Mortar shall be mixed only in such quantities as needed for immediate use. The re-tempering of mortar will not be permitted.

- 16.03.04 Water-Proofing – The concrete and/or brick structures and/or manholes, meter vaults, and valve chambers to be built where the ground water level is above the bottom of said structure shall be made substantially water-tight. All spurts, porous places, leaky joints, or other places yielding leakage, if any, shall be repaired in such manner and to such extent as shall procure a high degree of water-tightness.

Manholes, Catchbasins, Valve Chambers, and Meter Pits shall be waterproofed with Dyke or approved equal, where required.

- 16.03.05 Steel Reinforcement – shall be in accordance with Section 8.03.03.

- 16.03.06 Laying Brick or Block Units – shall be performed in such a manner that the courses will be true to line and the joints fully bonded.

In a structure of cylindrical design, the bricks shall be laid with the long dimension radially in the structure.

In a structure of rectangular design, the bricks shall be laid in alternate courses of headers and stretchers.

- 16.03.07 Manholes – shall be constructed of precast reinforced concrete as shown on the Standard Plans or Special Details.
- All Manholes shall be constructed to conform to the Standard Plans or Special Details governing the work. Openings shall be provided in the manholes for future connections as shown on the plans or as ordered by the Engineer, of such size and at such elevation as directed and shall be considered incidental to the construction of the manhole. All such openings shall be closed with concrete or vitrified clay stoppers or brick bulkheads, to prevent infiltration or leakage.
- Cast iron, galvanized iron, or plastic manhole steps shall be Wyoming Standard design set in a full mortar bed in the masonry.
- The manhole castings shall be set in a full mortar bed with the top at the required elevation.
- 16.03.08 Catch Basins – shall be constructed of precast reinforced concrete and shall conform to the Standard Plans or Special Details governing the work.
- Catch basin castings shall be Wyoming Standard Design, and shall be set in a full mortar bed on top of the structure. The castings shall be set with the top at the required elevation.
- 16.03.09 Standard Inlet – shall be constructed to conform to the Standard Plans or Special Details governing the work. An inlet of this design is to be used for a direct connection to a manhole or sewer, and is so specified on the plan.
- The castings to be used on this type of structure shall be a basin casting of the Wyoming Standard Design and shall be set in a full mortar bed on top of the structure. The castings shall be set with the top at the required elevation.
- 16.03.10 Valve Chambers – shall be constructed to conform to the Standard Plans or Special Details governing the work. They shall be constructed of precast reinforced concrete as shown on the Standard Plans or Special Details.
- Valve chambers castings shall be Wyoming Standard Design set in a full mortar bed on top of the structure. The castings shall be set with the top at the required elevation.
- 16.03.11 Meter Pits – shall be constructed to conform to the Standard Plans or Special Details governing the work. They shall be constructed of precast reinforced concrete.
- Meter pit castings shall be Wyoming Standard Design set in a full mortar bed on top of the structure. The castings shall be set so that the top is at the required elevation.
- 16.03.12 Adjustment of Castings – Castings shall be adjusted to meet the surface grade. Existing brick or block chimneys on Major Streets shall be removed and the adjustment made with

recycled rubber adjustment rings. Adjustments on local streets shall be made with precast reinforced concrete adjustment rings or recycled rubber adjustment rings. Maximum chimney height, measured from top of structure to top of casting shall be twenty-four (24") inches. If casting cannot be adjusted to grade without exceeding maximum chimney height work shall be paid under "Rebuild Existing Structure", Section 16.03.13.

Adjustment of castings in Major Streets shall utilize all rubber adjustment risers from precast manhole structure to casting when located in the traveled way. Adjustments of castings in Major Streets outside of the traveled way (medians and parkways) may use precast reinforced concrete adjustment rings. Any adjustment necessary to bring casting to finish grade shall be done with rubber adjustment rings. Existing rings, not disturbed or structurally compromised during the casting removal may remain and additional adjustment be completed with rubber rings.

Rubber adjustment riser shall meet the following specifications:

- (a) The adjustment riser shall consist of no less than 80%, by weight, recycled rubber from tires and no less than 10% by volume shredded fiber.
- (b) Recycled Rubber Adjustment Risers shall be "Infra-Riser" as manufactured by GNR technologies or approved equal.

Measurement and payment will be per casting (each).

16.03.13 Rebuild Existing Structures

Shall be the reconstruction and adjustment of existing structure tops where full diameter reconstruction is necessary to prevent chimney height from exceeding twenty four (24") inches.

- (a) Drainage Structures – Structure top shall be removed to a point where the full diameter of the structure is sound. Full diameter structure reconstruction shall be made to reduce the final chimney height to twenty four (24") inches or less. Precast reinforced concrete sections shall be used, unless other methods are approved by the Engineer.

Measurement and payment shall be measured from the top of casting to the top of the existing structure left in place and paid by the vertical foot.

- (b) Existing Drainage Structures in Pavement
The following items will be paid on each of these structures:
 - (1) Rebuild Structure Chimney (vertical foot).
 - (2) Drainage Structure Concrete Collar (each).

- (3) If full diameter reconstruction is required due to excessive chimney height (greater than 24”), “Rebuild Existing Drainage Structure, Full Diameter (vf)” shall be paid in lieu of item No. 1 above.

(c) Existing Drainage Structures Outside Pavement

The following items will be paid on each of these structures:

- (1) Rebuild Structure Chimney (vertical foot).
- (2) If full diameter reconstruction is required due to excessive chimney height (greater than 24”), “Rebuild Existing Drainage Structure, Full Diameter (vf)” will be paid in lieu of item No. 1 above.

(d) Existing Water Valve Boxes in the Pavement

The following items will be paid for this work:

- (1) Adjust Water Valve Box (each).

If Valve Box is located outside of a paved surface, adjustment is included with street grading. No additional compensation will be allowed.

- (e) New Drainage Structures and Water Valve Boxes – Only the Drainage Structure item will be paid when these structures fall within the street pavement. No separate payment will be made for any other work. When these new structures fall outside the pavement, no separate payment will be made for final adjustment. Vertical foot measurements shall be taken from the as-built bottom of casting down to the joint between new and existing structure elements.

- (f) Rebuild Existing Drainage Structures with Flattop – Where called for on the plans a flattop cover shall be used to reconstruct the drainage cover. The top of the flattop cover shall be placed a minimum of one (1’) foot below bottom of proposed pavement.

16.03.14 Manhole Castings – Final Adjustment – Casting installations within the pavement limits shall be made after completing the placement of the bituminous leveling course material. After paving of the leveling course is completed, the Contractor shall remove the bituminous material from around the manhole. The casting shall be set to grade with proper means of adjustment. The pavement material removed to set and adjust the casting, shall be discarded and concrete should be placed to a depth of seven (7”) inches below top of casting and bituminous mixture shall be placed in two equal lifts to meet the top of the leveling course. Sufficient material should be removed to ensure compaction of new material after casting has been adjusted.

16.03.15 Cast Iron Curb Boxes – on existing water services, and other existing cast iron valve boxes, shall be adjusted by the Contractor to fit the finished surface.

- (a) When any parts of such curb boxes or valve boxes are found broken before the Contractor begins work, the City will pay for replacement material, to be installed by the Contractor. The Contractor will be reimbursed for installing such replacement material.
- (b) When any parts of such curb or valve boxes are broken due to careless operations of the Contractor, new parts will be furnished and installed by the Contractor at their expense.

Adjustment of valve boxes shall be measured and paid for on a unit basis, at the contract price.

16.03.16 Utility Company Castings – on existing utilities such as; gas, telephone, or electricity shall be adjusted by the Contractor. Any rebuilding of tops of utility castings shall be the responsibility of the Contractor.

The cost of adjusting or rebuilding utility castings shall be paid for at the contract unit price in the proposal.

16.03.17 Weep Holes – shall be placed where shown on the plans or where directed by the Engineer.

16.03.18 Backfilling – around manholes, catch basins, valve chambers, meter pits and similar structures shall be free from large stones and lumps and other objectionable material. Compaction of backfill shall be done in six (6”) inch layers to a minimum density of ninety five (95%) percent maximum unit weight by means of a hoe pack method according to Section 13.03.10.

16.04 Method of Measurement:

Manholes, catch basins, inlets to catch basins, valve chambers, meter pits cast iron valve boxes, or other similar structures, will be measured as single units.

16.05 Basis of Payment:

The contract unit price per each for Manholes, Catch Basins, Inlets to Catch Basins, Valve Chambers, Meter Pits,” or for other similar structures, shall be payment in full for furnishing all labor, material, and equipment for building such structure complete and ready for use.