

**MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF AERONAUTICS - STANDARD SPECIFICATION
D-751**

Manholes, Catch Basins, Leaching Basins, Inlets, and Inspection Holes

DESCRIPTION

1.1 This item shall consist of manholes, catch basins, leaching basins, inlets and inspection holes, in accordance with these specifications, at the specific locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

This item shall also include adjusting, reconstructing, removing, or abandoning drainage structures, when specified. Drainage structures under this item shall mean those types of structures included in this specification. Adjusting and reconstructing shall be accomplished as specified herein for brick structures unless otherwise detailed on the plans.

Adjusting drainage structures shall mean changing the cover elevation, of an existing structure, upward no more than 1/2 foot, or downward no more than 1/4 foot. Upward adjustment may be made with cast metal rings or inserts, made for the purpose by a cover manufacturer, if such rings or inserts meet the casting specifications and provide the same bearing as the existing frame.

Reconstructing drainage structures shall mean changing the cover elevation, of an existing structure, in excess of 1/2 foot upward or 1/4 foot downward. This shall be accomplished by removing the bell and/or sufficient wall so that the structure can be reconstructed to the new elevation in the manner specified for new structures

When specified, new covers shall be furnished and installed on the existing structures and shall be paid for separately.

Removing drainage structures shall mean removal of the structure to below the pipe, disposal of all rubble and materials, reconstruction of any live sewers or drains by furnishing and placing pipe of the size and type existing, maintaining service where directed by the Engineer, plugging pipe ends where specified, and furnishing, placing and compacting any

necessary backfill.

Abandoning drainage structures shall mean removal of the structures down to a specified elevation, or 3 foot minimum below finished grade, disposal of all rubble and materials, capping the remaining structure with a reinforced concrete slab of the size specified, and furnishing, placing and compacting any necessary backfill.

Any salvaged covers become the property of the Contractor and may not be used in other portions of the work unless specified in the plans or approved by the Engineer.

Adjusting, reconstructing, removing, or abandoning drainage structures shall include the replacement of any pavement, curb or turf removed to accomplish the work, unless specified to be paid for under another work item.

Drainage structures poured in place, of plain or reinforced concrete, shall be constructed under Item D-752, unless specifically covered under this specification.

MATERIALS

2.1 Brick

1. Brick shall conform to the following nominal size limitations:

Depth, in.	Width, in.	Length, in.
2-2 1/2	3 1/2-3 3/4	7 1/2-8

All brick for any structure shall be of one nominal size and shall not vary from the manufacturer's specified standard dimensions by more than ± 1/8 inch in any dimension, except that for clay brick a variation in length of 1/4 inch will be permitted and up to 2 percent of the clay brick may exceed the tolerance in dimensions.

(a) **Clay Brick.** Clay brick to be used in construction of manholes, catch basins, and similar structures shall conform to the requirements of ASTM C32, Grade MS.

Recessed or cored brick shall be of a type approved by the Engineer. Salvaged paving brick is permitted, providing it meets the above specifications.

(b) **Concrete Brick.** This brick shall conform to the requirements for concrete building brick of ASTM C55, Grade S-11.

Recessed or cored brick shall be of a type approved by the Engineer.

(c) **Sand-Lime Brick.** Sand-lime brick for use in the construction of masonry structures shall conform to the requirements of ASTM C73, Grade SW, with the following addition:

Maximum Water Absorption, 5-hour Boiling Test:

Average of 5 brick	18 %
Individual brick	20 %

2. **Concrete Block.** Concrete block for manholes, catch basins, and inlets shall conform to ASTM C139, with the following exceptions:

(a) **Shape.** The blocks shall be solid curved blocks with the inside and outside surfaces curved to the required radii. The blocks shall have a groove or other approved type of joint at the ends. Curved blocks shall have the inside and outside surfaces parallel.

(b) **Size.** The nominal dimensions for length and height of the block shall be selected by the producer. The nominal dimension for width (thickness) shall be 6, 8, or 12 inches as called for on the plans, within a tolerance of ± 3 percent. Where the specified wall thickness on the standard plans is 12 inches, a multiple block wall of two 6-inch wide blocks is permitted. The blocks shall be designed for length so that only full length or half-length blocks are required to lay the circular wall at any one course.

Blocks intended for use in the cones or tops of manholes or other structures shall have such shapes as may be required to form the structure as shown on the plans with inside and outside joints not to exceed 1/4 inch in thickness.

2.2 Mortar. The mortar for brick masonry and similar work shall be composed of 1 part of portland cement and 2 parts of mortar sand, by volume. The portland cement shall conform to the requirements of ASTM C150. The sand shall conform to the requirements of ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. The water shall be clean and free of deleterious amounts of acids, alkalies, or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T26.

2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

2.4 Precast Concrete Pipe Manhole Rings. The precast concrete rings for risers and tops for manholes, catch basins, leaching basins, inlets, and inspection holes shall be circular with circular reinforcement and shall conform to ASTM C478, with the following exceptions and additions:

The internal diameter of the units shall conform to the dimensions shown on the plans.

The unit for the top of the structure shall be of a design approved by the Engineer and shall be constructed so as to provide for the use of standard covers as called for on the plans. Unless otherwise specified, top units shall be eccentric in shape to provide a vertical wall for steps. The joint with the risers shall be of the same design as the joints in the circular sections so as to have a uniform bearing on the full wall thickness of the pipe.

Riser sections may be cast with openings for one or two pipe. The hole for the pipe shall be cast with a diameter 3 inches larger than the outside diameter of the pipe. No holes for inlet or outlet pipes shall be made in precast units at the site of the work.

2.5 Corrugated Material. Corrugated metal shall conform to the requirements of Fed. Spec. WW-P-405.

2.6 Frames, Covers, and Grates. The castings shall conform to one of the following requirements:

(a) Gray iron castings shall meet the requirements of ASTM A48.

(b) Malleable iron castings shall meet the requirements of ASTM A47.

(c) Steel castings shall meet the requirements of ASTM A27.

(d) Structural steel for grates and frames shall conform to the requirements of ASTM A36.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned and given two coats of approved bituminous paint. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

2.7 Steps. Steps shall be of an approved design and may be made of cast iron, aluminum, or plastic-coated steel. Rungs shall be capable of supporting 300 lbs. and shall not be less than 10 inch clear length and shall allow for a minimum of 3 inch embedment.

CONSTRUCTION METHODS

3.1 Unclassified Excavation.

(a) The Contractor shall do all excavation for structures and structure footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the

full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximate only; and the Engineer may order, in writing, changes in dimensions or elevations of footings necessary to secure a satisfactory foundation.

(b) Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

(c) The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

(d) Unless otherwise provided, bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be affected in a manner which will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

(e) After each excavation is completed, the Contractor shall notify the Engineer to that effect; and concrete or reinforcing steel shall be placed after the Engineer has approved the depth of the excavation and the character of the foundation material.

3.2 Brick Structures.

(a) **Foundations.** A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and

placed in accordance with the requirements of Item P-610. The foundation shall be built to the correct elevation and shall be finished to cause the least possible resistance to flowing water.

(b) **Laying Brick.** All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used, and wherever practicable, whole brick shall be used and laid as headers.

(c) **Joints.** All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or parge with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parge, all joints on the back of the face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and whatever width is adopted shall be maintained uniform throughout the work.

(d) **Pointing.** Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used the holes shall be immediately plugged with mortar and

pointed when the nail or pin is removed.

(e) **Cleaning.** Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of clean fresh water.

(f) **Curing and Cold Weather Protection.** In hot or dry weather, or when directed by the Engineer, the brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost in the brick or when the air temperature is below 50°. Unless the Contractor has on the project already to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at the temperature of not less than 60° for the duration of the curing period.

3.3 Concrete Structures. Concrete structures shall be built on prepared foundations, conforming to the dimensions and form indicated on the plans. The constructions shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is poured.

All invert channels shall be constructed and shaped accurately so as to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be slopped downward toward the outlet.

3.4 Precast Concrete Pipe Structures. Precast concrete pipe structures shall be constructed on prepared or previously placed slab foundations and shall conform to the dimensions and locations shown on the plans. All precast concrete pipe sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily, and all jointing and connections shall be cemented with mortar. The top of the upper precast concrete pipe member shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for

lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps which are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches. When a metal ladder replaces the steps, it shall be securely fastened into position.

3.5 Corrugated Metal Structures. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. The structures shall be prefabricated. Standard or special fittings shall be furnished to provide pipe connections or branches of correct dimensions. The connections or branches shall be of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. When indicated, the structures shall be placed on a reinforced concrete base. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to which can be fastened a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans.

3.6 Inlet and Outlet Pipes. Inlet and outlet pipes shall extend through the walls of the structures for a sufficient distance beyond the outside surface to allow for connections but shall be cut off flush with the wall on the inside surface, unless otherwise directed. For concrete or brick structures, the mortar shall be placed around these pipes so as to form a tight, neat connection.

3.7 Placement and Treatment of Castings, Frames, and Fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are to be placed upon previously constructed masonry, the bearing surface or masonry shall be brought true to line and grade and shall present an even bearing surface in order that the entire face or back of the unit will come in contact with the masonry. The unit shall be set in

mortar beds and anchored to the masonry as indicated on the plans or as directed and approved by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position and the concrete or mortar has been allowed to harden for 7 days, then the grates or covers shall be placed and fastened down.

3.8 Installation of Steps. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is poured. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least 7 days. After this period has elapsed, the steps shall be cleaned and painted, unless they have been galvanized.

When the steps are required with precast concrete pipe structures, they shall be cast into the sides of the pipe at the time the pipe sections are manufactured or set in place after the structures is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches. In lieu of steps, prefabricated ladders may be installed. In the case of brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. In the case of metal structures, the ladder shall be secured by welding the top support and grouting the bottom support into drilled holes in the foundation or as directed.

3.9 Backfilling

(a) After a structure has been completed, the area around it shall be filled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152, and as determined by FAA compaction control tests T-611. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the engineer.

(b) Backfilling shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until the concrete has been in place 7 days, or until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

(c) Backfill shall not be measured for direct payment. Performance of this work shall be considered as a subsidiary obligation of the Contractor covered under the contract unit price for the structure involved.

3.10 Cleaning and Restoration of Site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as ordered by the Engineer. The Contractor shall restore all disturbed areas to their original condition.

Drainage structures constructed, adjusted, or reconstructed in unpaved areas shall have a 3 foot wide ring of sod placed around the cover incidental to the structure. Sod and method of installation shall conform to the requirements of Item T-904.

After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

4.1 Drainage structures will be measured vertically in feet, from the top of the base or footing to the top of the masonry of the structure except for drop inlets, which will be measured as units.

Drainage structures, 8 feet deep or less, of the diameter specified, and the upper 8 feet of drainage structures more than 8 feet in depth of the diameter specified, will be measured as units.

Additional depth of drainage structure, 8 feet to 15 feet, of the diameter specified, will be measured by the vertical foot, to the closest 0.1 foot, for that

portion of all drainage structures more than 8 feet in depth to the top of the base or footing.

Additional depth of drainage structure, more than 15 feet, of the diameter specified, will be measured by the vertical foot, to the closest 0.1 foot, for that portion of all drainage structures more than 15 feet in depth to the top of the base or footing.

Adjusting, reconstructing, removing, and abandoning drainage structures, and construction of special drainage structures, as specified, will be measured as units.

Special manhole bases of the size and type specified, will be measured as units. The riser above the manhole base will be measured as a drainage structure from the top of the manhole base.

Drainage structure covers, of the type specified, will be paid for as units, or by weight in pounds for the covers furnished, as specified. The following nominal weights are allowed for standard covers:

Cover	A	C	D	E	G	K
Weight, lb.	390	500	455	200	305	485

Removing and relocation of existing drainage structure covers will be measured as units.

BASIS OF PAYMENT

5.1 The accepted quantities of manholes, catch basins, inlets, leaching basins, and inspection holes, and the adjusting, reconstructing, removing, and abandoning drainage structures will be paid for at the contract unit price per each, complete in place, except that the extra depth, over 8 feet, of standard structures will be paid for at the contract unit price per vertical foot complete in place. Covers in the quantity or weight installed will be paid for at the contract unit price per each or per pound as specified. These prices shall be full compensation for furnishing all materials, and for all preparation, excavation, backfilling, and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans,

and for all labor, equipment, tools and incidentals necessary to complete the structure.

specifications.

Cross-referenced specifications required: P-152, P-610, T-904

Payment will be made under the nomenclature and seven digit item number specified in the plans and proposal for each type of drainage structure or cover work required per each, per foot, or per pound, as applicable.

The first three digits of any item number for work included under this specification shall be 751, i.e. 751XXXX.

TESTING AND MATERIAL REQUIREMENTS

Test and Short Titles

AASHTO T 26 - Water
FAA T 611 - Density

Material and Short Title

*WW-P-405	Corrugated Pipe
ASTM A 27	Carbon Steel Castings
ASTM A 36	Structural Steel
ASTM A 47	Malleable Iron Castings
ASTM A 48	Gray Iron Castings
ASTM A123	Zinc Coatings
ASTM C .6	Lime
ASTM C 32	Brick
ASTM C 55	Concrete Brick
ASTM C 73	Silicate Brick
ASTM C139	Concrete Masonry Units
ASTM C144	Mortar
ASTM C150	Portland Cement
ASTM C478	Precast Manhole Sections

*Federal Specification

Note: Others as required by referenced