



Standard Specification for Corrugated High Density Polyethylene (HDPE) Water Quality Units¹

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1. Scope

1.1 This specification covers materials, structural design, physical dimensions and manufacturing requirements for monolithic or sectional corrugated high density polyethylene (HDPE) water quality units with volumes greater than or equal to 140 ft³ or 1,050 gal (4,000 L).

1.2 The corrugated HDPE water quality units are placed as offline or inline treatment devices along storm drain pipe lines to remove total suspended solids (TSS), heavy metals and phosphorous. Typical sources of pollutants include construction activity, automotive transportation related wear and debris items, refuse, landscaping debris, agricultural activities, and other similar by-products.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 This specification covers horizontally laid corrugated HDPE water quality units as illustrated in Fig. 1.

1.5 The following safety hazard caveat pertains only to the test methods portion, Section 9, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D1600 Terminology for Abbreviated Terms Relating to Plastics

D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials

F412 Terminology Relating to Plastic Piping Systems

F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

F2306/F2306M Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

2.2 Plastic Pipe Institute:³

PPI TR-4 PPI Listing of Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Plastic Pipes

2.3 AASHTO Standard⁴

LDFD Bridge Design Specifications

3. Terminology

3.1 For definitions of terms relating to plastics, see Terminology F412 and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 Definitions of Terms Specific to This Standard:

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.26 on Olefin Based Pipe.

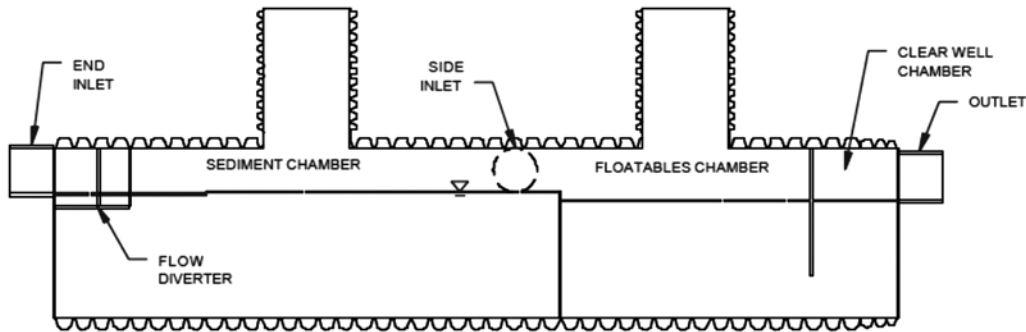
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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.

⁴ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.



HDPE water quality units contain three (3) chambers. A side inlet may be used in lieu of the end inlet and flow diverter when a full height longitudinal partition is constructed in the sediment chamber compartment to extend the particle travel length and isolate incoming flow from sediment build-up.

FIG. 1 Horizontally Laid Corrugated HDPE Water Quality Units

3.3 *access opening, n*—a hole in the top or crown of the water quality unit for access to the interior for inspection, cleaning and removing of sediment, hydrocarbons, floating debris, and pollutants without personnel entry.

3.4 *baffle, n*—a device at the inlet of the water quality unit that extends partially between the top and invert intended to deflect influent downward and increase the length of the flow path of the liquid as it travels through the water quality unit.

3.5 *bypass, n*—an optional external piping intended to convey storm flow in excess of the treatment flow rate beyond the water quality unit.

3.6

3.5 *Compartment, n*—a separate and distinct section of the water quality unit designated for specific contaminant removal.

3.7

3.6 *first flush, n*—the first half inch to one inch of rainfall which results in overland flow during a storm event or as required by the regional water quality regulatory agency.

3.7 *flow diverter (partitions), n*—a device at the inlet of the water quality unit that extends partially between the top and invert intended to deflect influent downward and increase the length of the flow path of the liquid as it travels through the water quality unit.

3.8 *joint, n*—a physical separation where two sections of the water quality unit are in contact.

3.9 *monolithic corrugated HDPE water quality unit, n*—a single extruded piece of pipe with no internal joints and welded end caps that serves as the water quality unit.

3.10 *non-sealed joint, n*—a joint where a machined fit will minimize the movement of liquid from one side of a wall to the opposite side.

3.11 *orifice equation, n*—prediction of flow rate through a round opening of liquid given the opening size and the head above the opening.

3.12 *owner, n*—is by definition end user, customer, or purchaser.

3.13 *sealed joint, n*—a joint that is sealed to prevent liquid passing from one side of a wall to the opposite wall.

3.14 *sectional corrugated HDPE water quality unit, n*—a group of two or more extruded pieces of pipe connected with sealed joints that when combined serve as the principal unit.

3.15 *Stokes Law, n*—prediction of settling time for particles of various sizes in a liquid.

3.16 *treatment flow rate, n*—the flow rate for which the water quality unit is intended to treat such to provide removal of Total Suspended Solids (TSS).

3.17 *water quality unit*—a single unit or series of units in which pollutants from storm runoff from land drainage is received, detained, and treated and from which the liquid effluent, which is comparatively free from settleable, suspended, and floating solids, is then discharged to a public storm sewer, water detention / retention structure, or publicly owned waterway.

3.18 *weir, n*—a partition across the width of the water quality unit sediment chamber that partially extends between the invert and top and is intended to trap pollutants.

4. Ordering Information

4.1 The owner shall include the following information in bidding documents and on the purchase order, as applicable to the units being ordered:

4.1.1 Reference to this specification, and date of issue.

4.1.2 Quantity or number of water quality units.

4.1.3 Capacity of the tank in ft³ or gal (L).

4.1.4 Project conditions such as peak storm flow rate, bypass diameter and associated piping elevations.

4.1.5 Acceptance will be based on a review of the calculations or testing submittals.

4.1.6 Design requirements such as depth of earth cover, live load applied at the surface, ground water level and joint requirements for bypass pipe.

4.1.7 Testing for water leakage shall not be required at the job site unless specifically required by the owner at the time of ordering.

5. Materials and Manufacture

5.1 *Water Quality Unit, Access Risers and Fittings*—Shall be fabricated from pipe and fittings meeting the requirements of Specification F2306/F2306M. It is permissible to utilize other pipe materials as long as they meet the performance criteria in this standard and are approved by the owner.

5.2 *Inlet and Outlet Tees*—Shall be fabricated from pipe and fittings meeting the requirements of Specification F2306/F2306M for dual wall pipe or Specification F714 ~~for solid wall pipe.~~ for solid wall pipe. It is permissible to utilize other pipe materials as long as they meet the performance criteria in this standard and are approved by the owner.

5.3 *Internal Tank Piping*—Internal piping within the water quality unit shall be fabricated from pipe and fittings meeting the requirements of Specification F2306/F2306M for dual wall pipe or Specification F714 ~~for solid wall pipe.~~ for solid wall pipe. It is permissible to utilize other pipe materials as long as they meet the performance criteria in this standard and are approved by the owner.

5.4 *Weirs, Baffles, Flow Diverters, and End Caps*—~~Weirs~~—Weirs, flow diverters (partitions), and end caps shall be fabricated from either flat plates meeting the requirements of PPI TR-4 PE 3408 material.

5.5 Pipe Connections:

5.5.1 Pipe to Water Quality Unit connections shall employ flexible watertight connectors conforming to the requirements of Specification F477.

6. Structural Design Requirements

6.1 Pipe sections used in the fabrication of the water quality unit shall be design by calculation using the AASHTO LRFD Bridge Specifications, Section 12, “ Buried Structures and Tunnel Liners”

6.2 Structural analysis and design of the water quality units shall be performed using commercially practicable methods and may include computer aided analysis, field based analysis, or analytical calculations.

6.2.1 Structural analysis and design shall include provisions for external hydrostatic pressure.

6.2.2 Structural analysis and design shall incorporate a minimum live load at the surface, of an AASHTO H-25 load, unless greater loading is anticipated.

6.2.3 Structural analysis and design shall take into consideration the number, placement, and size of all openings.

6.3 Installation shall be in accordance with the manufacturer’s instructions.

7. Physical Dimensions

7.1 Water Quality Unit Sizes:

7.1.1 The volume of water quality units is given in Table 1. These volumes do not reflect the treatment or removal efficiencies in 9.2.

7.2 Compartments:

7.2.1 Units shall utilize multiple compartments with dividing weirs and ~~baffles~~ flow diverters (partitions) welded to the unit. Separate compartments shall exist for solids and floatable removal.

7.2.1.1 Welding of the weir and ~~baffle~~ flow diverters (partitions) shall be done by continuous extrusion welding on both sides of the weir and ~~baffle~~ flow diverters (partitions).

7.2.1.2 Welding rod shall be of medium or high density polyethylene corresponding to the properties for the end plate materials in 5.4 with the exception that the tensile strength at yield shall not be less than 5000 psi (3.5MKg/m²).

7.2.2 Multiple units installed in series or parallel are acceptable.

7.2.3 Each compartment shall have an access riser for inspection and maintenance.

7.3 Inlet and Outlet Pipes:

7.3.1 The inlet pipe shall be no less than 10 in. (250 mm) in diameter.

7.3.2 The elevation difference between the invert of the inlet pipe and the invert of the outlet pipe shall be a minimum of 2 in. (50mm).

TABLE 1 Water Quality Unit Sizes

Unit Inside Diameter in. (mm)	Inside Length ft (m)	Total Volume gal (m ³)	Minimum Inlet/Outlet Diameter in. (mm)
36 (900)	20 (6)	1058 (4.0)	10 (250)
36 (900)	40 (12)	2116 (8.0)	10 (250)
42 (1050)	20 (6)	1439 (5.4)	12 (300)
42 (1050)	40 (12)	2879 (10.9)	12 (300)
48 (1200)	20 (6)	1879 (7.1)	12 (300)
48 (1200)	40 (12)	3758 (14.2)	12 (300)
60 (1500)	20 (6)	2937 (11.1)	15 (375)
60 (1500)	40 (12)	5874 (22.2)	15 (375)