

IAPMO IGC 325-~~2023~~2024



**PUBLIC REVIEW DRAFT**

*Industry Standard for*  
**High Efficiency Oil/Water Separators**



# ***IAPMO Standard***

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Consensus is established when substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

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# Preface

This is the third edition of IAPMO IGC 325, High Efficiency Oil/Water Separators. This Standard supersedes IAPMO IGC 325 – ~~2022~~<sup>ed</sup>2023, Oil/Water Separators Performance. An editorial edition was published to remove a graphic which was not referenced within the standard. The previous editions of this standard were: [November 2023](#), November 2022, and February 2016.

This Standard was developed by the IAPMO Standards Review Committee (SRC) in accordance with the policies and procedures regulating IAPMO industry standards development, Policy S-001, Standards Development Process. This Standard was approved as an IAPMO Industry Standard on **November 6, 2023**.

## Notes:

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- (4) *During its development, this Standard was made available for public review, thus providing an opportunity for additional input from stakeholders from industry, academia, regulatory agencies, and the public at large. Upon closing of public review, all comments received were duly considered and resolved by the IAPMO Standards Review Committee.*
- (5) *This Standard was developed in accordance with the principles of consensus, which is defined as substantial agreement; consensus implies much more than a simple majority, but not necessarily unanimity. It is consistent with this definition that a member of the IAPMO Standards Review Committee might not be in full agreement with all sections of this Standard.*
- (6) *Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
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  - (a) *standard designation (number);*
  - (b) *relevant section, table, or figure number, as applicable;*
  - (c) *wording of the proposed change, tracking the changes between the original and the proposed wording; and*
  - (d) *rationale for the change.*
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  - (b) *the definition of the problem, making reference to the specific section and, when appropriate, an illustrative sketch explaining the question;*
  - (c) *an explanation of circumstances surrounding the actual field conditions; and*
  - (d) *the request for interpretation phrased in such a way that a "yes" or "no" answer will address the issue.*

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- (12) Proposals for amendments to this Standard will be processed in accordance with the standards-writing procedures of IAPMO industry standards development, Policy S-001, Standards Development Process.*

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# IAPMO IGC 325-~~2023~~2024

## High Efficiency Oil/Water Separators

### 1 Scope

#### 1.1 General

- 1.1.1** This Standard covers high efficiency oil/water separators intended for residential and commercial applications and specifies requirements for materials, physical characteristics, performance testing, and markings.
- 1.1.2** This standard covers both the analysis procedure and specifies the minimum acceptable volume of residual oil in the effluent of a high efficiency oil/water separator. The high efficiency oil/water separator is tested in a way that measures the volume of residual oil in the effluent of the high efficiency oil/water separator. The volume of residual oil in the effluent is analyzed by gravimetric analysis.
- 1.1.3** The performance testing procedures of high efficiency oil/water separators developed in this standard harnessed select measurement procedures and analysis methodologies found in standards IGC 183, ASME A112.14.3, ASTM D6104, ASTM D7066, DIN 1999-3, EPA Method 1664a, Resolution MEPC.107(49) and EN 858-1.

#### 1.2 Alternative Materials

The requirements of this Standard are not intended to prevent the use of alternative materials or methods of construction provided such alternatives meet the intent and requirements of this Standard.

#### 1.3 Terminology

In this Standard,

- (a) “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy to comply with the Standard;
- (b) “should” is used to express a recommendation, but not a requirement;
- (c) “may” is used to express an option or something permissible within the scope of the Standard; and
- (d) “can” is used to express a possibility or a capability.

Notes accompanying sections of the Standard do not specify requirements or alternative requirements; their purpose is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and can be written as requirements.

## 1.4 Units of Measurement

SI units are the primary units of record in global commerce. In this Standard, the inch/pound units are shown in parentheses. The values stated in each measurement system are equivalent in application, but each unit system is to be used independently. All references to gallons are to U.S. gallons.

## 2 Reference Publications

This Standard refers to the following publications and, where such reference is made, it shall be to the current edition of those publications, including all amendments published thereto.

### **American Concrete Institute**

ACI 318

Building Code Requirements for Structural Concrete and Commentary

ACI 350

Code Requirements for Seismic Analysis and Design of Liquid-Containing Concrete Structures (ACI 350.3-20) and Commentary

### **American Society of Civil Engineers**

ASCE 7

Minimum Design Loads and Associated Criteria for Buildings and Other Structures

### **ASME International (The American Society of Mechanical Engineers)**

ASME A112.14.3

Hydromechanical Grease Interceptors

### **ASTM International**

ASTM C858

Standard Specification for Underground Precast Concrete Utility Structures

ASTM C890

Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

ASTM D1784

Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D1785

Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D2665

Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

ASTM D3350

Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

**ASTM D6104**

Standard Practice for Determining the Performance of Oil/Water Separators Subjected to Surface Run-Off

**ASTM D4101**

Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

**ASTM D7066**

Standard Test Method for dimer/trimer of chlorotrifluoroethylene (S-316) Recoverable Oil and Grease and Nonpolar Material by Infrared Determination

**ASTM F891**

Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core

**DIN****DIN EN 858-1**

Separator Systems for Light Liquids – Part 1: Principles of product design, performance and testing, marking and quality control

**DIN 1999-3**

Separators for light liquids, petrol-separators, fuel oil separators; testings

**EPA****EPA Method 1664A**

N-hexane Extractable Material (HEM; Oil and Grease) and Silica Gel treated N-Hexane Extractable Material (SGT-HEM; non-polar Material) by Extraction and Gravimetry

**IAPMO (International Association of Plumbing and Mechanical Officials)****IAPMO/ANSI Z1000**

Prefabricated Septic Tanks

**IAPMO IGC 183**

Oil/Water Separators and Coalescing Plate Separators

**IAPMO IGC 329**

Steel Reinforced Polyethylene Tanks

**IMO (International Maritime Organization)****Resolution MEPC.107(49)**

Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships

### 3 Definitions

#### 3.1 Definitions

The following definitions shall apply in this Standard:

**High Efficiency Oil/Water Separator** — a device installed in a drainage system that separates and collects oil from wastewater with a minimum 90% efficiency.

**Inlet**— An opening to connect the influent supply line to a tank.

**Outlet**— An opening to connect the effluent discharge line from a tank.

### 4 General Requirements

#### 4.1 Material Requirements

##### 4.1.1 Concrete

High efficiency concrete oil/water separators covered by this Standard shall:

- (a) comply with the applicable requirements of ASTM C858;
- (b) have a wall thickness of at least 2.5 in (63.5 mm);
- (c) be made with Type III cement, or Type II or Type V cement where required;
- (d) have a maximum water-cementitious ratio of 0.50; and
- (e) Concrete separators structural design shall be based on ACI 318, ACI 350 and ASTM C858.

##### 4.1.2 Fiber-Reinforced Polyester

High efficiency fiber-reinforced polyester oil/water separators covered by this Standard shall comply with the applicable requirements in Section 6 of IAPMO/ANSI Z1000.

##### 4.1.3 Thermoplastic

High efficiency polyethylene oil/water separators covered by this Standard shall comply with the applicable requirements in Section 7 of IAPMO/ANSI Z1000, or be made of the following materials:

- (a) Polyvinylchloride (PVC)
  - (i) that complies with cell classification 12454 when tested in accordance with ASTM D1784, or
  - (ii) that complies with cell classification 12344 when tested in accordance with ASTM D1784 with a tensile strength of not less than 45 MPa (6500 psi) and a modulus of elasticity of not less than 2620 MPa (380,000 psi).
- (b) Polyethylene (PE) that complies with or exceeds cell classification ~~21321C 33500B (Type III HDPE)~~ as specified in ASTM D3350.
- (c) Polypropylene (PP) that complies with or exceeds cell classification PP0110B55140 or PP0105G20A33350 specified in ASTM D4101.
- (d) Steel reinforced polyethylene separators shall comply with the applicable requirements of IAPMO IGC 329.

##### 4.1.4 Steel

High efficiency steel oil/water separators covered by this Standard shall comply with the applicable requirements in Section 8 of IAPMO/ANSI Z1000.

#### **4.2 Drawings and Supporting Documentation**

Drawings shall show all product components, dimensions, flow rate, oil capacity, and liquid capacity.

#### **4.3 Ultraviolet (UV) Light Protection**

Materials used in the manufacture of High Efficiency Oil/Water Separators that are sensitive to ultraviolet (UV) light or have no natural resistance to UV light shall be compounded to provide UV light exposure stabilization. The level of stabilization shall be dependent on end-use requirements (e.g., above-ground installations) and the sensitivity of the material to UV light exposure.

#### **4.4 Covers and Risers**

Covers and Risers shall:

- (a) provide access to the High Efficiency Oil/Water Separator by water/gas-tight sealed manhole frames, covers, and opening extension systems (risers).
- (b) allow access into the entire unit.
- (c) be sized to allow for proper maintenance of the units.
- (d) Not be able to flip, rotate, or slide, when properly installed.

#### **4.5 Components**

The inlets, outlets, baffles, and weirs shall be placed, and provided with the required piping, tees, and other approved fittings, allowing for the proper operation of the units. Pipes shall comply with the requirements of ASTM F891, tees and other approved fittings shall comply with the requirements of ASTM D1785 or ASTM D2665.

#### **4.6 Venting**

At least one 2 in (50.8 mm) diameter vent hole is to be provided on the unit. All vent connections shall be within the top 12 in (305 mm) of the tank.

#### **4.7 Buried Tanks**

##### **4.7.1 General**

High Efficiency Oil/Water Separators intended for below-grade (i.e., buried) installations shall be capable of withstanding:

- (a) The loads specified in sections 4.7.3 to 4.7.5 when full and when empty; and
- (b) Stresses and loads encountered during shipping, handling, installation, operation, and maintenance.

##### **4.7.2 Calculations**

Structural performance shall be verified by design calculations conducted by a licensed professional engineer in accordance with sections 4.7.3 and 4.7.5.

##### **4.7.3 Exterior Tank Walls**

Exterior tank walls shall be capable of withstanding an

- (a) internal hydrostatic pressure exerted by a column of water of a height equivalent to the height of the outlet invert; and
- (b) external earth load equivalent to the pressure exerted by a fluid with a density of 30 lb/ft<sup>3</sup> (480 kg/m<sup>3</sup>).

**4.7.4 Vertical Earth Loads**

Tanks and covers shall be designed to carry a vertical earth load of at least 500 lb/ft<sup>2</sup> (24 kPa) [i.e., designed for a minimum burial depth of 3 ft (0.9 m)].

**4.7.5 Vehicular Traffic**

High Efficiency Oil/Water Separators intended for installation in vehicular traffic areas shall be designed to meet the A-16 vehicle loads specified in ASTM C890 (i.e., AASHTO HS20-44).

**4.8 Above Ground Tanks**

High Efficiency Oil/Water Separators intended for above-ground installations shall be designed in accordance with ASCE 7 and capable of:

- (a) withstanding design loads;
- (b) maintaining their structural integrity when filled, without
  - (i) deforming in such a way as the structural integrity is compromised;
  - (ii) collapsing; or
  - (iii) cracking; and
- (c) withstanding stresses and loads during shipping, handling, installation, operation, and maintenance.

**5 Test Set-up****5.1 Water**

The water utilized to test the high efficiency oil/water separator shall be potable water obtained from a local municipality or similar source. The temperature shall be between 4°C (39°F) and 20°C (77°F) and the pH value shall be  $7 \pm 1$ .

**5.2 Light Liquid (Oil)**

The light liquid shall be motor oil having a specific gravity of  $54.94 \pm 0.9$  lb/ft<sup>3</sup> ( $0.88 \pm 0.015$  g/cm<sup>3</sup>) at 59°F (15°C).

**5.3 Liquid Holding Capacity**

The liquid holding capacity is the volume of liquid that the High Efficiency Oil/Water Separator holds prior to flowing out the outlet. This can be determined experimentally by filling the High Efficiency Oil/Water Separator through a totalizer to the invert of the outlet, or by supporting engineering calculations.

**5.4 Oil Holding Capacity**

The oil holding capacity is specified by the manufacturer. It is the maximum amount of oil the High Efficiency Oil/Water Separator can hold while continuing to operate within the performance requirements outlined in section 6.4. The minimum oil capacity is equal to 25% of the High Efficiency Oil/Water Separator's liquid holding capacity. For example, if the High Efficiency Oil/Water Separator's liquid holding capacity is calculated at 100 gal. (378.5L), the minimum oil capacity shall be 25 gal. (94.6L).

**5.5 Test Batches**

The test shall be run in batches. Each batch shall last 5 min in duration. 20 batches shall be run in succession until the manufacturer's specified oil holding capacity has been reached.

## 5.6 Pre-filled Oil Capacity

The High Efficiency Oil/Water separator will be pre-filled with oil prior to running the test batches. The amount of oil is determined by the below system of equations, or simplified single equation, such that the twentieth test batch will test to the manufacturer's specified oil holding capacity.

Manufacturer's Inputs	Constants	Outputs
<b>Q</b> = Volumetric Flow Rate (GPM)[L/min]	<b>T</b> = Batch Time = 5 min	<b>OC<sub>PF</sub></b> = Pre-filled Oil Capacity (Gallons)[Liters]
<b>OC<sub>HC</sub></b> = Oil Holding Capacity (Gallons) [Liters]	<b>B</b> = Batch Count = 20 Batches	

### Step by Step System:

$$\text{Oil per Batch} = \frac{Q}{1000} * T$$

$$\text{Total Oil Introduced} = \text{Oil per Batch} * B$$

$$\text{Pre-filled Oil Capacity} = \text{OCHC} - \text{Total Oil Introduced}$$

### Simplified:

$$OC_{PF} = OC_{HC} - \frac{Q}{10}$$

## 6 Testing Requirements

### 6.1 Test Apparatus

The test apparatus shall be assembled as shown in Figure 1. The High Efficiency Oil/Water Separator test specimen shall be installed in the test apparatus in accordance with the manufacturer's installation instructions. The High Efficiency Oil/Water Separator shall be outfitted with the smallest inlet/outlet size offered. The components of the test apparatus include the following:

- (a) Water supply from the local municipality
  - (i) The water supply can be either a water main, a water reservoir and a pump, or an elevated storage tank capable of providing the volume and flow rate of water necessary for a test run as described in the procedure.
- (b) Valve to control the flow rate of water.
- (c) Calibrated water flow meter with a resolution of 0.1 GPM (.37L/min).
- (d) Oil additive system
  - (i) The oil additive system can be either a reservoir and a pump, or an elevated storage tank, capable of providing the volume and flow rate of oil necessary for a batch run as described in the procedure.
- (e) Valve to control the flow rate of oil.
- (f) Calibrated oil flow meter with a resolution of 0.01 GPM (.037L/min).
- (g) Piping from the oil additive system to the oil injection mechanism.
- (h) Oil injection mechanism (see figure 1d)
  - (i) The oil injection mechanism is a copper tube installed at 45° angle into the supply pipe.
  - (ii) The seal between the copper tube and piping may be achieved using a water-proof epoxy or silicone.
  - (iii) Fittings, such as a wye fitting and plug, may be directly added into the supply pipe to help install the copper tubing correctly.

- (i) Supply pipe angled downward  $2.0 \pm 0.5^\circ$  from the oil injection mechanism toward the High Efficiency Oil/Water Separator
  - (i) The supply pipe between the oil injection mechanism and the High Efficiency Oil/Water Separator shall have the same diameter as the inlet of the separator and a length of 78.8in (2000 mm).
- (j) High Efficiency Oil/Water Separator
  - (i) The High Efficiency Oil/Water Separator shall be assembled and installed in accordance with the manufacturer's installation instructions.
  - (ii) The High Efficiency Oil/Water Separator shall be outfitted with the smallest inlet/outlet configuration offered.
- (k) Outlet pipe
  - (i) The outlet pipe shall have the same diameter as the outlet of the High Efficiency Oil/Water Separator.
- (l) Static Mixer
  - (i) The static mixer is installed in the outlet pipe prior to the sampling port.
- (m) Sampling port connected to outlet pipe prior to discharge (see figure 1e)
  - (i) The sampling port must be installed within 18 in (460 mm) of the separator outlet.
  - (ii) The sampling port is a copper tube installed at  $45^\circ$  angle into the effluent pipe.
  - (iii) One half the diameter of the copper tube is cut away from the length that is inserted into the effluent pipe to allow effluent flow to exit the sampling port.
  - (iv) The seal between the copper tube and piping may be achieved using a water-proof epoxy or silicone.
  - (v) Fittings, such as a wye fitting and plug, may be directly added into the effluent pipe to help install the copper tubing correctly.
- (n) Effluent pipe connected to sewer or effluent holding tank.

## 6.2 Test Procedure

The test shall be conducted as follows:

- (a) Prefill High Efficiency Oil/Water Separator to the pre-filled oil capacity referenced in 5.6.
- (b) Record the model number of the High Efficiency Oil/Water Separator being tested, inlet/outlet pipe size, batch number, the flow rate of water, the temperature and pH of the water, the date and time of testing.
- (c) Flow water into the apparatus at the maximum flow rate  $\pm 2\%$  specified by manufacturer.
- (d) Introduce the oil at a rate of 1000 ppm oil to water (.001 gal (3.78ml)  $\pm 5\%$  light liquid per 1 gal (3.78L) of water), using a valve to control the flow rate of oil.
- (e) Maintain a constant flow rate of water and oil for the 5 minute batch.
- (f) Allow the water-oil mixture to flow through the supply pipe into the High Efficiency Oil/Water Separator and exit through the outlet pipe.
- (g) Allow the effluent to discharge through the outlet pipe and into the sampling port.
- (h) Sixty seconds before the end of the batch time, collect the effluent discharge from the sampling port directly into the lab-approved collection container.
- (i) At the end of the 5-minute batch run, stop the flow of water and oil.
- (j) Seal the collection container containing the sample with a secure lid.
- (k) Label the sample with the High Efficiency Oil/Water Separator model number, batch number, date and time, and the name of the person(s) collecting the sample.
- (l) (Repeat steps c-k for 20 batches, reaching manufacturer specified oil holding capacity.

**6.3 Analysis**

The analysis shall be performed by using extraction and gravimetry method in accordance with EPA Method 1664a.

**6.4 Performance Requirements**

The maximum allowable content of residual oils in the effluent wastewater for compliance with this standard is 100 ppm (mg/L). If the average of any two successive batches is greater than the maximum allowable content of residual oils in the effluent wastewater, it constitutes a failure.

Examples:

	Example 1	Example 2	Example 3	Example 4
Batch n (ppm)*	99.0	1.0	50.0	70.0
Batch n+1 (ppm)*	102.0	201.0	149.0	130.0
Average (ppm)	100.5	101.0	99.5	100.0
Pass/Fail	Fail	Fail	Pass	Pass

\*n=batch number

**7 Testing Report**

The test report shall at a minimum include:

- The tested High Efficiency Oil/Water Separator's make and model as well as the manufacturer's description, including all standard ancillary equipment.
- A copy of the High Efficiency Oil/Water Separator's specification sheet.
- A copy of all the laboratory sample reports.
- The flow rate of oil and water at which the test was conducted, the High Efficiency Oil/Water Separator's inlet/outlet pipe size, the oil holding capacity, the type of oil used, its specific gravity, and viscosity, the date the test was performed, and the name and signature of the person who completed the test.

**8 Markings and Accompanying Literature****8.1 Markings**

High Efficiency Oil/Water separator complying with this Standard shall be marked with the:

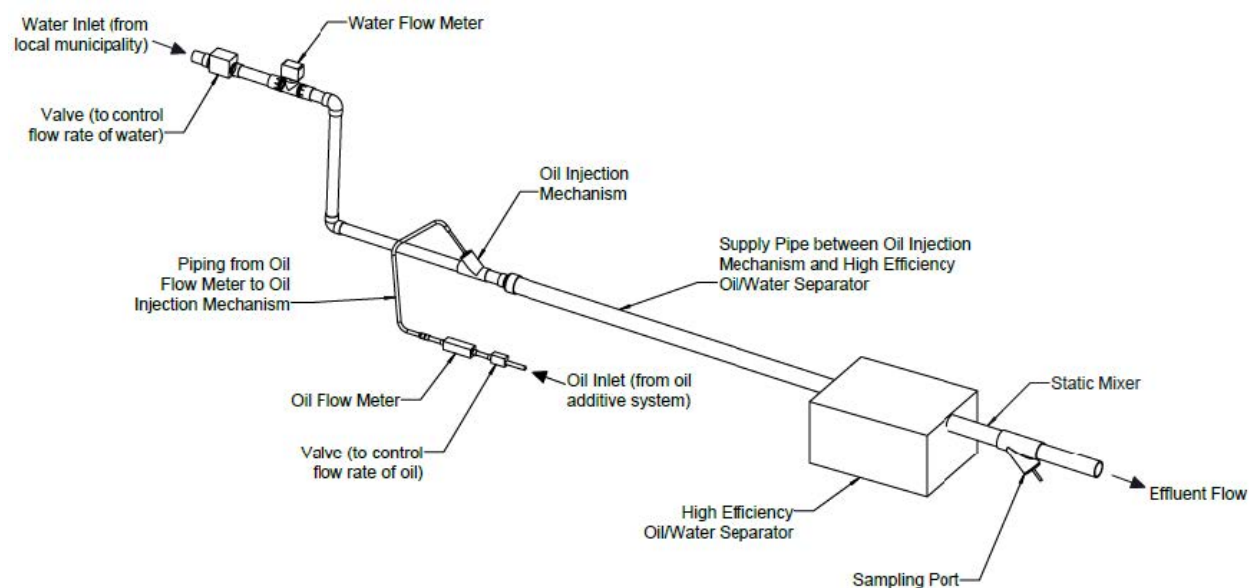
- manufacturer's name or trademark;
- model number;
- IAPMO standard designation (i.e., "IAPMO IGC 325").

**8.2 Visibility**

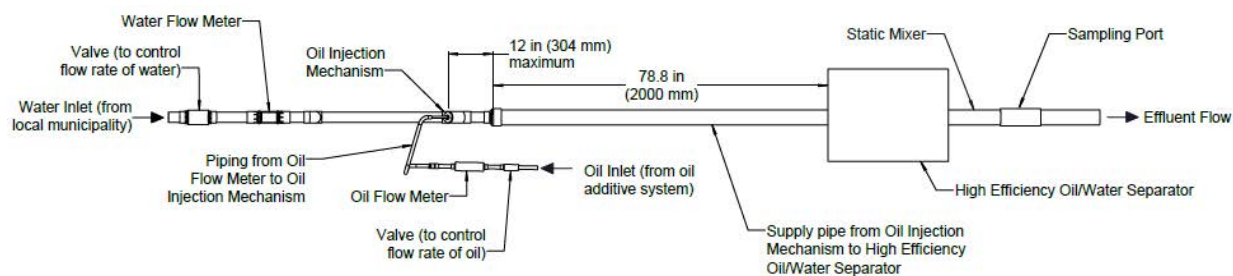
Markings shall be permanent, legible, and visible after installation.

**8.3 Installation Instructions**

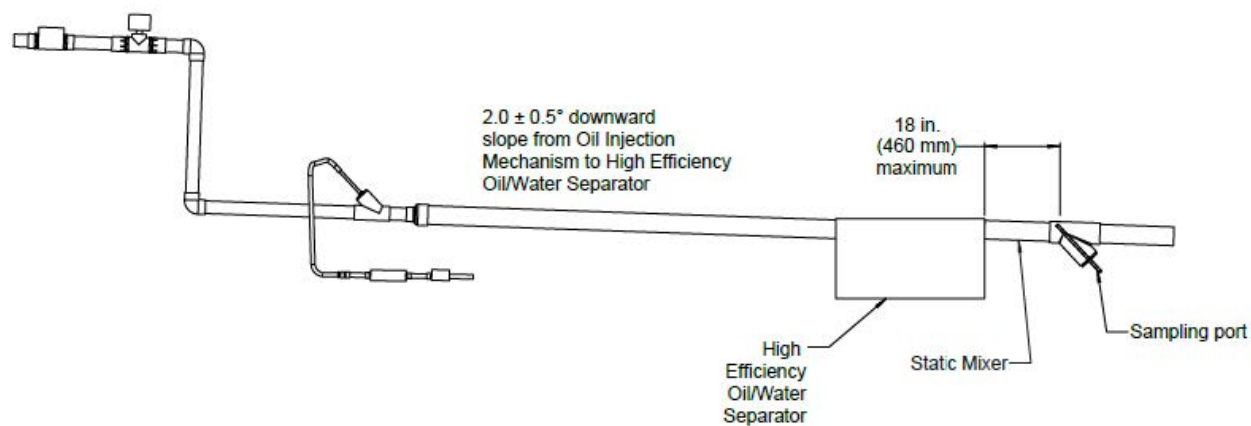
High Efficiency Oil/Water separator shall be accompanied by instructions for their installation, care and maintenance, and repair.



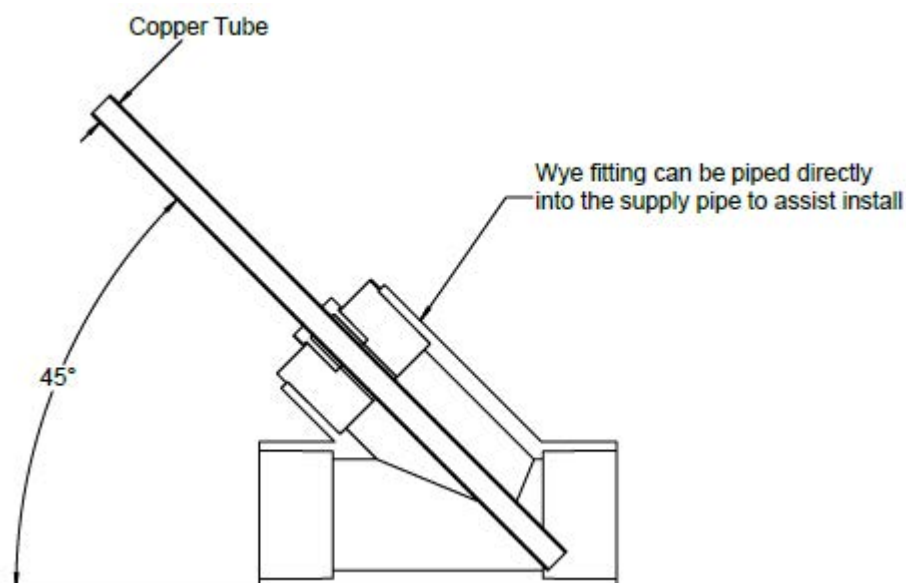
**Figure 1**  
**Test Apparatus**  
**(a) Isometric View**  
 (See Section 6.1)



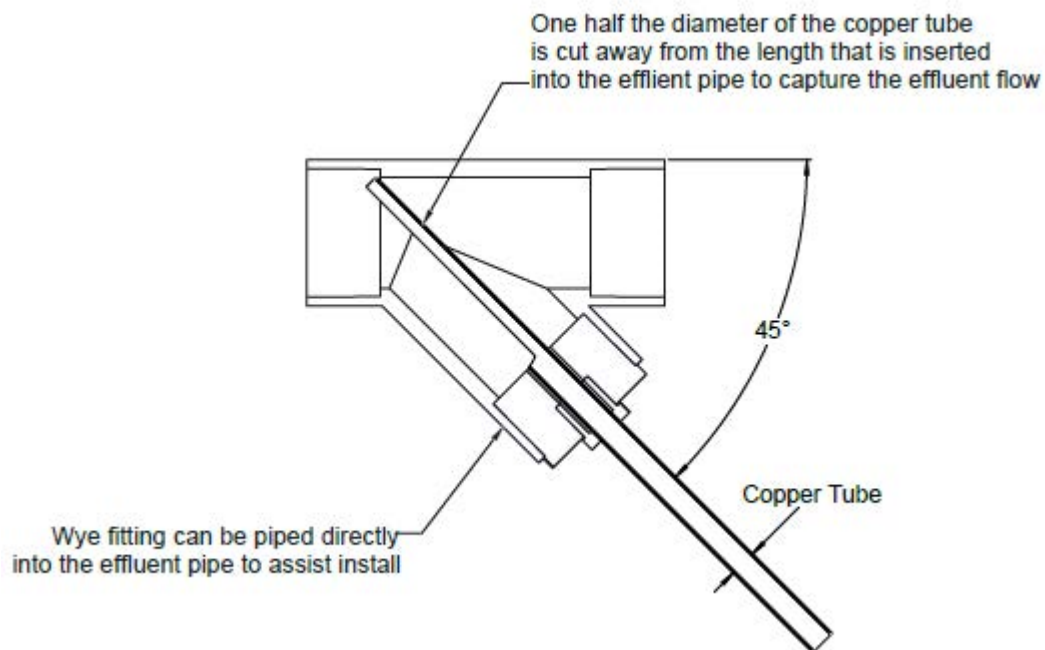
**Figure 1 (Continued)**  
**Test Apparatus**  
**(b) Top View**  
 (See Section 6.1)



**Figure 1 (Continued)**  
**Test Apparatus**  
**(c) Side View**  
(See Section 6.1)



**Figure 1 (Continued)**  
**Test Apparatus**  
**(d) Detailed View of Oil Injection Mechanism**  
(See Section 6.1)



**Figure 1 (Continued)**  
**Test Apparatus**  
**(e) Detailed View of Sampling Port**  
(See Section 6.1)



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