PART 2

Building Planning

Chapter 3

■ **Chapter 3** Building Planning

Chapter 3 includes the bulk of the nonstructural provisions, including the location on the lot, fire-resistant construction, light and ventilation, emergency escape and rescue, fire protection, safety glazing, fall protection, and many other provisions aimed at protecting the health, safety, and welfare of the public. In addition to such health and life-safety issues, Chapter 3 provides the overall structural design criteria for residential buildings regulated by the CRC. Section R301 addresses live loads, dead loads, and environmental loads such as wind, seismic, and snow. ■

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R301.1.4

Intermodal Shipping Containers

CHANGE TYPE: Addition

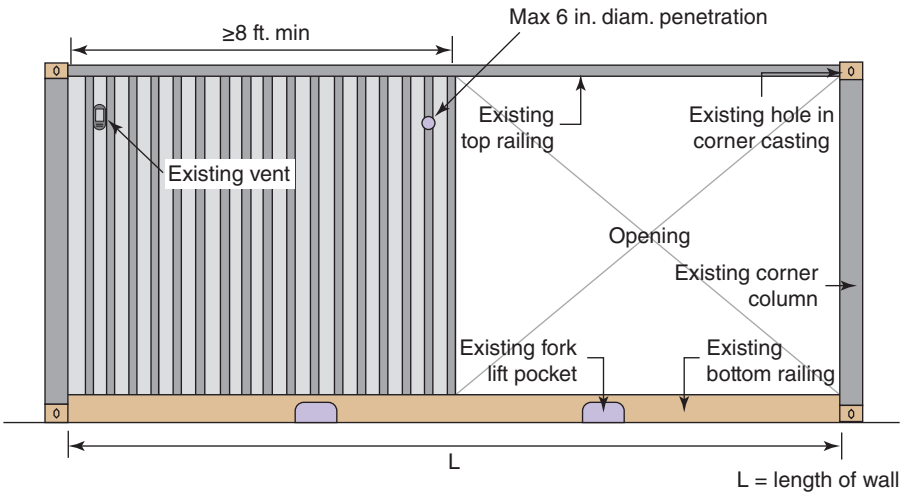
CHANGE SUMMARY: Provisions for construction with intermodal shipping containers are added to the *California Residential Code* (CRC).

2022 CODE TEXT: **R301.1.4 Intermodal shipping containers.** Intermodal shipping containers that are repurposed for use as buildings or structures, shall be designed in accordance with the structural provisions in Section 3115 of the *California Building Code*.

CHANGE SIGNIFICANCE: A wide variety of materials are regulated throughout the CRC. In addition to typical homes constructed of wood, other types of construction are addressed by reference to other codes or standards. Section R104.11 allows for the use of alternative materials and methods of construction provided such methods and materials have been approved by the building official. The use of intermodal shipping containers as buildings and structures is now specifically recognized in the CRC and criteria have been established to address the minimum safety requirements by reference to Section 3115 of the *California Building Code* (CBC). Additionally, ICC G5-2019 *Guideline for the Safe Use of ISO Shipping Containers Repurposed as Buildings and Building Components* was recently published to assist building departments in their evaluation.

Over 30 million intermodal shipping containers are in use around the world today. These containers, both new and used, are being repurposed and converted to occupiable structures. About 80 percent of shipping containers are either 20-foot (6.1 m) or 40-foot (12.2 m) standard length boxes for dry freight. These typical containers are rectangular, closed boxes, with doors fitted at one end, and made of corrugated weathering steel with a plywood floor. The corrugating of the sheet metal used for the sides and roof contributes significantly to the container's rigidity and stacking

Single container home.



Maximum penetration size in shipping containers used for bracing.

strength. Standard containers are 8-foot (2.44 m) wide by 8.5 feet (2.59 m) tall, although the taller hi-cube units measuring 9.5 feet (2.90 m) tall have become common in recent years.

The containers may sit at yards waiting to be used or can be appropriated for use as building materials. Like any repurposed material, they must be evaluated for strength and condition. By referencing Section 3115 of the CBC, the CRC brings in requirements for inspection of the containers before use to ensure material quality. The CBC requires an engineered design for the use of the containers. This design assumes that the containers meet the requirements of ISO 1496-1 which details testing for the strength capacity of the containers. All containers will be tested by an approved third-party to verify that they still meet the capacity of the ISO standard. This testing includes a check of the strength of the side walls, end walls, floor and roof; the rigidity of the container; and its ability to be lifted and stacked. When containers will be used individually in Seismic Design Categories (SDC) A, B or C, they may meet a simplified list of structural criteria.

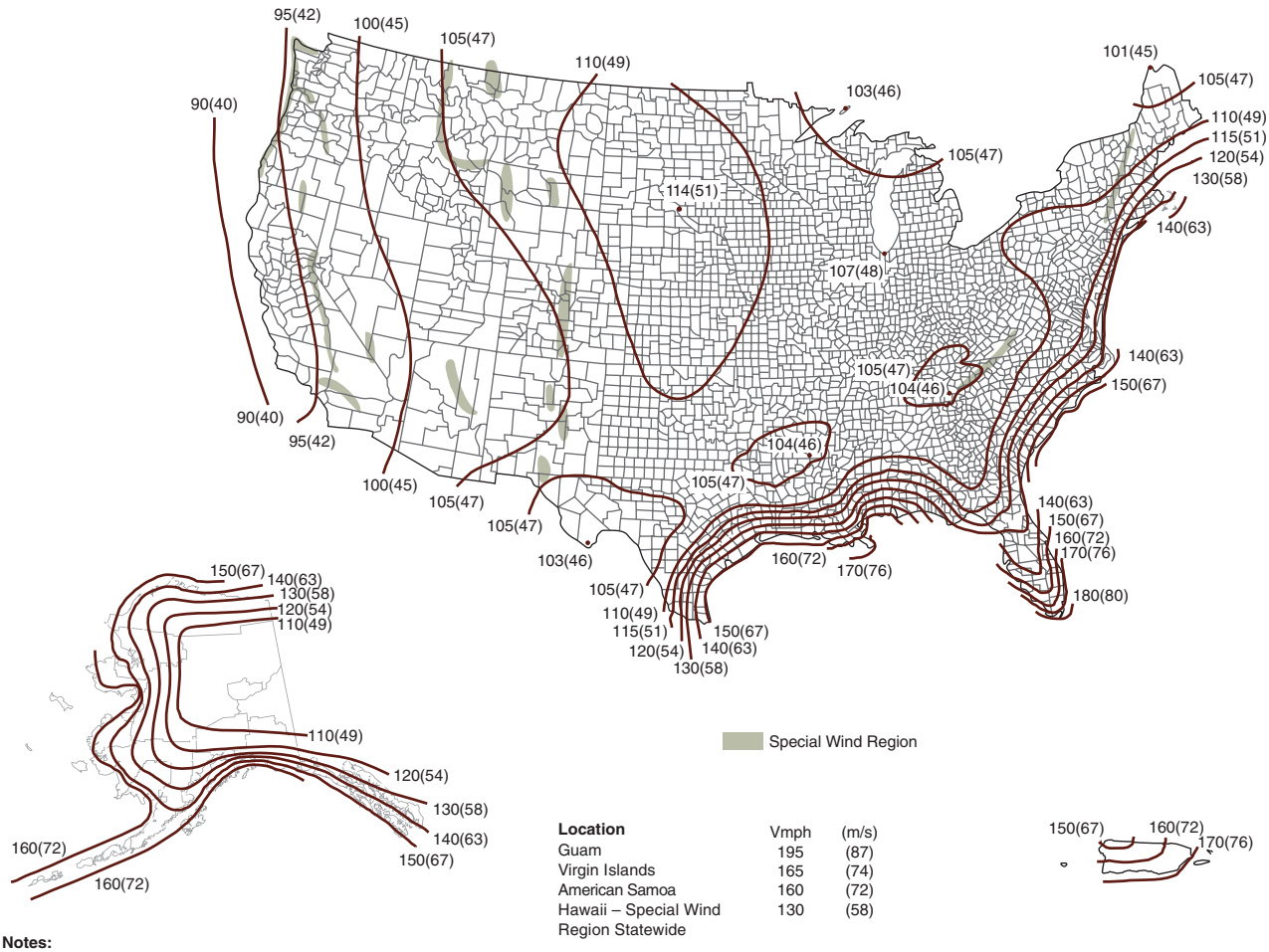
CHANGE TYPE: Modification

R301.2
Wind Speeds

CHANGE SUMMARY: Updated wind speed maps match CBC and ASCE 7 maps with a large portion of the country having wind speeds less than 115 mph.

2022 CODE TEXT: **R301.2.1 Wind design criteria.** Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table ~~R301.2(1)~~ R301.2 as determined from Figure ~~R301.2(5)A~~ R301.2(2). The structural provisions of this code for wind loads are not permitted where wind design is required as specified in Section R301.2.1.1. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table ~~R301.2(2)~~ R301.2.1(1) adjusted for height and exposure using Table ~~R301.2(3)~~ R301.2.1(2) shall be used to determine design load performance

Wind damage.



Location	Vmph	(m/s)
Guam	195	(87)
Virgin Islands	165	(74)
American Samoa	160	(72)
Hawaii – Special Wind Region Statewide	130	(58)

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas, and land boundaries outside the last contour shall use the last wind speed contour.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).
6. Location-specific basic wind speeds shall be permitted to be determined using www.atcouncil.org/windspeed.

Updated Wind Speeds.

requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. Metal roof shingles shall be designed for wind speeds in accordance with Section R905.4.4. A continuous load path shall be provided to transmit the applicable uplift forces in Section ~~R802.11.1~~ R802.11 from the roof assembly to the foundation. Where ultimate design wind speeds in Figure R301.2(2) are less than the lowest wind speed indicated in the prescriptive provisions of this code, the lowest wind speed indicated in the prescriptive provision of this code shall be used.

CHANGE SIGNIFICANCE: Section R301.2.1 coordinates the CRC wind design criteria with the 2016 edition of the engineering standard *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7). In ASCE 7-16, wind speeds in non-hurricane prone areas of the contiguous United States have been revised using contours to better reflect regional variations in extreme straight-line winds due to thunderstorms.

In Figure R301.2(2), wind speeds are no longer a minimum of 115 mph for the center of the country and 110 mph in the west. The map is updated to show lower wind speeds with isolines for 90, 95, 100 and 105 mph. Point values are added to the map to aid interpolation between isolines. Generally, wind speeds have dropped across the country, and in some locations the wind speed dropped significantly. Any area that had wind speeds set at 110 mph (west coast) or 115 mph (central United States) now has reduced wind speeds.

With updates to Figure R301.2(2), the map is now identical to the 2022 CBC and ASCE 7-16 wind speed maps for Risk Category II buildings – the category for most buildings including single- and two-family residences and townhouses. Wind speeds in hurricane-prone regions generally remained the same. For the northeastern United States, certain wind speeds dropped 5 to 10 mph inland away from the coastline. New hurricane contours were developed based on updated hurricane models, and hurricane coastline contour locations were adjusted to reflect new research into hurricane decay rates over land. The details of changes, data behind the isolines and methods used to estimate both non-hurricane and hurricane wind speeds are provided in ASCE 7-16's Commentary to Chapter 26. Note that while wind speeds have decreased in certain parts of the country, component and cladding roof wind pressures in certain cases have increased due to changes in Table R301.2.1(1). See the significant change discussion for roof components and cladding.

To see a specific wind speed for a town or individual building, go to either hazards.atcouncil.org or asce7hazardtool.online and type in an address or GPS coordinates. The website will give the wind speed assigned to the location. It is now possible to determine the ground snow load, wind speed, seismic design category and tornado risk from the Applied Technology Council (ATC) website, which remains free to users. The American Society of Civil Engineers (ASCE) website contains additional information while charging a nominal yearly fee and offering wind speeds and tsunami hazard zones for free.

Section R301.2.1 now also includes a reference for wind design of metal roof shingles. Metal roof shingles are fastened following the requirements of Section R905.4.4.

CHANGE TYPE: Modification

CHANGE SUMMARY: Component and cladding wind pressures in Table R301.2.1(1) are updated for new design wind speeds and hip or gable roof profiles.

2022 CODE TEXT:

Table R301.2.1(1)

Component and Cladding Wind Pressures

TABLE R301.2.1(1): Component and Cladding Loads for a Building with a Mean Roof Height of 30 Feet Located in Exposure B (ASD) (psf)

	Zone	Effective Wind Areas (ft^2)	Ultimate Design Wind Speed, V_{ult}													
			90		95		100		105		110		...		180	
			Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg
Gable Roof ≥7 to 20 degrees	1, 2e	10	5.4	-16.2	6	-18.0	6.7	-19.9	7.4	-22	8.1	-24.1	...	...	21.6	-64.6
	1, 2e	20	4.9	-16.2	5.4	-18	6.0	-19.9	6.6	-22	7.2	-24.1	...	...	19.4	-64.6
	1, 2e	50	4.1	-9.9	4.6	-11	5.1	-12.2	5.6	-13.4	6.1	-14.7	...	...	16.4	-39.4
	1, 2e	100	3.6	-5	4	-5.6	4.4	-6.2	4.8	-6.9	5.3	-7.5	...	...	14.2	-20.2
	2n, 2r, 3e	10	5.4	-23.6	6	-26.3	6.7	-29.1	7.4	-32.1	8.1	-35.2	...	...	21.6	-94.2
	2n, 2r, 3e	20	4.9	-20.3	5.4	-22.7	6	-25.1	6.6	-27.7	7.2	-30.4	...	...	19.4	-81.4
	2n, 2r, 3e	50	4.1	-16	4.6	-17.9	5.1	-19.8	5.6	-21.8	6.1	-24	...	...	16.4	-64.2
	2n, 2r, 3e	100	3.6	-12.8	4	-14.3	4.4	-15.8	4.8	-17.4	5.3	-19.1	...	...	14.2	-51.3
	3r	10	5.4	-28	6	-30.2	6.7	-34.6	7.4	-38.1	8.1	-41.8	...	...	21.6	-112
	3r	20	4.9	-24	5.4	-26.7	6	-29.6	6.6	-32.7	7.2	-35.9	...	...	19.4	-96
	3r	50	4.1	-18.7	4.6	-20.8	5.1	-23.1	5.6	-25.4	6.1	-27.9	...	...	16.4	-74.7
	3r	100	3.6	-14.7	4	-16.3	4.4	-18.1	4.8	-20	5.3	-21.9	...	...	14.2	-58.7
Hipped Roof ≥7 to 20 degrees	1	10	6.5	-14.7	7.3	-16.3	8	-18.1	8.9	-20	9.7	-21.9	...	...	26.1	-58.7
	1	20	5.6	-14.7	6.3	-16.3	7	-18.1	7.7	-20	8.4	-21.9	...	...	22.5	-58.7
	1	50	4.4	-11.3	5	-12.6	5.5	-14	6.1	-15.4	6.6	-16.9	...	...	17.8	-45.3
	1	100	3.6	-8.7	4	-9.7	4.4	-10.8	4.8	-11.9	5.3	-13.1	...	...	14.2	-35
	2r	10	6.5	-19.1	7.3	-21.3	8	-23.6	8.9	-26	9.7	-28.6	...	...	26.1	-76.5
	2r	20	5.6	-17.2	6.3	-19.2	7	-21.3	7.7	-23.4	8.4	-25.7	...	...	22.5	-68.9
	2r	50	4.4	-14.7	5	-16.4	5.5	-18.2	6.1	-20	6.6	-22	...	...	17.8	-58.8
	2r	100	3.6	-12.8	4	-14.3	4.4	-15.8	4.8	-17.4	5.3	-19.1	...	...	14.2	-51.3
	2e, 3	10	6.5	-20.6	7.3	-22.9	8	-25.4	8.9	-28	9.7	-30.8	...	...	26.1	-82.4
	2e, 3	20	5.6	-18.5	6.3	-20.6	7	-22.9	7.7	-25.2	8.4	-27.7	...	...	22.5	-74.1
	2e, 3	50	4.4	-15.8	5	-17.6	5.5	-19.5	6.1	-21.5	6.6	-23.6	...	...	17.8	-63.1
	2e, 3	100	3.6	-13.7	4	-15.3	4	-16.9	4.8	-18.7	5.3	-20.5	...	...	14.2	-54.8

(Only a portion of the table is shown for brevity and clarity.)