



# ICBO Evaluation Service, Inc.

A subsidiary corporation of the International Conference of Building Officials

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## ACCEPTANCE CRITERIA FOR PREFABRICATED SEPTIC TANKS

AC163

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### PREFACE

Evaluation reports issued by ICBO Evaluation Service, Inc. (ICBO ES), are based upon performance features of the Uniform family of codes and the International family of codes. Section 104.2.8 of the *Uniform Building Code*<sup>™</sup> (UBC), Section 104.11 of the *International Building Code*<sup>®</sup> (IBC) and Section R104.11 of the *International Residential Code*<sup>™</sup> (IRC) are the primary charging sections upon which evaluation reports are issued. Section 104.2.8 of the UBC reads as follows:

The provisions of this code are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

Similar provisions are contained in Sections 104.11 and R104.11 of the IBC and IRC, respectively.

The attached acceptance criteria has been issued to provide all interested parties with guidelines on implementing performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the Evaluation Committee and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from a previous edition, solid vertical lines (■) in the outer margin within the criteria indicate a technical change or addition from the previous edition. Deletion indicators (◆) are provided in the outer margins where a paragraph or item has been deleted if the deletion resulted from a technical change. This criteria may be further revised as the need dictates.

ICBO ES may consider alternate criteria, provided the proponent submits valid data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a material, type or method of construction, or equipment, meets the attached acceptance criteria, or that it can be demonstrated that valid alternate criteria are equivalent and otherwise meet the applicable performance requirements of the codes, if the material, product, system or equipment is such that either unusual care in its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use thereof, ICBO ES retains the right to refuse to issue or renew an evaluation report.

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# ACCEPTANCE CRITERIA FOR PREFABRICATED SEPTIC TANKS

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this acceptance criteria is to establish requirements for recognition in ICBO Evaluation Service, Inc. (ICBO ES), evaluation reports of prefabricated septic tanks under the 1997 *Uniform Plumbing Code*\* (UPC).

**1.2 Scope:** This criteria is limited to prefabricated septic tanks of steel, concrete, glass-fiber-reinforced polyester or polyethylene, intended for domestic sewage disposal systems that are designed in accordance with Appendix K of the 1997 UPC.

### 1.3 Reference Documents:

**1.3.1** 1997 *Uniform Plumbing Code*\*.

**1.3.2** ICBO ES Acceptance Criteria for Quality Control Manuals (AC10).

**1.3.3** ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85).

**1.3.4** ICBO ES Acceptance Criteria for Laboratory Accreditation (AC89).

## 2.0 BASIC INFORMATION AND REPORTS OF TESTS

### 2.1 Product Description:

**2.1.1** Complete information, as applicable, concerning materials, formulations, components, manufacturing processes and installation procedures, shall be submitted.

**2.1.2** Drawings stamped by a registered Professional Engineer (PE) shall be provided for all tanks submitted for recognition. Drawings shall be complete and shall show all dimensions, capacities, reinforcing, structural calculations and other such pertinent data as may be required.

**2.1.3** Independent laboratory tests and engineering calculations, certifying the tank capacity and structural stability, shall be provided.

**2.2 Testing Laboratories:** Testing laboratories shall comply with the ICBO ES Acceptance Criteria for Laboratory Accreditation (AC89).

**2.3 Test Reports:** Test reports and product sampling shall comply with the ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85).

## 3.0 REQUIRED DATA

**3.1 General Requirements:** Septic tanks shall be constructed in accordance with the specifications of Appendix K of the 1997 UPC and the following:

**3.1.1** Septic tanks shall be constructed of solid durable materials described in Sections 3.2, 3.3, 3.4 and 3.5 of this criteria, which are not subject to excessive corrosion and degradation in the presence of domestic sewage and which shall be watertight.

**3.1.2** Septic tanks shall have a minimum of two compartments. The inlet compartment of any septic tank shall be not less than two-thirds of the total capacity of the tank nor less than 500 gallons (1893 L) liquid capacity, and shall be at least 3 feet (914 mm) in width and 5 feet (1524 mm) in length. Liquid depth shall be not less than 30 inches (762 mm) nor more than of 6 feet (1829 mm). The secondary compartment of any septic tank shall have a minimum total capacity of 250 gallons (946 L) and a maximum capacity of one-third of the total capacity of such tank. In septic tanks having over 1,500 gallons (5678 L) capacity, the secondary

compartment may not be less than 5 feet (1,524 mm) in length.

**3.1.3** Access to each septic tank shall be provided by at least two manholes, each 20 inches (508 mm) in minimum dimension. One access manhole shall be located over the inlet and one access manhole shall be located over the outlet. Whenever the inlet compartment exceeds 12 feet (3,658 mm) in length, an additional access manhole shall be provided over the inlet side of the baffle wall fitting.

**3.1.4** The inlet and outlet pipe or baffle shall extend 4 inches (102 mm) above and at least 12 inches (305 mm) below the water surface, respectively. The bottom of the outlet opening shall be a minimum of 2 inches (51 mm) lower than the bottom of the inlet.

The inlet and outlet pipe of baffle openings shall have the equivalent cross-sectional area of the connecting sewer pipe and not less than a 4-inch (102 mm) diameter.

**3.1.5** Inlet and outlet fittings or baffles, and compartment partitions, shall have a free vent area equal to the cross-sectional area of a 3-inch pipe or the building drain to provide free ventilation above the water surface from the disposal field or seepage pit through the septic tank, building drain and vent stack to the outside air.

Partitions or baffles of approved durable material shall be constructed between compartments and shall extend at least 6 inches (152 mm) above the liquid level. Flow from inlet to outlet compartment shall be through a tee, ninety-degree elbow or similar fitting [equivalent in size to the tank inlet but not less than 4 inches (102 mm) in diameter], inverted and extending down into the inlet compartment so that the entry to the fitting is midway in the liquid depth of the tank. Wood baffles are prohibited.

**3.1.6** Septic tanks shall have an air space equal to not less than 10 percent of the liquid volume, and total depth shall not be less than 9 inches (229 mm) greater than the liquid depth. The cover of the septic tank shall be at least 2 inches (51 mm) above the back vent openings.

**3.1.7** Walls shall be designed for an inside hydrostatic water pressure to the level of the outlet and for an outside earth pressure equivalent to that exerted by a fluid weighing 30 pounds per cubic foot (481 kg/m<sup>3</sup>), in accordance with accepted engineering practice.

Internal baffles and fittings shall be designed to withstand the hydraulic and earth loads occurring when any compartment is empty of fluid and the remaining compartments are flooded.

**3.1.8** Septic tanks and covers shall be designed for an earth load of not less than 500 pounds per square foot (23.95 kN/m<sup>2</sup>) when the maximum coverage does not exceed 3 feet (914 mm).

Each access opening shall have a leak-resistant cover that cannot slide, rotate or flip, exposing the opening, when properly installed and which does not require the use of mechanical fasteners.

**NOTE:** The intention is that a child-resistant lid be provided. Mechanical fasteners are recommended to augment the safety of and positive closure of the lid. Covers manufactured from wood shall not be used.

Manufacturers shall supply each tank with either suitable manhole extensions or recommendations regarding suitable extensions.

**3.1.9** Gaskets, when required, shall be of resilient material, resistant to attack by acids or alkalis that may be pres-

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ent in soils or sewage. Manufacturers shall specify the appropriate ASTM standards for the gasket material.

**3.1.10** Tanks having two or more sections shall have joints designed such that uniform pressure is exerted on joint sealants or gaskets along their entire length, and so that a continuous watertight seal is provided. The joint material shall be supplied by the manufacturer and shall be applied at the time of installation, unless otherwise approved by the building official. Any tank with a horizontal joint below the liquid level shall be permanently bonded in accordance with accepted engineering practices by the manufacturer.

**3.2 Concrete Septic Tanks:**

**3.2.1** Concrete shall have a minimum compressive strength of 3,500 pounds per square inch (24.1 MPa). Concrete shall have a maximum water/cement material ratio of 6 gallons (22.7 L) per sack of cement. Concrete shall be made with Type II or Type V, low-alkali portland cement, conforming to ASTM C 150-97a, and Type II shall also include sulfate resistance option as specified in Table 4 of ASTM C 150-97a for Type II or Type V. Concrete shall contain 4 percent to 7 percent entrained-air utilizing admixtures conforming to ASTM C 260-98. Concrete aggregates shall conform to ASTM C 33-97. Ready-mix concrete, if used, shall conform to ASTM C 94-98. Fly ash and raw or calcined natural pozzolan, if used as a mineral admixture in portland cement concrete, shall conform to ASTM C 618-97.

**3.2.2** Walls shall have a thickness of at least 3 inches (76 mm), except where engineering analysis and production methods can justify a lesser thickness.

**3.2.3** The minimum area of steel reinforcement (in both directions) of the structural elements shall be in accordance with ACI 318-99. Specifications for steel reinforcements and placement location shall also comply with ACI 318-99. Tanks shall be of sufficient strength to resist stresses caused during handling and installation without structural cracking.

**3.2.4** If repairs are necessary, they shall be carried out in accordance with the appropriate provision of ASTM standards (referenced in Sections 3.2.1 and 3.2.3 of this criteria).

**3.3 Steel Septic Tanks:**

**3.3.1** The minimum wall thickness of any steel septic tank shall be No. 12 gage [0.097 inch (2.46 mm) base-metal thickness] and each such tank shall be protected from corrosion, both internally and externally, by waterproof bituminous compound complying with ASTM D 41-94 and ASTM D 449-89 (1999), Type I, or ASTM D 2823-90 (1997), Type I, and shall be applied per the manufacturer's recommendation.

**3.3.2** Steel plate and sheet used in the fabrication of steel tanks shall comply with ASTM A 283-98, A 569-98 and A 635-98. Baffles shall be made from steel having either a minimum thickness of 0.165 inch (4.19 mm) or a minimum thickness equal to the shell thickness, whichever is greater.

**3.4 Glass-fiber-reinforced Polyester Septic Tanks:**

**3.4.1 Terminology:** Unless otherwise indicated, the plastics terminology used in this criteria is in accordance with the definitions given in ASTM D 883-98.

**3.4.2 Materials:** The tank, cover, baffles, flanges, etc., shall be made from polyester resins with glass-fiber reinforcement.

**3.4.3 Resin:** The resin shall be a chemical-resistant grade of polyester resin and shall be evaluated as a laminate by test (see Section 4.7 of this criteria), or shall be known from previous service to be acceptable for the environment. The same resin shall be used throughout the laminate. Other plastic resins proven to be as satisfactory for the intended end use will be acceptable.

**Example:** An example of a plastic resin meeting the requirements is an isophthalic acid-based chemically resistant type having an alkyd cooked using propylene glycol and an approximately 1/1 molar ratio of isophthalic acid and maleic anhydride or fumaric acid. The alkyd shall have a minimum molecular weight of 250, an acid number of less than 20 and a hydroxyl number of less than 45. The alkyd shall be combined with styrene monomer in proportions to give the necessary working viscosity. The plastic resin may also contain thixotropic additives as defined in Section 3.4.1 and promoters for room temperature cures. Resin used for final surface coats on laminate surfaces exposed to air during curing may contain paraffin wax to prevent air inhibition.

**3.4.4 Reinforcing Material:** The reinforcing material shall be of a commercial grade of glass fiber (Type E glass) treated with a coupling agent, approved by the glass fiber manufacturer, that will provide a compatible bond between the resin and the glass. Glass-fiber surfacing materials, if used, shall be of a chemical-resistant glass (Type C glass) bonded with a suitable binder.

**3.4.5 Fillers and Pigments:** Resins shall not contain fillers except as required for viscosity control. Up to 2 percent by weight of the total resin content of thixotropic agent that will not interfere with visual inspection may be added to the resin for viscosity control.

**3.4.6 Laminate:** The laminate shall consist of the following (see Figure 1):

**3.4.6.1 Primary Chemical-resistant Surface:** This surface shall be between 0.0012 and 0.005 inch (0.030 and 0.127 mm) thick. It shall be a reinforced resin-rich surface.<sup>1</sup> It shall be free from cracks and crazing and shall have a smooth finish without bubbles or blisters. It shall be made in such a manner that air has not been allowed to inhibit the cure of the surface exposed to the environment.

**3.4.6.2 Internal Anti-Wicking Barrier:** Not less than 0.100 inch (0.254 mm) of chemical-resistant laminate next to the inner surface shall be reinforced with not less than 20 percent nor more than 30 percent by weight of mat or chopped strand.

(1) PRIMARY CHEMICAL-RESISTANT SURFACE (2) INTERNAL ANTI-WICKING BARRIER											
1	2	2	3	3	3	TO DESIRED THICKNESS FOR STRENGTH	3	3	4	4	5
(3) ADDITIONAL STRUCTURAL REINFORCING SECTION (4) EXTERNAL ANTI-WICKING BARRIER (5) EXTERIOR SURFACE											

FIGURE 1

<sup>1</sup>The resin-rich surface layer will usually contain less than 20 percent of reinforcing material. A specific limit is not included because of the impracticality of determining this value of the finished product.

**3.4.6.3 Additional Structural Reinforcing Section:**

This layer or body of the laminate shall be of chemically resistant construction, providing the additional strength necessary to meet the tensile and flexural requirements. Where separate layers such as mat, cloth or woven roving are used, all layers shall be lapped at least 1 inch (25.4 mm). Laps shall be staggered when woven roving or cloth is used; layers of chopped strand glass shall be placed as alternate layers.

**3.4.6.4 External Anti-Wicking Barrier:** (Same as Section 3.4.6.2)

**3.4.6.5 Exterior Surface:** This surface shall consist of a chopped strand glass over which shall be applied a resin-rich coating described in Section 3.4.6.1.

**3.4.7 Cut Edges:** All cut edges shall be coated with resin so that no glass fibers are exposed and all voids are filled. Structural elements having edges exposed to the chemical environment shall be made with chopped strand glass reinforcement only.

**3.4.8 Wall Thickness:** The minimum wall thickness shall be  $\frac{3}{16}$  inch (4.8 mm), regardless of operating conditions.

**3.4.9 Mechanical Properties:**

**3.4.9.1 General:** In order to establish proper wall thickness and other design characteristics, the minimum physical properties for any laminate shall be in accordance with Table 1 and Section 3.4.9.2.

**3.4.9.2 Surface Hardness (Barcol):** The laminate shall have a Barcol Hardness of at least the manufacturer's minimum specified hardness for the cured resins when tested in accordance with ASTM D 2583-95 and Section 4.6 of this criteria. This requirement applies to both interior and exterior surfaces.

**3.4.10 Appearance:** The finished laminate shall be free from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, pimples and delamination. Both surfaces shall be free from cracks and crazing and shall have a smooth finish and an average of not more than 2 pits per square foot (21.5 pits/m<sup>2</sup>), providing the pits are less than

$\frac{1}{8}$  inch (3.2 mm) in diameter and not more than  $\frac{1}{32}$  inch (0.79 mm) deep and are covered with sufficient resin to avoid exposure of inner surface fabric. Unless otherwise specified, ASTM D 2563-94 visual acceptance level 3 shall be the minimum standard for acceptance.

**3.4.11 Shell Joints:**

**3.4.11.1** Tanks manufactured in sections may be joined by use of flanges, bell and spigots and butt joints. However, any tank with horizontal joint below the liquid level shall be permanently bonded in accordance with accepted engineering practices by the manufacturer. All joints shall meet the same minimum corrosion-resistance requirements as for the tank. Overlaid joints shall be as specified in Table 2.

**3.4.11.2** Flange or bell and spigot joints above the liquid level shall be designed and bonded in accordance with accepted engineering practices.

**3.4.11.3** Butt joints shall consist of glass-fiber-reinforced resin at least the thickness of the heaviest section being joined. The reinforcement shall be applied both inside and out.

**3.5 Polyethylene:**

**3.5.1** The polyethylene used shall be Type II or III, Category 3, Class B (requiring an ultraviolet stabilizer) or Class C (requiring a minimum of 1 percent carbon black), per ASTM D 1248-98; shall have a stress crack resistance of at least 150 hours using condition C and 20 percent failure criteria, when determined per ASTM D 1693-98; shall have a value equal to or greater than 2,400 psi (16.5 MPa) when tested per ASTM D 638-98 (see Section 4.3.16.2); and shall have a flexural modulus of elasticity equal to or greater than 85,000 psi (586 MPa) when tested per ASTM D 790-98.

**3.5.2** The thickness of the side walls, top, bottom, and covers shall be at least  $\frac{1}{4}$  inch (6.4 mm). The thickness of the inlet and outlet ends shall be at least  $\frac{1}{4}$  inch (6.4 mm), and the thickness of internal walls and partitions shall be at least  $\frac{3}{16}$  inch (4.8 mm).

**TABLE 1  
REQUIREMENTS FOR PROPERTIES OF NEWLY FABRICATED REINFORCED POLYESTER LAMINATES**

PROPERTY AT 73°F (23°C)	THICKNESS, in (mm)				TEST METHOD SECTION
	$\frac{3}{16}$ (4.8)	$\frac{1}{4}$ (6.4)	$\frac{5}{16}$ (7.9)	$\frac{3}{8}$ and up (9.5)	
Ultimate tensile strength, min, psi (MPa)	9,000 (62)	12,000 (83)	13,500 (93)	15,000 (103)	4.3
Flexural strength, min, psi (MPa)	16,000 (110)	19,000 (131)	20,000 (137)	22,000 (152)	4.4
Tangent flexural modulus of elasticity, min, psi (MPa)	700,000 (4,823)	800,000 (5,512)	900,000 (6,201)	1,000,000 (6,895)	4.5
Glass content, percent	20-30	20-30	20-30	20-30	4.2

**TABLE 2  
MINIMUM TOTAL WIDTHS OF OVERLAYS FOR REINFORCED-POLYESTER TANK SHELL JOINTS**

PARAMETER	WIDTH, in (mm)									
	$\frac{3}{16}$ (4.8)	$\frac{1}{4}$ (6.4)	$\frac{5}{16}$ (7.9)	$\frac{3}{8}$ (9.5)	$\frac{7}{16}$ (11.1)	$\frac{1}{2}$ (12.7)	$\frac{9}{16}$ (14.3)	$\frac{5}{8}$ (15.9)	$\frac{11}{16}$ (17.5)	$\frac{3}{4}$ (19.1)
Tank wall thickness, in (mm)										
Minimum outside overlay width, in (mm)	4 (102)	4 (102)	5 (127)	6 (152)	7 (178)	8 (203)	9 (229)	10 (254)	11 (279)	12 (305)
Minimum inside overlay width, in (mm)	4 (102)	4 (102)	5 (127)	5 (127)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)

## 4.0 TESTING AND TEST METHODS

### Glass-fiber-reinforced Polyester:

#### 4.1 General:

**4.1.1 Specimens:** Tests shall be made on specimens cut from waste areas when possible; otherwise, the specimens shall be cut from flat laminates prepared in the same construction and by the same techniques as the process equipment. In all cases, the average value of the indicated number of specimens shall be used to determine conformance with the detailed requirements.

**4.1.2 Conditioning:** The test specimens shall be conditioned in accordance with Procedure A of ASTM D 618-96.

**4.2 Glass Content:** The glass content shall be no less than 20 percent nor more than 30 percent by weight of mat or chopped strand as determined in accordance with ASTM D 2584-94, except that the average of five specimens shall be used.

**4.3 Tensile Strength:** The tensile strength shall be determined in accordance with ASTM D 638-98, except that the specimens shall be the actual thickness of the fabricated article and the width of the reduced section shall be 1 inch (25.4 mm). Other dimensions of specimens shall be as designated by the standard for Type 1 specimens for materials over 1/2 inch to 1 inch (12.7 to 25.4 mm) thick, inclusive. Specimens shall not be machined on the surface. Tensile strength shall be the average of five specimens tested at a crosshead rate of 0.20 to 0.25 inch per minute (5.1 to 6.4 mm per minute).

**4.4 Flexural Strength:** The flexural strength shall be determined in accordance with Procedure A and Table 1 of ASTM D 790-98, except that the specimens shall be the actual thickness of the fabricated article and the width shall be 1 inch (25.4 mm). Other dimensions of specimens shall be as designated by the standard. Specimens shall not be machined on the surface. Tests shall be performed with the inner side in compression, using five specimens.

**4.5 Flexural Modulus:** The tangent modulus of elasticity in flexure shall be determined in accordance with ASTM D 790-98. (See Section 4.1.4 of this criteria.)

**4.6 Barcol Hardness:** A Barcol Impressor shall be used to determine hardness. Calibration of the Barcol instrument shall be verified by comparing with a reference sample having a known reading of 85-87. Ten readings on the clean resin-rich surface shall be made. After eliminating the two high and two low readings, the average of the remainder shall be the reported hardness reading.

**4.7 Chemical Resistance:** Chemical resistance shall be determined on laminate specimens, specified in Section 4.1.1, in accordance with ASTM C 581-94, with the following exceptions:

**4.7.1** Weight, thickness, Barcol hardness, flexural strength and modulus shall be determined on two sets of specimens prepared in accordance with Section 6.5 of ASTM C 581-94. One set shall be for testing after exposure

at each temperature, duration and reagent condition specified in Sections 4.7.3, 4.7.4 and 4.7.5, respectively, of this criteria; a second set shall be for testing after equal exposure durations in air in accordance with Section 4.1.2 of this criteria. Calculation of retained properties shall be as outlined in Section 8.2 of ASTM C 581-94.

**4.7.2** Notes of surface attack, referred to in Section 7.3.1 of ASTM C 581-94, shall include surface changes, color changes, obvious softening or hardening, crazing, delamination, exposure of fibers, or other effects indicative of complete degradation or potential failure.

**4.7.3** Exposure temperatures, referred to in Section 7.2 of ASTM C 581-94, shall be at any or all of the following: 73°F, 122°F, 158°F, 212°F [(± 3.6°F) (23°C, 50°C, 70°C, 100°C (± 2°C)); reflux temperature; required service temperature.

**4.7.4** Exposure durations, referred to in Section 7.2 of ASTM C 581-94, shall be 30 days, 90 days, 180 days and one year.

**4.7.5** The reagents, referred to in Section 5 of ASTM C 581-94, shall not be agitated (i.e., the exposures shall be under static conditions), and shall consist of the following solutions:

1. 15 percent hydrochloric acid
2. 25 percent acetic acid
3. 5 percent sodium hydroxide
4. 10 percent sodium carbonate
5. Saturated sodium chloride
6. 5 1/4 percent sodium hypochloride (replaced every 48 hours with fresh solution)
7. Distilled water (replaced every 48 hours with fresh solution)

## 5.0 QUALITY CONTROL

Prefabricated septic tanks recognized in an ICBO ES evaluation report shall be produced under a quality control program with unannounced inspections conducted at least quarterly, the program to be administered by a quality control agency accredited by ICBO ES. A quality control manual, developed in consultation with the approved agency and complying with the ICBO ES Acceptance Criteria for Quality Control Manuals (AC10), must be submitted.

## 6.0 MARKING AND IDENTIFICATION

**6.1** Each tank shall be clearly and permanently marked with the manufacturer's name and/or registered trademark, the month and year of manufacture, the ICBO ES evaluation report number, the maximum recommended depth of earth cover in feet, and the nominal working volume. Permanent markings shall be adequately protected from corrosion so as to remain readable over the life of the tank.

**6.2** Each tank shall be accompanied by instructions for installation. Cautions regarding the installation of cribbing or sleeves around the manhole shall also be included.