

**BCAC – IBC Chapter 31 – Intermodal Shipping Containers
Draft Code Change Proposal
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File name: IBC – Chapter 31

The following is a draft code change proposal that has been developed by the Building Code Action Committee. This draft proposal has been reviewed by the BCAC and is posted for information and comments. Please direct comments to the Chair of the Shipping Containers Working Group: Jonathan Humble at jhumble@steel.org. **This is a draft only and is subject to change prior to submittal to cdpACCESS by the January 8, 2018 deadline.**

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IBC Chapter 2 - Definitions

INTERMODAL SHIPPING CONTAINER. A six-sided steel framed unit designed as a general cargo container used for the transport of goods and materials.

IBC Chapter 31

SECTION 3101

GENERAL

3101.1 Scope. The provisions of this chapter shall govern special building construction including membrane structures, temporary structures, *pedestrian walkways* and tunnels, automatic *vehicular gates, awnings and canopies, marquees, signs, and towers, antennas, and intermodal shipping containers.*

(Continued next page)

Chapter 31, Section 310X (NEW)**SECTION 310X
INTERMODAL SHIPPING CONTAINERS**

310X.1 General. The provisions of Sections 310X.1 through 310X.X, and other applicable sections of this code shall apply to *intermodal shipping containers* that are repurposed for use as *buildings or structures* or as components of *buildings or structures*.

Exceptions:

1. *Intermodal shipping containers* approved as temporary structures complying with Section 3103.
2. *Intermodal shipping containers* approved as existing relocatable buildings ~~shall~~ complying with Chapter 14 of the International Existing Building Code.
3. Stationary storage battery arrays located in *intermodal shipping containers* ~~shall~~ complying with Chapter 12 of the International Fire Code.
4. *Intermodal shipping containers* that are *listed* as equipment complying with the standard for that equipment, such as air chillers, engine generators, modular data centers, and other similar equipment.

310X.2 Definition. The following term is defined in Chapter 2:

INTERMODAL SHIPPING CONTAINER.

310X.3 Construction Documents. In addition to the requirements of Sections 107 and 1603, the construction documents shall contain the necessary information about the physical properties of the steel components of the *intermodal shipping container* to serve as a *building or building components*.

310X.4 Foundations and footings. Foundations and footings are required for *intermodal shipping containers* that are repurposed for use as permanent *building or structure*, and shall be designed and constructed in accordance with Chapter 18.

310X.5 Protection against decay and termites. Wood structural floors of *intermodal shipping containers* shall be protected from decay and termites in accordance with the applicable provisions of Section 2304.12.

310X.6 Underfloor ventilation. The space between the underside of the *intermodal shipping container* and the earth under the container in a crawlspace or cellar shall be ventilated in accordance with Section 1202.4.

310X.7 Roof assemblies. All *intermodal shipping containers* roof assemblies shall comply with the requirements of Chapter 15.

Exception: Single-unit *intermodal shipping containers* not attached to, or stacked vertically over, other *intermodal shipping containers, buildings or structures*.

310X.8 Interior finishes. *Intermodal shipping containers* interior wood floor that is repurposed marine grade plywood consisting of 19-ply and not less than 1-1/8 inch thick (29 mm) is permitted to be assigned a *flame spread index* and *smoke-developed index* of a Class B interior finish material.

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310X.9 Joints and intersections. Joints installed in or between 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 Section 715.

310X.10 Structural.

310X.10.1 General. *Intermodal shipping containers* constructed in accordance with ISO 1496-1, that are repurposed for use as *buildings or structures* or as components of *buildings or structures*, shall be designed in accordance with Chapter 16 and this section.

310X.10.1.1 Intermodal shipping container information. *Intermodal shipping containers* shall bear an existing data plate containing the following information as required by ISO 6346; that is verified by an *approved agency*.

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1. Manufacturer's name or identification number
2. Date manufactured
3. Safety approval number
4. Identification number
5. Maximum operating gross mass (kg) (lbs)
6. Allowable stacking load for 1.8G (kg) (lbs)
7. Transverse racking test force (newtons)
8. Valid maintenance examination date

The existing data plate is affixed to the exterior side of an *intermodal shipping container door* . When approved by the *building official*, the markings and *existing data plate* are permitted to be removed from the *intermodal shipping containers* before they are repurposed for use as *buildings or structures* or as components of *buildings or structures*.

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310X.10.1.2 Structural Design. In addition to the structural provisions of this code, the structural design for the *intermodal shipping containers* shall comply with Section 310X.10.2 or 310X.10.3.

310X.10.2 Simplified Analysis.

310X.10.2.1 General. Each *intermodal shipping container* shall be designed in accordance with Section 310X.10.1.2 and the limitations in accordance with Section 310X.10.2.2.

310X.10.2.2 Limitations. The requirements of Section 310X.10.2 is subject to all the following conditions:

1. The *intermodal shipping container* shall be in good condition, free from excessive dents and other severe visual defects, undamaged and have no previous repairs.
2. The *intermodal shipping container* shall not be stacked vertically.
3. The *intermodal shipping container* top and bottom rails, corner castings, and columns or any portion thereof shall not be notched, cut or removed in any manner.
4. The *intermodal shipping container* shall be erected in a level and horizontal position with the floor located at the bottom.

310X.10.2.3 Allowable Strength. The allowable strength for the corrugated steel side walls (longitudinal) and end walls (transverse) shall be permitted to have the allowable strength values set forth in Table 310X.10.2.3 provided that all of the following conditions are met:

1. The total linear length of all openings in any of the side walls or end walls shall be limited to no more than 50% of the length of the side walls or end walls.
2. Any full height wall length, or portion thereof, less than 4 feet long (305 mm) shall not be considered as portion of the lateral force-resisting system.
3. All side or end walls used as part of the lateral force-resisting system shall have a boundary element on all sides capable of transferring the loads.
4. When openings are made in container walls for doors, windows and other openings, the openings shall be framed with steel elements that are designed in accordance with Chapter 16 and Chapter 22. The cross section of any new steel element shall be equal to or greater than the steel element removed. All new welds and connections shall be equal to or greater than the original connections.
5. 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 sq mm) for electrical boxes, is permitted for each individual 8 foot length (2,438 mm) lateral force resisting wall. Penetrations located in walls that are not part of the wall lateral force resisting system shall not be limited in size or quantity. Existing *intermodal shipping container* vents shall not be considered a penetration.

**TABLE 310X.10.2.3
ALLOWABLE STRENGTH VALUES FOR CORRUGATED STEEL SIDING
SHEAR WALLS FOR WIND OR SEISMIC LOADING**

CONTAINER DESIGNATION ²	CONTAINER DIMENSION (Nominal Length)	CONTAINER DIMENSION (Nominal Height)	ALLOWABLE SHEAR VALUES (PLF) ^{1,3}	
			Side Wall	End Wall
<u>1EEE</u>	45 feet (13.7 M)	9.5 feet (2896 mm)	75	843
<u>1EE</u>		8.6 feet (2591 mm)		
<u>1AAA</u>	40 feet (12.2 M)	9.5 feet (2896 mm)	84	
<u>1AA</u>		8.5 feet (2592 mm)		
<u>1A</u>		8.0 feet (2438 mm)		
<u>1AX</u>		<8.0 feet (2483 mm)		
<u>1BBB</u>	30 feet (9.1 M)	9.5 feet (2896 mm)	112	
<u>1BB</u>		8.5 feet (2591 mm)		
<u>1B</u>		8.0 feet (2438 mm)		
<u>1BX</u>		<8.0 feet (2438 mm)		
<u>1CC</u>	20 feet (9.1 M)	8.5 feet (2591 mm)	168	
<u>1C</u>		8.0 feet (2438 mm)		
<u>1CX</u>		<8.0 feet (2438 mm)		
<u>1D</u>	10 feet (3.0 M)	8.0 feet (2438 mm)	337	
<u>1DX</u>		<8.0 feet (2438 mm)		

1. The allowable strength for the side walls and end walls of the intermodal shipping containers are derived from ISO 1496-1 and reduced by a factor of safety of 5.
2. Container designation type is derived from ISO 668.
3. Limitations of Sections 310X.9.2.2 and 310X.9.2.3 shall apply.

310X.10.3 Detailed analysis. For any other configuration of *intermodal shipping containers*, other than those cited in Section 310X.10.2, a structural analysis shall be provided to demonstrate the adequacy of the structural capacity of the *intermodal shipping containers*. Structural characteristics shall be established by material tests when the steel cannot be identified by the manufacturer's designation as to manufacture and mill test.

Chapter 35 REFERENCED STANDARDS

ISO	International Organization for Standardization ISO Central Secretariat 1 ch, de la Voie-Creuse, Casa Postale 566 CH-1211 Geneva 20, Switzerland	
Standard Reference Number	Title	Referenced in code section number
ISO 1496-1:2013	Series 1 Freight Containers - Specification and Testing – Part 1: General Cargo Containers for General Purposes	310X.10.1, Table 301X.10.2.3
ISO 6346:1995, with Amendment 3: 2012	Freight Containers – Coding, Identification and marking	3010X.10.1
ISO 668:2013	Series 1 Freight Containers – Classifications, dimensions and ratings.	Table 301X.10.2.3

REASON:

This code change purpose is to introduce intermodal shipping containers into the International Building Code based on requests by code officials in the U.S. Prior to this proposal, several jurisdictions had created their own individual regulations or ordinances, or had administered additional requirements beyond the code (e.g. Section 104.11 “Alternative materials, design and methods of construction and equipment”) so as to be comfortable to ensure a safe structure. This code change proposal is in response to those requests to develop a set of consistent code provisions which cover the minimum safety requirements, but which do not duplicate existing code provisions.

The ICC Building Code Action Committee created a task group to facilitate the development of this proposal. Members of the assigned task group included representatives from: City of Long Beach, CA; County of Mecklenburg, NC; Modular Building Institute; American Iron and Steel Institute; Underwriters Laboratories; and the Portland Cement Association. Additional contacts included the State of California (Division of State Architect, Housing and Community Development), City of San Diego; City of Los Angeles, CA; City of Seattle; Clark County, NV; Falcon Structures, RADCO a Twining Company, SEABOX Company, and other guests who provided their individual expertise.

This proposal covers:

- Creation of a new definition in order to separate the container from other I-code sections which refer to, but intentionally do not define, shipping containers,
- Creating exceptions so to differentiate the intermodal shipping container from other code sections which could be interpreted as applying to intermodal shipping containers under other applications (e.g. temporary storage, relocatable buildings, energy storage facilities, and listed equipment),
- References to other sections concerning foundations, decay and termite control, crawlspace ventilation, roof assemblies, interior finishes, and joints/intersections.
- Verification of containers construction, condition, and structural integrity to assist the structural engineer in the evaluation for building construction,
- Introduction of structural provisions unique to intermodal shipping containers and which do not duplicate the existing structural requirements, and
- Addition of three ISO standards for reference.

New definition - A new definition has been created in order that these provisions can be adequately enforced and not confused the other multiple varieties of containers currently in the market.

Section 310X.1 – This represents the charging statement that outlines the requirements for containers, and list the appropriate exceptions with the I-codes in order to coordinate with other provisions that may appear similar in nature and where intermodal shipping containers could possibly be used in those other applications.

Section 310X.2 through 310X.9 – While we have strived to focus on only those provisions that recognize the unique aspects of intermodal shipping containers, we felt that some direction references were appropriate. In this case specific pointers are provided to foundations, decay and termite control, crawlspace ventilation, and roof requirements addressing drainage and weather protection, interior finish when repurposing the marine grade plywood flooring, and preventing smoke and hot gasses from passing between attached shipping containers.

Section 310X.10 – The structural provisions are divided into multiple categories. The general provisions are designed to address three aspects of structural design; 1) the verification of the intermodal shipping container before it is repurposed; 2) the design requirement that when repurposed it be done so in accordance with Chapter 16 of the structural provisions; and 3) additional requirements unique to the containers.

Section 310X.10.1 – These provisions focus on the characteristics of the intermodal shipping container prior to it being repurposed. In this case the provisions require a straight forward inspection by an approved agency, and verification of the data plate which is normally found on

intermodal shipping containers. There was an intent not to specify who the approved agency would be for two reasons; 1) so as to allow the code official or state law(s) to handle this aspect recognizing that in each jurisdiction their requirements may be different, and 2) to avoid dictating an international agreement onto jurisdictions that are currently employed by the shipping and container manufacturers worldwide today. In this case, the standards are regulated by the International Convention of Safe Containers (CSC) that have policies and procedures for inspecting containers worldwide. These procedures include policies for Approved Continuous Examination Program (ACEP) at the time the container is used in production, and policies for third party inspection agencies. The list shown in this section is an extract from the ISO standard and serves as a reference of items to be verified in order to validate the type of container.

Section 310X.10.1.2 – The structural design provisions have been divided into two categories; 1) single container buildings, and 2) multiple unit buildings (e.g. stacked vertically or attached linearly, or both).

Section 310X.10.2 - The concept for the single container approach is to make the design and construction process simpler. In this case the proposal provides pre-established shear wall information that is contained in the ISO standard which is used to design intermodal shipping containers.

Section 310X.10.3 – The detailed analysis engineering approach represents the general engineering practice allowed for all other types of building constructions. For this section the engineer of record is allowed to practice as they normally would for any other building type.

BCAC - The International Code Council's Building Code Action Committee (BCAC) was established by the ICC Board of Directors to pursue opportunities to improve and enhance an assigned International Code or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in July, 2011, the BCAC has held open meetings and numerous workgroup calls which included members of the BCAC as well as any interested party to discuss and debate the proposed changes and the public comments. Related documentation and reports are posted on the BCAC website at: <http://www.iccsafe.org/cs/BCAC/Pages/default.aspx>.

Cost Impact:

The code change proposal will decrease the cost of construction. This new code section will provide clarity on how to consistently design with, permit, and field inspect shipping containers that are repurposed for building construction.

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