
	<b>Land Use Services Building and Safety Division Information Bulletin</b>	<b>Number:</b> IB-0014
		<b>Code References:</b> 2019 CBC 2019 CRC
<b>Building Official Signature:</b> 		<b>Original Effective Date:</b> January 1, 2020
<b>Subject:</b> Cargo Containers Repurposed for Habitable Use		

### 1.0 PURPOSE

The purpose of this Information Bulletin is to clarify Building Code requirements and applicable standards for Cargo Containers (Containers) that will be repurposed as a building or structure for habitable use.

### 2.0 HISTORY

Original Effective Date: January 1, 2020

### 3.0 POLICY/PROCEDURE

**Permits:** Where Containers will be repurposed for habitable use, applicants will be required to obtain all necessary land use and development approvals, construction permits, and other permits from relevant local agencies or departments.

### 4.0 GENERAL

**4.1 Applicability:** The provisions of this Bulletin and other applicable sections of the California Building Code (CBC) and California Residential Code (CRC) shall govern the design of Containers repurposed as a building or structure for habitable use. Containers shall be treated as newly constructed with the applicable requirements for new construction applied. The means for accepting containers in this application is per CBC Section 104.11 and CRC Section R104.11 when approved by the Building Official.

**Exceptions:** Containers used in the following applications are not subject to the provision of this Bulletin:

1. Listed by an approved agency as equipment complying with the standard for that equipment, such as air chiller, engine generator, modular data center, and other similar equipment.
2. Used for incidental storage per IB-0002.
3. Used as temporary storage at an active construction site having a valid building permit or at an event site having a valid special event permit, and removed upon completion of work or special event authorized by the permit or upon expiration of the permit.
4. Approved as a Factory-Built Housing, Manufactured Home, Commercial Modular, or Special Purpose Commercial Modular by the California Department of Housing and Community Development.

**4.2 Definitions:** The following words used in this Bulletin shall be defined as follows:

**Approved Agency:** An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, where such agency has been approved by the Building Official.

**Code:** The latest edition of the California Building Standards Code adopted and amended by the local Authority Having Jurisdiction.

**International Association Of Classification Societies Or Classification Society:** A technically-based non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures.



**Intermodal Shipping Container Or Container:** An article of transport equipment that is: (1) of a permanent character and suitable for repeated use; (2) specially designed to facilitate the transport of goods, by one or more modes of transport (rail, truck or ship), without intermediate reloading; (3) designed to be secured and readily handled, having corner fittings for these purposes; (4) designed and built to the dimensional and strength requirements of the ISO 1496-1, ISO 1161, and ISO 668 standards; and (5) certified for compliance to the International Convention for Safe Containers by a classification society recognized by the US government.

**Single-Unit Stand-Alone Container:** A container that is: (1) not attached to or stacked vertically over other containers, buildings or structures; (2) erected or installed on grade in a level and horizontal position with the floor located at the bottom.

**4.3 Acronyms:** The following acronyms used in this Bulletin are as follows:

AC	Acceptance Criteria
AISI	American Iron and Steel Institute
ASCE	American Society of Civil Engineers
CBC	California Building Code
CEBC	California Existing Building Code
CFC	California Fire Code
CRC	California Residential Code
CSC	International Convention for Safe Containers
EOR	Engineer of Record
FEMA	Federal Emergency Management Agency
ISO	International Organization for Standardization

**4.4 Construction Documents:** The construction documents shall contain information to verify the dimensions and establish the physical properties of the container steel and wood floor components in addition to the information required by CBC Sections 107 and 1603, and CRC Section R106.

**4.5 Approved Agency:** Containers are manufactured all over the world to meet the standards set by the CSC. The CSC is an international agreement ratified by various countries including the United States. Inspection and testing services at the point of manufacture of the containers are provided by a Classification Society specifically authorized to certify containers by an administration signatory to the CSC. The selected Classification Society inspects the containers at the point of manufacture. Satisfactorily inspected containers receive a CSC Safety Approval Placard and are assigned a unique CSC safety approval number. The inspected containers will have the selected Classification Society's decal affixed to them (see Figures A and B).

The basis for recognizing a Classification Society as an approved agency is indicated in CBC Section 104.4 and CRC Section R104.4. The following Classification Societies are recognized as an approved agency:

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- China Classification Society (CCS)
- Croatian Register of Shipping/Austrian Veritas (CRS)
- Det Norske Veritas AS (DNV)
- Det Norske Veritas Germanischer Lloyd (DNV GL)
- Germanischer Lloyd (GL)
- Indian Register of Shipping (IR Class)
- Korean Register of Shipping (KR)



- Lloyd's Register (LR)
- Nippon Kaiji Kyokai (NK)
- Polish Register of Shipping (PRS)
- Registro Italiano Navale (RINA)
- Russian Maritime Register of Shipping (RS)

**4.6 CSC Safety Approval Placard:** Containers selected for repurposing as buildings or structures, or as structural building materials shall bear an existing CSC Safety Approval Placard affixed on the door as required by the CSC and other markings as required by the ISO 6346 (see Figure C). The information contained on the existing placard includes, but not limited to, the following:

- Manufacturer's name or identification number
- Date manufactured
- Safety approval number
- Identification number
- Maximum operating gross mass or weight (kg)(lbs)
- Allowable stacking load for 1.8G (kg)(lbs)
- Transverse racking test force (Newtons)
- Valid maintenance examination date

**4.7 Selection of Containers:** Containers selected to be repurposed and/or modified into buildings or structures, or as structural building materials, shall meet the following requirements:

- Container shall be general purpose containers as defined in the ISO 830 with a type group code designation of G as defined in the ISO 6346.
- Container shall have a CSC Safety Approval Placard and Classification Society's decal affixed to it. Identification number noted on placard shall be verified to match the actual identification number on the container. Documentation shall be provided to the satisfaction of the Building Official prior to removing the placard and/or decal.
- Container shall be undamaged, have no previous repairs, and structurally sound. The EOR shall survey and visually inspect the containers. Documentation shall be provided to the Building Official in the form of a Structural Observation Report. See Section 8 for further requirements.

**4.8 Structural Integrity Verification:** Containers meeting the requirements of item 7 above shall comply with a Condition Assessment per ASCE 41-13 Section 9.2.3, including nondestructive weld testing (NDT) as an alternate means of compliance with the requirements of ASCE 41-13 Section 9.2.2.4.2 (Comprehensive testing). Testing shall be performed (in the US) by an approved laboratory accepted by the Building Official after the container is purchased by the company performing the conversion to a building structure and prior to the start of construction or rehabilitation on the container. The owner(s) shall pay for the structural integrity verification of each unmodified container. Single-unit stand-alone containers are not subject to the requirements of this item.

1. Visually inspect each container to verify that the container is consistent with the container manufacturer's design drawings, is not damaged, and is structurally sound. The acceptable tolerances shall not exceed those given in the American Institute of Steel Construction (AISC) Code of Standard Practice for Steel Buildings and Bridges (AISC 303-10).
2. Visually inspect all welds connecting the corner casts to the beams and columns. Perform NDT of at least one weld connecting the corner cast to the beam or column. If the weld fails, NDT all similar welds to beams and columns.



3. Visually inspect all welds connecting the floor joists to the side rails (beams). Perform NDT of at least one weld connecting the floor joists to side rail. If the weld fails, NDT all similar welds.
4. Visually inspect all welds connecting the metal siding to posts and beams. Perform NDT of at least one weld connecting the metal siding to post or beam. If the weld fails, NDT all similar welds.
5. Visually inspect all welds connecting the metal roof deck to the header and rails (beams). Perform NDT of at least one weld connecting the metal roof deck to the beam. If the weld fails, NDT all similar welds.

For items 2 through 5 above, both the general condition assessment of the container and the visual inspection of welds shall be done by an AWS-CWI, employed by a laboratory approved by the Building Official. Nondestructive testing of existing container fillet welds shall be by a qualified Level II NDT technician employed by the laboratory. This examination shall be made using the magnetic particle (MT) method. If sub-surface discontinuities are suspected, alternate methods of NDT may be utilized as approved by the Building Official. For a container with failed welds, prepare written repair procedures for the Building Official review and approval prior to start of repair work. Alternatively, a different container meeting the requirements of this section may be used.

If existing plywood floor sheathing is going to be retained, confirm that it is not damaged. Inspect the plywood using the following procedures:

6. Tap the plywood floor with a hammer searching for hollow sounds, which will indicate delamination.
7. Look for obvious signs of failure in the plywood panels such as waviness and/or bulges on the outer plies, and cracks in the outer (usually lower) plies.
8. Look for visible permanent downward deflection in the plywood floor panels.

Plywood floor panels indicating hollow sounds, waviness, bulges, cracks, permanent deflection, and gouges, etc., are unsuitable for construction and shall not be retained. Only plywood floor panels without any noticeable damage may be retained.

9. A detailed written report verifying the condition, sealed by a California licensed professional engineer shall be prepared by the laboratory documenting the visual inspections, test results, and general condition assessment for each container. Copies shall be distributed to the Building Official, the owner, and the building inspector. A copy of the above report shall be placed in the container and shall be made available for inspections both in the plant and at the site.

## 5.0 BUILDING CODE REGULATIONS

**5.1 Nonstructural:** Containers that will be repurposed as buildings or structures or as structural building materials are to be treated as newly constructed and shall meet all applicable requirements for new construction in the relevant California Building Standards Codes. The following provisions outline specific fire and life-safety (nonstructural) requirements for construction utilizing containers.

- A. Protection against decay and termites: Wood structural floors of containers shall be protected from decay and termites in accordance with the applicable provisions of the CBC Section 2304.12.1.1 and CRC Sections 317 and 318.
- B. Under-floor ventilation: The space between the bottom of the floor joists and the earth under any container, except spaces occupied by basements and cellars, shall be provided with ventilation in accordance with the CBC Section 1202.4 and CRC Section 408.1.



- C. Roof assemblies: Container roof assemblies shall comply with the applicable requirements of the CBC Chapter 15 and CRC Chapter 9.  
(Exception: Single-unit stand-alone containers.)
- D. Joints and voids: Joints and voids that create concealed spaces between containers, that are connected or stacked, at fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system in accordance with CBC Section 715 and CRC Section R302.
- E. Penetrations and openings: Penetrations and openings in fire-resistance-rated construction shall meet the requirements of CBC Sections 714 and 716, and CBC Section R302.
- F. Container shall not have been used to transport hazardous materials, finished with paint containing lead, or have floor sheathing treated with chemicals harmful to humans, such as ammonia or arsenate based preservatives.  
(Exception: Container may be used if lead paint and treated floor sheathing are removed or abated in a manner acceptable to the Building Official.)

**5.2 Structural:** Containers that will be repurposed as buildings or structures or as structural building materials are to be treated as newly constructed and shall meet all applicable requirements for new construction in the applicable California Building Standards Codes in addition to the requirements of this Bulletin. Any modification to a container or application of loading shall be designed and detailed by the Engineer of Record (EOR) using common accepted practices, engineering principles, and provide a continuous load path for all design loads. The following provisions outline structural requirements for construction utilizing containers:

- G. Material properties: Structural material properties for existing container steel components shall be established by material testing where the steel grade and composition cannot be identified by the manufacturer's designation as to manufacture and mill test. The manufacturer's original design/fabrication construction documents for the container, with English translation where appropriate, shall be provided to the Building Official for the verification and evaluation of the as-built container material and member properties, and connection details. For the existing floor plywood sheathing, specifications for the plywood, exposure category, and expected identification and/or certification marks on the panel shall be provided.

Exceptions:

1. Material testing for the container steel components is not required where a valid ICC-ES Evaluation Report is issued in compliance with the AC408. The design and installation shall be subject to the conditions of use established in the report.
  2. Material testing for the container steel components is not required for single-unit stand-alone containers that comply with the exception to Part B, 2.D.2
- H. Foundation and anchorage: Containers used as permanent buildings or structures shall be supported on and anchored to foundations or other supporting structures as necessary to provide a continuous load path for all applicable design and environmental loads in accordance with the code.
  - I. Roof and floor diaphragm design: The container roof metal diaphragm capacity is permitted to be determined in accordance with applicable side wall or end wall allowable shear values in Section D.2, Table 1 of this Bulletin or utilizing accepted practices from approved reference standards or consensus documents. The container floor diaphragm capacity is permitted to be determined in accordance with the AISI S213.



- J. Lateral force-resisting system design: The design of the container lateral force-resisting system shall comply with the requirements outlined in this subsection.
1. Seismic design parameters: The seismic force-resisting system for containers shall be designed and detailed in accordance with one of the following methods:
    - a. Where all or portions of the container side or end walls are used as the seismic force-resisting system, design and detailing shall be in accordance with the ASCE 7 Table 12.2-1 requirements for light-frame bearing-wall systems with shear panels of all other materials. Single-unit stand-alone containers shall have their structural height,  $h_n$ , limited to no more than 9.5 feet (2,900 mm).
    - b. Where portions of the container side or end walls are retained but not used as the seismic force-resisting system, an independent seismic force-resisting system shall be selected, designed and detailed in accordance with ASCE 7 Table 12.2-1.
    - c. Where portions of the container side or end walls are retained and integrated into a seismic force-resisting system other than as permitted by Subsections a or b above, new seismic design parameters shall be developed from testing and analysis in accordance with the CBC Section 104.11, CRC Section R104.11, and ASCE 7 Section 12.2.1.1 or 12.2.1.2. FEMA P-795 and P-695 are permitted to be used to develop the new seismic design parameters specific to the new seismic force-resisting system.
  2. Allowable shear value: The allowable shear values for the container side and end walls for wind and seismic design shall be demonstrated by testing and analysis in accordance with the CBC Section 104.11 and CRC Section R104.11. Where penetrations are made in the container side or end walls that are designated as part of the lateral force-resisting system, the penetrations shall be substantiated by rational analysis.

Exception: Testing and analysis are not required for single-unit stand-alone container. The allowable shear values for the container side and end walls shall be permitted to use Table 1 of this Bulletin when the design complies with all of the following conditions:

- a. Any individual container top and bottom rails, corner castings, and columns or any portion thereof shall not be notched, cut, or removed in any manner. Existing fork lift openings at the container bottom rails are permitted (see Figure D).
- b. The total linear length of all openings in any individual container side or end walls shall be limited to not more than 50% of the length of that container side or end walls (see Figure E).
- c. Any individual container side or end walls with a lineal length of less than 4 feet (305 mm) shall not be considered as part of the lateral force-resisting system (see Figure F).
- d. Any individual container side or end walls used as part of the lateral force-resisting system shall have an existing or new boundary element on all sides of the wall to form a continuous load path, or paths, with adequate strength and stiffness to transfer all forces from the point of application to the final point of



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resistance (see Figure G).

- e. Any individual container side or end walls used as part of the lateral force-resisting system with a lineal length of 8 feet or greater is permitted to have a maximum of one penetration not greater than a 6-inch (152 mm) diameter hole for conduits, pipes, tubes or vents, or not greater than 16 square inches (10,322 square mm) for electrical boxes. Penetrations located in container side or end walls that are not part of the lateral force-resisting system shall not be limited in size or quantity (see Figure H). Existing container vents shall not be considered as a penetration.
- f. Any individual container end wall door(s) used as part of the lateral force-resisting system shall be welded closed in accordance with the design and detail specified by the EOR.



**TABLE 1**

**ALLOWABLE SHEAR VALUES FOR SINGLE-UNIT STAND-ALONE CONTAINER WALLS FOR WIND OR SEISMIC LOADING<sup>4</sup>**

CONTAINER DESIGNATION <sup>2</sup>	CONTAINER DIMENSION (Nominal Length)	CONTAINER DIMENSION (Nominal Height)	ALLOWABLE SHEAR VALUES (PLF) <sup>1,3</sup>	
			Side Wall	End Wall
1EEE	45 feet (13.7 M)	9.5 feet (2896 mm)	75	843
1EE		8.6 feet (2591 mm)		
1AAA	40 feet (12.2 M)	9.5 feet (2896 mm)	84	
1AA		8.5 feet (2592 mm)		
1A		8.0 feet (2438 mm)		
1AX		<8.0 feet (2483 mm)		
1BBB	30 feet (9.1 M)	9.5 feet (2896 mm)	112	
1BB		8.5 feet (2591 mm)		
1B		8.0 feet (2438 mm)		
1BX		<8.0 feet (2438 mm)		
1CC	20 feet (9.1 M)	8.5 feet (2591 mm)	168	
1C		8.0 feet (2438 mm)		
1CX		<8.0 feet (2438 mm)		

1. The allowable shear values for the container side and end walls are derived from the test and strength requirements of the ISO 1496-1 and reduced by a factor of safety of 5.
2. Container designation type is derived from ISO 668.
3. Limitations of Subsection D.2 shall apply.
4. Where allowable shear values are used for container roof diaphragm design as allowed in Subsection C, the length limitations of Subsection D.2 shall apply.





**TABLE 2**

**REFERENCED STANDARDS OR CONSENSUS DOCUMENTS**

<b>STANDARD OR CONSENSUS DOCUMENT REFERENCE NUMBER</b>	<b>TITLE</b>
AC462, February 2016	ICC-ES Acceptance Criteria for Structural Building Materials Sourced from Shipping Containers
ASCE 7:2010	Minimum Design Loads for Buildings and Other Structures
AISI S100-07, with Supplement 1:2010	North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S213-07	North American Standard for Cold Formed Steel Framing – Lateral Design
CSC 1972	International Convention for Safe Containers
FEMA P-695:2009	Quantification of Building Seismic Performance Factors
FEMA P-795:2011	Quantification of Building Seismic Performance Factors: Component Equivalency Methodology
ISO 668:2013	Series 1 Freight Containers – Classifications, dimensions and ratings.
ISO 1161:2016	Series 1 Freight Containers - Corner and Intermediate Fittings Specifications
ISO 1496-1:2013	Series 1 Freight Containers – Specification and Testing – Part 1: General Cargo Containers for General Purposes
ISO 6346:1995, with Amendment 3: 2012	Freight Containers – Coding, Identification and marking



**FIGURE A**

CSC SAFETY APPROVAL PLACARD

CSC SAFETY APPROVAL		
A/CS-1234 - 123 / 2013		
DATE MANUFACTURED	09/2013	
IDENTIFICATION NO.	CMCL 13 123456	
MAX OP GROSS MASS	32,500 KGS	71,650 LBS
ALLOW STACK LOAD FOR 1.8g	192,000 KGS	423,280 LBS
RACKING TEST LOAD VALUE	15,240 KGS	33,600 LBS

REMARKS FOR USE RATED

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

**FIGURE B**

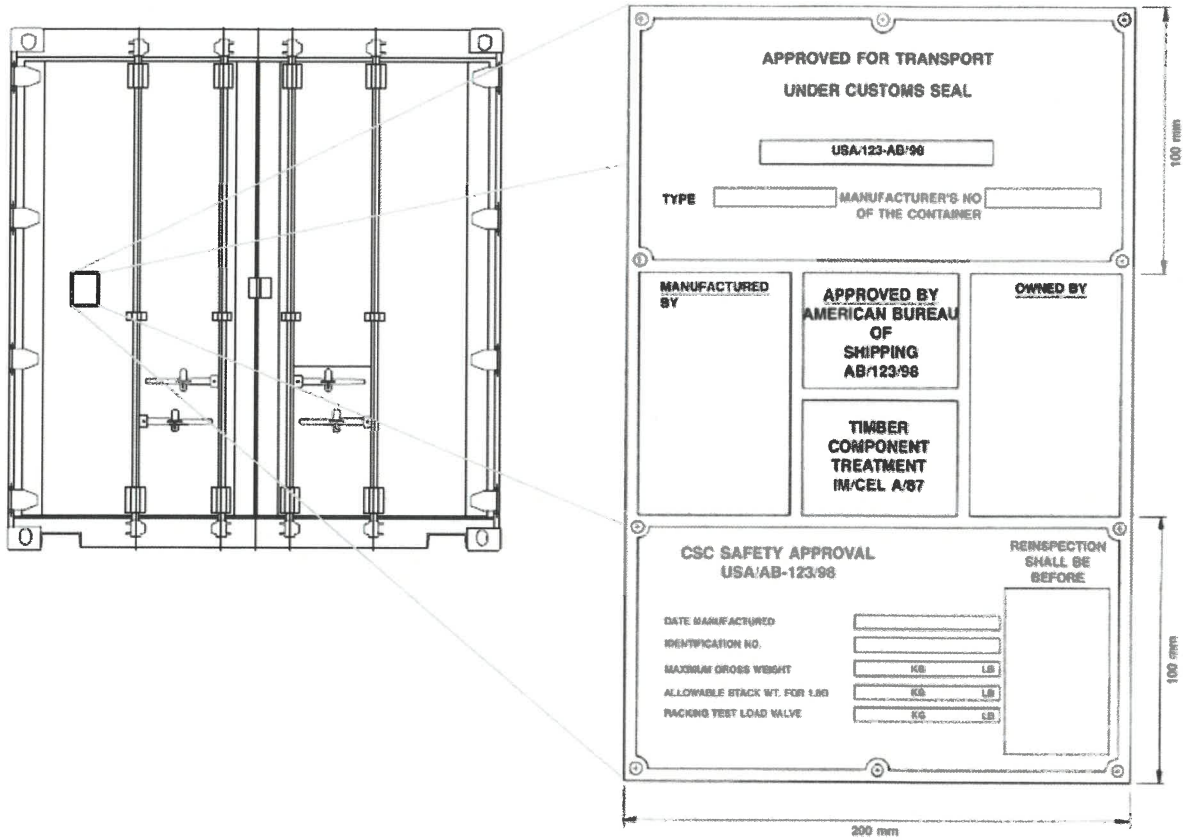
CSC SAFETY APPROVAL PLACARD

APPROVED FOR TRANSPORT UNDER CUSTOMS SEAL	
GB/C 8827 BV/2011	
TYPE	MANUFACTURER'S NO. OF THE CONTAINER
RYC-113T	RY1502 6744
OWNER'S NO. ANYU 20	TIMBER COMPONENT TREATMENT IM / TAILILEUM 400 / 15
Mobile Modular Portable Storage 5700 Las Positas Road Livermore, CA 94551 USA	ONE WAY LEASE, INC. (as Agent only)
CSC SAFETY APPROVAL	
F/BV/11369/11	
DATE MANUFACTURED	09/2015
IDENTIFICATION NO.	RY1502 6744
MAXIMUM OPERATING GROSS MASS	30,480 kg 67,200 lbs
ALLOWABLE STACKING LOAD FOR 1.8G	152,400 kg 336,000 lbs
TRANSVERSE RACKING TEST FORCE	118,000 newtons
END WALL STRENGTH 0.3Pg	
FIRST MAINTENANCE EXAMINATION DUE 09/2020	



**FIGURE C**

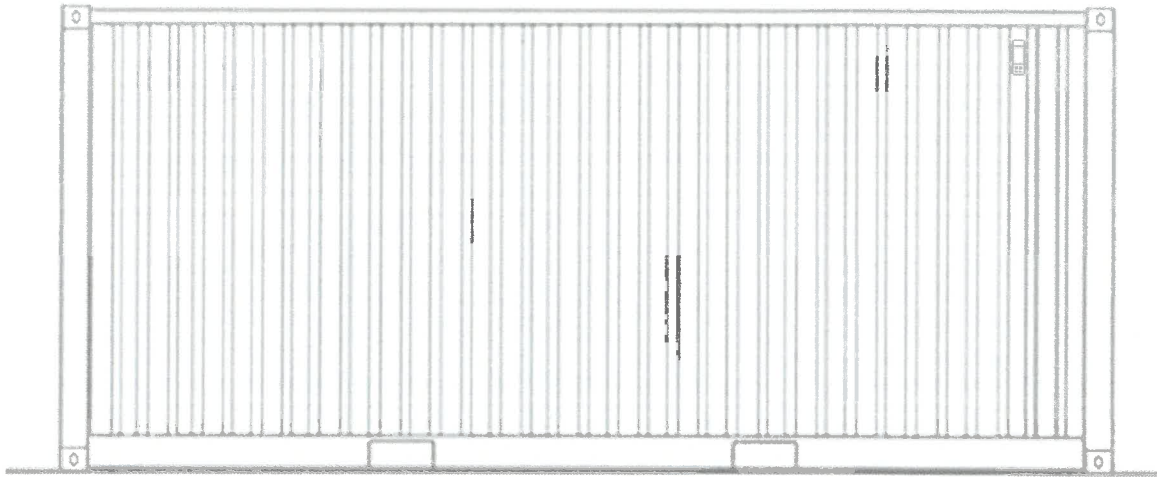
PLACARD LOCATION ON DOOR





**FIGURE D**

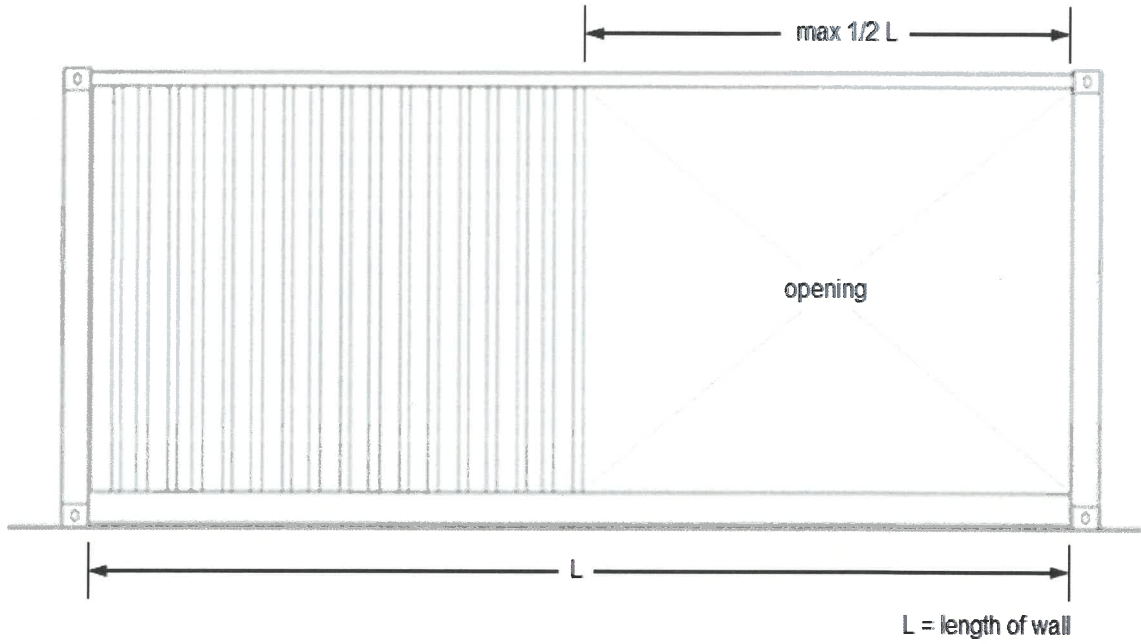
**CONTAINER – SIDE VIEW**





**FIGURE E**

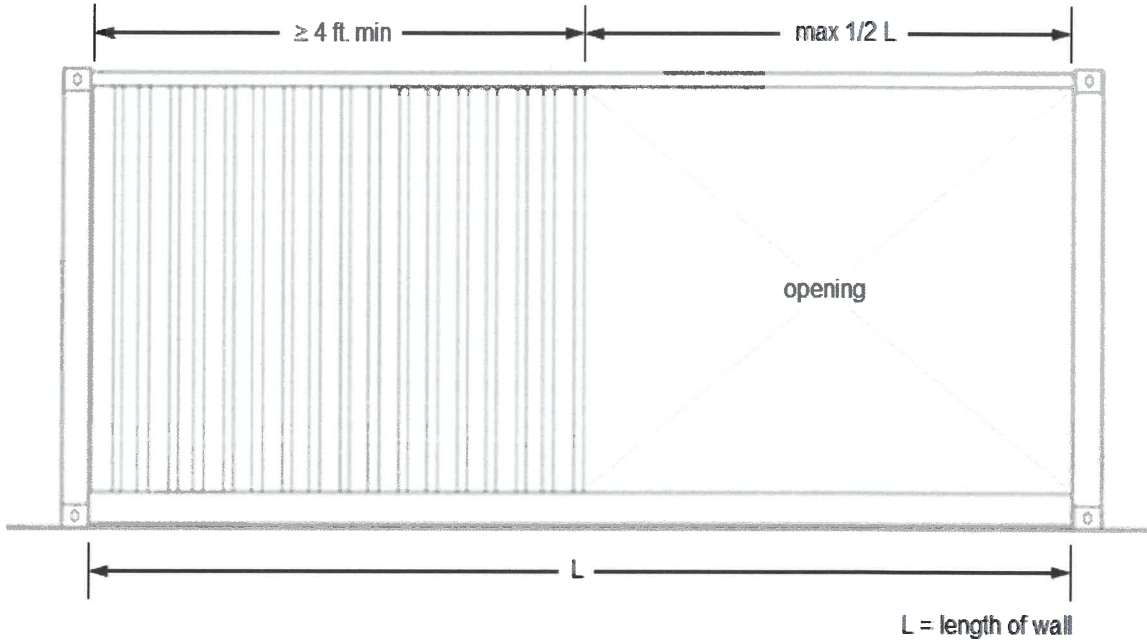
**CONTAINER – OPENINGS**





**FIGURE F**

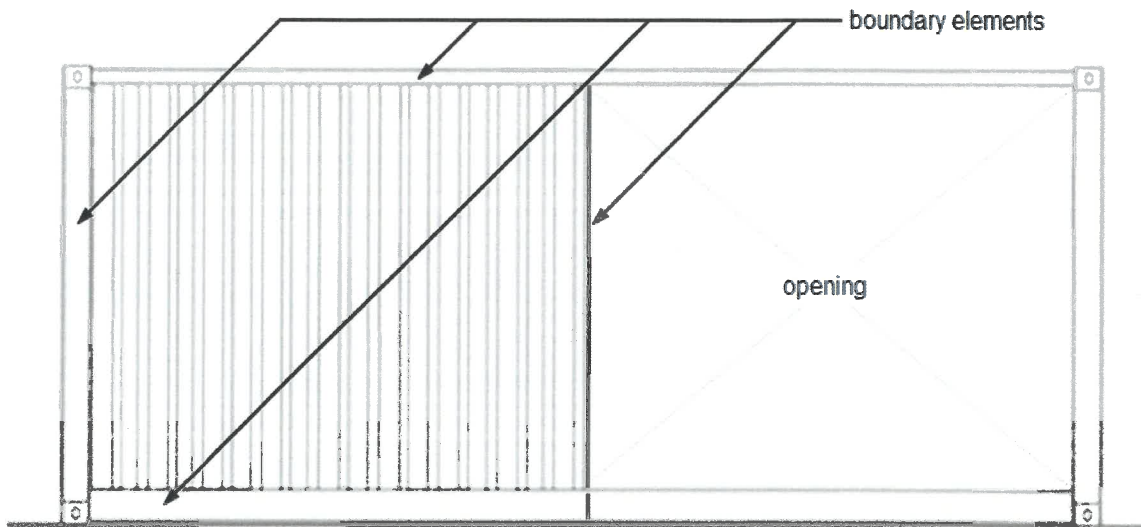
**CONTAINER – OPENINGS**





**FIGURE G**

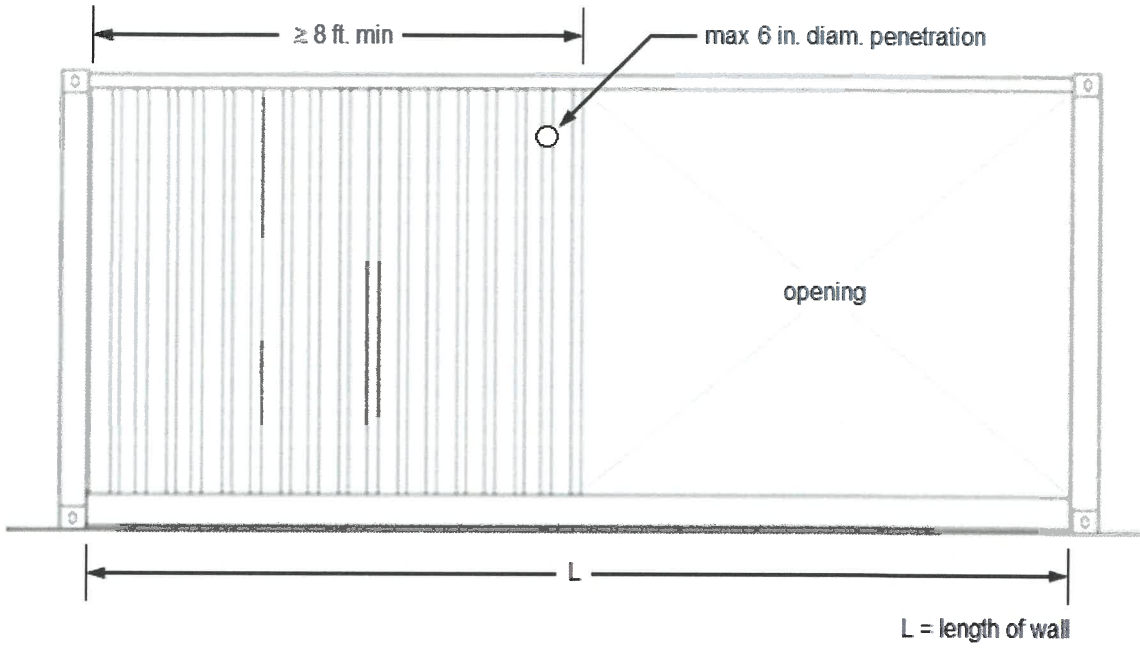
**CONTAINER – SIDE OR END WALL BOUNDARY ELEMENTS**





**FIGURE H**

**CONTAINER – PENETRATIONS**







**FIGURE I**

**CLASSIFICATION SOCIETY LOGOS**

