



## SECTION 1033

### PRECAST DRAINAGE UNITS

**1033.1 Scope.** This specification covers precast reinforced concrete manhole and drop inlet sections and appurtenances, such as grade rings, tops and special sections.

**1033.2 Acceptance.** Unless otherwise specified, the basis for acceptance shall be in accordance with AASHTO M 199. If Class B or B-1 concrete is used, compressive tests and absorption test specimens will not be required.

#### **1033.3 Material.**

**1033.3.1 Cement.** Cement shall be in accordance with [Sec 1019](#). Fly ash or Ground Granulated Blast Furnace Slag (GGBFS) may be substituted for cement in accordance with [Sec 501](#).

**1033.3.2 Fly Ash.** Fly ash shall be in accordance with [Sec 1018](#).

**1033.3.3 Ground Granulated Blast Furnace Slag.** GGBFS shall be in accordance with [Sec 1017](#).

**1033.3.4 Aggregate.** Fine and coarse aggregate shall be in accordance with [Sec 1005](#), except that requirements for gradation and percent passing the No. 200 sieve shall not apply.

**1033.3.5 Steel Reinforcement.** Reinforcement shall be in accordance with [Sec 1036](#).

**1033.3.6 Concrete Mixture.** The manufacturer may designate the mixture proportions, but in no case shall the proportion of cement in the mixture be less than 470 pounds per cubic yard of concrete. Admixtures or blends may be used with the approval from the engineer. At the option of the manufacturer, Class B or B-1 concrete may be used. If Class B or B-1 concrete is used, material, proportioning, mixing, slump and transporting of concrete shall be in accordance with [Sec 501](#).

#### **1033.4 Design.**

**1033.4.1 Precast Drainage Units.** The design of precast drainage units shall be in accordance with AASHTO M 199 with the following modifications.

**1033.4.1.1** Wall thickness for rectangular drop inlets shall be as shown on the plans.

**1033.4.1.2** The quantity of steel reinforcement for rectangular drop inlets shall be as shown on the plans.

**1033.4.2 Modified or Special Designs.** The manufacturer may request approval of designs, prior to manufacture, other than those specified in the contract documents. Special or modified designs shall be submitted to the engineer, in writing and shall fully describe any deviations from the contract documents. The description shall also include the wall thickness, all other dimensions, concrete compressive strength and the area, type, placement and strength

of the steel reinforcement. Such sections shall meet all of the test and performance requirements specified by the engineer in accordance with [Sec 1033.2](#).

**1033.4.3 Reinforcement in Rectangular Drop Inlets.** Placement of reinforcement in rectangular drop inlets shall be as shown on the plans.

**1033.4.4 Manhole Risers and Conical Tops.** Each line of circumferential reinforcement shall be assembled into a cage that shall contain sufficient spacer bars or members, extending through the wall of the manhole risers and conical tops, to maintain the reinforcement rigidly in shape and correct position within the form. The exposure of the ends of stirrups or spacers that have been used to position the cages during the placement of the concrete will not be cause for rejection.

**1033.5 Joints.** The reinforced concrete riser sections, except grade rings, shall be formed such that the risers and top when assembled will make a continuous and uniform structure compatible with the tolerances specified for risers in AASHTO M 199. The joints shall be designed to permit placement without appreciable irregularities in the interior wall surface.

### **1033.6 Manufacture.**

**1033.6.1 Placement of Concrete.** The transporting and placing of concrete shall be by methods that will prevent the segregation of the concrete material and the displacement of the reinforcing steel from the proper position in the form.

#### **1033.6.2 Curing.**

**1033.6.2.1** Precast units shall be cured in accordance with [Sec 1026](#). Precast sections shall not be transported or erected until the design compressive strength has been reached.

**1033.6.2.2** If Class B or B-1 concrete is used, the sections shall be cured with wet burlap for 72 hours or by covering with transparent membrane applied in accordance with [Sec 502](#). Precast units constructed with Class B or B-1 concrete shall not be transported or erected until at least seven days after casting. If forms are removed before the expiration of the curing period, the parts of the structure exposed shall be cured as directed by the engineer.

**1033.6.3 Lift Holes.** Lift holes shall be in accordance with [Sec 1026](#). If approved by the engineer, lifting hooks or bars may be cast into the sections.

**1033.6.4 Forms.** Forms shall be mortar-tight and of sound material adequate to prevent distortion during placing and curing of the concrete. Forms shall be reasonably smooth and free of loose knots, holes and other defects.

**1033.6.5 Cold Weather Concreting.** Concrete placed in cold weather shall be protected from freezing during the curing period by the use of a heated, weatherproof enclosure. Concrete shall not be placed on or against reinforcing steel or other surfaces with temperatures lower than 35 F. No concrete shall be placed when the ambient temperature is below 35 F.

### **1033.7 Physical Test Requirements.**

**1033.7.1 Concrete Test Requirements.** The basis for concrete test requirements shall be AASHTO M 199. The specified number of specimens required for the tests shall be furnished without charge by the manufacturer and shall be selected at random by the engineer. The cores for compression tests shall be taken from manhole or drop inlet sections that would not otherwise be rejected under this specification. The selection shall be made at the point or points designated by the engineer.

**1033.7.2 Compression Tests.** Compression tests for satisfying the design concrete strength requirement may be made on either standard rodded concrete cylinders or cylinders compacted and cured in a similar manner to the manhole or drop inlet sections or, at the option of the manufacturer, on cores drilled from the wall of the section. If compression test cylinders are being used, the manufacturer shall furnish a sufficient number of molds of a type meeting the approval from the engineer. The compressive strength of each core tested shall be equal to or greater than the design strength of the concrete. If a core does not meet the required strength, another core from the same section may be tested. If this core does not meet the required strength, that section will be rejected. Additional tests shall be made on other sections to determine the acceptability of the lot.

**1033.7.3 Absorption Test Requirements.** The engineer may require samples for absorption tests if concrete other than Class B or B-1 is used. Each sample shall be a piece broken from the wall or a core drilled from the wall, have a minimum area of 9 square inches as measured on one surface of the wall, have a thickness equal to the wall and be free of visible cracks.

**1033.8 Permissible Variations in Dimensions.**

**1033.8.1** The basis for permissible variations in dimensions shall be AASHTO M 199.

**1033.8.2** The internal dimensions of precast units shall not vary more than one percent or 3/8 inch, whichever is greater.

**1033.8.3** The vertical spacing and vertical alignment between adjacent manhole steps and horizontal distance from the inside wall to the centerline of a manhole step shall not vary more than one inch from the design dimensions.

**1033.9 Steps.** Steps for precast manholes and drop inlets shall be in accordance with [Sec 604](#) and as shown on the plans.

**1033.10 Repairs.** Filling of form tie cavities and repair of other defects shall be in accordance with [Sec 703](#).

**1033.11 Inspection.** The quality of material, the process of manufacture and the finished precast units shall be subject to inspection and approval by the engineer.

**1033.12 Marking.** Marking shall be indented into the section or shall be painted thereon with waterproof paint. The following information shall be clearly marked on the inside of each precast unit:

- (a) MH for manholes or DI for drop inlets. Other units do not need a designation.
- (b) Date of manufacture.
- (c) Name or trademark of the manufacturer.