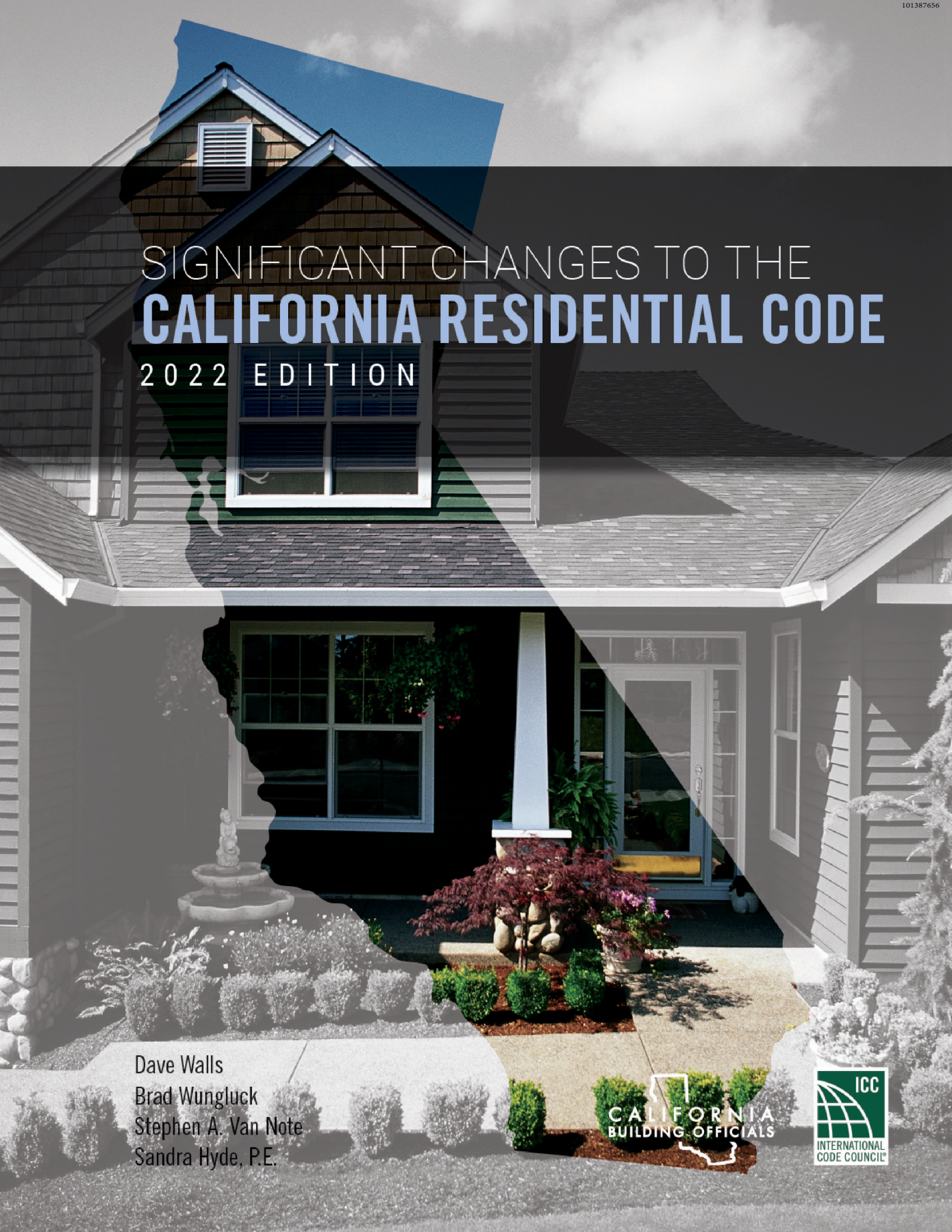

SIGNIFICANT CHANGES TO THE CALIFORNIA RESIDENTIAL CODE

2022 EDITION

Dave Walls
Brad Wungluck
Stephen A. Van Note
Sandra Hyde, P.E.

CALIFORNIA BUILDING OFFICIALS

ICC INTERNATIONAL CODE COUNCIL®

Significant Changes to the California Residential Code 2022 Edition

Dave Walls
Brad Wungluck
Stephen A. Van Note
Sandra Hyde

International Code Council Staff:

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Mark A. Johnson

Senior Vice President, Business and Product Development:
Hamid Naderi

Vice President and Technical Director, Products and Services:
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Preface

The purpose of *Significant Changes to the California Residential Code*, *2022 Edition*, is to familiarize building officials, fire officials, plans examiners, inspectors, design professionals, contractors and others in the building construction industry with many of the important changes in the 2022 *California Residential Code* (CRC). This publication is designed to assist code users in identifying the specific code changes that have occurred and understanding the reasons behind the changes. It is also a valuable resource for jurisdictions in their code-adoption process.

Only a portion of the code changes to the CRC are discussed in this book. The changes selected were identified for a number of reasons, including their frequency of application, special significance or change in application. However, the importance of the changes not included is not to be diminished. Further information on all code changes can be found in the Complete Revision History to the 2021 I-Codes, available from the International Code Council® (ICC®) online store. This resource provides the published documentation for each successful code change contained in the 2021 IRC since the 2018 edition of IRC, which is the base model code for the CRC.

Significant Changes to the California Residential Code, 2022 Edition, is organized into four parts, each representing a distinct grouping of code topics. It is arranged to follow the general layout of the CRC, including code sections and section number format. The table of contents, in addition to providing guidance in the use of this publication, allows for a quick identification of those significant code changes that occur in the 2022 CRC.

Throughout the book, each change is accompanied by a photograph, an application example or an illustration to assist and enhance the reader's understanding of the specific change. A summary and a discussion of the significance of the change are also provided. Each code change is identified by type, be it an addition, modification, clarification or deletion.

The code change itself is presented in a legislative format similar to the style utilized for code-change proposals. Deleted code language is shown with a strikethrough, and new code text is indicated by underlining. As a result, the actual 2022 code language is provided, as well as

a comparison with the 2019 language, so the user can easily determine changes to the specific code text.

As with any code-change text, *Significant Changes to the California Residential Code, 2022 Edition*, is best used as a companion to the 2022 CRC. Because only a limited discussion of each change is provided, the code itself should always be referenced in order to gain a more comprehensive understanding of the code change and its application.

The commentary and opinions set forth in this text are those of the authors and do not necessarily represent the official position of ICC. In addition, they may not represent the views of any enforcing agency, as such agencies have the sole authority to render interpretations of the CRC. In many cases, the explanatory material is derived from the reasoning expressed by code-change proponents.

Comments concerning this publication are encouraged and may be directed to ICC at significantchanges@iccsafe.org.

About the *California Residential Code*

Building officials, design professionals, contractors and others involved in the field of residential building construction recognize the need for a modern, up-to-date residential code addressing the design and installation of building systems through both prescriptive and performance requirements. The 2022 *California Residential Code* (CRC), is intended to meet these needs through code regulations that safeguard the public health and safety in all communities, large and small. The 2022 CRC utilizes the 2021 *International Residential Code*® (IRC®) as its basis and is kept up to date through California's code adoption process. The effective date of the 2022 CRC is January 1, 2023.

The *California Residential Code* is Part 2.5 of thirteen parts of the official triennial compilation and publication of the adoptions, amendments and repeal of administrative regulations to the *California Code of Regulations, Title 24*, also referred to as the *California Building Standards Code.* This comprehensive residential code establishes minimum regulations for residential building systems by means of prescriptive- and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new building designs. The *California Building Standards Code* is published in its entirety every 3 years. The California Building Standards Commission is responsible for the administration of each code adoption cycle. Supplements and errata are issued throughout the 3-year cycle.

The CRC is applicable throughout the state. However, a city, county, or city and county may establish more restrictive building standards reasonably necessary because of local climatic, geological or topographical conditions. Findings of the local condition(s) and the adopted local building standard(s) amendments must be filed with the California Building Standards Commission to become effective. Only the state's significant change amendments are included as part of this publication.

Acknowledgments

Grateful appreciation is due to many ICC staff members, including those in Product Development, Publishing, Marketing and Technical Services, for their generous assistance in the preparation of this publication. John "Buddy" Showalter, P.E., ICC Senior Staff Engineer, reviewed the structural provisions giving helpful insight and suggestions. All contributed to the accuracy and quality of the finished product.

About the Authors

Stephen A. Van Note, CBO
International Code Council
Managing Director, Product Development

Stephen A. Van Note was the Managing Director of Product Development for the International Code Council (ICC), where he was responsible for developing technical resource materials in support of the International Codes. His role also included the management, review and technical editing of publications developed by ICC staff members and other expert authors. He has authored a number of ICC support publications, including *Residential Code Essentials and Inspector Skills*. In addition, Steve developed and presented *International Residential Code* seminars nationally. He has over 50 years of experience in the construction and building code arena. Prior to joining ICC in 2006, Steve was a building official for Linn County, Iowa. Prior to his 15 years at Linn County, he was a carpenter and construction project manager for residential, commercial and industrial buildings. A certified building official and plans examiner, Steve also holds certifications in several inspection categories.

Sandra Hyde, P.E.
International Code Council
Senior Staff Engineer, Product Development

Sandra Hyde is the Managing Director at the International Code Council (ICC), where, as part of the Product Development team, she develops technical resource materials in support of the structural provisions of the *International Residential Code*, *International Building Code* and *International Existing Building Code*. Her role also includes review and technical editing of publications authored by ICC and engineering associations, and the presentation of technical seminars on the IRC and IBC structural provisions. She has authored and reviewed support publications, including *Significant Changes to the International Building Code*, *Special Inspection Manual* and, in conjunction with APA, *Guide to the IRC Wall Bracing Provisions*. Prior to joining ICC in 2010, Sandra worked in manufacturing and research of engineered wood products. She is a Registered Civil Engineer in Idaho and California.

Brad Wungluck, MPA, MCP, CBO
California Building Officials
First Vice President

With more than 15 years of building safety management experience, Brad currently serves on the Executive Board for California Building Officials (CALBO) as the First Vice President. In addition, he teaches regularly for CALBO, has developed a number of CALBO training courses, and serves on the committee responsible for all training and education, the CALBO Training Institute.

In addition, Brad serves the City of Manteca as a Deputy Director for Development Services and is responsible for all Building Safety functions. Serving as the Chief Building Official for the City, he manages building plan review, counter assistance and inspection services.

Brad earned his BS in Political Science from Loyola University Chicago and his Masters in Public Administration from San Diego State University. Brad has participated on various local, state-wide and national committees, including the California Building Standards Code Advisory Committees on Accessibility; California Building Standards Code Advisory Committee on Plumbing, Electrical, Mechanical and Energy; the CALBO State Code Committee; the CALBO Energy Committee; and the ICC Plumbing, Mechanical and Fuel Gas Code Action Committee.

Brad is also a certified Master Code Professional, Building Official and Plans Examiner, holding certifications in several inspection categories.

Dave Walls
International Code Council
Vice President of Business Support Initiatives

David Walls is the Vice President of Business Support Initiatives for the International Code Council (ICC). His responsibilities include both domestic and international business development activities. Prior to joining ICC, Dave was appointed as the Executive Director of the California Building Standards Commission (BSC). In this capacity, he successfully directed the development and publication of CALGreen. Prior to joining the State of California, he served as a code official in the building safety division for two local jurisdictions in California. Dave is a California Licensed General Contractor and also served as an adjunct professor in the construction management program at the University of California Davis. Dave is certified in several ICC fields, including Building, Residential, Accessibility, Electrical and Energy. He has served as a Commissioner on the California Seismic Safety Commission and as a Board Member of the California Hospital Building Safety Board.

About California Building Officials

California Building Officials (CALBO) is a non-profit corporation dedicated to promoting public health and safety in building construction through responsible legislation, education and building code development. CALBO was founded in 1962 to promote and further the profession of the local California Building Official. With time and achievement, the organization has become the advocate and representative of not only the local California Building Official, but of local building departments, local government entities, and public safety and code enforcement officials.

About the International Code Council®

The International Code Council is the leading global source of model codes and standards and building safety solutions that include product evaluation, accreditation, technology, codification, training and certification. The Code Council's codes, standards and solutions are used to ensure safe, affordable and sustainable communities and buildings worldwide. The International Code Council family of solutions includes the ICC Evaluation Service, the International Accreditation Service, General Code, S. K. Ghosh Associates, NTA Inc., Progressive Engineering Inc., ICC Community Development Solutions and the Alliance for National & Community Resilience. The Code Council is the largest international association of building safety professionals and is the trusted source of model codes and standards, establishing the baseline for building safety globally and creating a level playing field for designers, builders and manufacturers.

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PART 1

Administration

Chapters 1 and 2

- **Chapter 1** Scope and Administration
- **Chapter 2** Definitions

The administration part of the *California Residential Code* (CRC) covers the general scope, purpose, applicability, and other administrative issues related to the regulation of residential buildings by building safety departments. The administrative provisions establish the responsibilities and duties of the various parties involved in residential construction and the applicability of the technical provisions within a legal, regulatory, and code-enforcement arena.

Section R101.2 establishes the criteria for buildings that are regulated by the CRC. Buildings beyond the scope of Section R101.2 are regulated by the *California Building Code* (CBC). The remaining topics in the administration provisions of Chapter 1 include the establishment of the building safety department, duties of the building official, permits, construction documents, and inspections.

The definitions contained within the CRC are intended to reflect the special meaning of such terms within the scope of the code. As terms can often have multiple meanings within their ordinary day-to-day use or within the various disciplines of the construction industry, it is important that their meanings within the context of the CRC be understood. Most definitions used throughout the CRC are found in Chapter 2. ■

R102.7.1

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R102.7.1

Additions, Alterations or Repairs

CHANGE TYPE: Clarification

CHANGE SUMMARY: The code references the *California Existing Building Code* (CEBC) only when alterations are part of a change to a use or occupancy outside the scope of the CRC.

2022 CODE TEXT: **R102.7.1 Additions, alterations or repairs.** Additions, alterations or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with the requirements of this code, unless otherwise stated. Additions, alterations, repairs and relocations shall not cause an existing structure to become ~~unsafe or adversely affect the performance of the building.~~ less compliant with the provisions of this code than the existing building or structure was prior to the addition, alteration or repair. An existing building together with its additions shall comply with the height limits of this code. Where the alteration causes the use or occupancy to be changed to one not within the scope of this code, the provisions of the *California Existing Building Code* shall apply.

CHANGE SIGNIFICANCE: As with other California codes, the CRC provides relief for existing buildings to allow the legal occupancy to continue without fully complying with current codes. To impose regulations to bring existing buildings into current compliance would be impractical and unreasonable. This provision also applies to existing buildings undergoing modifications or additions. Generally, only the modification or addition need comply with the current code. Previous editions of the CRC stated that additions, alterations or repairs could not cause any portion of the existing building to become unsafe or otherwise adversely affect the performance of the building. For clarification, that provision has changed to state that modifications cannot cause the existing building to become less compliant with the current code. Additional

Addition to a single-family dwelling.

language emphasizes that the building height limitations still apply to additions. The relationship of the CEBC to the CRC has caused some confusion and is clarified in the added language. The CEBC offers alternative compliance paths for renovations to existing buildings. The code now only sends users to the CEBC if the alteration or addition is part of a change of use or change of occupancy that takes the building outside the scope of the CRC. That is, the new use is classified as a building under the CBC and the CEBC applies to the modifications. Similarly, the CEBC states in an exception to its scope that modifications to one- and two-family dwellings and townhouses and their accessory buildings are regulated either by the CEBC or the CRC. Appendix J of the CRC also offers guidance and alternatives for compliance with the code during renovation of existing buildings. The appendix chapters are only in effect if specifically adopted by the jurisdiction. Appendix J provisions, similar to those found in the CEBC, intend to encourage the continued use or reuse of legally existing buildings and structures.

R202

Definition of Child Care

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Child Care has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Child care. *For the purposes of these regulations, child care means the care of children during any period of a 24-hour day where permanent sleeping accommodations are not provided. The time-period shall not be more than 24 hours.*

> ***Note:*** *"Child care" shall not be construed to preclude the use of cots or mats for napping purposes, provided all employees, attendants and staff personnel are awake and on duty in the area where napping occurs.*

CHANGE SIGNIFICANCE: The change is representative of current regulation as it is printed in California Code of Regulations (CCR) Title 22. For approximately 10 years, the Department of Social Services (DSS) has been transitioning from the term "Day-Care" to "Child-Care." The profession of child-care has evolved into a more inclusive type of care that can include early learning and child development. The caring aspect of the facilities are more emphasized. The State Fire Marshal work group is including the definition to be more consistent between regulations. CCR 22 Section 101152 c (7) "Child-Care Center" or "Day-Care Center" (or "center") means any child-care facility of any capacity, other than a family child-care home as defined in Section 102352f (1), in which less than 24-hour per day non-medical care and supervision are provided to children in a group setting. The term "Child-Care Center" supersedes the term "Day-Care Center" as used in previous regulations.

Example of a child-care facility.

R202
Definition of Day-Care

CHANGE TYPE: Modification

CHANGE SUMMARY: A definition of Day-Care has been modified in the CRC.

2022 CODE TEXT: **R202 Definitions**

Day-care *shall, for the purposes of these regulations, mean the care of persons during any period of a 24-hour day where permanent sleeping accommodations are not provided. The time-period shall not be more than 24 hours.*

> ***Note:*** *"Day-care" shall not be construed to preclude the use of cots or mats for napping purposes, provided all employees, attendants and staff personnel are awake and on duty in the area where napping occurs.*

CHANGE SIGNIFICANCE: Similar to the change significance with the additional definition of Child-Care, this change is representative of current regulation as it is printed in California Code of Regulations (CCR) Title 22. For approximately 10 years, the Department of Social Services (DSS) has been transitioning from the term "Day-Care" to "Child-Care." The profession of child-care has evolved into a more inclusive type of care that can include early learning and child development. The caring aspect of the facilities are more emphasized. The State Fire Marshal work group is including the definition to be more consistent between regulations. CCR 22 Section 101152 c (7) "Child-Care Center" or "Day-Care Center" (or "center") means any child-care facility of any capacity, other than a family child-care home as defined in Section 102352f (1), in which less than 24-hour per day non-medical care and supervision are provided to children in a group setting. The term "Child-Care Center" supersedes the term "Day-Care Center" as used in previous regulations. This will allow the building and fire code officials to classify the occupancy of I-4 or E based on Social Services classifications for licensing. This will be determined by the age of the children within the child-care facility.

Example of a day-care.

R202

Definition of Emergency Escape and Rescue Opening

CHANGE TYPE: Clarification

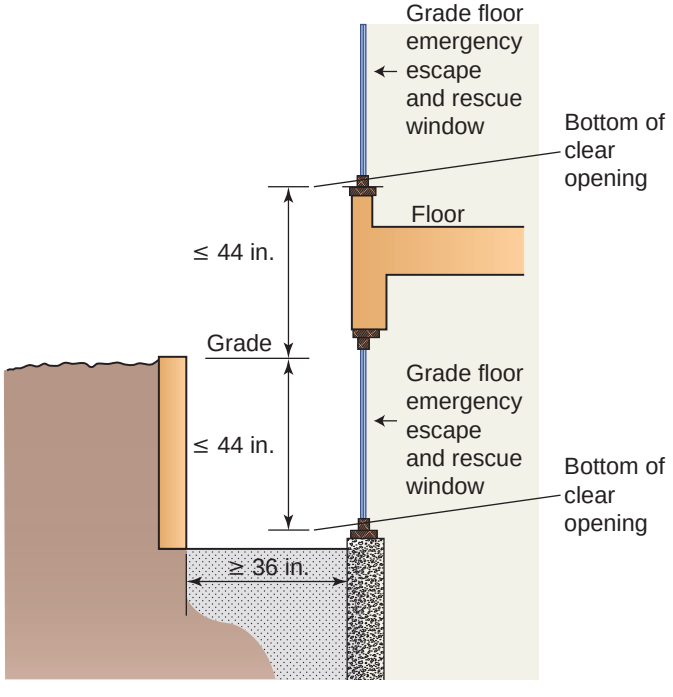
CHANGE SUMMARY: Definitions for emergency escape and rescue openings and grade floor openings have been updated for clarification and to be consistent with the CBC.

2022 CODE TEXT: R202 Definitions

Emergency escape and rescue opening. An operable exterior window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency. (See also "Grade floor emergency escape and rescue opening.")

Grade floor emergency escape and rescue opening. ~~A window or other~~ An emergency escape and rescue opening located such that the ~~sill height~~ bottom of the clear opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also "Emergency escape and rescue opening.")

CHANGE SIGNIFICANCE: The emergency escape and rescue provisions have regularly undergone revisions in past code cycles and the same is true of the 2022 CRC. In conjunction with the reorganization and new text in Section R310, two related definitions have been revised. In part, these changes are for consistency with the CBC and other California codes. They also clarify their meaning and application. In the 2013 CRC, the measurement for the maximum height of the emergency escape opening (often referred to as the sill height) was clearly spelled out as the distance



Grade floor emergency escape and rescue openings require only 5.0 sq. ft. of clear area.

from the finished floor to the lowest point of the net clear opening. Traditionally that has been interpreted and used as the intent of the code, even when the terminology was more ambiguous. The measurement language of the 2013 code was dropped in the 2016 and 2019 editions. Now the definition clearly spells out that the measurement is taken to the lowest point of the opening, which may or may not be a traditional windowsill.

There have been similar misunderstandings related to the definition of grade floor opening. Section R310 has always allowed a reduction in the area of the net clear opening for emergency escape and rescue openings close to grade. This is based on the reduced hazard when compared to escape and rescue from a second or third story opening. However, the definition previously did not mention emergency escape and rescue and its connection to Section R310 was not apparent. As a result, there has been some confusion as to when the exception for reduced opening area was in effect. The code stated that the exception applied to grade floor openings and below grade openings. A literal interpretation of this language would allow a below grade opening deeper than 44 inches below grade and still take advantage of the size reduction, though that was not the intent. To make the connection clear, the definition has been revised to include emergency escape and rescue in the term.

R202

Definition of Entry Level

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Entry Level has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Entry level. *For the purposes of Section R327, entry level is the floor or level of the dwelling unit on which an entry is located.*

CHANGE SIGNIFICANCE: HCD proposed this new definition in the *California Residential Code* (CRC) to clarify the term used in Section R327. There is no implication of whether there are one or more entries into the dwelling unit.

Entry level of a dwelling based upon the entry location.

R202

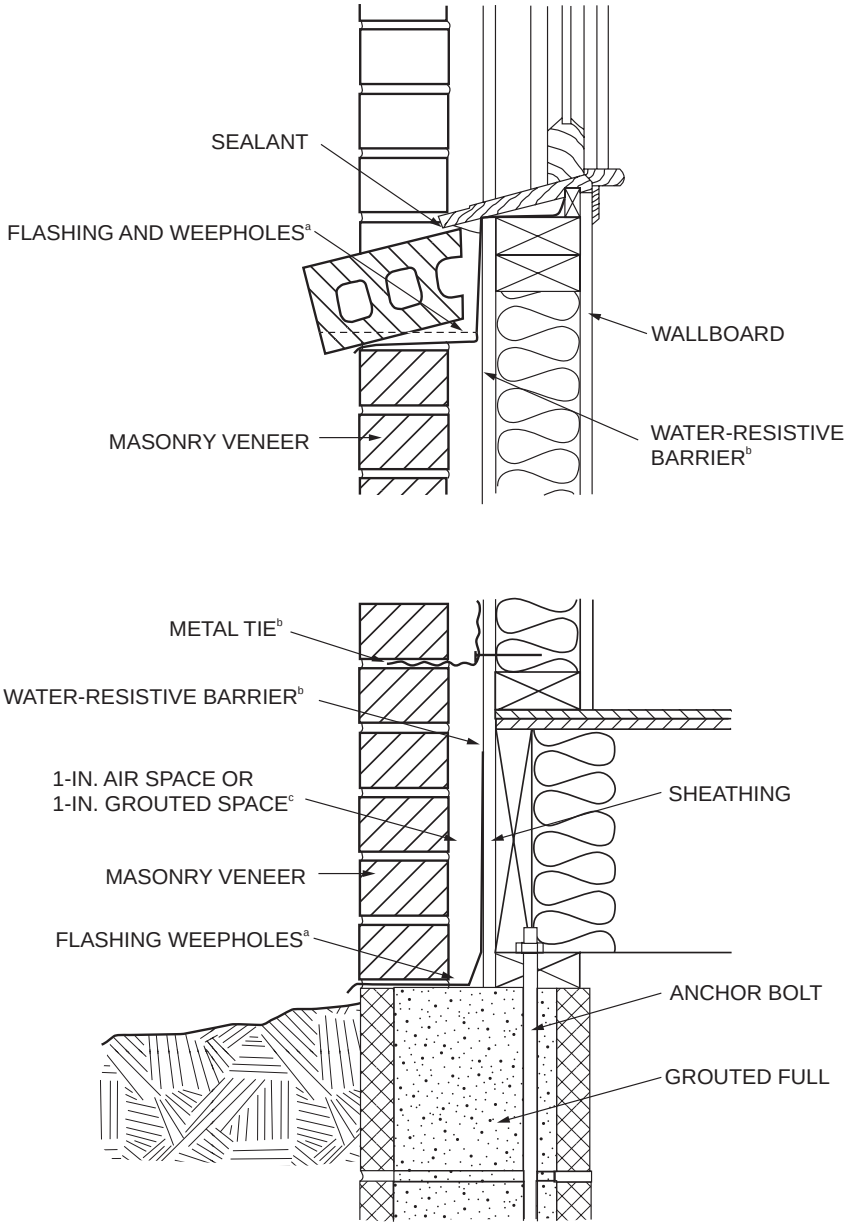
Definition of Exterior Wall Assembly

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Exterior Wall Assembly has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Exterior wall assembly. *A system or assembly of exterior wall components, including exterior wall covering materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment.*



Example of an exterior wall assembly diagram.

CHANGE SIGNIFICANCE: The definition of exterior wall assembly has been added because it was needed to distinguish between different exterior wall products in Section 707 of the *California Building Code*. Further, the term had been used in the previous edition of the CRC; however, it was not defined. Further, Section R337.7.3 contains requirements for both the "exterior wall covering" and the "exterior wall assembly" as though they are the same. In fact, exterior wall coverings and exterior wall assemblies are different, and it is important to separate them. This is being done by splitting Section R337.7.3 into Section R337.7.3 (for coverings) and Section R337.7.4 (for assemblies). The changes to Section R337.7.2 were simply editorial, so it is important also to add a definition of "exterior wall assembly" and of "exterior wall covering."

R202

Definition of Exterior Wall Covering

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Exterior Wall Covering has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Exterior wall covering. *A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, facias, gutters and leaders.*

CHANGE SIGNIFICANCE: The definition of exterior wall covering has been added because it was needed to distinguish between different exterior wall products in Section 707 of the *California Building Code*. Further, the term had been used in the previous edition of the CRC; however, it was not defined. Further, Section R337.7.3 contains requirements for both the "exterior wall covering" and the "exterior wall assembly" as though they are the same. In fact, exterior wall coverings and exterior wall assemblies are different, and it is important to separate them. This is being done by splitting Section R337.7.3 into Section R337.7.3 (for coverings) and Section R337.7.4 (for assemblies). The changes to Section R337.7.2 were simply editorial, so it is important also to add a definition of "exterior wall assembly" and of "exterior wall covering."

Exterior wall covering.

R202

Definition of Inflatable Amusement Device

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Inflatable Amusement Device has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Inflatable amusement device. *A device made of flexible fabric or other combustible materials that is inflated by one or more air-blowers providing internal air pressure to maintain its shape. Such a device is designed for recreational activities that allow occupants to bounce, climb, slide, negotiate an obstacle course or participate in interactive play.*

CHANGE SIGNIFICANCE: It is important to note that an amendment in the Referenced Standards was also made that now includes ASTM F2374, *Standard Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices.* These devices are continuing to become more popular throughout the State of California. Similarly, the number of injuries related to these devices is significant; therefore, the State Fire Marshal proposed the language be included and the ASTM standard be referenced to provide a greater level of safety for the users of these devices and a tool for enforcement by local jurisdictions.

An inflatable amusement device as defined.

R202

Definition of Photovoltaic (PV) System, Ground-Mounted

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Photovoltaic (PV) Panel System, Ground-Mounted has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Photovoltaic (PV) panel system, ground-mounted. *An independent photovoltaic (PV) panel system without useable space underneath, installed directly on the ground.*

CHANGE SIGNIFICANCE: The new definition is already used in Section R324.7 and now has a definition for jurisdictions to better apply ground-mounted photovoltaic panel system requirements as appropriate and differentiate those installations from elevated photovoltaic support structures.

A ground-mounted photovoltaic system.

R202

Definition of Photovoltaic (PV) Support Structure, Elevated

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Photovoltaic (PV) Support Structure, Elevated has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Photovoltaic (PV) support structure, elevated. *An independent photovoltaic (PV) panel support structure designed with useable space underneath with minimum clear height of 7 feet 6 inches (2286 mm), intended for secondary use such as providing shade or parking of motor vehicles.*

CHANGE SIGNIFICANCE: This new definition clarifies the intent of how elevated photovoltaic panel systems and their supports are defined in the code and how the requirements for these structures are applied. Specifically, most PV panels in the marketplace have been fire tested and assigned a "type rating" in accordance with UL 1703. However, some PV panels might not have that fire testing, and could be marked "not fire rated." PV panels marked "not fire rated" cannot be used on elevated/overhead PV structures that could have people or cars beneath them, with or without a full roof assembly. The definition as adopted helps code users to identify applications where these types of panels can or cannot be installed.

A photovoltaic support structure.

R202

Definition of Toddler

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of Toddler has been added to the CRC.

2022 CODE TEXT: **R202 Definitions**

Toddler. *Any child between 18 months and 36 months of age.*

CHANGE SIGNIFICANCE: Day Care facilities are licensed by the Department of Social Services. The classifications of the children are infants: age 0 to 24 months; toddlers: 18 to 36 months; and preschool, etc. The intent of these regulations is to provide a level of safety to the children that are nonambulatory or unable to self-evacuate in an emergency. The conflict is that there is an overlap of the definition of infants and toddlers. The Office of the State Fire Marshal conducted a Day-Care Workgroup to address issues with the current regulations. The workgroup recommended the legal definition of toddlers be picked up from the Health & Safety Code Section 1596.55 and included in the regulations to remove the conflict in the definitions. This proposal will also remove the conflict with the Social Service's classification of day-cares. This will allow the building and fire code officials to classify the occupancy of I-4 or E based on Social Services classifications for licensing. This will be determined by the age of the children within the child-care facility.

A toddler that would require greater level of safety in accordance with the new definition.

R202

Definition of Townhouse

CHANGE TYPE: Clarification

CHANGE SUMMARY: A revised definition of townhouse (a building) and a new definition for townhouse unit (a dwelling unit) clarify the appropriate use of the terms.

2022 CODE TEXT: R202 Definitions

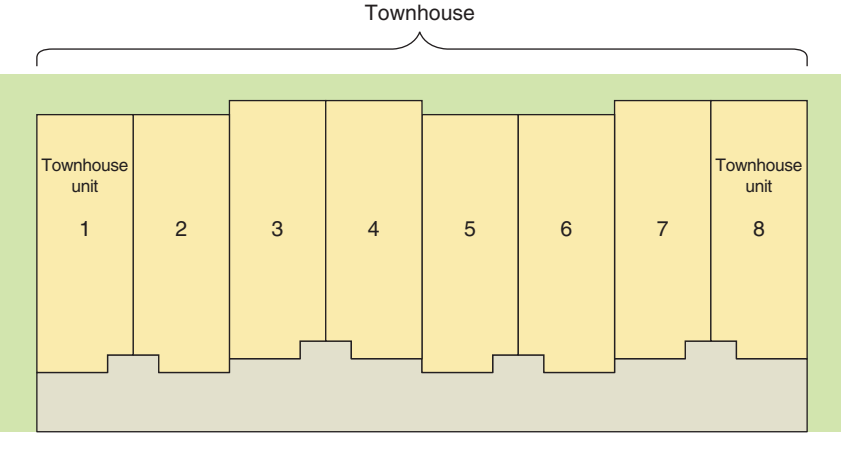
Building. Any one- or two-family dwelling or townhouse, or portion thereof, ~~including townhouses,~~ used or intended to be used for human habitation, for living, sleeping, cooking or eating purposes, or any combination thereof, or any accessory structure.

Exceptions: *For applications listed in Section 1.8.2 regulated by the Department of Housing and Community Development, "Building" shall not include the following:*

1. *Any mobilehome as defined in Health and Safety Code Section 18008.*
2. *Any manufactured home as defined in Health and Safety Code Section 18007.*
3. *Any commercial modular as defined in Health and Safety Code Section 18001.8 or any special purpose commercial modular as defined in Section 18012.5.*
4. *Any recreational vehicle as defined in Health and Safety Code Section 18010.*
5. *Any multifamily manufactured home as defined in Health and Safety Code Section 18008.7. For additional information, see Health and Safety Code Section 18908.*

Note: *Building shall have the same meaning as defined in Health and Safety Code Sections 17920 and 18908 for the applications specified in Section 1.11.*

Townhouse.



Townhouse with 8 townhouse units.

Townhouse. A ~~single-family dwelling unit constructed in a group of~~ building that contains three or more attached townhouse units. ~~in which each unit extends from foundation to roof and with a yard or public way on not less than two sides.~~

Townhouse unit. A single-family dwelling unit in a townhouse that extends from foundation to roof and that has a yard or public way on not less than two sides.

CHANGE SIGNIFICANCE: There has been some confusion and certainly some inconsistency in the use of the term "townhouse." Previously, a townhouse was defined as a single-family dwelling unit in a group of three or more dwelling units in one building. However, the term was used interchangeably to describe the entire building and the individual dwelling units within that building. The new definition of "townhouse unit" intends to remedy that inconsistency. A townhouse unit describes each individual single-family dwelling unit in a townhouse building. Therefore, a townhouse is a building that contains three or more townhouse units. The new terms appear in the townhouse provisions of Section R302.2 and in other locations throughout the code. The definition of building has also been updated to make a direct reference to townhouse in addition to one- and two-family dwellings and accessory structures.

18

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

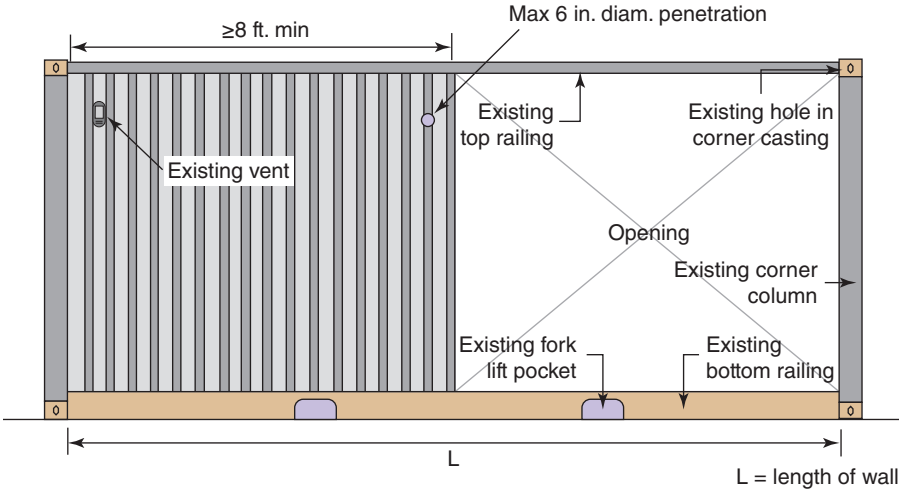
CHANGE SUMMARY: Provisions for construction with intermodal shipping containers are added to the *California Residential Code* (CRC).

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.

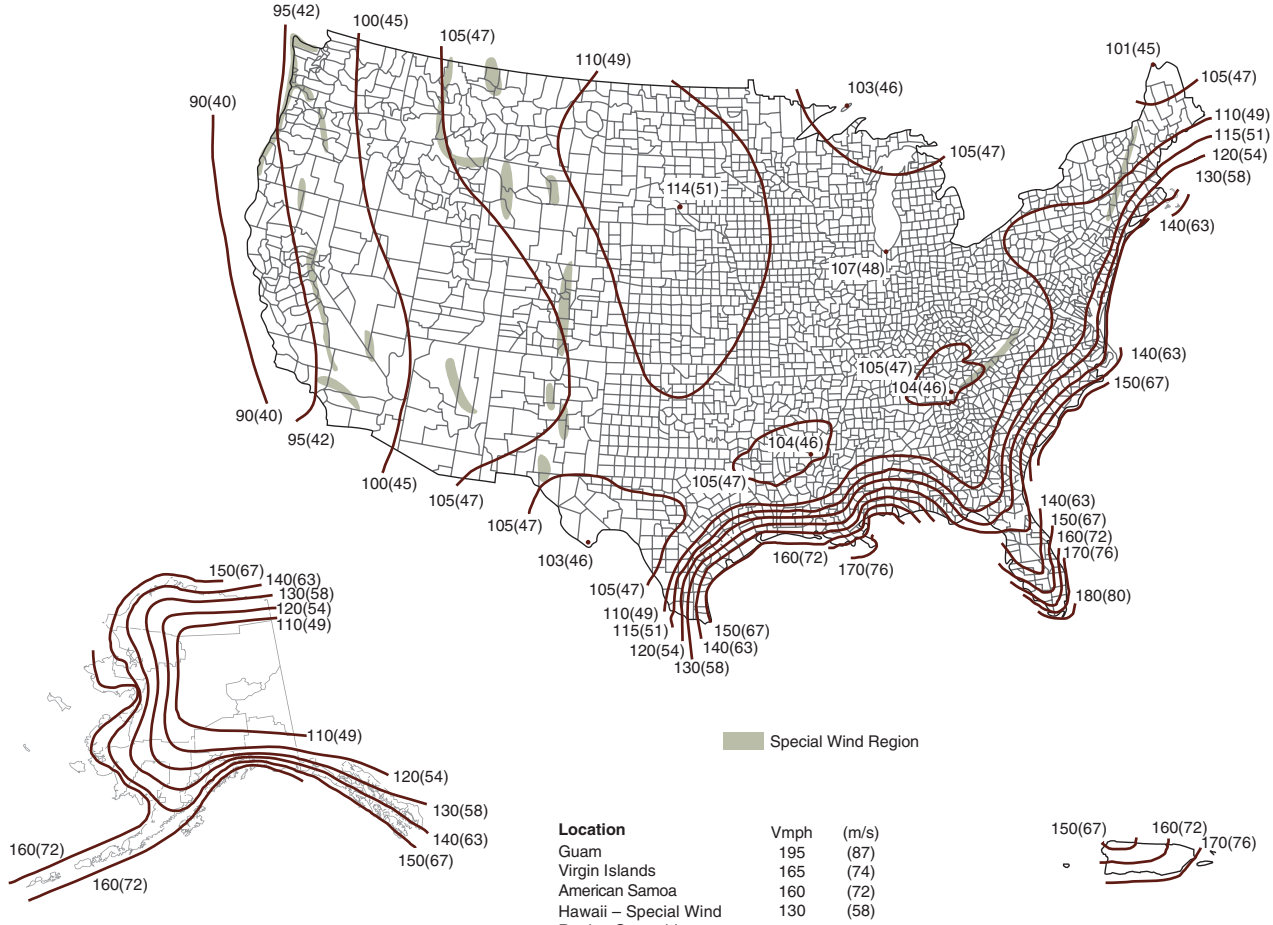
CHANGE TYPE: Modification

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.

R301.2
Wind Speeds

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.)

Roof cladding damage.

CHANGE SIGNIFICANCE: Changes to Section R301.2 coordinate wind design criteria in the CRC with the referenced engineering load standard *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16). Simplified component and cladding loads in Table R301.2.1(1) are revised for consistency with ASCE 7 roof component and cladding loads (C&C) for buildings with mean roof heights less than or equal to 60 feet. The roof zones and pressure coefficients in ASCE 7-16 Figure 30.3-2 (which includes Figures 30.3-2A through 30.3-2I) have been revised based on analysis of an extensive wind tunnel test results database.

Compared to previous versions of the CRC, C&C pressure coefficients have increased. C&C roof zone sizes are also modified. Monitoring of buildings across the country indicates that for low-rise buildings, C&C roof zone sizes depend primarily on building height, *h*. Note that for Exposure B, when the building mean roof height is less than 30 feet, the adjustment is less than 1.0 allowing a reduction in required wind pressure. Mean roof height is defined as the average of the ridge and eave heights.

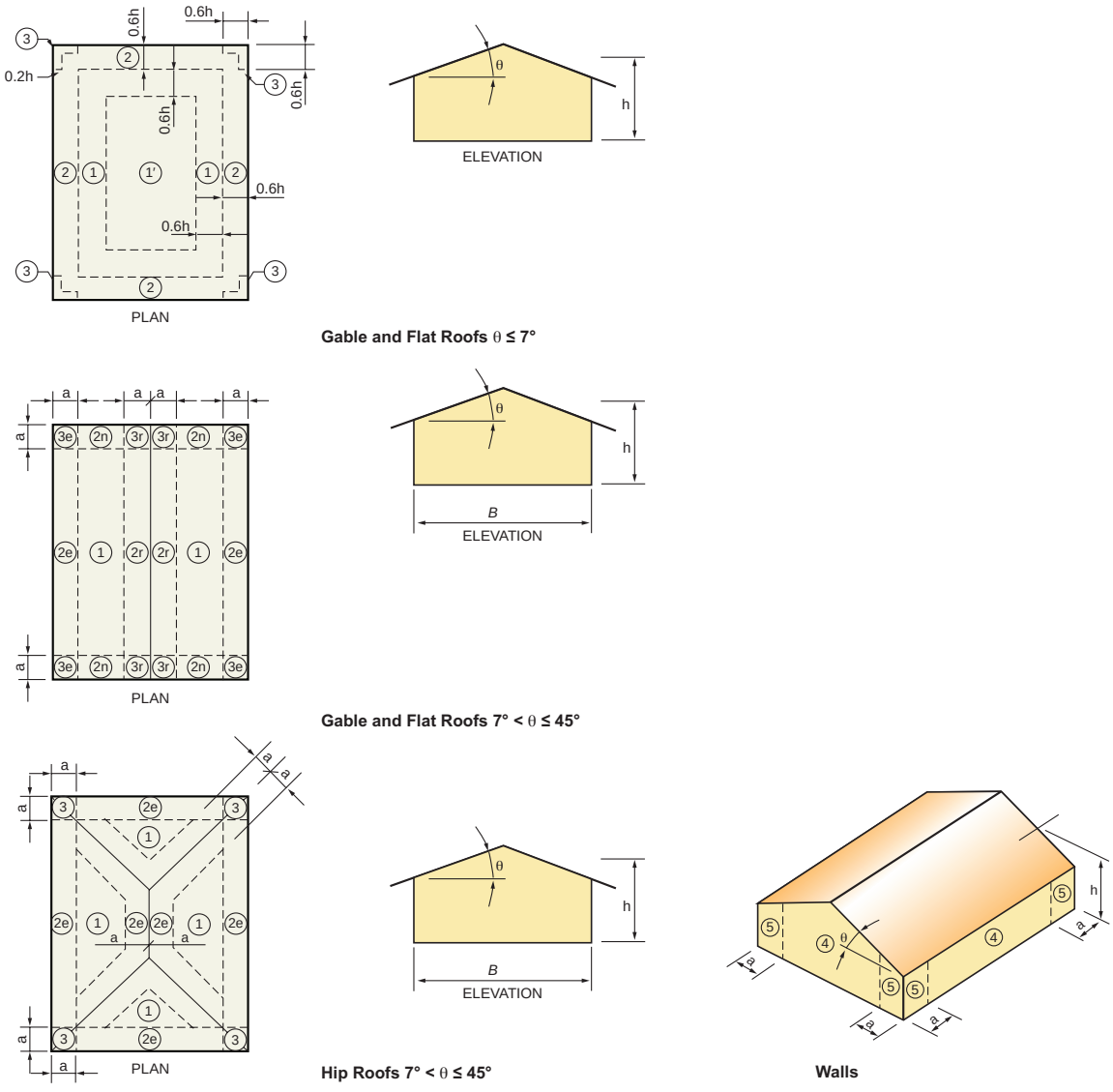
TABLE R301.2.1(2) Height and Exposure Adjustment Coefficients for Table R301.2.1(1)

Mean Roof Height (ft)	Exposure		
	B	C	D
15	0.82 ~~1.00~~	1.21	1.47
20	0.89 ~~1.00~~	1.29	1.55
25	0.94 ~~1.00~~	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70

Figure R301.2.1, component and cladding pressure zones, is illustrated in the figure on gable roof wind zones and shows corner (3, 3e, 3r), edge (2e, 2r, 2n) and interior (1) roof zones. These C&C zones are different from roof zones in previous editions of the CRC. The updated Figure R301.2.1 and Table R301.2.1(1) incorporate recent research by increasing edge and corner wind pressures as appropriate. To better define which roof surface areas require increased wind resistance, gable and hip roofs are divided into two categories and low-slope roofs (0 to 7 degrees) are separated from roofs with shallow slopes (>7 to 20 degrees) and steeper slopes (>20 to 27) and (>27 to 45 degrees). By separating the roof slope into multiple categories and dividing the roof surface into multiple regions, nailing patterns are increased only when necessary and less restrictive patterns can be used where appropriate.

New vocabulary includes division of C&C corner and edge zones as follows:

2 – edge zones
2e – edge zone along bottom of roof above the soffit
2r – edge zone along roof peak
2n – edge zone along rake edge of gable roof



Component and cladding pressure zones.

3 – corner zones
3e – corner zone at bottom of roof above the soffit
3r – corner zone at roof peak
a = 4 feet

Interior C&C zones are broken into two categories. For the CRC, zone 1 and zone 1′ use the same value. If the roof requires design per the CBC, these values will be different.

1 – interior zone
1′ – central interior zone, flat or low slope roof

When considering nailing patterns for buildings constructed following the 2022 CRC, consider how many different nailing patterns are reasonable to require on a single roof. A single nailing pattern is preferred by framers, but in high wind zones, it may be preferable to have a nailing pattern for corner and edge zones with a different pattern in the interior of the roof. Also note that relatively new fasteners, such as Roof Sheathing Ring Shank (RSRS) nails have been tabulated in Table R602.3(1) specifically to address these increased roof wind pressures.

R301.2.1.1

Special Wind Regions

CHANGE TYPE: Clarification

CHANGE SUMMARY: Engineered design requirements for special wind regions are explicitly stated in Section R301.2.1.1.

2022 CODE TEXT: **R301.2.1.1 Wind limitations and wind design required.** The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with ~~Figure R301.2(5)B~~ Figure R301.2.1.1, or where the ultimate design wind speed, V_{ult}, in Figure R301.2(2) equals or exceeds 140 mph in a special wind region.

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.
3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

High winds in a special wind region.

In regions where wind design is required in accordance with ~~Figure R301.2(5)B~~ Figure R301.2.1.1 or where the ultimate design wind speed, V_{ult}, in Figure R301.2(2) equals or exceeds 140 mph in a special wind region, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. AWC *Wood Frame Construction Manual* (WFCM).
2. ICC *Standard for Residential Construction in High-Wind Regions* (ICC 600).
3. ASCE *Minimum Design Loads for Buildings and Other Structures* (ASCE 7).
4. AISI *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings* (AISI S230).
5. *California Building Code*.

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code.

Where ASCE 7 or the *California Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *California Building Code* shall be used.

CHANGE SIGNIFICANCE: The 2019 *California Residential Code* (CRC) did not explicitly prohibit CRC prescriptive provisions in special wind regions for wind speeds less than 140 mph. Rather, special wind regions were identified in the map for areas with wind design required in hurricane prone regions but no text stated whether the special wind region also required wind design. The 2022 CRC clarifies the intent of the code by stating that the CRC prescriptive provisions can be used in special wind regions where the wind speed is less than 140 mph. If design wind speeds are 140 mph or greater, an alternative design method must be followed.

Figure R301.2.1.1 prohibits use of CRC prescriptive provisions for the structural frame of the building in shaded areas of the map which are defined as "wind design required" regions. These regions mainly cover hurricane-prone areas where wind speeds exceed 130 mph (gulf coast and southern Atlantic coast, Caribbean, South Pacific and Hawaii) and other coastal areas where wind speeds exceed 140 mph (northern and central Atlantic coast and Alaska). Special wind regions are also defined on the map, but a special wind region has highly variable wind speeds depending on specific lot locations. Not all wind speeds in these regions are above 140 mph. With this clarification, it is clear that engineering is only required in special wind regions where design wind speeds exceed 140 mph.

Engineered design is also required for buildings on upper slopes of hills when design wind speeds exceed 140 mph. Table R301.2.1.5.1, Ultimate Design Wind Speed Modification for Topographic Wind Effect, now lists wind speeds for buildings on the upper half of a hill for lower design wind speed areas. Values have been added for design wind speeds of 95, 100 and 105 mph.

R301.2.2.6

Irregular Buildings in Seismic Areas

CHANGE TYPE: Addition

CHANGE SUMMARY: Irregular building limitations now include hillside light-frame construction.

2022 CODE TEXT: **R301.2.2.6 Irregular buildings.** The seismic provisions of this code shall not be used for structures, or portions thereof, located in Seismic Design Categories C, D_0, D_1 and D_2 and considered to be irregular in accordance with this section. A building or portion of a building shall be considered to be irregular where one or more of the conditions defined in Items 1 through ~~7~~ 8 occur. Irregular structures, or irregular portions of structures, shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system. Where the forces associated with the irregularity are resisted by a structural system designed in accordance with accepted engineering practice, the remainder of the building shall be permitted to be designed using the provisions of this code.

(No changes to Items 1-7)

8. Hillside light-frame construction. Conditions in which all of the following apply:

8.1. The grade slope exceeds 1 vertical in 5 horizontal where averaged across the full length of any side of the dwelling.

Irregular building shape.

8.2. The tallest cripple wall clear height exceeds 7 feet (2134 mm), or where a post and beam system occurs at the dwelling perimeter, the post and beam system tallest post clear height exceeds 7 feet (2134 mm),

8.3. Of the total plan area below the lowest framed floor, whether open or enclosed, less than 50 percent is living space having interior wall finishes conforming to Section R702.

Where Item 8 is applicable, design in accordance with accepted engineering practice shall be provided for the floor diaphragm immediately above the cripple walls or post and beam system and all structural elements and connections from this diaphragm down to and including connections to the foundation and design of the foundation to transfer lateral loads from the framing above.

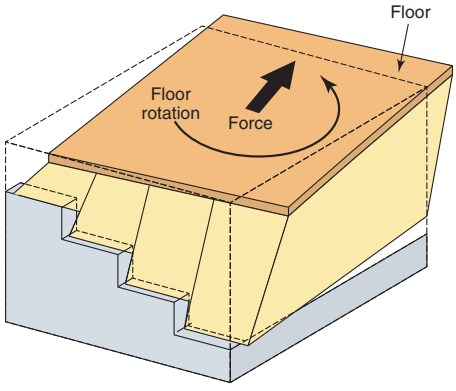
Exception: Light-frame construction in which the lowest framed floor is supported directly on concrete or masonry walls over the full length of all sides except the downhill side of the dwelling need not be considered an irregular dwelling under Item 8.

R202 Cripple wall clear height. The vertical height of a cripple wall from the top of the foundation to the underside of floor framing above.

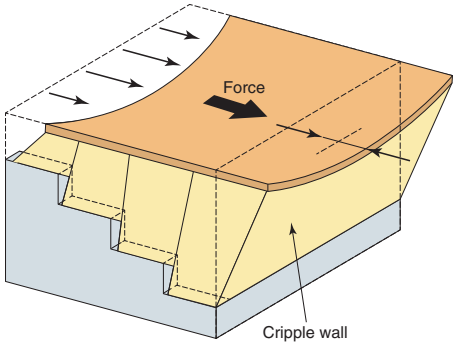
CHANGE SIGNIFICANCE: For light-frame dwellings on steep hillsides, the typical assumption of floor loads transferring to braced wall panels based on the tributary area of a flexible wood floor does not work for adequate seismic performance. Whether earthquake shaking is across the slope or perpendicular to the hill, seismic forces follow the stiffest load path to the uphill foundation, rather than distributing evenly to all braced wall panels as assumed in CRC seismic wall bracing provisions. To address this issue, a trigger was added to Section R301.2.2.6 requiring engineered design of hillside dwellings, now defined as irregular buildings.

Hillside dwellings were found to be vulnerable in the 1994 Northridge, California earthquake. 117 significantly damaged hillside dwellings of typical light-frame wood construction were identified in reconnaissance reporting, with an additional 40 damaged buildings utilizing post and beam foundations. 15 dwellings were reported to have collapsed with another 15 near collapse.

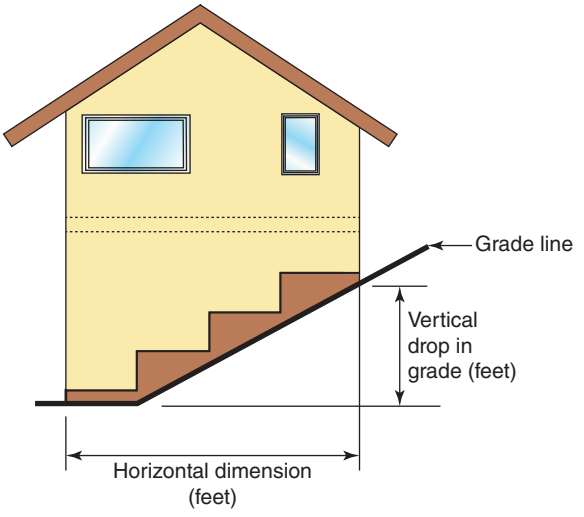
The slope trigger (Item 8.1) is used to limit applicability of this irregularity to dwellings that are on sites with a significant slope. Averaging the grade along the side of the dwelling is intended to focus on the overall elevation drop across the dwelling and not trigger the irregularity based only on limited areas of steeper slope. For most dwellings this criterion will be evaluated by looking at the grade elevation on each side of the building. For large and complex dwellings, additional "sides" will need to be evaluated.



Seismic forces across the slope cause the building to rotate.

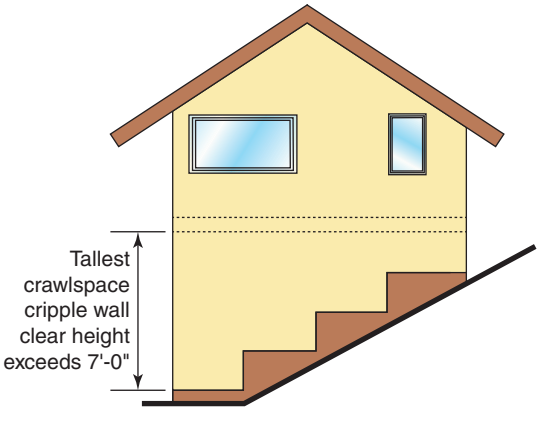


Seismic forces in the direction of the slope move the building downhill causing the center of the foundation to bend or flex inward.

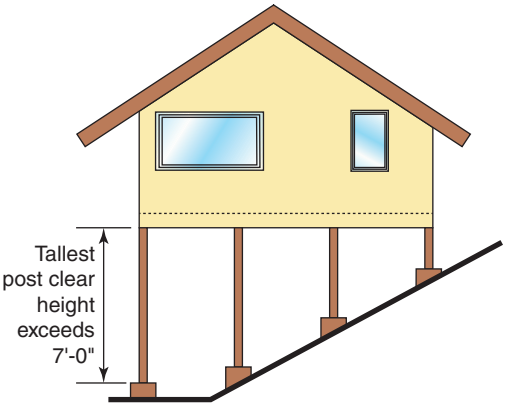


Determine slope by dividing the elevation change by the slope.

A second trigger considers cripple wall height. A cripple wall height or post height greater than seven feet tall triggers an engineered design (Item 8.2). Lastly, where a basement area is less than 50 percent finished and not sheathed with interior finish (Item 8.3), engineering of the bracing system is required. Interior finish stiffens walls, increasing a building's ability to resist earthquake forces. All three triggers must be met before a dwelling is deemed irregular. These triggers were observed as points at which damage and displacements of uphill foundations appear to significantly increase the likelihood of building collapse.



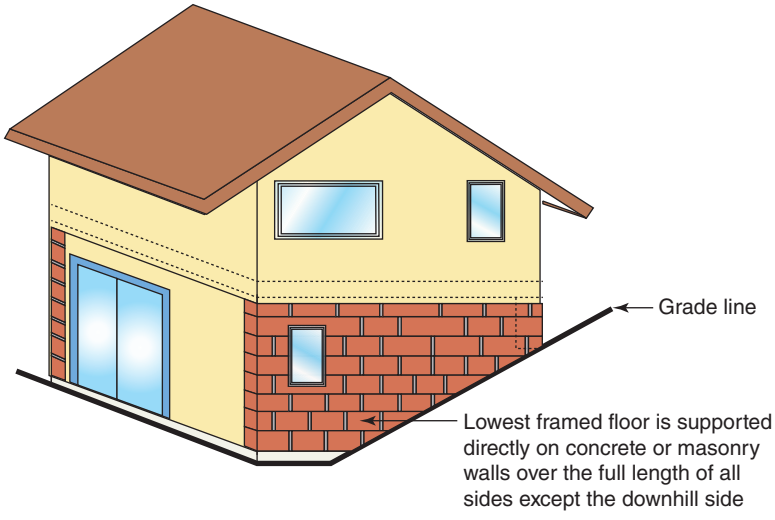
Cripple wall clear height.



Post clear height.

The exception exempts dwellings that have full-height concrete or masonry walls. For a dwelling with a simple rectangular floor plan, full-height concrete or masonry walls would need to occur on three sides (excluding the downhill side) to qualify for the exception. For a more complex dwelling configuration, additional concrete or masonry walls would be required to qualify. Dwellings with doors and windows in the

concrete or masonry walls still qualify for the exception. In all dwellings, the concrete or masonry walls need to conform to applicable CRC provisions. A basement described in the exception could have a wood cripple wall as the downhill side exterior building wall.



Basement with masonry walls on three sides.

R301.3

Story Height

CHANGE TYPE: Clarification

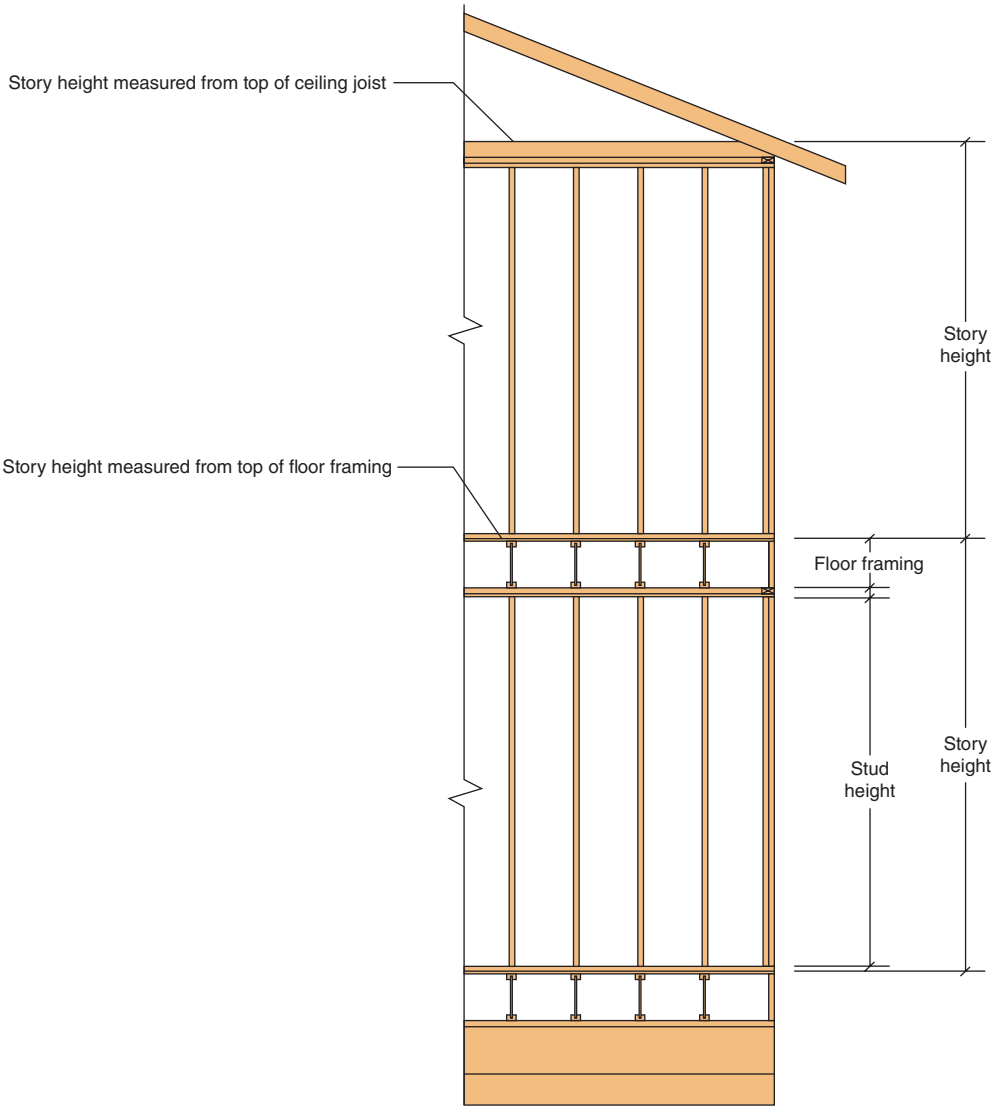
CHANGE SUMMARY: Maximum story height for wood wall framing is 13 feet 7 inches when the exception requirements are met.

2022 CODE TEXT:

R301.3 Story height. The wind and seismic provisions of this code shall apply to buildings with story heights not exceeding the following:

1. For wood wall framing, the story height shall not exceed 11 feet 7 inches (3531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5).

   Exception: A story height not exceeding 13 feet 7 inches (4140 mm) is permitted provided the maximum wall stud clear height does not exceed 12 feet (3658 mm), the wall studs



Story height vs. stud height.

are in accordance with Exception 2 or Exception 3 of Section R602.3.1 or an engineered design is provided for the wall framing members, and wall bracing for the building is in accordance with Section R602.10. Studs shall be laterally supported at the top and bottom plate in accordance with Section R602.3.

2. For cold-formed steel wall framing, the story height shall be not more than 11 feet 7 inches (3531 mm) and the unsupported bearing wall stud height shall be not more than 10 feet (3048 mm).
3. For masonry walls, the story height shall be not more than 13 feet 7 inches (4140 mm) and the bearing wall clear height shall be not more than 12 feet (3658 mm).

   Exception: An additional 8 feet (2438 mm) of bearing wall clear height is permitted for gable end walls.
4. For insulating concrete form walls, the maximum story height shall not exceed 11 feet 7 inches (3531 mm) and the maximum unsupported wall height per story as permitted by Section R608 tables shall not exceed 10 feet (3048 mm).
5. For structural insulated panel (SIP) walls, the story height shall be not more than 11 feet 7 inches (3531 mm) and the bearing wall height per story as permitted by Section R610 tables shall not exceed 10 feet (3048 mm).

For walls other than wood-framed walls, ~~individual~~ walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 ~~provisions~~, provided that the story heights of this section are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the story height limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the *California Building Code*.

CHANGE SIGNIFICANCE: Section R301.3 is updated to address confusion with story height provisions.

In the 2010 CRC, revision of Section R301.3 allowed floor framing members (e.g., i-joists or trusses) deeper than 16 inches to be used if bearing wall stud heights were less than 10 feet. This was accomplished by specifying an overall story height limit of 11 feet 7 inches, based on the sum of a 10 feet 0 inch tall stud, two top and one bottom plate, and 16-inch deep floor framing. This limit superseded the exception which allowed bearing wall studs up to 12 feet tall with wall bracing per Section R602.10, also conflicting with the 12-foot bearing wall height limit for masonry walls.

In the 2016 CRC, this section was revised again by deleting the 11 feet 7 inches story height limit from Section R301.3 and placing it in each individual subsection to which it applied. This addressed the conflict with masonry walls but did not correct the conflict with Section R602.10. The exception for bearing wall studs up to 12 feet was deleted due to concern that code users would double-count adjustment factors for wall bracing. However, no correction was provided for the conflict between story height limits and wall bracing provisions.

A new Table R602.3(6) was added to the 2019 CRC allowing bearing wall stud heights up to 12 feet for limited conditions. The conflict between story height limits, wall bracing provisions and the new table was not addressed. The new provisions relied on the last paragraph of Section R301.3, which stated that individual walls or wall studs could exceed the limits of Section R301.3 when story heights were not exceeded.

The 2022 CRC restores the exception allowing bearing wall stud clear heights to be increased to 12 feet without engineering, provided compliance with Section R602.10 for wall bracing is met. Additionally, one of the two exceptions to 10-foot bearing wall heights in Section R602.3.1 is applicable, including the exception leading to Table R602.3(6). The story height exceptions provide a critical link to provisions allowing a stud height up to 12 feet without engineering. The engineering requirement for studs in tall walls not otherwise complying with one of the Section R602.3.1 exceptions is maintained for gravity and out-of-plane loads.

Section R602.3.1 limits studs above 10 feet in height to lower snow load regions. The ground snow load limit for Exception 2 is 25 pounds per square foot while the limit in Exception 3 is 30 pounds per square foot.

R302.2
Townhouses

CHANGE TYPE: Modification

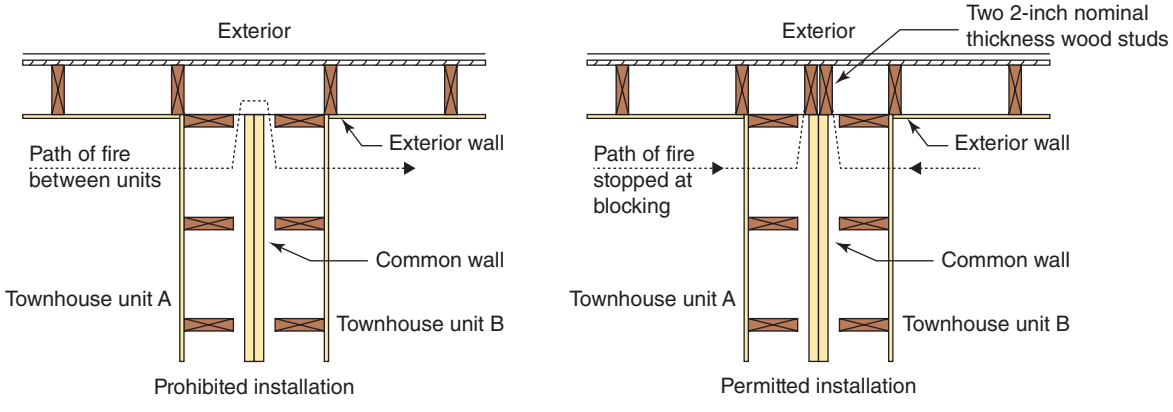
CHANGE SUMMARY: Common walls separating townhouses are permitted to terminate at the inside of exterior walls where the prescribed fireblocking is provided.

2022 CODE TEXT: **R302.2 Townhouses.** Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or R302.2.2 and shall comply with Sections 302.2.3 through 302.2.5.

R302.2.1 Double walls. Each townhouse unit shall be separated from other townhouse units by two 1-hour fire-resistance-rated wall assemblies tested in accordance with ASTM E119, UL 263 or Section ~~703.3~~ 703.2.2 of the *California Building Code*.

R302.2.2 Common walls. Common walls separating ~~townhouses~~ townhouse units shall be assigned a fire-resistance rating in accordance with Item 1 or 2~~.~~ and shall be rated for fire exposure from both sides. Common walls shall extend to and be tight against the exterior sheathing of the exterior walls, or the inside face of exterior walls without stud cavities, and the underside of the roof sheathing. The common wall shared by two ~~townhouses~~ townhouse units shall be constructed without plumbing or mechanical equipment, ducts or vents, other than water-filled fire sprinkler piping, in the cavity of the common wall. ~~The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing.~~ Electrical installations shall be in accordance with the *California Electrical Code*. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

1. Where ~~a fire~~ an automatic sprinkler system in accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance- rated wall assembly tested in accordance with ASTM E119, UL 263 or Section ~~703.3~~ 703.2.2 of the *California Building Code*.



Common wall extending to the inside of the exterior wall.

2. Where ~~a fire~~ an automatic sprinkler system in accordance with Section R313 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section ~~703.3~~ 703.2.2 of the *California Building Code*.

   Exception: Common walls are permitted to extend to and be tight against the inside of the exterior walls if the cavity between the end of the common wall and the exterior sheathing is filled with a minimum of two 2-inch nominal thickness wood studs.

R302.2.3 Continuity. The fire-resistance-rated wall or assembly separating ~~townhouses~~ townhouse units shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed accessory structures.

R302.2.4 Parapets for townhouses. Parapets constructed in accordance with Section R302.2.5 shall be constructed for townhouses as an extension of exterior walls or common walls separating townhouse units in accordance with the following:

Items 1 through 3. *No changes to text.*

R302.2.6 Structural independence. Each ~~individual~~ townhouse unit shall be structurally independent.

Exceptions:

1. Foundations supporting exterior walls or common walls.
2. Structural roof and wall sheathing from each unit fastened to the common wall framing.
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. ~~Townhouses~~ Townhouse units separated by a common wall as provided in Section R302.2.2, Item 1 or 2.
6. Townhouse units protected by a fire sprinkler system complying with *Section R313* or NFPA 13D.

CHANGE SIGNIFICANCE: Section R302.2 has been updated to incorporate the new definition of "townhouse unit" and the revised definition of "townhouse." The terms had sometimes been used interchangeably and inconsistently. In this context, a townhouse is a building that contains three or more dwelling units, now referred to as "townhouse units." The definition of building has also been updated to directly reference townhouses.

There are two recognized methods for the fire-resistant separation between townhouse units: either two 1-hour rated walls or a common wall with a 1-hour rating with fire sprinkler protection or a 2-hour rating without sprinklers. At issue has been the termination point of the common

wall at the intersection with the exterior wall. The code language has been somewhat ambiguous in stating that the common wall must extend to and be tight against exterior walls. To some, this meant that the common wall had to extend through the wall to a termination point at the exterior wall sheathing, while others took it to mean a termination point at the interior side of the exterior wall. For typical frame cavity walls, the language has been revised to require the common wall to extend to and be tight against the exterior sheathing of the exterior wall to block the passage of fire from one townhouse unit to the next. A new exception allows the fire-resistance-rated wall to terminate against the interior side of the exterior wall provided at least two 2-inch nominal thickness wood studs fill the cavity in the exterior wall. Because the code language is very specific as to the fireblocking material, other types of fireblocking to fill this gap would not be allowed unless approved under the alternative methods provisions in Section R104.11.

Where two 1-hour fire-resistance-rated walls are used as the separation, structural independence related to fire resistance is required for each townhouse unit. Some exceptions to this rule appear in Section R302.2.6, including the application of exterior sheathing and finish materials. A new exception strikes the structural independence rule if the townhouse units are protected with a fire sprinkler system complying with Section P2904 or NFPA 13D. This adds another sprinkler incentive to the code to elevate the safety of CRC buildings in those areas of the country that do not adopt the sprinkler provisions of the model code, which require sprinklers in all dwellings and townhouses.

Common walls for separating townhouse units enjoy an advantage in that structural independence is not required. However, the code does add some other conditions regarding common walls; specifically, plumbing and mechanical piping, equipment, ducts and vents are not allowed in the common wall. In a new exception, the code now permits water filled sprinkler piping to be in the common wall based on the added safety provided by sprinklers outweighing any negative impact on the effectiveness of the rated common wall. Allowing common fire sprinkler piping to protect multiple townhouse units in a townhouse building can significantly reduce installation costs, and the provision is consistent with the CBC, which allows penetration of townhouse separation walls in any townhouse that does not exceed the height and area limits. See Sections R302.4.1 and R302.4.2 for additional information on sprinkler piping penetrations of fire-resistance-rated assemblies.

R302.3

Two-Family Dwelling Separation

CHANGE TYPE: Modification

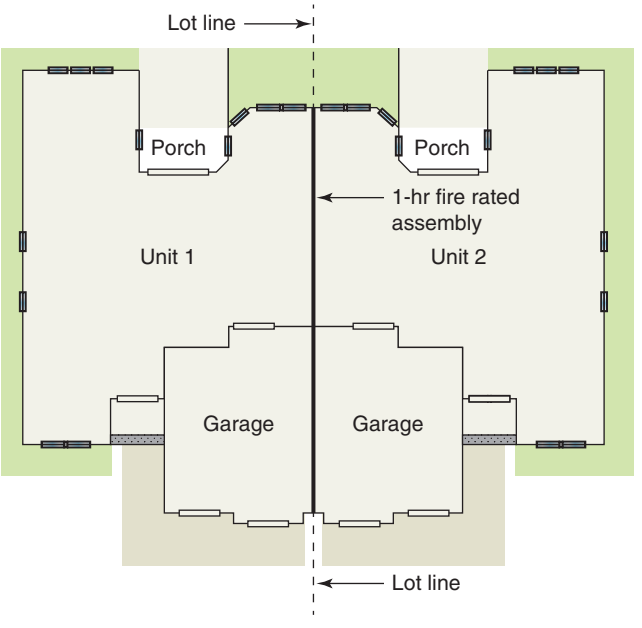
CHANGE SUMMARY: The prescribed fire-resistance-rated separation between two dwelling units in a single building is not affected by the presence of a lot line between the units.

2022 CODE TEXT: **R302.3 Two-family dwellings.** Dwelling units in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM E119, UL 263 or Section ~~703.3~~ 703.2.2 of the *California Building Code*. Such separation shall be provided regardless of whether a lot line exists between the two dwelling units or not. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

1. A fire-resistance rating of ½ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with ~~NFPA 13~~ *Section R313*.
2. Wall assemblies need not extend through attic spaces where the ceiling is protected by not less than ⅝-inch (15.9 mm) Type X gypsum board, an attic draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the dwellings and the structural framing supporting the ceiling is protected by not less than ½-inch (12.7 mm) gypsum board or equivalent.

Two-family dwelling.



Two-family dwelling separated by lot line and 1-hr fire-resistant separation.

CHANGE SIGNIFICANCE: Unlike townhouse unit separations, two-family dwellings (duplexes) only require a 1-hour fire-resistance-rated separation between dwelling units. It has been debated whether a lot line between the dwelling units (which is common in some areas of the country and not common in others) impacts this separation requirement. The question has been whether the lot line means that the wall at the separation is considered to be an exterior wall that needs to meet the provisions of Section R302.1, resulting in two 1-hour walls at the lot line. In some jurisdictions, the answer was yes. Further, in some cases with a separating lot line, the interpretation has been that the building is no longer a two-family dwelling, but two separate detached single-family dwellings, each requiring a 1-hour wall at the lot line. In other jurisdictions, the answer was no: a duplex is a duplex no matter if the dwelling units are divided by a lot line. The reasoning behind this approach was that the fire does not know if there is a lot line there and only the 1-hour separation applies. The change to this section intends to end the debate and clarify the application of this separation. The intent of the new language is that a fire-resistance rating need never be greater than 1 hour, whether there is a lot line between dwelling units or not. For the lot line question, this brings the two-family dwelling provisions into agreement with the townhouse provisions. If the townhouse has fire sprinkler protection, a common 1-hour wall has been acceptable even if there was a lot line between townhouse units. If the exterior wall provisions in Section R302.1 were applied to townhouses, the 1-hour common wall would not be allowed.

Presumably, this change to the code allowing a 1-hour separation when there is a lot line between duplex dwelling units is meant to apply to the exception as well. The exception permits a draft stop to separate the attics of the dwelling units if other fire-resistance requirements are satisfied.

Another exception to the 1-hour separation requirement for two-family dwellings has allowed the rating to be reduced to ½ hour if a full NFPA 13 sprinkler system was installed. This exception has not been used nor would it be used because of the extra cost associated with a full NFPA 13 system typically associated with commercial structures. The cost would far outweigh any savings realized from reducing the rating from 1 hour to ½ hour. As another incentive to install a sprinkler system for areas of the country that do not adopt the CRC sprinkler provisions, a dwelling sprinkler system installed in accordance with Section P2904 or NFPA 13D now can be used to reduce the rating to ½ hour.

R302.4

Dwelling Unit Rated Penetrations

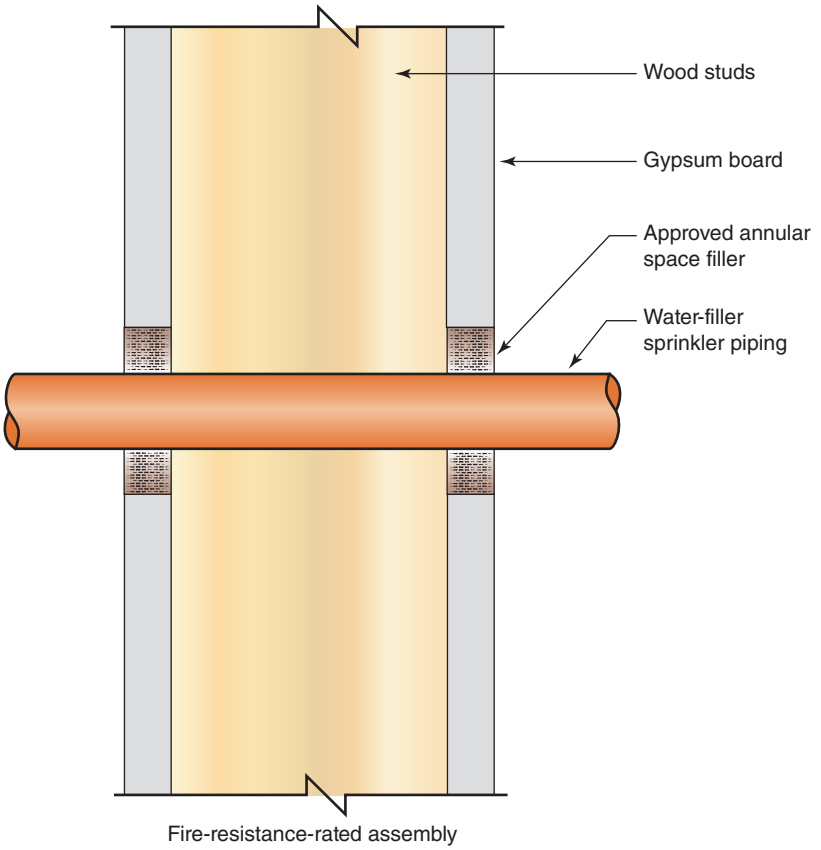
CHANGE TYPE: Clarification

CHANGE SUMMARY: Water-filled fire sprinkler piping of any approved material joins the list of metal penetrating items that do not require a firestop system provided the annular space is filled with the prescribed materials.

2022 CODE TEXT: **R302.4.1 Through penetrations.** Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

Exceptions:

1. Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space shall be protected as follows:
   - ~~1.~~ 1.1. In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided that both of the following are complied with:
     - ~~1.1~~ 1.1.1. The nominal diameter of the penetrating item is not more than 6 inches (152 mm).
     - ~~1.2~~ 1.1.2. The area of the opening through the wall does not exceed 144 square inches (92 900 mm^2).



Water-filled fire sprinkler piping penetrating a fire-rated assembly.

~~2.~~ 1.2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 or UL 263 time temperature fire conditions under a positive pressure differential of not less than 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

2. The annular space created by the penetration of water-filled fire sprinkler piping, provided that the annular space is filled using a material complying with Item 1.2 of Exception 1.

R302.4.2 Membrane penetrations. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced.

Exceptions:

1. and 2. *No changes to text.*

3. The annular space created by the penetration of a fire sprinkler or water-filled fire sprinkler piping, provided that ~~it~~ the annular space is covered by a metal escutcheon plate.

4. *No changes to text.*

CHANGE SIGNIFICANCE: When items such as pipes or ducts penetrate one or both sides of the fire-resistance-rated wall assembly separating dwelling units, both the penetrating item and the space around it must be protected to maintain the integrity of the fire-resistant assembly. In general, penetrations by metal pipe require that the space around the pipe be filled with approved materials to prevent the passage of flame and hot gases. Other penetrating materials, such as plastic pipe, must be protected by an approved penetration fire-stop system. Such a system often consists of intumescent material that expands when heated by fire conditions, filling the penetration as the plastic pipe melts and preserving the fire-resistance rating of the wall assembly.

Listed nonmetallic fire sprinkler piping is ignition resistant and will not sustain combustion. The CRC now permits water-filled fire sprinkler piping to penetrate a fire-resistance-rated membrane or both membranes of a through penetration without a listed firestop system provided that the annular space is filled using an approved material. This matches the installation requirements for metal piping penetrations. Exception 1.2 of Section R302.4.1 sets the criteria for the material filling the annular space of the membrane or through penetration.

R302.5

Dwelling-Garage Opening Protection

CHANGE TYPE: Clarification

CHANGE SUMMARY: Doors between the garage and residence must be self-latching.

2022 CODE TEXT: **R302.5 Dwelling-garage opening and penetration protection.** Openings and penetrations through the walls or ceilings separating the dwelling from the garage shall be in accordance with Sections R302.5.1 through R302.5.3.

R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1⅜ inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1⅜ inches (35 mm) thick, or 20-minute fire-rated doors. Doors shall be self-latching and equipped with a self-closing or an automatic-closing device.

> ***Exception:*** *Where the residence and the private garage are protected by an automatic residential fire sprinkler system in accordance with Sections R309.6 and R313, other door openings between the private garage and the residence need only be self-closing and self-latching. This exception shall not apply to rooms used for sleeping purposes.*

CHANGE SIGNIFICANCE: To provide some minimum protection against the spread of a fire that originates in the attached garage, the CRC has always required some fire resistance for the separation between the garage and dwelling unit. Typically, this requirement is satisfied with the application of regular ½-inch gypsum board on the garage side of the separation. This separation is not a fire-resistant-rated assembly, but simply a layer of approved material installed on the garage side to provide

Door from garage to house must be self-closing and self-latching.

some resistance to fire that originates in the garage and slows spread into the dwelling unit. Similarly, the code does not require a fire-resistant-rated door assembly for the opening between the garage and residence. Instead, the CRC prescribes the type and thickness of the door or requires a 20-minute rating for the door slab. The requirement for self-closing devices introduced in the 2013 CRC intended that the door return to a closed position after opening to address concerns related to increased fuel loads in garages, and the potential for fire and the related toxic combustion byproducts to migrate into the dwelling unit. Although Sections R302.5 and R302.6 are primarily concerned with fire resistance, the decision to place self-closing devices in the code was also intended to prevent carbon monoxide from the exhaust of vehicles operating in a garage from entering the dwelling unit. Having a closed door between the garage and residence supplements the safeguards of required smoke and carbon monoxide alarms. Self-closing devices are typically spring-loaded hinges or door closers. An automatic closing device is also permitted but is not typically seen in one- and two- family dwellings.

New to the 2022 edition, the code adds that the self-closing door must also be self-latching. In this case the smooth operation of the door and strength of the self-closing device need to be sufficient for the latch to engage and the door to be secured. Self-latching was judged to be as important as self-closing. Air pressures caused by a fire could cause doors without a self-latching device to overpower the closing device and push open. The provision for dwelling-garage opening protection is consistent with the premise that closed doors limit the spread and impact of residential fires and addresses the increased fire hazard in garages.

R303.1

Mechanical Ventilation

CHANGE TYPE: Clarification

CHANGE SUMMARY: A local exhaust system is an acceptable substitute for natural ventilation in kitchens.

2022 CODE TEXT: **R303.1 Habitable rooms.** Habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural ventilation shall be through windows, skylights, doors, louvers or other approved openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The openable area to the outdoors shall be not less than 4 percent of the floor area being ventilated.

Exceptions:

1. ~~The~~ For habitable rooms other than kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical ventilation system or a mechanical ventilation system capable of producing 0.35 air changes per hour in the habitable rooms is installed in accordance with the *California Mechanical Code*.
2. For kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a local exhaust system is installed in accordance with the *California Mechanical Code*.
3. ~~2.~~ The glazed areas need not be installed in rooms where Exception 1 is satisfied and artificial light is provided that is capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

Local exhaust mechanical ventilation for a kitchen substitutes for an openable window.

~~3.~~**4.** Use of sunroom and patio covers, as defined in Section R202, shall be permitted for natural ventilation if in excess of 40 percent of the exterior sunroom walls are open, or are enclosed only by insect screening.

5. *The windows, doors, louvers and other approved closeable openings not required by Section R310 may open into a passive solar energy collector for ventilation required by this section. The area of ventilation openings to the outside of the passive solar energy collector shall be increased to compensate for the openings required by the interior space.*

6. *Glazed openings may open into a passive solar energy collector provided the area of exterior glazed opening(s) into the passive solar energy collector is increased to compensate for the area required by the interior space.*

CHANGE SIGNIFICANCE: To provide flexibility in satisfying the ventilation air requirements, the code adds some options for mechanical ventilation. Prior to the 2013 edition, the CRC provided an option for mechanical ventilation systems capable of producing 0.35 air changes per hour (ACH) or whole-house mechanical ventilation systems where the prescribed natural ventilation was not provided. In the 2013 CRC, the first option was deleted in favor of the whole house mechanical ventilation system covered in the mechanical provisions of Chapter 15. The 2022 code reintroduces the option for 0.35 ACH for room-based mechanical ventilation systems, which are especially useful for additions or remodels. The code also now specifically recognizes that a local exhaust system (e.g., a kitchen exhaust hood) is an acceptable substitute for natural ventilation in kitchens. This is consistent with provisions in Chapter 15 that recognize kitchens have different ventilation requirements than other habitable rooms. The intent is to clarify that local exhaust, not whole-house mechanical ventilation that could be located in a far corner of the house, is needed for kitchens to ensure that cooking pollutants generated in the kitchen are captured and exhausted at their source. The CRC sets installation requirements for kitchen exhaust but has not previously required a range hood. The intent of the change to the exceptions in Section R303.1 is to require local mechanical exhaust in the kitchen if natural ventilation through openable windows and doors is not provided.

R305.1
Ceiling Height

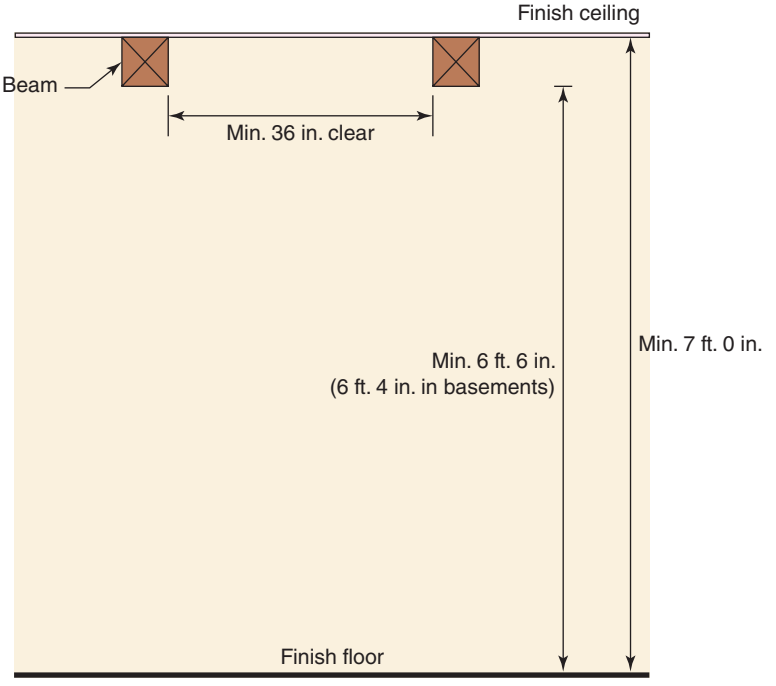
CHANGE TYPE: Modification

CHANGE SUMMARY: The minimum ceiling height is reduced to 6 feet 6 inches under beams spaced at least 36 inches apart.

2022 CODE TEXT: **R305.1 Minimum height.** Habitable space, hallways and portions of basements containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm). Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exceptions:

1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet (1524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2134 mm).
2. The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches (2032 mm) above an area of not less than 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.
3. Beams, girders, ducts or other obstructions in basements containing habitable space shall be permitted to project to within 6 feet 4 inches (1931 mm) of the finished floor.
4. Beams and girders spaced apart not less than 36 inches (914 mm) in clear finished width shall project not more than 78 inches (1981 mm) from the finished floor.



Habitable space ceiling heights.

CHANGE SIGNIFICANCE: Prior to the 2010 edition of the CRC, an exception to the general rule for a minimum ceiling height of 7 feet allowed beams to project 6 inches below that ceiling height provided they were spaced at least 4 feet apart. That language was removed in the 2010 code because there was consensus that the minimum ceiling height of 7 feet was reasonable to be maintained under spaced beams. At that time, portions of unfinished basements could have beams, girders and ducts with a minimum ceiling height of 6 feet 4 inches. In the 2016 CRC, that exception was expanded to include these projections in all spaces in basements including habitable space.

Although the new exception sets a maximum projection from the floor, the intent of the language in the code is to allow beams to project from the ceiling such that the base of the beam is at least 6 feet 6 inches above the floor. The minimum finish-to-finish horizontal dimension between the beams is 36 inches. The exception would not be applicable to basements as the code already permits a ceiling height reduction to 6 feet 4 inches for beams, girders and ductwork in basements. The new exception is a result of concern expressed that the size of beams and girders has increased in recent years with the advent of engineered lumber and open floor plans, and that a ceiling height of 7 feet was not always achievable. The height of 6 feet 6 inches was chosen based on the clear height dimension of the one required egress door measured from the threshold to the underside of the head stop. The code does not regulate the dimensions of other doors in the house, but typically they maintain a clear height exceeding 6 feet 6 inches.

R308.4.5

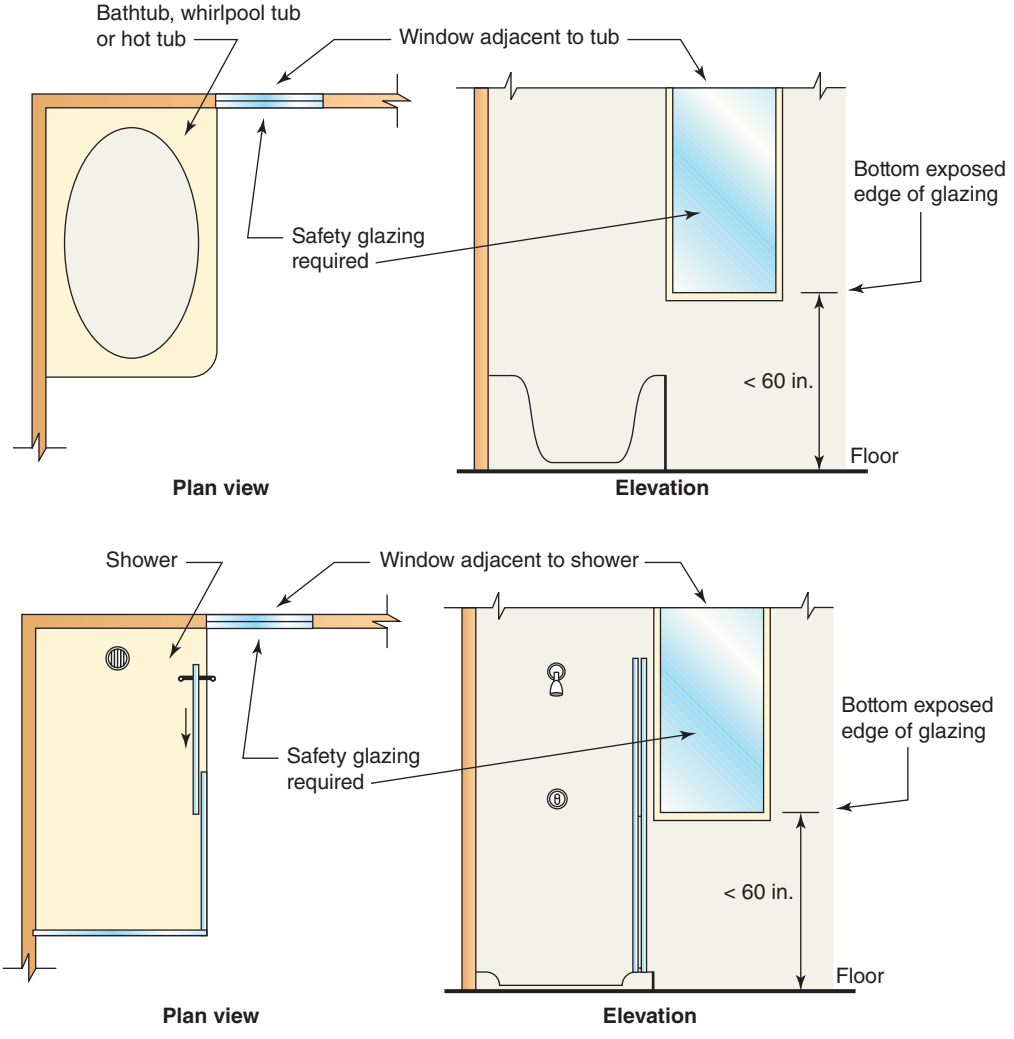
Glazing and Wet Surfaces

CHANGE TYPE: Clarification

CHANGE SUMMARY: The language addressing glazing in walls, enclosures or fences near tubs, showers and swimming pools has replaced the word "facing" with the words "adjacent to" for those elements related to wet surfaces.

2022 CODE TEXT: **R308.4.5 Glazing and wet surfaces.** Glazing in walls, enclosures or fences containing or ~~facing~~ adjacent to hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

> **Exception:** Glazing that is more than 60 inches (1524 mm), measured horizontally ~~and in a straight line~~, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.



Glazing adjacent tubs and showers.

CHANGE SIGNIFICANCE: Glazing installed in the vicinity of tubs, showers and swimming pools is considered to be in a hazardous location because of the increased likelihood of slips and falls on wet surfaces, with the potential for injury from falling into and breaking the glass. Therefore, the code requires that glazing installed in these locations must be safety glazing. As with all of the hazardous locations identified in Section R308.4, changes to the language in this section over several code development cycles have attempted to make the provisions more objectively measurable and easier to understand.

There has been some debate as to the proper interpretation and application of the glazing provisions related to wet surfaces. It has been clear that glass enclosing tubs, showers, spas and swimming pools (to name the common items under consideration) has to be safety glazing unless meeting the minimum height above the walking surface. Less clear is the application to glazing that is located some distance horizontally from these fixtures and areas. The code has generally established a zone that is within 60 inches horizontally of the water's edge (the edge of a shower) as a potentially wet surface and hazardous location. The 60-inch measurement originated in the early editions of the code where it was applied to swimming pools to create a 60-inch buffer zone between the water and standard glazing. The 60-inch horizontal measurement relating to tubs and showers first appeared in the 2010 edition of the CRC. The safety glazing rules for swimming pools and tubs and showers were merged in the 2013 edition of the code. Part of the ongoing confusion is that, at least since the 2013 edition, the 60-inch horizontal measurement is written as an exception to the main rule.

It follows that various interpretations are not always in agreement. For example, a majority of code users have determined that glazing within 60 inches in any direction requires safety glazing, unless there is some barrier in place to separate the wet surface from the glazing. Others have said that only the glazing that faces the tub, shower or swimming pool is regulated in that 60-inch zone and exclude glazing that is perpendicular and not enclosing the fixture. This change intends to remedy these differences by using the word "adjacent" rather than "facing" to describe the location of the glazing. This is similar to language used to describe glazing adjacent to the bottom stair landing. For stairs, the term adjacent and the 60-inch dimension appear together in the main code section with text accompanied by a figure to clarify the application.

The intent of the change to Section R308.4.5, Glazing and Wet Surfaces, is to apply the horizontal measurement provision in the same way as the bottom stair landing in Section R308.4.7. A person is just as likely to slip and fall to the side as a person is to fall forward. Depending on how the word "adjacent" is interpreted, there may again be some disagreement as to the application. However, the intent is to protect occupants from falling into glass in any orientation when they are in the slippery area within 60 inches of the tub or shower or the other described areas.

R308.6

Skylight Glass Retention Screens

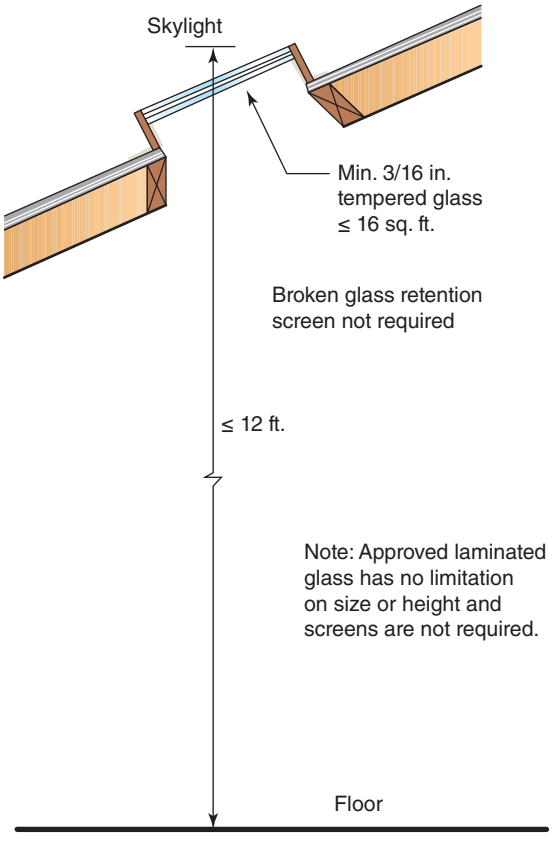
CHANGE TYPE: Clarification

CHANGE SUMMARY: New terminology clarifies the broken glass retention screen requirements for skylights.

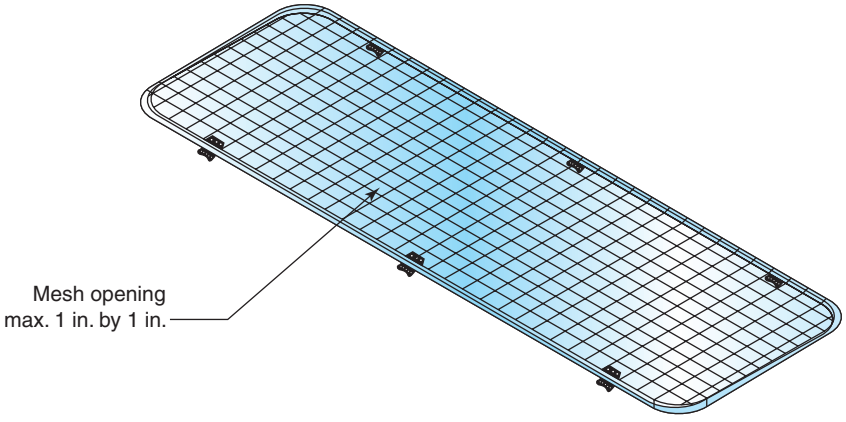
2022 CODE TEXT: **R308.6.2 Materials.** Glazing materials shall be limited to the following:

1. Laminated glass with not less than a 0.015-inch (0.38 mm) polyvinyl butyral interlayer for glass panes 16 square feet (1.5 m^2) or less in area located such that the highest point of the glass is not more than 12 feet (3658 mm) above a walking surface; for higher or larger sizes, the interlayer thickness shall be not less than 0.030 inch (0.76 mm).
2. Fully tempered glass.
3. Heat-strengthened glass.
4. Wired glass.
5. Approved rigid plastics.

R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a ~~retaining~~ broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for fully tempered glass that meets ~~either~~ condition 1 or 2 listed in Section R308.6.5.



Broken glass retention screens are not required for laminated glass or when meeting the size, height and material limitations for tempered glass.



Broken glass retention screen.

R308.6.4 Screens with multiple glazing. Where the inboard pane is fully tempered, heat-strengthened or wired glass, a ~~retaining~~ broken glass retention screen meeting the requirements of Section R308.6.7 shall be installed below the full area of the glass, except for ~~either condition~~ Condition 1 or 2 listed in Section R308.6.5. Other panes in the multiple glazing shall be of any type listed in Section R308.6.2.

R308.6.5 Screens not required. Screens shall not be required where laminated glass complying with item 1 of Section R308.6.2 is used as single glazing or the inboard pane in multiple glazing. Screens shall not be required where fully tempered glass is used as single glazing or the inboard pane in multiple glazing and either of the following conditions are met:

1. The glass area is 16 square feet (1.49 m^2) or less; the highest point of glass is not more than 12 feet (3658 mm) above a walking surface; the nominal glass thickness is not more than 3/16 inch (4.8 mm); and, ~~(~~for multiple glazing only~~)~~, the other pane or panes are fully tempered, laminated or wired glass.
2. The glass area is greater than 16 square feet (1.49 m^2); the glass is sloped 30 degrees (0.52 rad) or less from vertical; and the highest point of glass is not more than 10 feet (3048 mm) above a walking surface.

R308.6.7 Screen characteristics. The screen and its fastenings shall: be capable of supporting twice the weight of the glazing~~.~~; be firmly and substantially fastened to the framing members~~.~~; be installed within 4 inches (102 mm) of the glass; and have a mesh opening of not ~~more~~ greater than 1 inch by 1 inch (25 mm by 25 mm).

CHANGE SIGNIFICANCE: Previous language related to the installation of "retaining" screens below unit skylights has caused some confusion and occasionally misinterpretation resulting in the installation of screens where they were not required. In some cases, skylight manufacturers have been asked to intervene to ensure that unsightly, unnecessary screens are not installed in these instances. Furthermore, in some instances, an optional skylight installation is removed from submitted plans due to misinterpretation at the plan review stage. In reality, glass retention screens

are rarely required in CRC buildings and are never required if qualifying laminated glass is used in the skylight. The previous code language addressed qualifying laminated glass by simple omission from the sections dealing with screens. It was this omission that seemed to create some confusion within the industry. The added sentence in Section R308.6.5 states directly that permitted laminated glass does not require retention screens.

To further clarify the application, the terminology has been modified to fully describe the purpose of the screens as broken glass retention screens. This is to ensure readers do not confuse them with insect screens or fall protection screens, which are physically different and will not serve as effective retention screens. The hazard being addressed is to retain larger pieces of broken glass from falling on and injuring occupants.

Changes to Section R308.6.7 addressing the physical characteristics of the retention screens, if required, are consistent with the language in CBC Section 2405.3. None of the changes to the code text affect the longstanding requirements, but simply clarify the provisions to ensure more consistent enforcement.

R310.1

Emergency Escape and Rescue Opening Required

CHANGE TYPE: Modification

CHANGE SUMMARY: Section R310 has been modified to correlate regulations in the *California Residential Code* with those previously contained within the *California Building Code* related to Emergency Escape and Rescue Openings. The changes made were to ensure continuity and consistency between the two codes for Emergency Escape and Rescue openings.

2022 CODE TEXT: **R310.1 Emergency escape and rescue opening required.** Basements, habitable attics, and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way.

Exceptions:

(Deleted text not shown for brevity)

1. *Basements with a ceiling height of less than 80 inches (2032 mm) shall not be required to have emergency escape and rescue openings.*
2. *Emergency escape and rescue openings are not required from basements or sleeping rooms that have an exit door or exit access door that opens directly into a public way or to a yard, court or exterior egress balcony that opens to a public way.*

An emergency escape and rescue opening in use during a fire.

3. *Basements without habitable spaces and having not more than 200 square feet (18.6 m^2) in floor area shall not be required to have emergency escape and rescue openings.*
4. *Storm shelters are not required to comply with this section where the shelter is constructed in accordance with ICC 500.*
5. *Where the dwelling unit or townhouse unit is equipped with an automatic sprinkler system installed in accordance with Section R313, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:*
    - 5.1. *One means of egress complying with Section R311 and one emergency escape and rescue opening.*
    - 5.2. *Two means of egress complying with Section R311.*

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be maintained free of any obstructions other than those allowed by this section and shall be operational from the inside of the room without the use of keys, tools, or special knowledge. Window opening control devices and fall prevention devices complying with ASTM F2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening and shall be not more than 70 inches (178 cm) above the finished floor. The release mechanism shall be maintained operable at all times.

Such bars, grills, grates, or any similar devices shall be equipped with an approved exterior release device for use by the fire department only when required by the authority having jurisdiction.

Where security bars (burglar bars) are installed on emergency egress and rescue windows or doors, on or after July 1, 2000, such devices shall comply with California Building Standards Code, Part 12, Chapter 12-3, and other applicable provisions of this code.

CHANGE SIGNIFICANCE: Previously, the requirements in the CRC and CBC for emergency escape and rescue openings were not consistent. Specifically, while the requirements in CRC R310.1 and CBC 1030.1 were consistent, the exceptions to where operable emergency escape and rescue openings were not. CBC 1030.1 provided additional exceptions such as basements with a ceiling height of less than 80 inches, basements or sleeping rooms with an exit door or exit door access, basements without habitable space and not more than 200 square feet, and also added storm shelters constructed in accordance with ICC 500. These exceptions have now been incorporated into Section R310.1, and the two codes are more consistent about the required locations of emergency escape and rescue openings.

Further, additional language was added to Section R310.1.1 regarding the maximum height of 70 inches for opening control devices and that the device shall be maintained at all times. The previous edition provided no such language, which allowed for the installation of control devices at heights or locations that were not accessible to occupants in the event of fire or other emergency.

Similarly, language was added regarding the requirement that exterior release device for use by the Fire Department is needed only when required by the authority having jurisdiction. In some circumstances it was found that the exterior release device decreased the intended security for the occupants by allowing exterior access. This additional language will allow the local fire department and authority having jurisdiction to determine whether the exterior release device is required or if occupant egress can be achieved by other means.

Lastly, a reference to Part 12, Chapter 12-3 for the required standards for Releasing Systems for Security Bars in Dwellings was added into this section as well. Chapter 12-3 contains requirements covering releasing systems for bars, grilles, mesh, glazing or other items intended to provide security at doors and windows required for emergency escape from dwelling units. When actuated by the occupant, the system allows the obstructions over the door or window to be moved so occupants can escape in the event of an emergency. Chapter 12-3 only cover the ability of the releasing system to be manually activated from the interior of a dwelling unit by an occupant to affect an escape through the protected opening. However, it is an important additional reference as it directs the user to the requirements of Part 12, Chapter 12-3 and its associated requirements.

R310.2

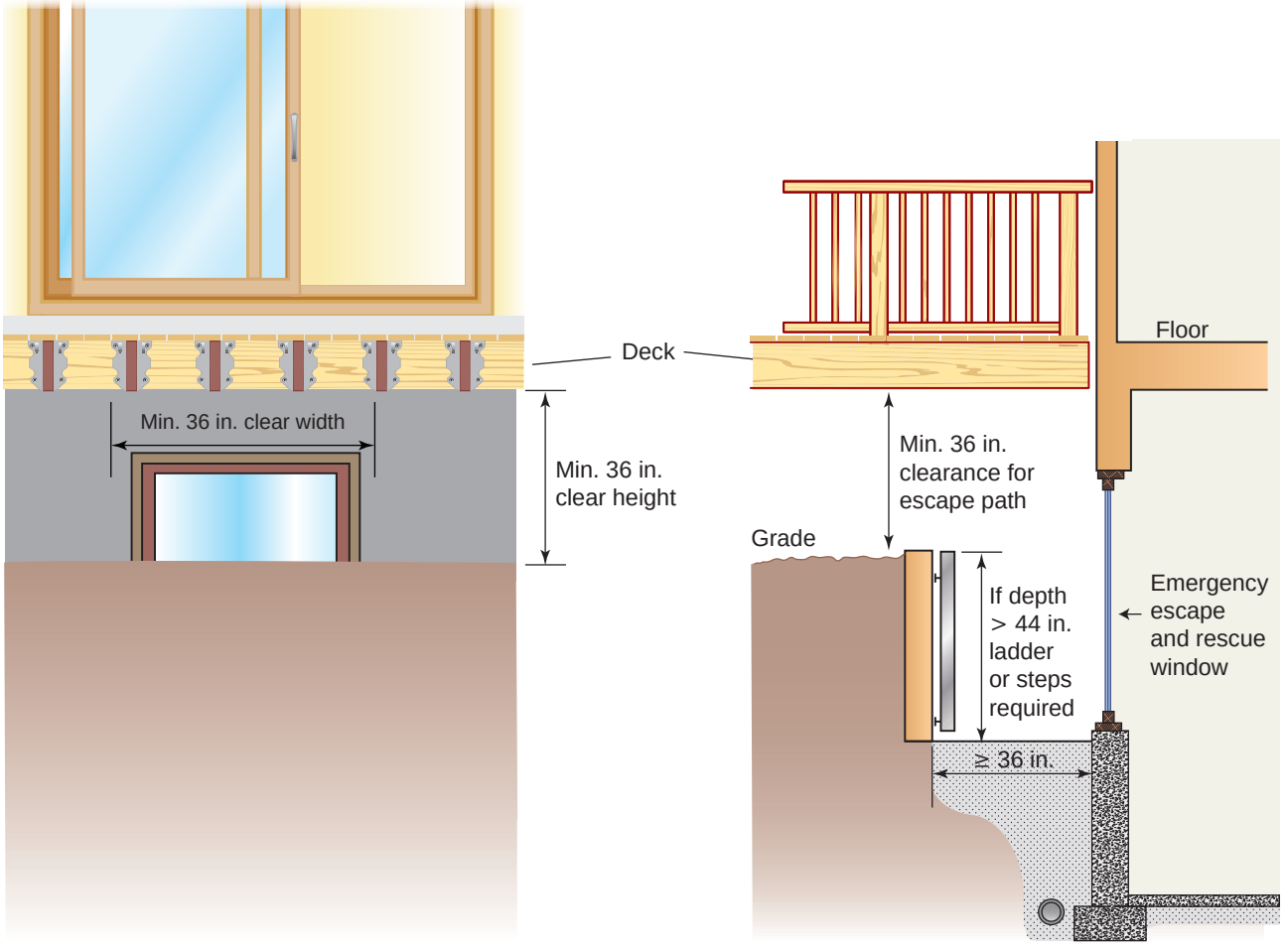
Emergency Escape and Rescue Openings

CHANGE TYPE: Modification

CHANGE SUMMARY: Emergency escape openings under decks, porches and cantilevers require a path not less than 36 inches wide. Opening dimensions have been clarified.

2022 CODE TEXT: **R310.2 Emergency escape and rescue openings.** Emergency escape and rescue openings shall have minimum dimensions ~~as specified in this section~~ in accordance with Sections R310.2.1 through R310.2.4.

R310.2.1 Minimum ~~opening area~~ size. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m^2). ~~The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).~~



Section at deck facing house

Cross section of area well below deck

Minimum width and height for emergency escape path below a deck or porch.

Exception: ~~Grade floor openings or below-grade openings shall have a net clear opening area of not less than~~ The minimum net clear opening for grade-floor emergency escape and rescue openings shall be 5 square feet (0.465 m^2).

R310.2.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.

R310.2.3 Maximum height from floor. Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 44 inches (1118 mm) *measured from the floor*.

~~R310.2.4~~ R310.2.4 Emergency escape and rescue openings under decks ~~and~~, porches and cantilevers. Emergency escape and rescue openings installed under decks ~~and~~, porches and cantilevers shall be fully openable and provide a path not less than 36 inches (914 mm) in height and 36 inches (914 mm) in width to a yard or court.

CHANGE SIGNIFICANCE: Most of the changes to Section R310.2, with a couple of exceptions, are editorial and organizational in nature.

The minimum net clear opening area (5.7 square feet) and the minimum opening dimensions (20 inches in width and 24 inches in height) are placed in separate sections. The exception for a grade floor opening allowing a minimum area of 5.0 square feet has been clarified and matches the revised definition, now titled "Grade Floor Emergency Escape and Rescue Opening." The code previously stated that the exception applied to grade floor openings and below grade openings, not recognizing that "grade floor opening" was a defined term in the code. There was some question as to whether a "below grade opening" could be deeper than 44 inches below grade (a dimension from the definition of grade floor opening) and still take advantage of the size reduction. To make the connection clear, the definition has been revised and the exception in Section R310.2.1 has been placed in the section text and applies only to an opening meeting the defined term "Grade Floor Emergency Escape and Rescue Opening."

Consistent with several other changes (e.g., Definitions and Sections R310 and R312) in the 2022 CRC related to measurements from the floor to window openings, references to sills and window sills have been removed in favor of dimensions measured to the clear opening of the window. Such is the case with Section R310.2.4 where the title has been changed from "Window sill height" to "Maximum height from floor." The revised text clarifies that the measurement for the maximum height of 44 inches for an emergency escape window is from the finished floor to the bottom of the clear opening. Interestingly, this measurement language appeared in the 2013 CRC but was inadvertently dropped from the 2016 and 2019 editions.

The code has specifically permitted emergency escape and rescue openings under decks and porches in previous editions. A minimum height of 36 inches has been required for the path under the deck or porch to the yard. New to the 2022 CRC, openings under floor cantilevers are also allowed and the path to the yard must have a minimum width of 36 inches in addition to the 36-inch height requirement.

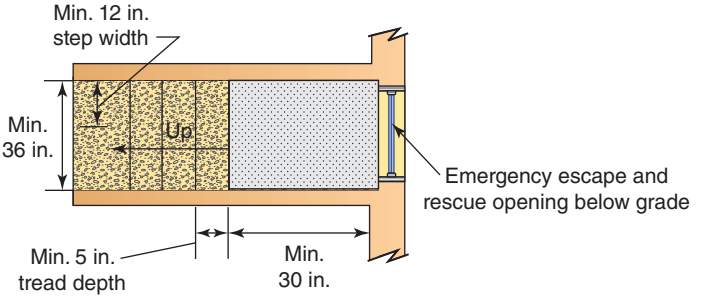
R310.3, R310.4

Area Wells for Emergency Escape and Rescue Openings

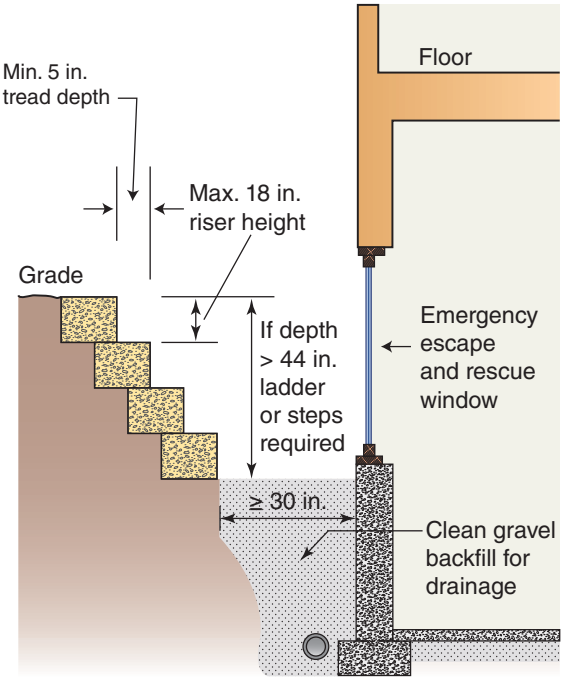
CHANGE TYPE: Modification

CHANGE SUMMARY: The provisions for window wells and area wells serving emergency escape and rescue openings have been merged into one section for area wells.

2022 CODE TEXT: **R310.3 Emergency escape and rescue doors.** Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a ~~slider. Where the opening is below the adjacent grade, it shall be provided with an area well.~~ sliding door.



Plan view



Area well with steps

Section

Step dimensions for area wells exceeding 44 inches in depth.

~~**R310.3.1 Minimum door opening size.** The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.~~

~~**R310.3.2 Area wells.** Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.~~

~~**R310.3.2.1 Ladder and steps.** Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.~~

~~**R310.3.2.2 Drainage.** Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.~~

> ~~**Exception:** A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.~~

R310.4 Area wells. An emergency escape and rescue opening where the bottom of the clear opening is below the adjacent grade shall be provided with an area well in accordance with Sections R310.4.1 through R310.4.4.

~~**R310.2.3**~~ **R310.4.1** ~~**Window wells.**~~ **Minimum size.** The horizontal area of the ~~window~~ area well shall be not less than 9 square feet (0.9 m^2), with a horizontal projection and width of not less than 36 inches (914 mm). The ~~area~~ size of the ~~window~~ area well shall allow the emergency escape and rescue opening to be fully opened.

> **Exception:** The ladder or steps required by Section ~~R310.2.3.1~~ R310.2.4.2 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the ~~window~~ area well.

~~**R310.2.3.1**~~ **R310.4.2 Ladder and steps.** ~~Window~~ Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with ~~a~~ an approved permanently affixed ladder or steps. The ladder or steps ~~usable with~~ shall not be obstructed by the emergency escape and rescue opening where the window or door is in the ~~fully~~ open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. ~~Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.~~

R310.4.2.1 Ladders. Ladders and rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the area well.

R310.4.2.2 Steps. Steps shall have an inside width of at least 12 inches (305 mm), a minimum tread depth of 5 inches (127 mm) and a maximum riser height of 18 inches (457 mm) for the full height of the area well.

~~R310.2.3.2~~ R310.4.3 Drainage. ~~Window~~ Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 ~~or by an approved alternative method~~.

> **Exception:** A drainage system for ~~window~~ area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

~~R310.4~~ R310.4.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, ~~area wells~~ bulkhead enclosures, or ~~window~~ area wells that serve such openings, the minimum net clear opening size shall comply with Sections ~~R310.2.1~~ R310.2 through ~~R310.2.3,~~ R310.2.2 and ~~such~~ R310.4.1. Such devices shall be releasable or removable from the inside without the use of a key, ~~or~~ tool, ~~special knowledge~~ or force greater than that required for the normal operation of the escape and rescue opening. *The release mechanism shall be maintained operable at all times.*

Such bars, grills, grates or any similar devices shall be equipped with an approved exterior release device for use by the fire department only when required by the authority having jurisdiction.

Where security bars (burglar bars) are installed on emergency egress and rescue windows or doors, on or after July 1, 2000, such devices shall comply with California Building Standards Code, Part 12, Chapter 12-3 and other applicable provisions of this code.

CHANGE SIGNIFICANCE: As part of the significant overhaul of Section R310, Sections R310.3 and R310.4 in the 2022 CRC consolidate and reorganize provisions for doors, window wells, area wells and related items, such as covers, ladders and steps. Section R310.3 now only covers doors that are used for emergency escape and rescue openings. Doors were specifically added to Section R310 in the 2015 edition of the code to reassure users that doors, which typically far exceed the required opening dimensions, are permitted for emergency escape and rescue. The door must be a side-hinged or sliding door.

Section R310.4 covers area wells, merging all the previous provisions for window wells and area wells. It is a general scoping paragraph that clarifies that the bottom of an emergency escape and rescue opening lower than the adjacent grade triggers the requirements for an area well. For below-grade emergency escape and rescue openings, an area well is required whether the opening is a door or a window. The term "window well" is no longer used in the provisions for emergency escape and rescue openings.

The significant technical change to the area well provisions serving either a door or a window is the addition of dimension requirements for steps. When the area well is more than 44 inches deep, the code requires either a ladder or steps for the occupant to safely climb from the area well in an emergency situation. Language confirming that the ladder or steps can encroach up to 6 inches into the required area well dimensions has been retained as an exception. The code still emphasizes that ladder or steps must be usable with the door or window in the open position. The code has always been very specific about ladder dimensions but silent on the step dimensions other than to say that they were not required to comply with the stair provisions in Section R311.7. The step dimensions for width and riser now parallel those for ladders and the tread depth is the minimum width for alternating tread devices and ships ladders in Sections R311.7.11 and R311.7.12. The minimum inside width is 12 inches with a minimum tread depth of 5 inches and a maximum riser height of 18 inches. There are many manufactured area (window) well units of various materials on the market with steps built in that meet these dimension requirements.

Changes to the area well requirements include:

- Section R310.3: The last sentence about area wells is deleted as redundant since the criteria for area wells is specifically addressed later in Section 310.4.
- Sections R310.3.2, R310.3.2.1 and R310.3.2.2: The separate area well requirements for doors are deleted. Window wells and area wells are merged into the area well provisions of Section R310.4.
- Section R310.4.1: The new title and revisions to the text for area well dimensions provide consistent terminology.
- Section R310.4.2: This section states when a ladder or steps are required. The sentence about the window not obstructing the steps or ladder is a safety feature that has been retained.
- Sections R310.4.2.1 and R310.4.2.2: The dimensions for ladders and steps have been moved into separate sections. The step dimensions are new as discussed above.
- Section R310.4.3: Since the code always allows approved alternative methods, the last phrase for an alternative means of area well drainage has been deleted.
- Section R310.4.4: The provisions for bars, grilles, covers and screens over area wells have been revised to coordinate with other sections. The term "special knowledge" has been removed from the operational constraints because it allows for too broad an interpretation. (Note that the term has been retained in Section R310.2.1 for operation of emergency escape and rescue openings.)

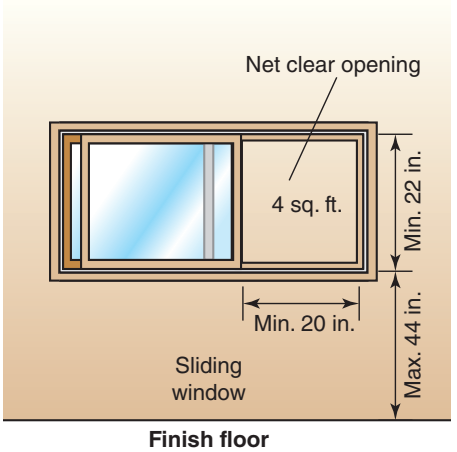
R310.5, R310.6, R310.7

Emergency Escape and Rescue Openings in Existing Buildings

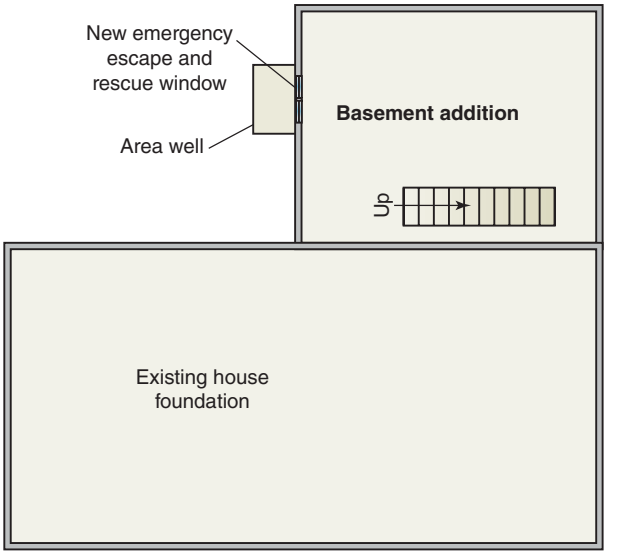
CHANGE TYPE: Modification

CHANGE SUMMARY: Opening dimensions have been reduced for emergency escape and rescue openings for a basement remodel, basement addition and for a change of occupancy.

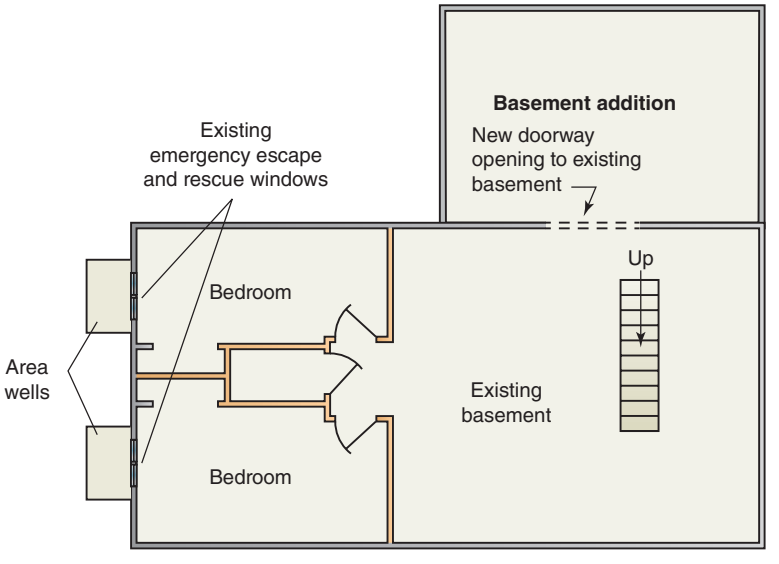
2022 CODE TEXT: ~~**R310.2.5**~~ **R310.5 Replacement windows for emergency escape and rescue openings.** Replacement windows installed in buildings meeting the scope of this code shall be exempt from



Reduced opening dimensions for emergency escape and rescue openings serving a basement addition or for a change of occupancy.



Basement addition with required emergency escape and rescue opening



Basement addition with opening to existing basement

Access to an emergency escape and rescue opening is required for basement additions.

~~the maximum sill height requirements of Section R310.2.2 and the requirements of Section R310.2.1~~ Sections R310.2 and R310.4.4, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. The replacement window is not part of a change of occupancy.

~~R310.5~~ R310.6 Dwelling additions. Where dwelling additions contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where dwelling additions have basements, an emergency escape and rescue opening shall be provided in the new basement.

Exceptions:

1. An emergency escape and rescue opening is not required in a new basement that contains a sleeping room with an emergency escape and rescue opening.
2. An emergency escape and rescue opening is not required in a new basement where there is an emergency escape and rescue opening in an existing basement that is accessed from the new basement.
3. An operable window complying with Section 310.7.1 shall be acceptable as an emergency escape and rescue opening.

~~R310.6~~ R310.7 Alterations or repairs of existing basements. ~~An emergency escape and rescue opening is not required where existing basements undergo alterations or repairs.~~ **~~Exception:~~** New sleeping rooms created in an existing basement shall be provided with emergency escape and rescue openings in accordance with Section R310.1. Other than new sleeping rooms, where existing basements undergo alterations or repairs an emergency escape and rescue opening is not required.

Exception: An operable window complying with Section 310.7.1 shall be acceptable as an emergency escape and rescue opening.

R310.7.1 Existing emergency escape and rescue openings. Where a change of occupancy would require an emergency escape and rescue opening in accordance with Section 310.1, operable windows serving as the emergency escape and rescue opening shall comply with the following:

1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m^2) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm).
2. A replacement window where such window complies with both of the following:

   2.1 The replacement window meets the size requirements in Item 1.

2.2 The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

CHANGE SIGNIFICANCE: The provisions for replacing existing windows in locations requiring an emergency escape and rescue opening have been relocated from Section R310.2.5 to their own Section R310.5. Changes to the text are editorial. The section title has changed to clarify that it is about emergency escape and rescue openings. The exemptions and criteria for replacement windows remain the same, but information has been shifted as part of the reorganization. When replacing windows in an existing dwelling unit, such as in a bedroom where an emergency escape and rescue opening is required, the intent is that the replacement window is no less safe than the existing window. The replacement must be the manufacturer's largest standard size window that will fit within the existing opening and be of the same operating style as the existing window or equivalent.

Section R310.6 deals with requirements for dwelling additions. The previous language requiring an emergency escape and rescue opening for new bedrooms and for a new basement that is part of the addition has been retained. A new Exception 3 references new Section R310.7.1 providing that the emergency escape and rescue opening can be reduced in size to a clear area not less than 4 square feet with a minimum height of 22 inches and minimum width of 20 inches.

Section R310.7 regarding alterations or repairs of existing basements has been restructured to clarify the application. Only if new sleeping rooms are added to an existing basement does an emergency escape and rescue opening need to be installed. Previously, this was written as an exception, but is more appropriately placed in the general rule. Otherwise, remodeling of an existing basement does not retroactively trigger the installation of an emergency escape opening as is required for new basements. A new exception addresses a situation where a new sleeping room is being created in an existing basement and there is an existing window in that new bedroom area. The code now allows some compromise on the opening size of this existing window by referencing a new provision in Section R310.7.1. In this case, the net clear opening area needs to be at least 4 square feet (rather than 5 square feet for a new grade floor opening) with a minimum height of 22 inches (rather than 24 inches for a new installation) and a minimum width of 20 inches.

Section R310.7.1 deals with existing windows where there is a change of occupancy and an emergency escape and rescue opening is required. In this case, the builder can take advantage of the reduced opening size of 4 square feet for the existing opening. While this section is specific to changes of occupancy, it is also referenced for new additions and for alterations to existing basements as discussed previously. A change of use or occupancy is unusual in the CRC unless the building is changed to a use governed by the CBC, in which case R310.7.1 would not apply – the building would need to comply with the CBC under changes of use or occupancy. A change of use under the CRC typically involves changing from a townhouse unit to a live/work unit or changing a single-family dwelling to a bed and breakfast operation. The new provisions are based on language in the *California Existing Building Code* (CEBC).

R311.7, R311.8

Stairways and Ramps

CHANGE TYPE: Clarification

CHANGE SUMMARY: The provisions of Sections R311.7 and R311.8 apply only to stairways and ramps within or serving a building, porch or deck.

2022 CODE TEXT: **R202 Stairway.** One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another ~~within or attached to a building, porch or deck~~.

R311.7 Stairways. Where required by this code or provided, stairways shall comply with this section.

Exceptions:

1. Stairways not within or attached to a building, porch or deck.
2. Stairways leading to nonhabitable attics.
3. Stairways leading to crawl spaces.

Stairways attached to porches and decks must meet the requirements of Section R311.7.

R311.8 Ramps. Where required by this code or provided, ramps shall comply with this section.

Exception: Ramps not within or attached to a building, porch or deck.

CHANGE SIGNIFICANCE: Scoping language has been added to Section R311.7 Stairways and R311.8 Ramps to clarify that the associated elements apply when they are within or attached to a building, porch or deck. Previously, similar language was found in Section R202 in the definition of a stairway as being "within or attached to a building, porch or deck." The definition has been changed to delete the scoping language and place it in Section R311. The definition now matches the CBC definition for consistency. The new text in Section R311 clarifies the intent and matches what has been common practice in most parts of the country. Stair safety is equally important to occupants of the dwelling whether it is an interior or exterior stair associated with the dwelling or if it is a stair that serves a deck or porch on any side of the house. Some voiced concern that because the stair provisions were located in the means of egress section of the code, that only those stairs leading to or from the one required exterior egress door were being regulated. That has never been the intent and the scoping is now clear.

There are now three exceptions to the stairway provisions in Section R311.7. The first, as discussed above, states that stairways that are not within or attached to a building, porch or deck are not regulated by this section. Exceptions 2 and 3 exempt stairs leading to nonhabitable attics and crawl spaces. This now specifically allows the common practice of providing a ladder to crawl spaces and a drop-down ladder/stair device for accessing a nonhabitable attic area.

R311.7.7

Stairway and Landing Walking Surface

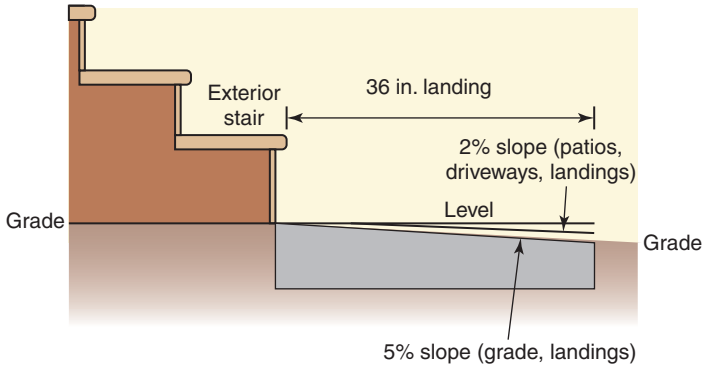
CHANGE TYPE: Modification

CHANGE SUMMARY: A new exception allows steeper slopes for exterior landings that also serve to drain surface water away from the building.

2022 CODE TEXT: **R311.7.7 Stairway walking surface.** The walking surface of treads and landings of stairways shall be sloped not steeper than 1 unit vertical in 48 ~~inches~~ units horizontal (2-percent slope).

> **Exception:** Where the surface of a landing is required elsewhere in the code to drain surface water, the walking surface of the landing shall be sloped not steeper than 1 unit vertical in 20 units horizontal (5-percent slope) in the direction of travel.

CHANGE SIGNIFICANCE: The code regulates the slope of the ground (grade) and impervious surfaces, such as concrete patios, to provide minimum drainage requirements to direct surface water away from the structure. Section R401.3 generally requires a minimum slope for finish grade of 6-inch fall in the first 10 feet away from the building. This is a minimum 5 percent average slope. Impervious surfaces, such as concrete or brick paving, are more efficient at draining water and the code reduces the minimum slope accordingly to 2 percent or 2 inches fall in 10 feet. Sections R311.3 and R311.7.7 set maximum slopes for interior and exterior landings and stairs to provide comfortable and safe walking surfaces, and still provide drainage for exterior surfaces. The new exception addresses a concern that there are situations where the minimum slope for drainage might conflict with the maximum slope allowed for an exterior landing. In other words, the installation would require a steeper slope than is permitted for a landing when the landing is part of the drainage platform. Another possible installation difficulty would be to achieve a minimum slope of 2 percent for drainage while matching that with a maximum slope of 2 percent for walking, precision that may present some challenges. To satisfy the surface water drainage requirements under these circumstances, an exterior landing will now be permitted to slope as much as the minimum required for finish grade (ground) of 5 percent slope. This 5 percent also matches the maximum slope for an accessible route in the accessibility provisions of Chapter 11 of the CBC.



5 percent slope is permitted for landings that are required to provide drainage away from the dwelling.

R312.2

Window Fall Protection

CHANGE TYPE: Clarification

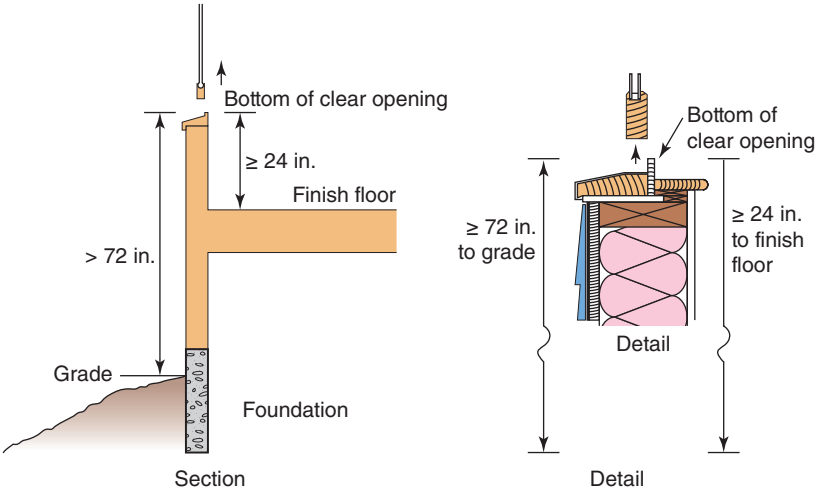
CHANGE SUMMARY: The revised language clarifies that measurements for determining the need for fall protection are taken to the bottom of the clear opening of the window.

2022 CODE TEXT: **R312.2 Window fall protection.** Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.

R312.2.1 Window ~~sills~~ opening height. In dwelling units, where the ~~top~~ bottom of the ~~sill~~ clear opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished grade or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.
2. Operable windows are provided with window opening control devices or fall prevention devices that comply with ASTM F2090.
3. ~~Operable windows are provided with window opening control devices that comply with Section R312.2.2.~~

R312.2.2 ~~Window opening control devices.~~ Emergency escape and rescue openings. ~~Window opening control devices shall comply with ASTM F2090. The~~ Where an operable window serves as an emergency escape and rescue opening, a window opening control device or fall prevention device, after operation to release the control device or fall prevention device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Sections R310.2.1 and R310.2.2.



Measurements for window fall protection are taken to the bottom of the clear opening.

CHANGE SIGNIFICANCE: The provisions for window fall protection intend to reduce the number of injuries to children resulting from falls through windows. These provisions first appeared in the 2006 edition of the CRC. Since then, the height of the opening above grade deemed to pose a hazard has been greater than 72 inches. Where the height has exceeded 72 inches, the minimum height of the opening above the finished floor has been set at 24 inches, unless other protection, such as an opening control device, was provided. The wording, particularly how the measurements for this section are taken, have changed from time to time. In the original text, the section was titled "Window Sills" and the measurements were taken to the opening. In the 2015 edition, the language changed so the measurement was taken to the window sill. A sill, if it exists, is not necessarily the lowest point of the window opening. The reference to window sill in the title and the text has been removed and measurements are taken to the bottom of the clear opening.

The other change to this section relates to window opening control devices and fall prevention devices that have been alternates to the opening height requirements for child fall prevention. When used, these devices must be in compliance with ASTM F2090, *Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms*. As the title indicates, these devices are approved for use on emergency escape and rescue windows when conforming to this standard. Changes to the code text are meant to clarify the use of these devices and emphasize that they are acceptable for use on emergency escape and rescue windows. Text for opening control devices and fall prevention devices being allowed for emergency escape and rescue windows also appears in Section R310.

R315.2.2

Carbon Monoxide Alarms

CHANGE TYPE: Modification

CHANGE SUMMARY: Repairs to an existing fuel-fired mechanical system now trigger the retroactive requirements for carbon monoxide alarms.

2022 CODE TEXT: **R315.2.2 Alterations, repairs and additions.** *Where an addition is made to an existing dwelling, or a fuel-burning heater, appliance or fireplace is added to an existing dwelling, not previously required to be provided with carbon monoxide alarms, new carbon monoxide alarms shall be installed in accordance with Section R315.*

Exceptions:

1. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck.
2. Installation, alteration or repairs of plumbing ~~or mechanical~~ systems.
3. Installation, alteration or repairs of mechanical systems that are not fuel fired.

CHANGE SIGNIFICANCE: Requirements for carbon monoxide alarms were introduced in the 2010 edition of the CRC to reduce accidental injury and deaths from carbon monoxide poisoning. Because the source of unsafe levels of carbon monoxide in the home is typically from faulty operation of a fuel-fired furnace or water heater, or from the exhaust of an automobile, the provisions only apply to dwellings containing fuel-fired appliances or having an attached garage that communicates with the residence. Carbon monoxide accumulates in the body over time relative to

Carbon monoxide alarm.

Repair of a fuel-fired furnace.

its concentration in the air. Accordingly, carbon monoxide alarms sound an alarm based on the concentration of carbon monoxide and the amount of time that certain levels are detected, simulating an accumulation of the toxic gas in the body. High levels of carbon monoxide will trigger an alarm within a short time, while lower levels must be present over a longer time period for the alarm to sound. This design prevents false-positive alarms.

Because carbon monoxide poisoning deaths often occur when the occupants are sleeping, the CRC requires carbon monoxide alarms to be located in the areas outside of and adjacent to bedrooms. Similar to the smoke alarm provisions, carbon monoxide alarms are not only required in new dwellings but are also required in existing dwelling units when triggered by construction work on the existing dwelling, one of only two provisions in the code that are retroactive. When work requiring a permit occurs, alarms must be installed in the locations prescribed by the code. Matching the smoke alarm provisions, exterior work requiring a permit, such as roofing, siding, windows, doors, porches and decks, does not trigger the retroactive carbon monoxide alarm requirements.

The second exception to the retroactive provisions has exempted the installation, alteration or repairs of plumbing or mechanical systems. New to the 2022 CRC, alteration or repairs to mechanical systems are only exempt if they do not include fuel-fired equipment. Mechanical systems often include forced air units and water heaters that are fuel burning and therefore subject to carbon monoxide leakage in the event of faulty operation. Consensus was that fuel-fired equipment that is being altered, repaired or replaced and requires a permit should be subject to the carbon monoxide alarm provisions. The language for this exception has been changed to only apply to mechanical systems that are not fuel fired.

R317.1

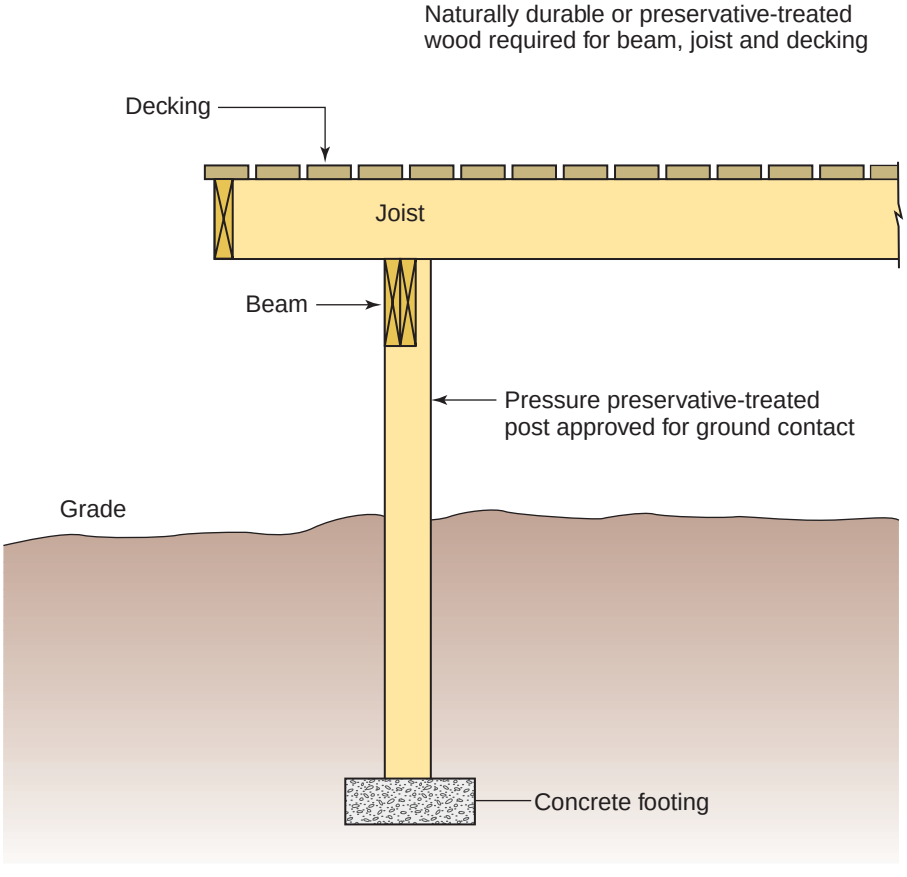
Protection of Wood Against Decay

CHANGE TYPE: Clarification

CHANGE SUMMARY: The provisions of Section R317.1 have been revised and reorganized for clarification.

2022 CODE TEXT: **R317.1 Location required.** Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

1. ~~Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or, wood girders where closer than 12 inches (305 mm) to the exposed ground , in~~ In crawl spaces or unexcavated area located within the periphery of the building foundation~~.~~, wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) to exposed ground, wood girders where closer than 12 inches (305 mm) to exposed ground, and wood columns where closer than 8 inches (204 mm) to exposed ground.
2. Wood framing members, including columns, that rest directly on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.



Protection against decay for wood structural members exposed to the weather.

3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than ½ inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier. *The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.*
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.
8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

   Exception: Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or preservative-treated wood where the structure is exposed to the weather.
9. Wood columns in contact with basement floor slabs unless supported by concrete piers or metal pedestals projecting at least 1 inch (25 mm) above the concrete floor and separated from the concrete pier by an impervious moisture barrier.

R317.1.1 Field treatment. *[No change]*

R317.1.2 Ground contact. *[No change]*

R317.1.3 Ventilation required beneath balcony or elevated walking surfaces. *Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow or drainage from irrigation shall be provided with openings that provide a net-free cross-ventilation area not less than 1/150 of the area of each separate space.*

~~**R317.1.3 Geographical areas.** In geographical areas where experience has demonstrated a specific need, approved naturally durable or pressure-preservative-treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members typically include:~~

~~1. Horizontal members such as girders, joists and decking.~~

~~2. Vertical members such as posts, poles and columns.~~

~~3. Both horizontal and vertical members.~~

~~**R317.1.4 Wood columns.** Wood columns shall be approved wood of natural decay resistance or approved pressure-preservative-treated wood.~~

~~**Exceptions:**~~

~~1. Columns exposed to the weather or in basements where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an approved impervious moisture barrier.~~

~~2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.~~

~~3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.~~

~~**R317.1.5 Exposed glued-laminated timbers.** The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative-treated wood.~~

CHANGE SIGNIFICANCE: The provisions for protection of wood against decay have not changed significantly for many code editions. This update accomplishes a much-needed overhaul. There is no intent to significantly change the technical content of Section R317, only to clarify the requirements, clean up some errors in syntax, and correct some misleading text. The revised text more accurately reflects the way this section has been applied.

The following is a summary of the changes:

- Section R317.1 Item 1: The wording is rearranged for readability. Similar to floor framing and girders, columns are given a required clearance from exposed earth in crawl spaces, which is generally consistent with former Exception 2 to Section R317.1.4. The

moisture barrier language related to columns in crawl spaces has been removed because that should be governed by the crawl space provisions in Section R408.

- Section R317.1 Item 2: This item now includes columns with other wood framing members since the columns Section R317.1.4 has been deleted.
- Section R317.1 Item 8: The language comes from the deleted Section R317.1.3 (Geographical areas), which seemed to require wood members exposed to the weather to be treated or naturally durable only if a need was demonstrated. The code now requires protection as the general rule and provides an exception for arid geographical regions where it has been demonstrated that the protection is not needed. Relocating this to the list of locations in R317.1 and providing an exception clarifies the requirement. The new exception also makes clear that it only applies to sawn lumber, not engineered wood products, which should be protected when exposed to the weather regardless of climate or geographic location, and manufacturers' recommendations require protection.
- Section R317.1 Item 9: This new item is necessary to preserve the reduced clearance for columns above basement floor slabs consistent with part of deleted Exception 1 to Section R317.1.4. It provides for as little as 1 inch of clearance if on a metal pedestal and 1 inch of clearance on a concrete pier if it is separated from the pier by an impervious moisture barrier, since concrete is porous and will allow wicking of moisture more readily.
- Section R317.1.3: The section has been deleted, and the text revised and moved to the new Item 8 of Section R317.1. The descriptors in Items 1 through 3 about horizontal and vertical members have been removed because they were considered to be commentary rather than code language.
- Section R317.1.4: This section has been deleted because it was unnecessarily confusing and contained errors in syntax, making it difficult to apply. The charging language seemed to require all columns, regardless of location (including interior locations), to be treated. That is not the intent of the code.
  - Exception 1: This deleted exception seemed to exempt all columns exposed to the weather, which was not the intent. The rest of Exception 1 had criteria which conflicted with the current CBC and also seemed to conflict with Exception 2.
  - Exception 2: This has been clarified and moved to revised Item 1 of Section R317.1.
  - Exception 3: This exception has been deleted because it seemed to exempt any deck posts that are supported by piers or pedestals extending 1 inch above concrete or 6 inches above exposed earth. Best practices dictate that any deck post exposed to the weather should be protected against decay regardless of clearance to a slab or ground.
- Section R317.1.5: This section has been deleted because glued laminated timber is covered under the scope of new Item 8 of Section R317.1 and the current language is therefore redundant.

R323

Storm Shelters

CHANGE TYPE: Addition

CHANGE SUMMARY: Added guidance on the design of storm shelters is placed in Section R323.

2022 CODE TEXT: **R202 Definitions**

Storm shelter. A building, structure or portion thereof, constructed in accordance with ICC 500 and designated for use during a severe windstorm event, such as a hurricane or tornado.

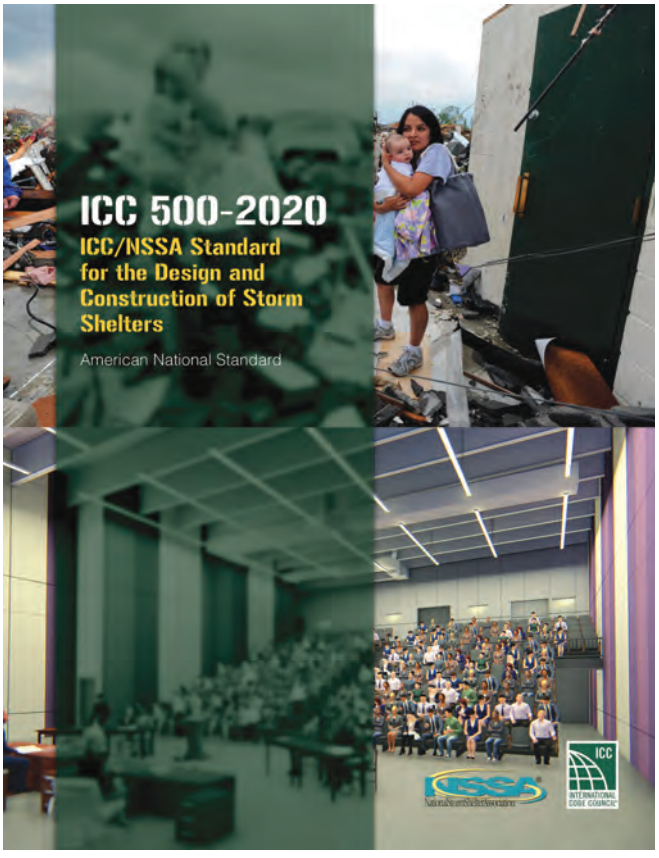
R106.1.5 Information on storm shelters. Construction documents for storm shelters shall include the information required in ICC 500.

SECTION R323
STORM SHELTERS

R323.1 General. This section applies to storm shelters where constructed as separate detached buildings or where constructed as safe rooms within buildings for the purpose of providing refuge from storms that produce high winds, such as tornados and hurricanes. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC~~/NSSA~~-500.

Exterior of storm shelter.

Single-family storm shelter.



ICC 500.

R323.1.1 Sealed documentation. The construction documents for all structural components and impact protective systems of the storm shelter shall be prepared and sealed by a registered design professional indicating that the design meets the criteria of ICC 500.

> **Exception:** Storm shelters, structural components and impact-protective systems that are listed and labeled to indicate compliance with ICC 500.

CHANGE SIGNIFICANCE: Impact-protective systems of structures intended as residential storm shelters have failed prematurely when they do not meet the testing requirements of ICC 500 *Standard for the Design and Construction of Storm Shelters*. In some cases, the structures have been placed above ground where they were not designed for loads created by tornadoes or hurricanes. Reports of failures associated with residential storm shelters that are not designed and constructed in accordance with ICC 500 underscore the importance of these new provisions.

Failures have not occurred in residential shelters engineered and certified as residential storm shelters. The provisions of ICC 500 cannot be met by prescriptive methods in the CRC and require the expertise of a registered design professional.

Section R323.1 requires that storm shelters comply with ICC 500. By adding a definition of a storm shelter to the CRC, adding a requirement in Section R106, Construction documents, for details required by ICC 500 and a requirement for sealed plans providing structural and impact protection system design, these shelters should withstand tornadoes or hurricanes keeping deaths and injuries to a minimum. The exception in Section R323.1.1 allows listed and labelled shelter designs to be submitted without an individual design as these shelters have a third-party review process checking the design's resistance to high wind loads and impacts.

R324.3

Photovoltaic Systems

CHANGE TYPE: Modification

CHANGE SUMMARY: Building-integrated photovoltaic (BIPV) systems meeting the specified criteria do not require firefighter access pathways and setbacks.

2022 CODE TEXT: **R324.3 Photovoltaic systems.** Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.1~~, NFPA 70~~ and the manufacturer's installation instructions. The electrical portion of solar PV systems shall be designed and installed in accordance with *California Electrical Code*.

R324.3.1 Equipment listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction. Mounting systems listed and labeled in accordance with UL 2703 shall be installed in accordance with the manufacturer's installation instructions and their listings.

R324.5 Building-integrated photovoltaic systems. Building-integrated photovoltaic (BIPV) systems that serve as roof coverings shall be designed and installed in accordance with Section R905.

R324.5.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16.

R324.5.2 Fire classification. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section R902.3.

R324.5.3 BIPV roof panels. BIPV roof panels shall comply with Section R905.17.

Building-integrated photovoltaic system.

R324.6 Roof access and pathways. Roof access, pathways and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.

Exceptions:

1. Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access.
2. Roof access, pathways and setbacks need not be provided where the *enforcing agency* has determined that rooftop operations will not be employed.
3. These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less.
4. BIPV systems listed in accordance with Section 690.12(B) (2) of the *California Electrical Code*, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazards.

~~R324.6.2.2~~ R324.6.3 Emergency escape and rescue openings. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914 mm) wide shall be provided to the emergency escape and rescue opening.

Exception: BIPV systems listed in accordance with Section 690.12(B)(2) of the *California Electrical Code*, where the removal or cutting away of portions of the BIPV system during firefighting operations have been determined to not expose a firefighter to electrical shock hazards.

R905.16.4 Material standards. Photovoltaic shingles shall be listed and labeled in accordance with UL ~~1703~~ 7103 or with both UL 61730-1 and UL 61730-2.

R905.17.5 Material standards. BIPV roof panels shall be listed and labeled in accordance with UL ~~1703~~ 7103 or with both UL 61730-1 and UL 61730-2.

CHANGE SIGNIFICANCE: Photovoltaic (PV) solar energy systems offer property owners the ability to generate their own electricity and, in many cases, sell excess electricity back to the utility provider. These PV systems have proliferated in recent years and are now commonly seen on rooftops of residential buildings in many areas of the country.

The roof access and pathway provisions for firefighters first appeared in the 2019 CRC. Access, pathways and ridge setbacks are provided so firefighters can perform manual ventilation by cutting one or more holes in a building roof and other rooftop activities as necessary. The provisions do not apply to detached garages and similar buildings or to dwellings

with low-slope roofs of 2:12 or less. There is also a provision that exempts dwellings where the building official has determined that the fire department will not perform rooftop operations for that property.

The technology of solar roofs has been advancing with new materials and methods, particularly in the area of BIPV systems. Unlike conventional PV panel systems mounted above the roof surface, BIPV systems are integrated into the finished roof surface, and do not present significant trip hazards or physical obstacles to equipment. There are BIPV systems available today that have been shown through testing to not present electrical hazards to firefighters even when cutting into them during ventilation operations. The code now recognizes these safety features in two new exceptions to the firefighter access and occupant emergency escape rooftop pathways. Where listed to the recognized standard that determines that the BIPV materials do not expose a firefighter to electrical shock hazards including during cutting operations, the requirement to provide for access and pathways has been deleted. Similarly, a clear pathway is no longer required below an emergency escape and rescue opening where these BIPV systems are installed. The BIPV is the roof surface that provides the walking surface similar to other conventional roofing materials.

R324.8, R324.8.1, R324.8.2

Elevated Photovoltaic (PV) Support Structures

CHANGE TYPE: Addition

CHANGE SUMMARY: Elevated Photovoltaic (PV) support structures require fire type rating of PV panels for open-grid or noncombustible deck, or fire classification of the panel system installed over a roof assembly.

2022 CODE TEXT: ***R324.8 Elevated photovoltaic (PV) support structures.*** *Elevated PV support structures shall comply with either Section R324.8.1 or R324.8.2.*

> ***Exception:*** *Elevated PV support structures that are installed over agricultural use.*

R324.8.1 PV panels installed over open grid framing or noncombustible deck. *Elevated PV support structures with PV panels installed over open grid framing or over a noncombustible deck shall have PV panels tested, listed and labeled with a fire type rating in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Photovoltaic panels marked "not fire rated" shall not be installed on elevated PV support structures.*

R324.8.2 PV panels installed over a roof assembly. *Elevated PV support structures with a PV panel system installed over a roof assembly shall have a fire classification in accordance with Section R324.4.*

An elevated photovoltaic support structure used in a parking facility.

CHANGE SIGNIFICANCE: The primary purpose of this section is to establish appropriate fire testing and listing criteria for overhead photovoltaic (PV) support structures that could have people or vehicles in the space beneath them. Sometimes referred to as "solar shade structures," they are most commonly constructed over vehicle parking spaces of surface parking lots, are sometimes built on the uppermost level of parking garages but could be built in a variety of locations with or without cars parked beneath. Overhead PV structures are referenced in 2022 CBC Section 1607.14.4, and in 2019 *California Building Code* Section 503.1, but without any definitions. In 2022 CBC Section 1607.14.4.3, these structures are described as: "Structures with open grid framing and without a roof deck or sheathing supporting photovoltaic panel systems." In 2019 *California Building Code* Section 503.1, Exception 2, these structures are described as: "solar photovoltaic panels supported by a structure with no use underneath." In Exception 3, there is a more specific description by location: "solar photovoltaic panels supported by a structure over parking stalls." For the proposed definition of Elevated PV Support Structure, note the minimum height threshold of 7 feet 6 inches is consistent with CBC Section 1003.2.

R326
Habitable Attics

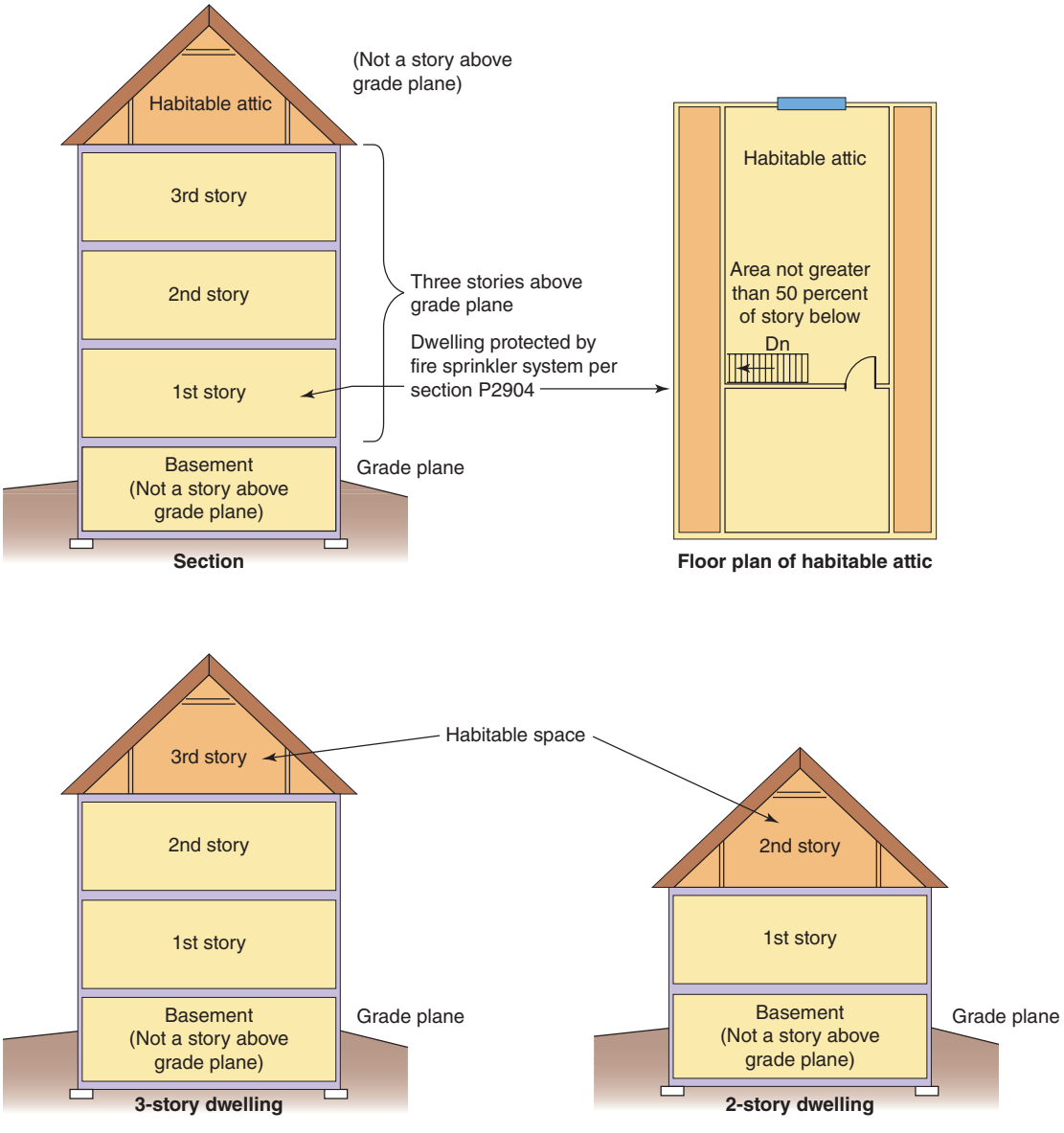
CHANGE TYPE: Modification

CHANGE SUMMARY: The habitable attic provisions have been placed in new Section R326 and new restrictions limit their area and require an automatic fire sprinkler system.

2022 CODE TEXT: **R325.1 General.** Mezzanines shall comply with Sections R325 through R325.5. ~~Habitable attics shall comply with Section R325.6.~~

~~**R325.6 Habitable attic.** A habitable attic shall not be considered a story where complying with all of the following requirements:~~

~~1. The occupiable floor area is not less than 70 square feet (17 m), in accordance with Section R304.~~



Dwellings meeting the CRC limit of 3 stories above grade plane.

~~2. The occupiable floor area has a ceiling height in accordance with Section R305.~~

~~3. The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below.~~

~~4. The floor of the occupiable space shall not extend beyond the exterior walls of the floor below.~~

SECTION R326
HABITABLE ATTICS

R326.1 General. Habitable attics shall comply with Sections R326.2 and R326.3.

R326.2 Minimum dimensions. A habitable attic shall have a floor area in accordance with Section R304 and a ceiling height in accordance with Section R305.

R326.3 Story above grade plane. A habitable attic shall be considered a story above grade plane.

Exception: A habitable attic shall not be considered to be a story above grade plane provided that the habitable attic meets all of the following:

1. The aggregate area of the habitable attic is either of the following:
   - 1.1 Not greater than one-third of the floor area of the story below.
   - 1.2 Not greater than one-half of the floor area of the story below where the habitable attic is located within a dwelling unit equipped with a fire sprinkler system in accordance with Section *R313*.
2. The occupiable space is enclosed by the roof assembly above, knee walls, if applicable, on the sides and the floor-ceiling assembly below.
3. The floor of the habitable attic does not extend beyond the exterior walls of the story below.
4. Where a habitable attic is located above a third story, the dwelling unit or townhouse unit shall be equipped with a fire sprinkler system in accordance with Section *R313*.

R326.4 Means of egress. The means of egress for habitable attics shall comply with the applicable provisions of Section R311.

CHANGE SIGNIFICANCE: The term "habitable attic" first appeared in the definitions of the 2010 edition of the CRC. Although finishing off habitable space in an attic was not unheard of, the origin of the term "habitable attic" is unclear and it may have been created for use in the CRC. By definition, an "attic" is unfinished space, and it is not considered to be occupiable or habitable. The only purpose for introducing the term "habitable attic" was to add another usable level to a dwelling constructed under the CRC in addition to the maximum height in stories prescribed by the code. Since its introduction, a habitable attic has not been considered

a story and has been permitted in addition to the maximum three stories above grade plane as allowed by the scope of the code. Where a dwelling or townhouse had a basement that was not a story above grade plane, identifying the top level as a habitable attic in addition to the three stories above grade plane created five usable or habitable levels. This has been a design option to benefit the designer, builder and property owner in constructing taller buildings under the CRC. There is at least a perceived advantage to building under the CRC as opposed to the CBC. Perhaps the biggest issue comes down to the installation of a fire sprinkler system, which is required in both model codes. The sprinkler provisions of the CRC have been amended out of local ordinances in many parts of the United States. Where a builder perceived an advantage to building under the CRC provisions rather than those of the CBC, a habitable attic may have provided that flexibility.

In most parts of the country, three-story houses are unusual and those exceeding three stories are rarer still. However, in some urban areas of the country, space for new construction is limited and it is desirable to build a taller building (or add to the height of an existing building) on a smaller footprint.

In the code editions since the 2010 CRC, the rules for a habitable attic have remained consistent and changes have been mostly editorial. Technical requirements have been removed from the definition and placed in a section near the end of Chapter 3. The space has had to meet the minimum room area and ceiling height for habitable spaces and be enclosed by the roof assembly and floor/ceiling assembly of the attic. The code has also required habitable attics to have a smoke alarm and an emergency escape and rescue opening.

Concern was expressed that the added habitable space above the third story creates a fire- and life-safety hazard for occupants because of the height above fire department access and the maximum reach of standard 35-foot extension ladders that may be used in a fire department response. Discussion has also centered around the differences between the CRC and CBC. The CBC does not have provisions for a "habitable attic." As in the CRC, an "attic" in the CBC is unfinished and is not occupiable or habitable space. If the attic is converted to habitable space, it is no longer an attic but becomes habitable space on another story because it then meets the definition of story. The addition of habitable attic in the 2010 CRC was purposeful in that it was adding an option to the CRC to avoid being under the scope of the CBC. There was no intent for the provisions in the two codes to match.

New to the 2022 CRC, Section R326.3 states that a habitable attic is a story above grade plane. The exceptions retain the concept of a habitable attic being allowed above the third story and not being considered a story above grade plane with further restrictions. This option is available only if the dwelling unit is protected with a fire sprinkler system in accordance with Section R313, and the "aggregate" area of the habitable attic does not exceed one-half of the area of the story below. These additional requirements are thought to mitigate the life-safety concerns for occupants in these taller buildings.

The limitation on "aggregate" area for a habitable attic is borrowed from the mezzanine provisions (which also have very limited use under the CRC but, like habitable attics, may be used to build taller buildings since they are not considered a story). Unlike mezzanines, attics typically match the area of the story below. Presumably the intent, though not stated,

is that this 50 percent limitation only applies to the habitable area of the attic and that "aggregate" means the combined area of habitable space on that level. For example, storage areas and areas that do not meet the minimum ceiling height requirements are not considered habitable space and would not be included in the 50 percent calculation. On the other hand, the area of the story below would include both habitable space and other spaces for calculation purposes. Exception 1.1 (one-third area limitation) has no application because it applies to a building without fire sprinklers and sprinklers are required in all cases where a habitable attic is above the third story and is not considered a story. This conflict occurs because there were multiple public comments to the initial code change proposal that were approved at the public comment hearings.

The new code language presents the option to call habitable space in the attic above a one-story or two-story house a "habitable attic" but there is no advantage to doing so as a design option. As in previous editions of the CRC, including the editions before the term habitable attic was introduced to the code, and as is done in the CBC, when an attic of a one- or two-story house is finished into habitable space, it is no longer an attic and becomes habitable space. Whether or not it is considered a story is no longer an issue.

R327.1, R327.1.1, R327.1.2, R327.1.3

Aging-in-Place Design and Fall Prevention

CHANGE TYPE: Addition

CHANGE SUMMARY: Aging-in-place design and fall prevention requirements have now been added to the code in Section R327.

2022 CODE TEXT: ***R327.1 Aging-in-place design and fall prevention.*** *Newly constructed dwellings subject to the requirements of this code shall be designed and constructed in accordance with Sections R327.1.1 through R327.1.4.*

Exceptions:

1. *Covered multifamily dwellings designed and constructed in accordance with Chapter 11A of the California Building Code.*
2. *Public housing and places of public accommodation required to comply with Chapter 11B of the California Building Code.*

R327.1.1 Reinforcement for grab bars. *At least one bathroom on the entry level shall be provided with reinforcement installed in accordance with this section. Where there is no bathroom on the entry level at least one bathroom on the second or third floor of the dwelling shall comply with this section.*

1. *Reinforcement shall be solid lumber or other construction materials approved by the enforcing agency.*
2. *Reinforcement shall not be less than 2 by 8 inch (51 mm by 203 mm) nominal lumber. [1½ inch by 7¼ inch (38 mm by 184 mm) actual dimension] or other construction material providing equal height and load capacity. Reinforcement shall be located between 32 inches (812.8 mm) and 39¼ inches (997 mm) above the finished floor flush with the wall framing.*
3. *Water closet reinforcement shall be installed on both side walls of the fixture, or one side wall and the back wall.*

An example of design and construction to assist with aging in place.

4. *Shower reinforcement shall be continuous where wall framing is provided.*
5. *Bathtub and combination bathtub/shower reinforcement shall be continuous on each end of the bathtub and the back wall. Additionally, back wall reinforcement for a lower grab bar shall be provided with the bottom edge located no more than 6 inches (152.4 mm) above the bathtub rim.*

Exceptions:

1. *Where the water closet is not placed adjacent to a side wall capable of accommodating a grab bar, the bathroom shall have provisions for installation of floor-mounted, foldaway or similar alternate grab bar reinforcements approved by the enforcing agency.*
2. *Reinforcement shall not be required in wall framing for prefabricated shower enclosures and bathtub wall panels with integral factory-installed grab bars or when factory-installed reinforcement for grab bars is provided.*
3. *Shower enclosures that do not permit installation of reinforcement and/or grab bars shall be permitted, provided reinforcement for installation of floor-mounted grab bars or an alternate method is approved by the enforcing agency.*
4. *Bathtubs with no surrounding walls, or where wall panels do not permit the installation of reinforcement shall be permitted, provided reinforcement for installation of floor-mounted grab bars adjacent to the bathtub or an alternate method is approved by the enforcing agency.*
5. *Reinforcement of floors shall not be required for bathtubs and water closets installed on concrete slab floors.*

R327.1.1.1 Documentation for grab bar reinforcement. *Information and/or drawings identifying the location of grab bar reinforcement shall be placed in the operation and maintenance manual in accordance with the California Green Building Standards Code, Chapter 4, Division 4.4.*

R327.1.2 Electrical receptacle outlet, switch and control heights. *Electrical receptacle outlets, switches and controls (including controls for heating, ventilation and air conditioning) intended to be used by occupants, shall be located no more than 48 inches (1219.2 mm) measured from the top of the outlet box and not less than 15 inches (381 mm) measured from the bottom of the outlet box above the finish floor.*

Exceptions:

1. *Dedicated receptacle outlets; floor receptacle outlets; controls mounted on ceiling fans and ceiling lights; and controls located on appliances.*
2. *Receptacle outlets required by the California Electrical Code on a wall space where the distance between the finished floor and a built-in feature above the finish floor, such as a window, is less than 15 inches (381 mm).*

R327.1.3 Interior doors. *Effective July 1, 2024, at least one bathroom and one bedroom on the entry level shall provide a doorway with a net clear opening of not less than 32 inches (812.8 mm), measured with the door positioned at an angle of 90 degrees from the closed position; or, in the case of a two- or three-story single family dwelling, on the second or third floor of the dwelling if a bathroom or bedroom is not located on the entry level.*

R327.1.4 Doorbell buttons. *Doorbell buttons or controls, when installed, shall not exceed 48 inches (1219.2 mm) above exterior floor or landing, measured from the top of the doorbell button assembly. Where doorbell buttons integrated with other features are required to be installed above 48 inches (1219.2 mm) measured from the exterior floor or landing, a standard doorbell button or control shall also be provided at a height not exceeding 48 inches (1219.2 mm) above exterior floor or landing, measured from the top of the doorbell button or control.*

CHANGE SIGNIFICANCE: On October 8, 2019, Senate Bill 280 was signed into law, adding Section 17922.15 to the Health and Safety Code (HSC) which requires Housing and Community Development (HCD) to investigate possible changes to regulations in the *California Residential Code* that promote aging-in-place design elements. The elements were specifically limited to the following locations: doorbells, light switches and heating/ventilation/air conditioning controls; the installation of grab bar reinforcements; and one bathroom door and one bedroom door with a 32-inch clear opening width. The new *California Residential Code* amendments implemented HSC Section 17922.15 and the requirements in the new Section R327.

R328.4

ESS Located in an Attached Garage

CHANGE TYPE: Modification

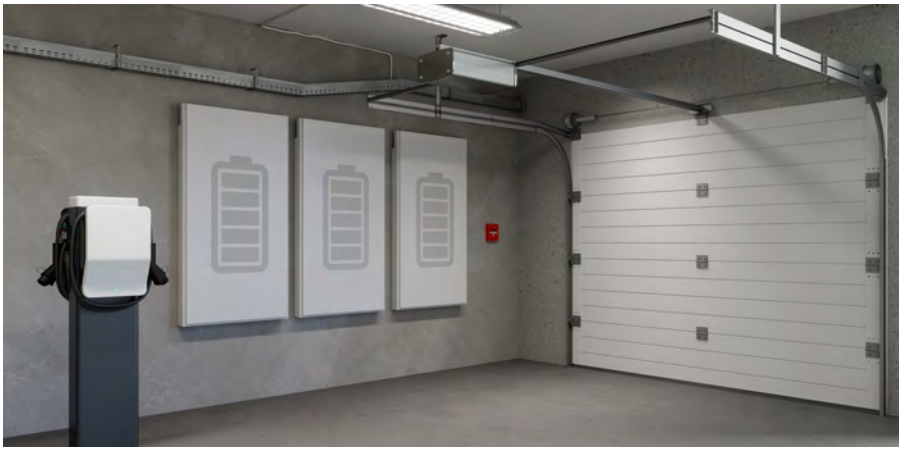
CHANGE SUMMARY: Section R328.4 was amended to include language that Energy Storage Systems shall not be installed in habitable spaces of dwelling units.

2022 CODE TEXT: **R328.4 Locations.** ESS shall be installed only in the following locations:

1. Detached garages and detached accessory structures.
2. Attached garages separated from the dwelling unit living space in accordance with Section R302.6.
3. Outdoors or on the exterior side of exterior walls located not less than 3 feet (914 mm) from doors and windows directly entering the dwelling unit.
4. Enclosed utility closets, basements, storage or utility spaces within dwelling units with finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with not less than ⅝-inch (15.9 mm) Type X gypsum wallboard.

ESS shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms *or in habitable spaces of dwelling units.*

CHANGE SIGNIFICANCE: The change in this section is the addition stating "or in habitable spaces of dwelling units." This change amends the current language that did not allow for installations in "habitable spaces of dwelling units." This section has been modified to add a restriction against the installation of Energy Storage Systems in "living space" to address concerns that there are other locations such as hallways that are not covered by the previous restrictions on installations within habitable spaces. That addition provides consistency with language added to NFPA 855.The listing of specific installation locations is consistent with the allowed locations contained within the *California Fire Code* R-3 and R-4 locations and NFPA 855.



An example of ESS located in an attached garage.

R328.8.1, R328.2, R328.3

Vehicle Impact Protection for ESS within Garages

CHANGE TYPE: Modification

CHANGE SUMMARY: Existing code sections for protection from impact have been amended and new code sections have been added to the CRC to provide specific requirements for vehicle impact protection for Energy Storage Systems (ESS) and protection options within a garage.

2022 CODE TEXT: **R328.8.1 Garages.** *Where an ESS is installed in the normal driving path of vehicle travel within a garage, impact protection complying with Section 1207.11.7.3 shall be provided. The normal driving path is a space between the garage vehicle opening and the interior face of the back wall to a height of 48 inches (1219 mm) above the finished floor. The width of the normal driving path shall be equal to the width of the garage door opening. Impact protection shall also be provided for ESS installed at either of the following locations (See Figure R328.8.1):*

1. *On the interior face of the back wall and located within 36 inches (914 mm) to the left or to the right of the normal driving path.*
2. *On the interior face of a side wall and located within 24 inches (609 mm) from the back wall and 36 inches (914 mm) of the normal driving path.*

Exception: *Where the clear height of the vehicle garage opening is 7 feet 6 inches (2286 mm) or less, ESS installed not less than 36 inches (914 mm) above finished floor are not subject to vehicle impact protection requirements.*

R328.8.2 Other locations subject to vehicle impact. *Where an ESS is installed in a location other than as defined in Section R328.8.1, and is subject to vehicle damage, impact protection shall be provided in accordance with Section R328.8.3.*

R328.8.3 Impact protection options. *Where ESS is required to be protected from impact in accordance with Section R328.8.1 or R328.8.2, such protection shall comply with one of the following:*

1. *Bollards constructed in accordance with one of the following:*
   - **1.1** *Minimum 48 inches (1219 mm) in length by 3 inches (76 mm) in diameter Schedule 80 steel pipe embedded in a concrete pier not less than 12 inches (304 mm) deep and 6 inches (152 mm) in diameter, with at least 36 inches (914 mm) of pipe exposed, filled with concrete and spaced at a maximum interval of 5 feet (1524 mm). Each bollard shall be located not less than 6 inches (152 mm) from an ESS.*
   - **1.2** *Minimum 36 inches (914 mm) in height by 3 inches (76 mm) in diameter Schedule 80 steel pipe fully welded to a minimum 8-inch (203 mm) by ¼-inch (6.4 mm) thick steel plate and bolted to a concrete floor by means of 4½ inch (13 mm) concrete anchors with 3-inch (76 mm) minimum embedment. Spacing shall be not greater than 60 inches (1524 mm), and each bollard shall be located not less than 6 inches (152 mm) from the ESS.*

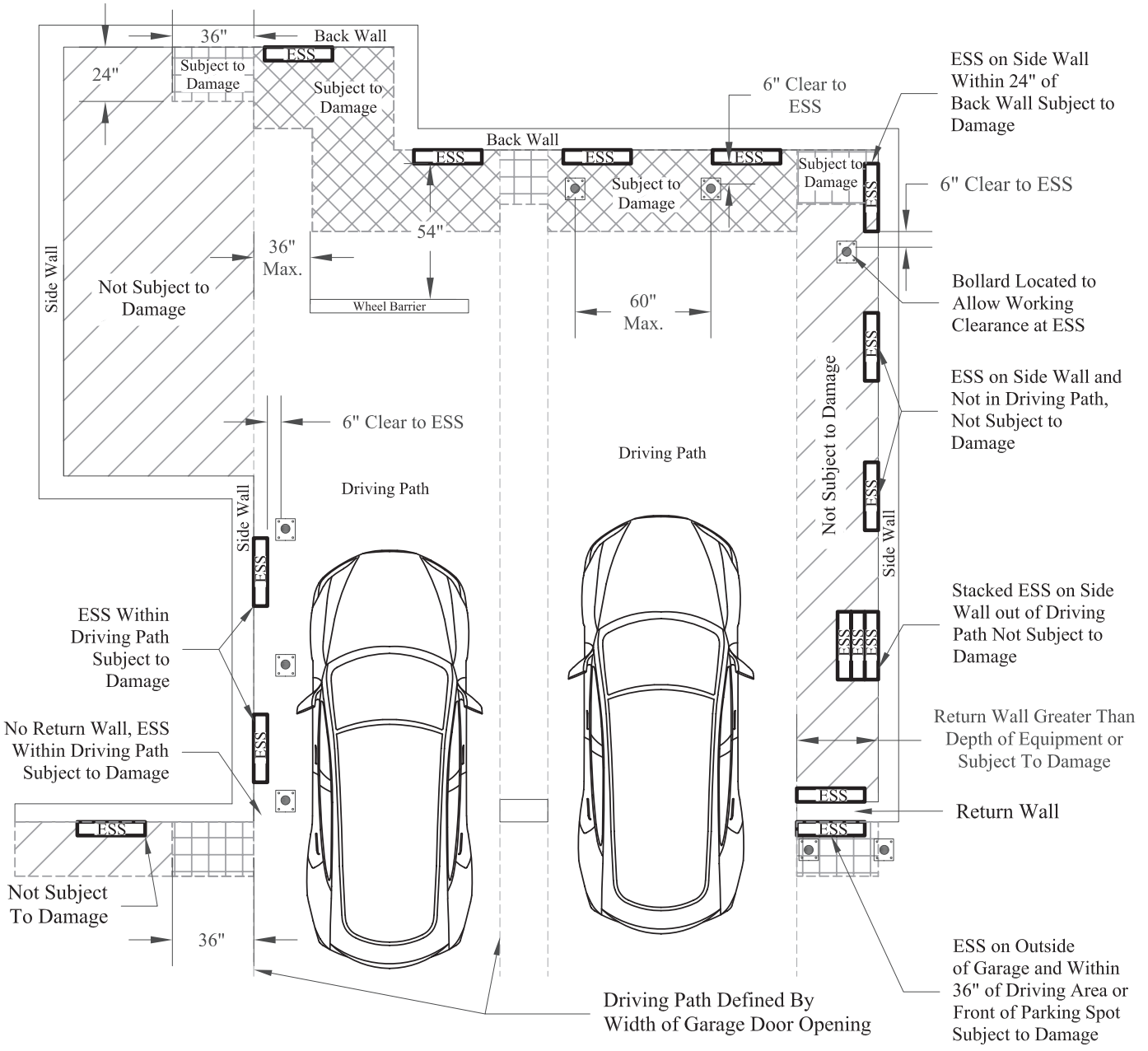


Figure R328.8.1 ESS Vehicle Impact Protection

1.3 *Pre-manufactured steel pipe bollards shall be filled with concrete and anchored in accordance with the manufacturer's installation instructions, with spacing not greater than 60 inches (1524 mm), and each bollard shall be located not less than 6 inches (152 mm) from the ESS.*

2. *Wheel barriers constructed in accordance with one of the following:*

2.1 *Four inches (102 mm) in height by 5 inches (127 mm) in width by 70 inches (1778 mm) in length wheel barrier made of concrete or polymer, anchored to the concrete floor not less than every 36 inches (914 mm) and located not less than 54 inches*

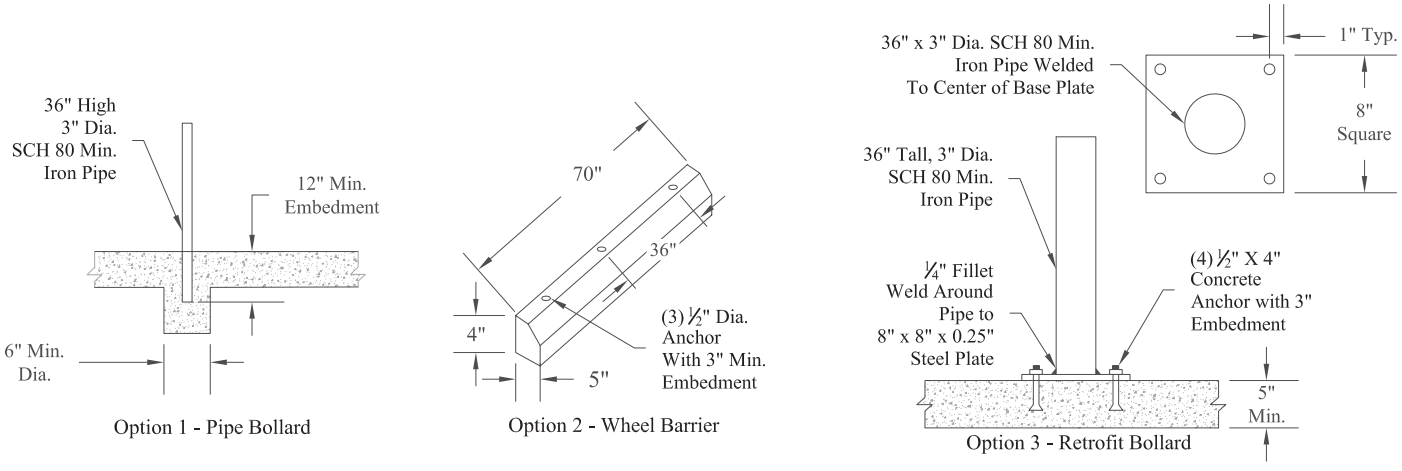


Figure R328.8.3 ESS Vehicle Impact Protection Options

(1372 mm) from the ESS. Minimum 3½-inch (89 mm) diameter concrete anchors with a 3-inch (76 mm) embedment per barrier shall be used. Spacing between barriers shall be no greater than 36 inches (914 mm).

2.2 *Pre-manufactured wheel barriers shall be anchored in accordance with the manufacturer's installation instructions.*

3. *Approved method designed to resist a 2000-lb. (8899 Newtons) impact in the direction of travel at 24 inches (608 mm) above grade.*

CHANGE SIGNIFICANCE: Section R327 was amended as part of the most recent 2019 Intervening Code Adoption Cycle and was intended to address the quickly evolving installations of Energy Storage Systems (ESS). During this process, the language of Section R327 was amended to reflect a consensus of the proponents of different ESS proposals heard at the International Code Council's Group A and B code hearings for the 2021 International Codes. During the 2021 Triennial Code Adoption Cycle, Section R327 was amended and included in Section R328, Energy Storage Systems. Many of the existing code amendments have been carried forward from the Intervening Code to the 2022 *California Residential Code*.

Sections R328.8.1 and R328.8.2 were added and provide requirements of impact protection requirements for ESS installed within a garage or subject to vehicular impact. Further, Section R328.8.3 has been added to define impact protection areas and set the expectation that the barriers are intended to deflect, resist or visually deter an impact. The language of Section R328.8.3 mirrors the existing language of Section 312.3 in the *California Fire Code*. Further, a minimum installation height of 48 inches within the likely impact area has been added to allow elevation of the ESS as a permissible mitigation option. An exception to this 48-inch minimum has also been included to recognize that a reduced garage opening height would thereby limit vehicle height and allow a lower placement of equipment before additional protection is needed.

R337.2

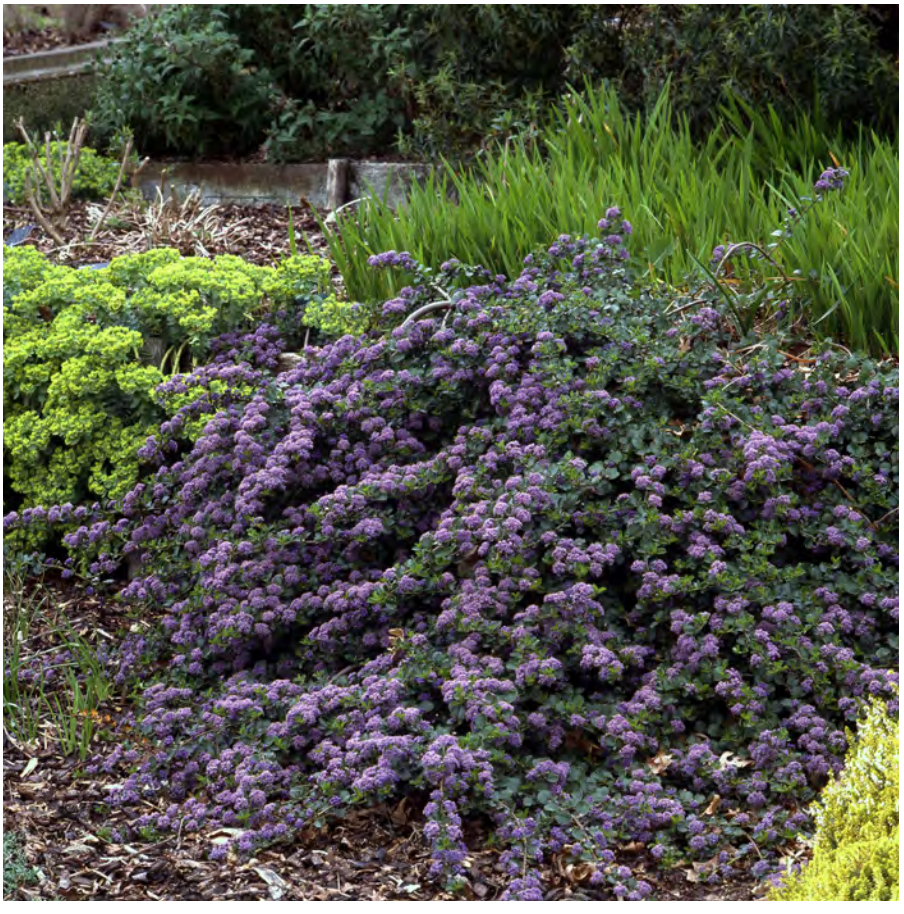
Fire-Resistant Vegetation

CHANGE TYPE: Addition

CHANGE SUMMARY: A definition of fire-resistant vegetation has been added that provides clarification of a term that was previously referenced but not defined.

2022 CODE TEXT: ***R337.2 Fire-resistant vegetation.*** *Plants, shrubs, trees and other vegetation which exhibit properties, such as high moisture content, little accumulation of dead vegetation, and low sap or resin content, that make them less likely to ignite or contribute heat or spread flame in a fire than native vegetation typically found in the region.*

*[**Note:** The following sources contain examples of types of vegetation that can be considered as fire-resistant vegetation. (Fire-resistant Plants for Home Landscapes, A Pacific Northwest Extension publication; Home Landscaping for Fire, University of California Division of Agriculture and Natural Resources; Sunset Western Garden Book)]*



California lilac, an example of fire-resistant vegetation.

CHANGE SIGNIFICANCE: The State Fire Marshal proposed the addition of the definition of Fire-Resistant Vegetation in Section R337.2 in order to correlate to the changes made in Chapter 49 of the *California Fire Code*. Both *California Residential Code* Section R337 and *California Fire Code* Chapter 49 include mitigation strategies to reduce the hazards of fire originating within a structure and spreading to wildland in addition to fire originating in wildland and spreading to structures. Those mitigation strategies include requirements about landscape and vegetation management. The intent of these sections is to balance the aesthetic beauty of our area, protect our resources and reduce the risk associated with wildfire and habitat resources.

The term fire-resistant vegetation, which is referenced in Chapter 49 of the *California Fire Code*, was not previously defined. Chapter 49 has been significantly revised, and the definition adds clarification to the term used throughout the revised code language. Realizing that vegetation can never be completely fire resistant, the definition was composed to describe the beneficial characteristics that determine when vegetation is less likely to be a significant contributing factor in a wildfire.

While all burning vegetation will contribute some heat to a fire, the amount of heat is variable. For instance, dry grasses and other light fuels will initially contribute heat and proceed to burn out quickly compared to thick branches of a tree which take more energy to ignite but will contribute significantly more heat once ignited than a light fuel. The definition also reflects the requirements in Public Resources Code, Division 4, Part 2, Chapter 3, Section 4291 which stipulates the Department of Forestry and Fire Protection to provide guidance on fuel management ensuring "regionally appropriate vegetation suggestions that preserve and restore native species that are fire resistant and/or drought tolerant." It is also important as this definition and listed plants will provide greater opportunities for residents to select vegetation that is fire resistant in the widely variable climatic regions within California. The newly added definition and note help in this effort.

R337.10.4

Fire Ratings of Accessory Buildings' Roofs

CHANGE TYPE: Addition

CHANGE SUMMARY: Section R337.10.4 was added to clarify that roofs of accessory buildings that are required to be built from noncombustible materials shall comply with Section R337 and Chapter 9, and the roof must meet a Class A fire rating.

2022 CODE TEXT: ***R337.10.4 Roof construction.*** *Roofs of accessory buildings required to be constructed entirely of noncombustible materials or of ignition-resistant materials shall comply with the requirements of Section 337 and Chapter 9. Roofs shall have a roofing assembly installed in accordance with its listing and the manufacturer's installation instructions. Roof assemblies in Fire Hazard Severity Zones shall comply with a Class A rating when tested in accordance with ASTM E108 or UL790.*

CHANGE SIGNIFICANCE: Section R337.10.4 Roof construction of accessory structures, has been added to CRC Section 337, Materials and Construction Methods for Exterior Wildfire Exposure, after having the overwhelming support of multiple code change proponents. The intent of the newly added section is to address a recognized "Achilles Heel" to the intent of Section R337.10, and the overall Section R337 for that matter, ensuring an appropriate level of fire protection for accessory structures. This section clarifies and requires that whenever an accessory building is required to be constructed of noncombustible materials or of ignition-resistant materials, its roof must meet Class A fire rating.

An engulfed roof fire constructed without noncombustible materials.

PART 3

Building Construction

Chapters 4 through 10

- **Chapter 4** Foundations
- **Chapter 5** Floors
- **Chapter 6** Wall Construction
- **Chapter 7** Wall Covering
- **Chapter 8** Roof-Ceiling Construction
- **Chapter 9** Roof Assemblies
- **Chapter 10** Chimneys and Fireplaces

No changes addressed

Chapters 4 through 10 address the prescriptive methods for building foundations, floor construction, wall construction, wall coverings, roof construction, roof assemblies, chimneys, and fireplaces. Concrete, masonry, and wood foundations; retaining walls; supporting soil properties; surface drainage; and foundation dampproofing and drainage are found in Chapter 4. Chapters 5, 6, and 8 contain the construction provisions for floors and decks, walls, and roofs, respectively, with most of the provisions addressing light-frame construction. Chapter 7 addresses interior finishes, such as drywall and plaster installations, and exterior wall coverings, including water-resistive barriers, flashings, siding, and veneer, to provide a durable weather-resistant exterior. Chapter 9 covers the various waterproof roof assemblies, including roofing underlayment, roof eave ice barrier, flashings, asphalt shingles, and other roof coverings. Site-built masonry fireplaces and chimneys as well as prefabricated fireplaces and chimneys, including their weather-tight roof terminations, are addressed in the provisions of Chapter 10. ■

TABLE R403.1(1)

Footings Below Light-Frame Construction

R406.2

Foundation Waterproofing

R408.8

Vapor Retarder in Crawlspaces

R506.2.3

Vapor Retarders Under Concrete Slabs

R507

Deck Loads

R507.3

Deck Footings

R507.4

Deck Posts

R507.5

Deck Beams

R507.6

Deck Joists

R507.7

Decking

R507.10

Exterior Guards

TABLE R602.3(1)
Fasteners – Roof and Wall

TABLE R602.3(1)
Fasteners – Roof Sheathing

TABLE R602.3(2)
Alternate Attachments

R602.9
Cripple Walls

R602.10.1.2
Location of Braced Wall Lines

R602.10.2.2
Location of Braced Wall Panels (BWPs)

R602.10.3(1)
Bracing for Winds

TABLE R602.10.3(3)
Seismic Wall Bracing

TABLE R602.10.3(4)
Adjustment Factors – Seismic

R602.10.6.5
Stone and Masonry Veneer

R609.4.1
Garage Doors

R703.2, R703.7.3
Water-Resistive Barriers

TABLE R703.8.4(1)
Veneer Attachment

R703.11.2
Vinyl Siding Installation Over Foam Plastic Sheathing

R704
Soffits

R802
Wood Roof Framing

TABLE R802.5.2(1)
Heel Joint Connections

R802.6
Rafter and Ceiling Joist Bearing

TABLE R804.3
CFS Roof Framing Fasteners

R806.1.1
Vents in the Wildland-Urban Interface (WUI)

R905.4.4.1
Metal Roof Shingle Wind Resistance

CHANGE TYPE: Modification

CHANGE SUMMARY: Tables R403.1(1), (2) and (3) are revised to more accurately reflect current practice.

2022 CODE TEXT:

Table R403.1(1)

Footings Below Light-Frame Construction

TABLE R403.1(1) Minimum Width and Thickness for Concrete Footings for Light-Frame Construction (inches) [a, b, c, d]

Ground Snow Load or Roof Live Load	Story and Type of Structure with Light Frame	Load Bearing Value of Soil (psf)					
		1500	2000	2500	3000	3500	4000
20 psf Roof Live Load or 25 psf Ground Snow Load	1 story – slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – with crawl space	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – plus basement	16 × 6 / ~~18 × 6~~	12 × 6 / ~~14 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – slab on grade	13 × 6 / ~~12 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – with crawl space	15 × 6 / ~~16 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – plus basement	19 × 6 / ~~22 × 6~~	14 × 6 / ~~16 × 6~~	12 × 6 / ~~13 × 6~~	12 × 6	12 × 6	12 × 6
	3 story – slab on grade	16 × 6 / ~~14 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – with crawl space	18 × 6 / ~~19 × 6~~	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – plus basement	22 × 7 / ~~25 × 8~~	16 × 6 / ~~19 × 6~~	13 × 6 / ~~15 × 6~~	12 × 6 / ~~13 × 6~~	12 × 6	12 × 6
30 psf	1 story – slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – with crawl space	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – plus basement	16 × 6 / ~~19 × 6~~	12 × 6 / ~~14 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – slab on grade	13 × 6 / ~~12 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – with crawl space	16 × 6 / ~~17 × 6~~	12 × 6 / ~~13 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – plus basement	19 × 6 / ~~23 × 6~~	14 × 6 / ~~17 × 6~~	12 × 6 / ~~14 × 6~~	12 × 6	12 × 6	12 × 6
	3 story – slab on grade	16 × 6 / ~~15 × 6~~	14 × 6 / ~~12 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – with crawl space	19 × 6 / ~~20 × 6~~	14 × 6 / ~~15 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – plus basement	22 × 7 / ~~26 × 8~~	16 × 6 / ~~20 × 6~~	13 × 6 / ~~16 × 6~~	12 × 6 / ~~13 × 6~~	12 × 6	12 × 6

continues

TABLE R403.1(1) (*continued*)

Ground Snow Load or Roof Live Load	Story and Type of Structure with Light Frame	Load Bearing Value of Soil (psf)					
		1500	2000	2500	3000	3500	4000
50 psf	1 story – slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – with crawl space	14 × 6 ~~16 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – plus basement	18 × 6 ~~21 × 6~~	13 × 6 ~~16 × 6~~	12 × 6 ~~13 × 6~~	12 × 6	12 × 6	12 × 6
	2 story – slab on grade	15 × 6 ~~14 × 6~~	13 × 6 ~~12 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – with crawl space	17 × 6 ~~19 × 6~~	13 × 6 ~~14 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – plus basement	21 × 7 ~~25 × 7~~	15 × 6 ~~19 × 6~~	12 × 6 ~~15 × 6~~	12 × 6	12 × 6	12 × 6
	3 story – slab on grade	18 × 6 ~~17 × 6~~	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – with crawl space	20 × 6 ~~22 × 6~~	15 × 6 ~~17 × 6~~	12 × 6 ~~13 × 6~~	12 × 6	12 × 6	12 × 6
	3 story – plus basement	24 × 8 ~~28 × 9~~	18 × 6 ~~21 × 6~~	14 × 6 ~~17 × 6~~	12 × 6 ~~14 × 6~~	12 × 6	12 × 6
70 psf	1 story – slab on grade	14 × 6 ~~12 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – with crawl space	16 × 6 ~~18 × 6~~	12 × 6 ~~13 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	1 story – plus basement	19 × 6 ~~24 × 7~~	14 × 6 ~~18 × 6~~	12 × 6 ~~14 × 6~~	12 × 6	12 × 6	12 × 6
	2 story – slab on grade	17 × 6 ~~16 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story – with crawl space	19 × 6 ~~21 × 6~~	14 × 6 ~~16 × 6~~	12 × 6 ~~13 × 6~~	12 × 6	12 × 6	12 × 6
	2 story – plus basement	22 × 7 ~~27 × 9~~	17 × 6 ~~20 × 6~~	13 × 6 ~~16 × 6~~	12 × 6 ~~14 × 6~~	12 × 6	12 × 6
	3 story – slab on grade	20 × 6 ~~19 × 6~~	15 × 6 ~~14 × 6~~	12 × 6	12 × 6	12 × 6	12 × 6
	3 story – with crawl space	22 × 7 ~~25 × 7~~	16 × 6 ~~18 × 6~~	13 × 6 ~~15 × 6~~	12 × 6	12 × 6	12 × 6
	3 story – plus basement	24 × 8 ~~30 × 10~~	19 × 6 ~~23 × 6~~	15 × 6 ~~18 × 6~~	13 × 6 ~~15 × 6~~	12 × 6 ~~13 × 6~~	12 × 6

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not ~~allowed~~ permitted.

b. ~~Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~ The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 9 feet; Basement wall height: 8 feet; Dead loads: 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floors. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

continues

d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width, provided the minimum width is 12 inches (304.8 mm) and minimum depth is 6 inches (152.4 mm).

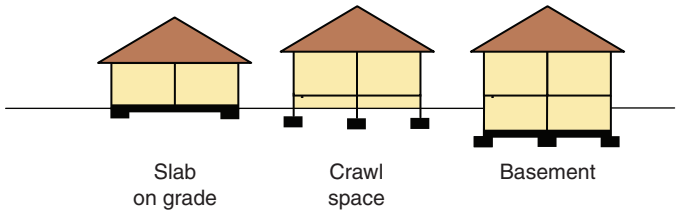


TABLE R403.1(2) Minimum Width and Thickness for Concrete Footings for Light-Frame Construction with Brick Veneer or Lath And Plaster (inches)[a, b, c, d]

Ground Snow Load or Roof Live Load	Story and Type of Structure With Brick Veneer	Load-Bearing Value of Soil (psf)					
		1500	2000	2500	3000	3500	4000

TABLE R403.1(3) Minimum Width and Thickness for Concrete Footings with Cast-In-Place Concrete or ~~Fully~~ Partially Grouted Masonry Wall Construction (inches)[a, b, c, d]

Ground Snow Load or Roof Live Load	Story and Type of Structure With CMU or Concrete	Load-Bearing Value of Soil (psf)					
		1500	2000	2500	3000	3500	4000

(For changes to Tables R403.1(2) and R403.1(3) please see the 2021 CRC)

CHANGE SIGNIFICANCE: Designers using Tables R403.1(1), (2) or (3), minimum width and thickness for concrete footings, introduced in the 2016 *California Residential Code* (CRC), have found in certain instances footing widths required by the table to be different than those required by previous editions of the CRC. In fact, due to conservative assumptions for the tables, some footing widths were wider than an engineering analysis

Stem wall and interior footings.

would suggest necessary. A review of underlying calculations found minimum widths and thicknesses where load assumptions were incorrect. Therefore, changes to the tables were proposed for the *2022 California Residential Code*.

Revised assumptions and calculations for concrete footing tables include the following:

1. Application of roof snow load rather than ground snow load to the roof. The actual roof snow load per ASCE 7, unadjusted by any other factors, is 70 percent of the ground snow load or 20 pounds per square foot, whichever is greater. Consistent with Chapter 8 rafter tables, a thermal factor (C_t) of 1.1 per ASCE 7 is also applied to roof snow load calculations.
2. A 100-pound per square foot (psf) load was previously used for above-grade concrete or masonry walls, representing a solid or fully grouted 8-inch CMU wall. Such walls are more likely to be either 8-inch CMU grouted at 48 inches on center or 8-inch insulated concrete forms, both of which impose only a 55 pound per square foot load. This change affects Table R403.1(3) for footings under above-grade concrete or CMU walls.
3. Previous calculations used the ASCE 7 load combination applying a 0.75 factor for concurrent roof/snow and floor live loads, ignoring load combinations that apply to just a roof/attic live load, just a snow load, or just a floor live load. These additional load combinations apply for a single-story building and for interior footings.
4. Calculations were formerly based on tributary width, yet footnote b added 2 inches of footing width for every 2 feet of additional building width. For a building with interior concrete footings, the tributary width is half the distance between footings, not half the entire building width. As a result of confusing building and tributary width, footnote b potentially doubled the additional footing width for buildings wider than 32 feet.

In many cases, revised footing widths in the 2022 CRC are more consistent with historic practice, while still technically justified under engineering standards and accepted practices. There are a few cases for houses on weaker soils (1500 psf and 2000 psf soil bearing strength) with slab-on-grade or crawlspace foundations, where a revised assumption of clear-spanning roof trusses led to a slight increase to footing widths.

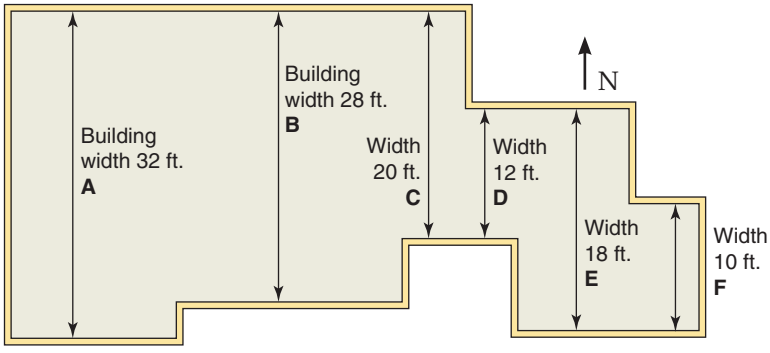
Footnote b allowing adjustment of footing width and depth is now divided into two footnotes. Footnote c requires an increase in footing width and depth when the building width perpendicular to a wall footing exceeds 32 feet. Footnote d permits, but does not require, a decrease in footing width and depth for a building width narrower than 32 feet.

Example: Footing Size with Variable Building Width

A single-family home has the following attributes:

- Two-story
- Gable roof
- Crawl space foundation
- Thirty psf ground snow load

- 1500 psi soil capacity assumed
- Building width varies between 12 and 32 feet
- Clear-span trusses at 24 inches on center
- Center-bearing floors



For building widths A – F, the tributary length is:

A. Tributary length = 16 ft

B. Tributary length = 14 ft

C. Tributary length = 10 ft

D. Tributary length = 6 ft

E. Tributary length = 9 ft

F. Tributary length = 5 ft

For building widths A–F, the worst case footing size is a 16 × 6 footing for a 32-foot building width. The footing could be reduced to 12 × 6 where applicable on the north and south walls of the building.

Footings support building loads which include the weight of the building (dead loads), live loads (people and furnishings) and environmental loads, for example snow. Exterior bearing walls carry roof loads based on an assumption of a clear-span roof, such as a truss, which means the roof's tributary area is calculated based on half the building width. With an assumption of a center-bearing wall or beam carrying the load from floor joists or trusses, the tributary area for floors is based on one-quarter of the building width.

Gable-end exterior walls carry only the weight of nonload-bearing walls and the roof load from one-half of the truss or rafter spacing. In the example, the truss spacing is 24 inches on-center so the roof load tributary width is only 1 foot. Gable-end walls will typically never need more than the 12 × 6 minimum footing size.

For a hip roof, it is reasonable to measure the building width perpendicular to the wall from the peak of the hip (where it connects to the ridge) to the end wall—in other words, the length of the longest hip truss or rafter.

R406.2

Foundation Waterproofing

CHANGE TYPE: Deletion

CHANGE SUMMARY: Six-mil polyvinyl chloride and polyethylene fabrics are removed from the list of approved waterproofing materials.

2022 CODE TEXT: **R406.2 Concrete and masonry foundation waterproofing.** In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below grade shall be waterproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished grade. Walls shall be waterproofed in accordance with one of the following:

1. Two-ply hot-mopped felts.
2. Fifty-five-pound (25 kg) roll roofing.
3. ~~Six-mil (0.15 mm) polyvinyl chloride.~~
4. ~~Six-mil (0.15 mm) polyethylene.~~
3. Forty-mil (1 mm) polymer-modified asphalt.
4. Sixty-mil (1.5 mm) flexible polymer cement.

Approved waterproofing material.

5. One-eighth inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
6. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.

All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane.

Exception: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and esters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of ASTM D449. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).

CHANGE SIGNIFICANCE: Waterproofing is the formation of a durable and impervious barrier designed to prevent water from entering a specific building envelope section, generally the foundation. To be effective, a waterproofing system consists of durable and continuous materials applied to all foundation areas that will be subjected to ground water. During backfill, materials containing debris, frost, sharp stones or rocks may scrape along the foundation tearing thinner waterproofing materials.

Section R406.2 is amended by deleting Items 3 and 4 from the list of approved products that can be used as a waterproofing material. Six-mil polyvinyl chloride and polyethylene products have not proven to possess the thickness or strength to be effective and durable in this application. These materials are likely to rip or tear allowing water behind the waterproofing material, trapping moisture behind undamaged fabric and potentially creating issues for the building interior.

Other products approved as waterproofing materials are made of heavier materials more resistant to damage or displacement during backfill, with minimum ⅛-inch or 40-mil (approximately 3⁄64-inch) thickness.

R408.8

Vapor Retarder in Crawlspaces

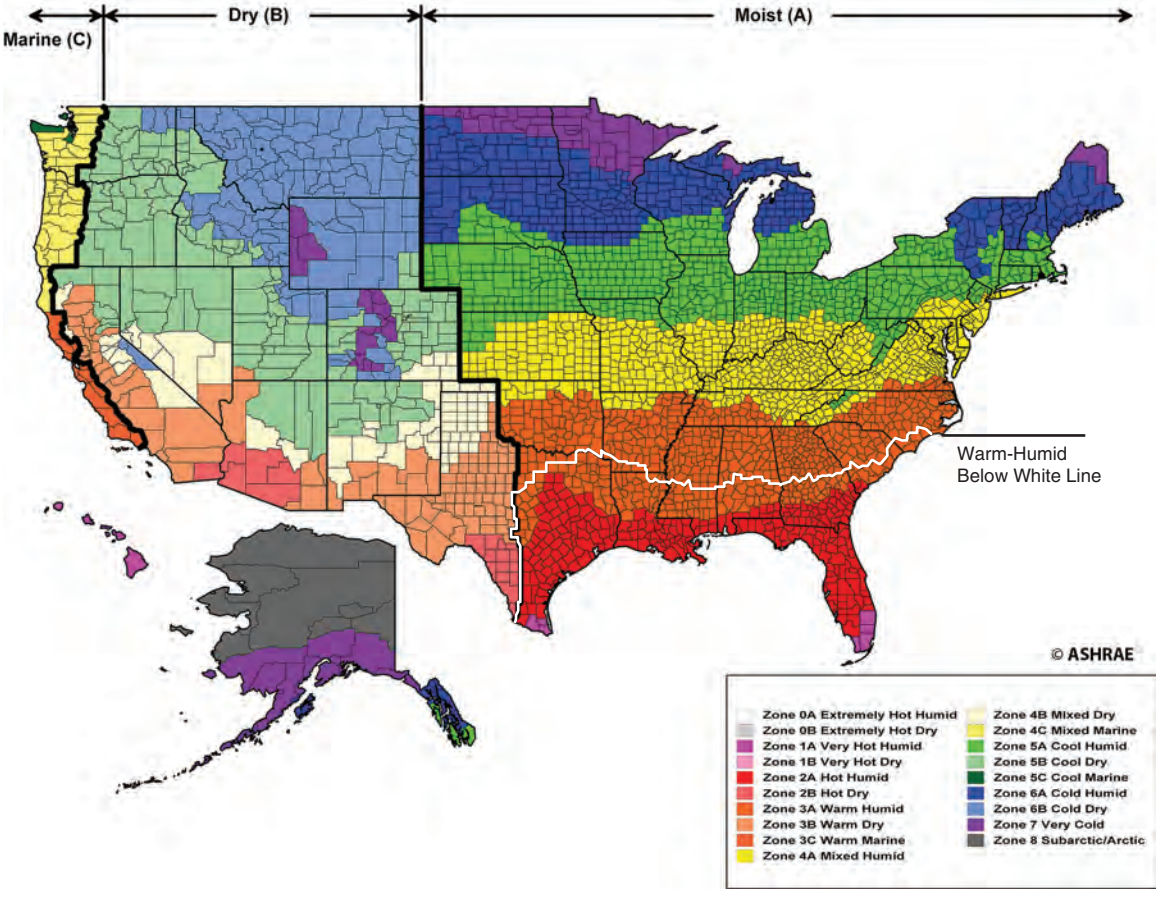
CHANGE TYPE: Addition

CHANGE SUMMARY: Where exposed to grade in a crawl space, a Class I or II vapor retarder is required on exposed air permeable insulation between floor joists in Climate Zones 1A, 2A and 3A.

2022 CODE TEXT: **R408.8 Under-floor vapor retarder.** In Climate Zones 1A, 2A and 3A below the warm-humid line, a continuous Class I or II vapor retarder shall be provided on the exposed face of air permeable insulation installed between the floor joists and exposed to the grade in the under-floor space. The vapor retarder shall have a maximum water vapor permeance of 1.5 perms when tested in accordance with Procedure B of ASTM E96.

Exception: The vapor retarder shall not be required in unvented crawl spaces constructed in accordance with Section R408.3.

Note: *The International Energy Conservation Code (IECC) climate zones used by this section differ from those used by the California Energy Code to determine applicability of energy efficiency measures. Comparison of IECC and California Energy Code climate zones is shown in Table R702.7(5).*



Locations where vapor retarder is required under floor joists.

CHANGE SIGNIFICANCE: New Section R408.8 addresses issues with moisture accumulation in floors above vented crawl spaces in warm-humid climates. Water vapor migrating from vented crawl spaces or post and beam foundations toward cooler and drier indoor spaces may cause mold, mildew and decay within floor assemblies, especially where an impermeable floor covering or underlayment is used, as moisture can condense and be trapped within the wood subfloor. Such moisture problems have been observed even where crawl spaces are constructed in accordance with the CRC, with properly sized and located ventilation openings.

This section requires a Class I or Class II vapor retarder on the exposed face of air-permeable insulation materials installed between floor framing members above the crawl space. The vapor retarder can be a separate layer of material or incorporated as part of the insulation. Examples include foil facing on fiberglass batts, polyisocyanurate rigid foam, or a 6-mil polyethylene sheet applied over permeable insulation along the base of floor joists, I-joists or trusses.

R506.2.3

Vapor Retarders Under Concrete Slabs

CHANGE TYPE: Modification

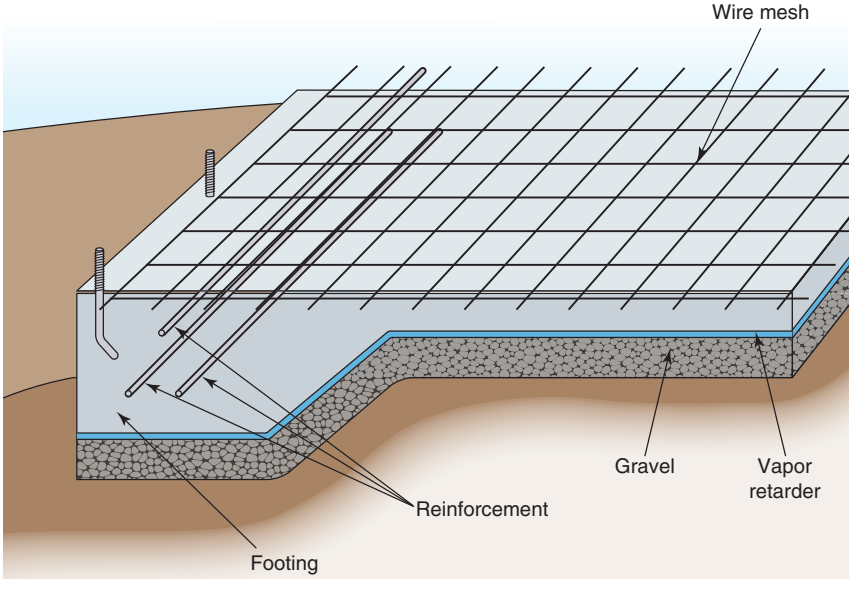
CHANGE SUMMARY: Thicker vapor retarders are now required below slabs-on-grade.

2022 CODE TEXT: **R506.2.3 Vapor retarder.** A minimum ~~6-mil~~ 10-mil (~~0.006~~ 0.010 inch; ~~152 µm~~ 0.254 mm) ~~polyethylene or approved~~ vapor retarder conforming to ASTM E1745 Class A requirements with joints lapped not less than 6 inches (152 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where a base course does not exist.

Exception: The vapor retarder is not required for the following:

1. Garages, utility buildings and other unheated accessory structures.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m^2) and carports.
3. Driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date.
4. Where approved by the building official, based on local site conditions.

CHANGE SIGNIFICANCE: Water vapor migrating from the ground into spaces such as vented crawlspaces and open foundation systems or through concrete slabs on ground toward cooler and drier indoor spaces may cause mold, mildew and decay, as condensed moisture is trapped indoors. Thin membranes on the ground can be torn during construction allowing moisture to migrate up into the house.



Vapor retarder laid between subgrade and concrete.

Section R506.2.3 requires a vapor retarder between a concrete slab and the top of underlying soil or gravel. The vapor retarder is now required to be a minimum of 10-mil thickness and may be any material that meets ASTM E1745 Class A requirements. The greater thickness offers increased resistance to moisture transmission and provides increased durability during and after installation.

The updated minimum vapor retarder requirements now meet American Concrete Institute (ACI) recommendations as well. ACI 302.1, *Guide to Concrete Floor and Slab Construction*, requires a below slab vapor retarder to meet the requirements of ASTM E1745, *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*.

R507

Deck Loads

CHANGE TYPE: Modification

CHANGE SUMMARY: Deck design is now based on live and snow loads.

2022 CODE TEXT: **R507.1 Decks.** Wood-framed decks shall be in accordance with this section. Decks shall be designed for the live load required in Section R301.5 or the ground snow load indicated in Table R301.2, whichever is greater. For decks using materials and conditions not prescribed in this section, refer to Section R301.

CHANGE SIGNIFICANCE: *California Residential Code* (CRC) prescriptive deck provisions historically have only assumed a 40 psf live load and 10 psf dead load for all components in the deck. However, a significant portion of the population in the United States lives in areas where the ground snow load exceeds the live load in Table R301.5, Minimum Uniformly Distributed Live Loads.

For the 2022 CRC, a deck is now either designed for a 40 pounds per square foot (psf) live load or for the ground snow load listed in a jurisdiction's table of climatic and geographic design criteria (Table R301.2). This

Snow on deck.

requires use of whichever load is higher. Updated lumber tables consider ground snow loads of 50, 60 and 70 psf while allowing interpolation between loads.

For snow loading, an increase in wood strength is accounted for using a load duration factor from the *National Design Specification (NDS) for Wood Construction*. While deck geometry and nearby structures can cause drifting, these effects are outside the scope of CRC deck tables. Similarly, elevated decks have snow loads less than the ground snow load based on ASCE 7, but this reduction is not included to provide simpler tables.

Note that when comparing the *2022 California Building Code* (CBC) and the 2022 CRC, minimum deck live loads will be 1.5 times the associated room live load per the 2022 CBC. For a sleeping room, this will be 1.5 $\times$ 30 psf or 45 psf. For all other residential areas, the deck live load will be 1.5 $\times$ 40 psf or 60 psf. In the CRC, for decks accessed from any room, the minimum live load remains 40 psf.

R507.3

Deck Footings

CHANGE TYPE: Modification

CHANGE SUMMARY: Clarifications are made for freestanding deck footing exceptions and a tributary area of 5 psf is added to the deck footing size table.

2022 CODE TEXT: **R507.3 Footings.** Decks shall be supported on concrete footings or other approved structural systems designed to accommodate all loads in accordance with Section R301. Deck footings shall be sized to carry the imposed loads from the deck structure to the ground as shown in Figure R507.3. ~~The footing depth shall be in accordance with Section R403.1.4.~~

~~Exception~~ Exceptions:

1. Footings shall not be required for free~~Free~~-standing decks consisting of joists directly supported on grade over their entire length.
2. Footings shall not be required for free-standing decks that meet all of the following criteria:
   - **2.1.** The joists bear directly on precast concrete pier blocks at grade without support by beams or posts,
   - **2.2.** The area of the deck does not exceed 200 square feet (18.6 m^2),

Footings for buried pressure-treated deck posts.

TABLE R507.3.1 Minimum Footing Size for Decks

Live Or Ground Snow Load[b] (psf)	Tributary Area (sq. ft.)	Soil bearing capacity[a,c,d] 1500[e] psf: Side of a Square Footing (inches)	1500[e] psf: Diameter of a Round Footing (inches)	1500[e] psf: Thickness[f] (inches)	2000[e] psf: Side of a Square Footing (inches)	2000[e] psf: Diameter of a Round Footing (inches)	2000[e] psf: Thickness[f] (inches)	≥ 3000[e] psf: Side of a Square Footing (inches)	≥ 3000[e] psf: Diameter of a Round Footing (inches)	≥ 3000[e] psf: Thickness[f] (inches)
40	5	7	8	6	7	8	6	7	8	6
	20	10	12	6	9	9	6	7	8	6
	40	14	16	6	12	14	6	10	12	6
50	5	7	8	6	7	8	6	7	8	6
	20	11	13	6	10	11	6	8	9	6
	40	15	17	6	13	15	6	11	13	6
60	5	7	8	6	7	8	6	7	8	6
	20	12	14	6	11	12	6	9	10	6
70	5	7	8	6	7	8	6	7	8	6
	20	12	14	6	11	13	6	9	10	6

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted; extrapolation not permitted.

b. Based on highest load case: Dead + Live or Dead + Snow.

c. ~~Assumes minimum square footing to be 12 inches × 12 inches × 6 inches for 6 × 6 post.~~ Footing dimensions shall allow complete bearing of the post.

d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.

e. Area, in square feet, of deck surface supported by post and footings.

f. Minimum thickness shall only apply to plain concrete footings.

(Deleted text not shown for clarity: values in tables that did not change are not shown for brevity.)

2.3. The walking surface is not more than 20 inches (508 mm) above grade at any point within 36 inches (914 mm) measured horizontally from the edge.

CHANGE SIGNIFICANCE: Footing exceptions for freestanding decks have been clarified. In the first exception, joists supported on grade do not require footings. In the second exception, a small deck low to the ground may use concrete piers as footings directly supporting deck joists (no beams or posts). The exception limits these decks to 200 square feet and a height to the top of the deck of 20 inches above grade.

Table R507.3.1, minimum footing size for decks, is expanded to offer a minimum footing size decreased from a 12-inch by 12-inch square in the 2019 CRC to a smaller 7-inch by 7-inch square or 8-inch round footing in the 2022 CRC based on a new 5 psf tributary area. The former limit of a 12-inch by 12-inch footing was significantly oversized for small areas such as stairs or landings. The smaller tributary area also allows for some precast concrete solutions for small landings and porches.

Updated footnote c clarifies that the footing must be wide enough to allow complete bearing of the post. New footnote f states that minimum footing thickness is based on plain concrete. A thinner reinforced footing may be possible with calculations.

R507.4

Deck Posts

CHANGE TYPE: Modification

CHANGE SUMMARY: The deck post height table is expanded by adding the tributary area supported by a post and the wood species for determination of maximum post height.

2022 CODE TEXT: **R507.4 Deck posts.** For single-level ~~wood-framed~~ decks, ~~with beams sized in accordance with Table R507.5, deck~~ wood post size shall be in accordance with Table R507.4.

TABLE R507.4 Deck Post Height

Loads[b] (psf)	Post Species[c]	Post Size[d]	Tributary Area[g,h] (sq/ft.)							
			20	40	60	80	100	120	140	160
			Maximum Deck Post Height[a] (feet-inches)							
40 Live Load	Southern Pine	4 × 4	14-0	13-8	11-0	9-5	8-4	7-5	6-9	6-2
		4 × 6	14-0	14-0	13-11	12-0	10-8	9-8	8-10	8-2
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas Fir[e], Hem-fir[e], SPF[e]	4 × 4	14-0	13-6	10-10	9-3	8-0	7-0	6-2	5-3
		4 × 6	14-0	14-0	13-10	11-10	10-6	9-5	8-7	7-10
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	4 × 4	14-0	13-2	10-3	8-1	5-8	NP	NP	NP
		4 × 6	14-0	14-0	13-6	11-4	9-9	8-4	6-9	4-7
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	13-7	9-7
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
50 Ground Snow Load	Southern Pine	4 × 4	14-0	12-2	9-10	8-5	7-5	6-7	5-11	5-4
		4 × 6	14-0	14-0	12-6	10-9	9-6	8-7	7-10	7-3
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	13-4
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas Fir[e], Hem-fir[e], SPF[e]	4 × 4	14-0	12-1	9-8	8-2	7-1	6-2	5-3	4-2
		4 × 6	14-0	14-0	12-4	10-7	9-4	8-4	7-7	6-11
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	12-10
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	4 × 4	14-0	11-8	9-0	6-10	3-7	NP	NP	NP
		4 × 6	14-0	14-0	12-0	10-0	8-6	7-0	5-3	NP
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	10-8	2-4
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

continues

TABLE R507.4 (*continued*)

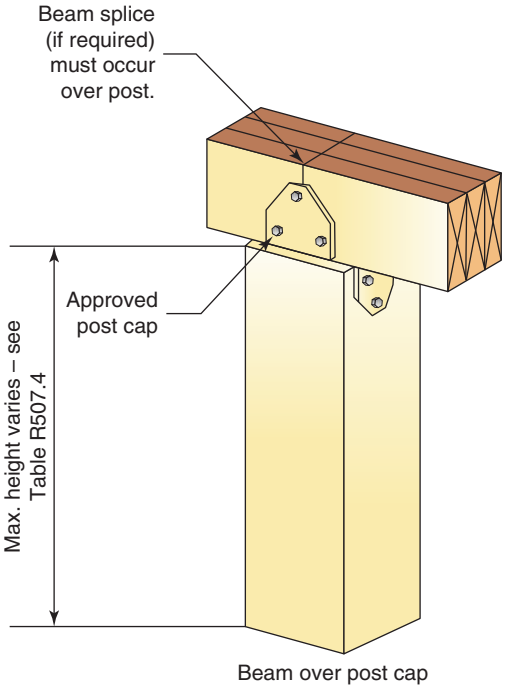
Loads[b] (psf)	Post Species[c]	Post Size[d]	Tributary Area[g,h] (sq/ft.) 20	40	60	80	100	120	140	160
			Maximum Deck Post Height[a] (feet-inches)							
60 Ground Snow Load	Southern Pine	4 × 4	14-0	11-1	8-11	7-7	6-7	5-10	5-2	4-6
		4 × 6	14-0	14-0	11-4	9-9	8-7	7-9	7-1	6-6
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	12-9	11-2
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas Fir[e], Hem-fir[e], SPF[e]	4 × 4	14-0	10-11	8-8	7-3	6-2	5-0	3-7	NP
		4 × 6	14-0	13-11	11-2	9-7	8-4	7-5	6-8	5-11
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	12-2	10-2
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	4 × 4	14-0	10-6	7-9	4-7	NP	NP	NP	NP
		4 × 6	14-0	13-7	10-9	8-9	7-0	4-9	NP	NP
		6 × 6	14-0	14-0	14-0	14-0	14-0	9-9	NP	NP
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
70 Ground Snow Load	Southern Pine	4 × 4	14-0	10-2	8-2	6-11	5-11	5-2	4-4	3-4
		4 × 6	14-0	12-11	10-5	8-11	7-10	7-1	6-5	5-10
		6 × 6	14-0	14-0	14-0	14-0	14-0	12-9	10-11	8-7
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas Fir[e], Hem-fir[e], SPF[e]	4 × 4	14-0	10-1	7-11	6-6	5-3	3-7	NP	NP
		4 × 6	14-0	12-10	10-3	8-9	7-7	6-8	5-10	4-11
		6 × 6	14-0	14-0	14-0	14-0	14-0	12-2	9-9	5-9
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	4 × 4	14-0	9-5	6-5	NP	NP	NP	NP	NP
		4 × 6	14-0	12-6	9-8	7-7	5-3	NP	NP	NP
		6 × 6	14-0	14-0	14-0	14-0	10-8	NP	NP	NP
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa., NP = Not Permitted

a. Measured from the underside of the beam to the top of footing or pier.
b. 10 psf dead load. Snow load not assumed to be concurrent with live load.
c. No. 2 grade, wet service factor included.
d. Notched deck posts shall be sized to accommodate beam size in accordance with Section R507.5.2
e. Includes incising factor.
f. Incising factor not included.
g. Area, in square feet, of deck surface supported by post and footings.
h. Interpolation permitted. Extrapolation not permitted.

(Deleted text not shown for clarity.)

CHANGE SIGNIFICANCE: Table R507.4, Maximum Deck Post Height, is greatly expanded to allow for a larger variety of post heights. By including consideration of tributary area supported by a post for smaller decks, porches and landings, the table allows greater heights with 4 × 4 and 4 × 6 posts. Having a maximum tributary area also defines an upper size limit for decks unless additional posts are added. Similar to deck footing size provisions, consideration for 50, 60 and 70 psf ground snow loads is provided. All tabulated wood species can attain the maximum post height



Deck post maximum height varies.

of 14 feet with an 8 × 8 minimum nominal dimension or a maximum tributary area of 20 square feet. Southern pine, Douglas Fir, Hem-fir and Spruce-Pine-Fir posts with 6 × 6 minimum nominal dimensions can also achieve the 14-foot maximum for decks carrying a 40 psf live load.

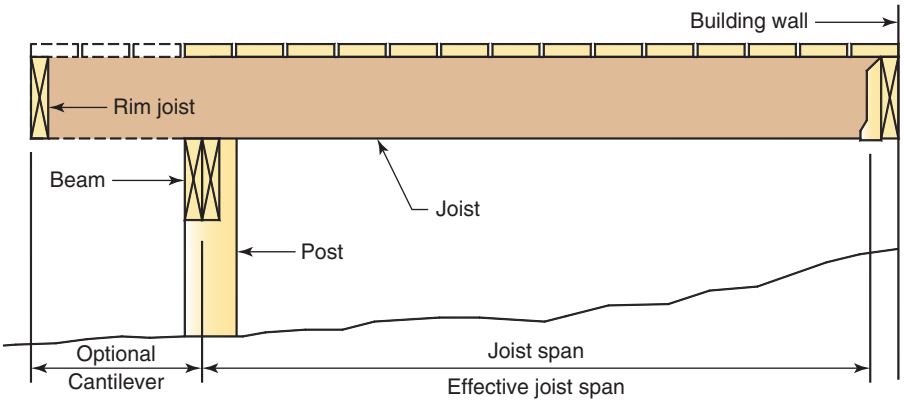
Standard wood assumptions are shown in the footnotes. Lumber is assumed to be wet, of No. 2 grade and carry a 10 psf dead load. Some species require incising to provide appropriate preservative treatment retention levels.

R507.5
Deck Beams

CHANGE TYPE: Modification

CHANGE SUMMARY: The deck beam span table is split into multiple tables providing spans for given deck live or snow loads. Single and multi-ply spans as well as options for support of cantilevered deck joists are listed.

2022 CODE TEXT: **R507.5 Deck beams.** Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with ~~Table R507.5.~~ Tables R507.5(1) through R507(4). Beam plies shall be fastened together with two rows of 10d (3-inch × 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the ~~allowable~~ actual beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.



Deck beam span.

TABLE R507.5(2) Maximum Deck Beam Span – 50 PSF Ground Snow Load[c]

		Effective Deck Joist Span Length[a,i,j] (feet)						
		6	8	10	12	14	16	18
Beam Species[d]	Beam Size[e]	Maximum Beam Span[a,b,f] (feet-inches)						
Southern Pine	1-2 × 6	4-6	3-11	3-6	3-2	2-11	2-9	2-7
	1-2 × 8	5-9	4-11	4-5	4-0	3-9	3-6	3-3
	1-2 × 10	6-9	5-10	5-3	4-9	4-5	4-2	3-11
	1-2 × 12	8-0	6-11	6-2	5-8	5-3	4-11	4-7
	2-2 × 6	6-8	5-9	5-2	4-9	4-4	4-1	3-10
	2-2 × 8	8-6	7-4	6-7	6-0	5-7	5-2	4-11
	2-2 × 10	10-1	8-9	7-10	7-1	6-7	6-2	5-10
	2-2 × 12	11-11	10-3	9-2	8-5	7-9	7-3	6-10
	3-2 × 6	7-11	7-2	6-6	5-11	5-6	5-1	4-10
	3-2 × 8	10-5	9-3	8-3	7-6	6-11	6-6	6-2
	3-2 × 10	12-8	10-11	9-9	8-11	8-3	7-9	7-3
	3-2 × 12	14-11	12-11	11-6	10-6	9-9	9-1	8-7

continues

TABLE R507.5(2) (*continued*)

Beam Species[d]	Beam Size[e]	Effective Deck Joist Span Length[a,i,j] (feet)						
		6	8	10	12	14	16	18
		Maximum Beam Span[a,b,f] (feet-inches)						
	1-2 × 6	4-0	3-5	2-11	2-7	2-4	2-2	2-0
	1-2 × 8	5-4	4-7	3-11	3-5	3-1	2-10	2-8
	1-2 × 10	6-7	5-8	4-11	4-5	4-0	3-8	3-5
	1-2 × 12	7-7	6-7	5-11	5-4	4-10	4-6	4-2
Douglas fir-larch[g], Hem-fir[g], Spruce-pine-fir[g]	2-2 × 6	6-0	5-2	4-7	4-2	3-10	3-5	3-2
	2-2 × 8	8-0	6-11	6-2	5-8	5-0	4-7	4-2
	2-2 × 10	9-9	8-5	7-7	6-11	6-4	5-10	5-4
	2-2 × 12	11-4	9-10	8-9	8-0	7-5	6-11	6-6
	3-2 × 6	7-6	6-6	5-9	5-3	4-11	4-7	4-4
	3-2 × 8	10-0	8-8	7-9	7-1	6-6	6-1	5-8
	3-2 × 10	12-3	10-7	9-6	8-8	8-0	7-6	7-0
	3-2 × 12	14-3	12-4	11-0	10-1	9-4	8-9	8-3
	1-2 × 6	4-1	3-6	3-0	2-8	2-5	2-3	2-1
	1-2 × 8	5-2	4-6	4-0	3-6	3-2	2-11	2-9
	1-2 × 10	6-4	5-6	4-11	4-6	4-1	3-9	3-6
	1-2 × 12	7-4	6-4	5-8	5-2	4-10	4-6	4-3
Redwood[h], Western cedars[h], Ponderosa pine[h], Red pine[h]	2-2 × 6	6-1	5-3	4-8	4-4	3-11	3-6	3-3
	2-2 × 8	7-8	6-8	5-11	5-5	5-0	4-8	4-3
	2-2 × 10	9-5	8-2	7-3	6-8	6-2	5-9	5-5
	2-2 × 12	10-11	9-5	8-5	7-8	7-2	6-8	6-3
	3-2 × 6	7-1	6-5	5-11	5-5	5-0	4-8	4-5
	3-2 × 8	9-4	8-4	7-5	6-10	6-4	5-11	5-7
	3-2 × 10	11-9	10-2	9-1	8-4	7-8	7-2	6-9
	3-2 × 12	13-8	11-10	10-7	9-8	8-11	8-4	7-10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.
b. Beams supporting a single span of joists with or without cantilever.
c. Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever. Snow load not assumed to be concurrent with live load.
d. No. 2 grade, wet service factor included.
e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
g. Includes incising factor.
h. Incising factor not included.
i. Deck joist span as shown in Figure R507.5
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with R507.5(5).

TABLE R507.5(5) Joist Span Factors for Calculating Effective Deck Joist Span [for use with footnote j in Tables R507.5(1), R507.5(2), R507.5(3) and R507.5(4)]

C/J[a]	Joist Span Factor
0 (no cantilever)	0.66
1/12 (0.87)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

a. C = actual joist cantilever length (feet) J = actual joist span length (feet)

(Deleted table text not shown for clarity; to see Tables R507.5(1), (3) or (4) refer to the 2022 CRC.)

CHANGE SIGNIFICANCE: Similar to changes for deck post heights, there is a need to consider snow loads greater than 40 psf for deck beams. The 2019 CRC's prescriptive deck provisions only included a 40 psf live load and 10 psf dead load. Table R507.5, Deck beam span lengths, is replaced by four tables, R507.5(1) – (4), which account for 50, 60 and 70 psf ground snow load conditions. Single-ply spans are now listed for all wood species while there continue to be multi-ply span options for each wood species.

Maximum beam spans consider the load from tributary areas based on joist spans. In Tables R507.5(1)-(4), all deck joists are assumed to cantilever the allowable one-quarter of the joist back span past the supporting beam. This assumption is included in the calculated tributary area of the beam. When a beam supports a shorter joist cantilever, new Table R507.5(5) may be used to determine an effective joist span. When the joist cantilever is shorter than ¼ of the back span or there is no cantilever, the joist span may be decreased when determining the beam's maximum span. This allows the maximum beam span to increase due to the shorter effective joist span. Several examples are provided to illustrate the effective joist span:

Example 1:
A deck with a ground snow load of 50 psf is designed using two plies of Southern Pine 2 × 10.

Joist span is 12 feet and there is no cantilever.

- C – cantilever, J – joist
- C = 0 feet
- J = 12 feet
- Without footnote j, Table R507.5(2) limits the beam to a maximum span of 7′-1″.

Applying the adjustment factor from footnote j and Table R507.5(5):

- C/J = 0 and the joist span factor is 0.66.
- An effective joist span can be calculated as 0.66 × 12′ = 8″.
- The maximum beam span is 8′-9″ per Table R507.5(2) because there is no cantilever.

Note: The beam span is not reduced by 0.66, rather the joist span is reduced by 0.66 to determine an effective joist span.

Example 2:
A deck with a ground snow load of 50 psf is designed using two plies of Southern Pine 2 × 10.

Joist span is 12 feet and there is a 12-inch cantilever.

- C – cantilever, J – joist
- C = 1 feet
- J = 12 feet
- Without footnote j, Table R507.5(2) limits the beam to a maximum span of 7′-1″.

Applying the adjustment factor from footnote j and Table R507.5(5):

- C/J = 1/12 therefore the joist span factor is 0.72.
- An effective joist span can be calculated as 0.72 × 12′ = 8′-8″.
- A maximum beam span can be determined from Table R507.5(2) for a 10’ effective joist span = 7′-10″.
- Or by interpolating per footnote a, a beam span of 8′-5″ is achieved as follows:

Maximum Beam Span (converted to inches):

	A	B	C
Effective joist span	8 ft. 96 in.	8 ft. 8 in. 104 in.	10 ft. 120 in.
Maximum beam span	105 in.	?	94 in.

To interpolate, subtract the number of inches between the 10 ft (column C) and 8 ft (column A) joist spans, which is 24 inches. The effective joist span in column B is 8 inches longer than the smaller span in column A, which is 8/24 or 1/3 the difference in lengths. Subtract beam span C from beam span A to get 11 inches. Multiply 11 inches by 1/3 to get 3.67 inches. Then take beam span A which is 105 inches and subtract 4 inches (rounded up from 3.67 inches). This gives a maximum beam span of 101″ or 8′-5″.

Maximum Beam Span

	A	B	C
Effective joist span	96 in.	104 in.	120 in.
Maximum beam span	105 in.	**101 in.** **8 ft. 5 in.**	94 in.

Example 3:
A deck with a ground snow load of 50 psf is designed using two plies of Southern Pine 2 × 10.

Joist span is 12 feet and there is a 3-foot cantilever.

- C – cantilever, J – joist
- C = 3 feet
- J = 12 feet
- Without footnote j, Table R507.5(2) limits the beam to a maximum span of 7′-1″.

Applying the adjustment factor from footnote j and Table R507.5(5):

- C/J = 3/12 or 1/4 and the joist span factor is 1.0.

Tabulated beam spans are based on a joist with a cantilever of 1/4 of the back span therefore the maximum beam span remains 7′-1″.

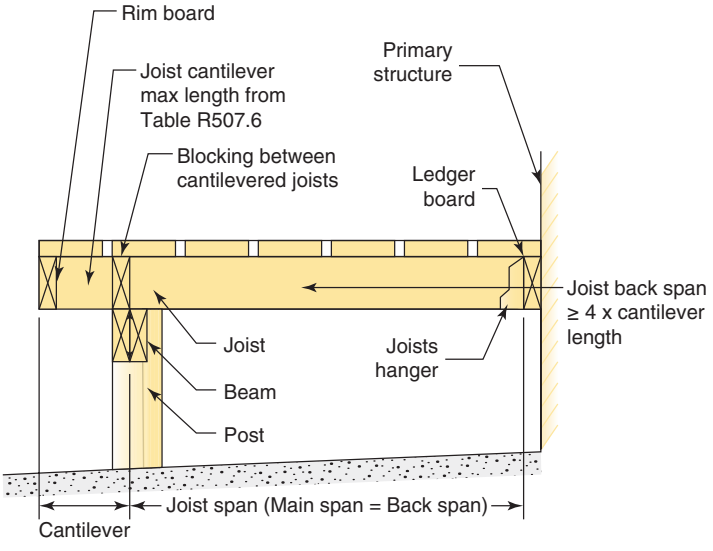
R507.6

Deck Joists

CHANGE TYPE: Modification

CHANGE SUMMARY: Deck joist options are added for decks with large ground snow loads. Cantilever spans are now specifically based on maximum joist spans.

2022 CODE TEXT: R507.6 Deck joists. Maximum allowable spans for wood deck joists, as shown in Figure R507.6, shall be in accordance with Table R507.6. The maximum joist spacing shall be limited by the decking materials in accordance with Table R507.7. ~~The maximum joist cantilever shall be limited to one-fourth of the joist span or the maximum cantilever length specified in Table R507.6, whichever is less.~~



Joists with dropped beam.

TABLE R507.6 Maximum Deck Joist Spans

Load[a] (psf)	Joist Species[b]	Joist Size	Allowable Joist Span[c] (feet-inches) Joist Spacing (inches) 12	16	24	Maximum Cantilever[d] (feet-inches) Joist Back Span[g] (feet) 4	6	8	10	12	14	16	18
40 Live Load	Southern Pine	2 × 6	9-11	9-0	7-7	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	13-1	11-10	9-8	1-0	1-6	2-0	2-6	2-3	NP	NP	NP
		2 × 10	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-4	3-4	NP
		2 × 12	18-0	16-6	13-6	1-0	1-6	2-0	2-6	3-0	3-6	4-0	4-1
	Douglas Fir[e], Hem-fir[e], Spruce-Pine-Fir[e]	2 × 6	9-6	8-4	6-10	1-0	1-6	1-4	NP	NP	NP	NP	NP
		2 × 8	12-6	11-1	9-1	1-0	1-6	2-0	2-3	2-0	NP	NP	NP
		2 × 10	15-8	13-7	11-1	1-0	1-6	2-0	2-6	3-0	3-3	NP	NP
		2 × 12	18-0	15-9	12-10	1-0	1-6	2-0	2-6	3-0	3-6	3-11	3-11
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	2 × 6	8-10	8-0	6-10	1-0	1-4	1-1	NP	NP	NP	NP	NP
		2 × 8	11-8	10-7	8-8	1-0	1-6	2-0	1-11	NP	NP	NP	NP
		2 × 10	14-11	13-0	10-7	1-0	1-6	2-0	2-6	3-0	2-9	NP	NP
		2 × 12	17-5	15-1	12-4	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP

continues

TABLE R507.6 (*continued*)

Load[a] (psf)	Joist Species[b]	Joist Size	Allowable Joist Span[c] (feet-inches) Joist Spacing (inches) 12	16	24	Maximum Cantilever[d] (feet-inches) Joist Back Span[g] (feet) 4	6	8	10	12	14	16	18
50 Ground Snow Load	Southern Pine	2 × 6	9-2	8-4	7-4	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	12-1	11-0	9-5	1-0	1-6	2-0	2-5	2-3	NP	NP	NP
		2 × 10	15-5	13-9	11-3	1-0	1-6	2-0	2-6	3-0	3-1	NP	NP
		2 × 12	18-0	16-2	13-2	1-0	1-6	2-0	2-6	3-0	3-6	3-10	3-10
	Douglas Fir[e], Hem-fir[e], Spruce-Pine-Fir[e]	2 × 6	8-10	8-0	6-8	1-0	1-6	1-4	NP	NP	NP	NP	NP
		2 × 8	11-7	10-7	8-11	1-0	1-6	2-0	2-3	NP	NP	NP	NP
		2 × 10	14-10	13-3	10-10	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP
		2 × 12	17-9	15-5	12-7	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	2 × 6	8-3	7-6	6-6	1-0	1-4	1-1	NP	NP	NP	NP	NP
		2 × 8	10-10	9-10	8-6	1-0	1-6	2-0	1-11	NP	NP	NP	NP
		2 × 10	13-10	12-7	10-5	1-0	1-6	2-0	2-6	2-9	NP	NP	NP
		2 × 12	16-10	14-9	12-1	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP
60 Ground Snow Load	Southern Pine	2 × 6	8-8	7-10	6-10	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	11-5	10-4	8-9	1-0	1-6	2-0	2-4	NP	NP	NP	NP
		2 × 10	14-7	12-9	10-5	1-0	1-6	2-0	2-6	2-11	2-11	NP	NP
		2 × 12	17-3	15-0	12-3	1-0	1-6	2-0	2-6	3-0	3-6	3-7	NP
	Douglas Fir[e], Hem-fir[e], Spruce-Pine-Fir[e]	2 × 6	8-4	7-6	6-2	1-0	1-6	1-4	NP	NP	NP	NP	NP
		2 × 8	10-11	9-11	8-3	1-0	1-6	2-0	2-2	NP	NP	NP	NP
		2 × 10	13-11	12-4	10-0	1-0	1-6	2-0	2-6	2-10	NP	NP	NP
		2 × 12	16-6	14-3	11-8	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	2 × 6	7-9	7-0	6-2	1-0	1-4	NP	NP	NP	NP	NP	NP
		2 × 8	10-2	9-3	7-11	1-0	1-6	2-0	1-11	NP	NP	NP	NP
		2 × 10	13-0	11-9	9-7	1-0	1-6	2-0	2-6	2-7	NP	NP	NP
		2 × 12	15-9	13-8	11-2	1-0	1-6	2-0	2-6	3-0	3-2	NP	NP
70 Ground Snow Load	Southern Pine	2 × 6	8-3	7-6	6-5	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	10-10	9-10	8-2	1-0	1-6	2-0	2-2	NP	NP	NP	NP
		2 × 10	13-9	11-11	9-9	1-0	1-6	2-0	2-6	2-9	NP	NP	NP
		2 × 12	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP
	Douglas Fir[e], Hem-fir[e], Spruce-Pine-Fir[e]	2 × 6	7-11	7-1	5-9	1-0	1-6	NP	NP	NP	NP	NP	NP
		2 × 8	10-5	9-5	7-8	1-0	1-6	2-0	2-1	NP	NP	NP	NP
		2 × 10	13-3	11-6	9-5	1-0	1-6	2-0	2-6	2-8	NP	NP	NP
		2 × 12	15-5	13-4	10-11	1-0	1-6	2-0	2-6	3-0	3-3	NP	NP
	Redwood[f], Western Cedars[f], Ponderosa Pine[f], Red Pine[f]	2 × 6	7-4	6-8	5-10	1-0	1-4	NP	NP	NP	NP	NP	NP
		2 × 8	9-8	8-10	7-4	1-0	1-6	1-11	NP	NP	NP	NP	NP
		2 × 10	12-4	11-0	9-0	1-0	1-6	2-0	2-6	2-6	NP	NP	NP
		2 × 12	14-9	12-9	10-5	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg. NP = Not Permitted

a. Dead load = 10 psf. Snow load not assumed to be concurrent with live load.
b. No. 2 grade, wet service factor included.
c. L/Δ = 360 at main span.
d. L/Δ = 180 at cantilever with 220-pound point load applied to end.
e. Includes incising factor.
f. Incising factor not included.
g. Interpolation permitted. Extrapolation is not permitted.

(Deleted text not shown for clarity.)

CHANGE SIGNIFICANCE: Table R507.6, maximum deck joist spans, has created confusion for determining cantilever lengths for given joist spans. The 2019 CRC table listed an allowable cantilever length in terms of joist spacing. Since the assumed main span was the maximum allowable joist span for that spacing, the maximum cantilevers in some cases were not intuitive. Determining whether a joist and its cantilever met the maximum limits was time consuming and unclear. The second cantilever limit of one-quarter of the main span was located within the footnotes where it may have been overlooked. In the 2019 CRC, designers had to check both the table's maximum cantilever length and the limit of not more than one-fourth of the actual joist span.

With the updated 2022 CRC table, cantilevers are based on the actual back span creating a more intuitive maximum cantilever length. The term back span is used to differentiate the actual joist span from the maximum joist span available in the table. Where the table states a cantilever is not permitted, the back span in the table is longer than the maximum permitted joist span. An example of this is a 2 × 6 joist which has a maximum joist span in the 6.5-foot to 9-foot range. The table has entries for back spans of 10 feet to 18 feet but the cantilever length for a 2 × 6 is shown as "Not Permitted" since a joist span of 10 feet is not permitted for a 2 × 6.

New table organization now first lists maximum joist spans based on their on-center spacing. Then the table lists maximum cantilever lengths. Cantilevers, in order to carry their loads, must have the joist extend back along the deck a distance longer than the cantilever's length. Generally, a back span needs to be at least four times as long as the cantilever.

For example, for a Southern Pine 2 × 6 joist, if the joist spans 8 feet from the ledger to a supporting beam, then the joist can continue past the beam and cantilever up to 18 inches beyond the beam. But a Southern Pine 2 × 8 joist can cantilever 2 feet or a full one-quarter of the joist back span (distance between ledger and beam).

Table R507.6 is also updated to account for ground snow loads of 50, 60 and 70 pounds per square foot (psf).

R507.7
Decking

CHANGE TYPE: Modification

CHANGE SUMMARY: The wood decking table is updated to show maximum on-center joist spacing for single- and multi-span configurations.

2022 CODE TEXT: **R507.7 Decking.** Maximum allowable spacing for joists supporting wood decking, excluding stairways, shall be in accordance with Table R507.7. Wood decking shall be attached to each supporting member with not less than two 8d threaded nails or two No. 8 wood screws. Maximum allowable spacing for joists supporting plastic composite decking shall be in accordance with Section R507.2. Other approved decking or fastener systems shall be installed in accordance with the manufacturer's installation requirements.

TABLE R507.7 Maximum Joist Spacing for Wood Decking

Decking Material Type and Nominal Size	~~Maximum On-Center Joist Spacing~~[c]			
	Decking perpendicular to joist		Decking diagonal to joist[a]	
	Single Span[c]	Multi-Span[c]	Single Span[c]	Multi-Span[c]
	Maximum On-Center Joist Spacing (inches)			
1¼ inch-thick wood deck boards[b]	12	16 ~~inches~~	8	12 ~~inches~~
2-inch-thick wood	24	24 ~~inches~~	18	24 ~~16~~ inches
~~Plastic composite~~	~~In accordance with Section R507.2~~		~~In accordance with Section R507.2~~	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

a. Maximum angle of 45 degrees from perpendicular for wood deck boards.

b. Or other maximum span provided by an accredited lumber grading or inspection agency.

c. Individual wood deck boards supported by two joists shall be considered single span and three or more joists shall be considered multi-span.

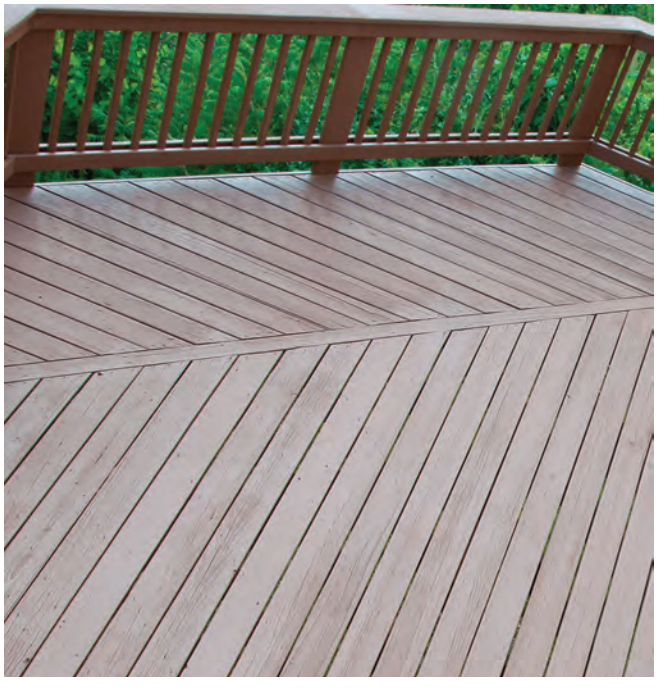


Photo courtesy of Anne Kitzman

Decking may span two or more joists.

CHANGE SIGNIFICANCE: Table R507.7, Maximum Joist Spacing for Decking, is conservative for 2-inch nominal wood decking material. When evaluated using the American Lumber Standard Committee's (ALSC) decking policy, 2-inch nominal material can span 24 inches rather than 16 inches as shown in the 2019 CRC. Similarly, ¾-inch decking is rated per ALSC's decking policy. While the minimum rated span is 16 inches, for certain species and grades, the allowable joist spacing may increase. The 2022 CRC Table R507.7 keeps a conservative baseline while increasing flexibility for manufacturers and designers.

The maximum joist spacing is updated to consider whether decking spans across two joists (called a single span) or three or more joists (a multi-span condition). Load resistance changes when decking is laid across multiple joists. This can change the allowable joist spacing. A multispan condition with decking allows an increase in the maximum joist spacing in some cases, particularly when decking is relatively thin and flexible. If a wider spacing of joists is desired for ¾-inch-thick wood decking, footnote b allows a lumber grading agency or third-party wood inspection agency to provide maximum spans for specific ¾-inch-thick decking.

R507.10
Exterior Guards

CHANGE TYPE: Addition

CHANGE SUMMARY: Specific requirements for deck guards are added.

2022 CODE TEXT:

R507.10 Exterior guards. Guards shall be constructed to meet the requirements of Sections R301.5 and R312 and this section.

R507.10.1 Support of guards. Where guards are supported on deck framing, guard loads shall be transferred to the deck framing with a continuous load path to the deck joists.

R507.10.1.1 Guards supported by side of deck framing. Where guards are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners in end grain withdrawal are not permitted.

R507.10.1.2 Guards supported on top of deck framing. Where guards are mounted on top of the decking, the guards shall be connected to the deck framing or blocking and installed in accordance with manufacturer's instructions to transfer the guard loads to the adjacent joists.

R507.10.2 Wood posts at deck guards. Where 4-inch by 4-inch (102 mm by 102 mm) wood posts support guard loads applied to the top of the guard, such posts shall not be notched at the connection to the supporting structure.

Photo courtesy of Peter Kulczyk

Deck guards are used for fall protection.

R507.10.3 Plastic composite guards. Plastic composite guards shall comply with the provisions of Section R507.2.2.

R507.10.4 Other guards. Other guards shall be in accordance with manufacturer's instructions or in accordance with accepted engineering principles.

CHANGE SIGNIFICANCE: The 2019 CRC had no requirements for constructing exterior guards on decks in Section R507. Guards provide the first line of defense against significant falls, which can result in serious and sometimes fatal injuries. Exterior guards on decks, particularly the guard system connection to the deck framing, are rarely engineered and even more rarely tested to verify adequacy to meet the 200-pound load requirements of Table R301.5, Minimum Live Loads.

Exterior deck guards must continue to meet Section R312 requirements and the loads listed in Table R301.5. The new provisions also reinforce the need for a load path from the guard and rail into the deck joists, beams or blocking to which a guard is connected. End grain connections in withdrawal are prohibited. In other words, guard fasteners may not be installed into the ends of deck joists or beams if loading will occur parallel to the length of the joist or beam slowly pulling the fasteners out of the lumber. When guards are connected to the side of beams or joists, the beam or joist shall be connected to adjacent joists—for example by blocking or straps—to resist rotation of the beam or joist when load is applied to the guard.

CHANGE TYPE: Modification

CHANGE SUMMARY: Additional fastener options are added to the fastener table for roof and walls.

2022 CODE TEXT:

Table R602.3(1)

Fasteners – Roof and Wall

EXCERPT OF TABLE R602.3(1) Fastening Schedule

Item	Description of Building Elements	Number and Type of Fastener[a,b,c,e]	Spacing and Location
		Roof	
1	Blocking between ceiling joists, ~~or~~ rafters or trusses to top plate or other framing below	4-8d box (2½″ × 0.113″) nails 3-8d common (2½″ × 0.131″) nails 3-10d box (3″ × 0.128″) nails 3-(3″ × 0.131″) nails	Toenail
	Blocking between rafters or truss not at the wall top plates, to rafter or truss	2-8d common (2½″ × 0.131″) nails 2-(3″ × 0.131″) nails	Each end, toenail
		2-16d common (3½″ × 0.162″) nails 3-(3″ × 0.131″) nails	End nail
	Flat blocking to truss and web filler	16d common (3½″ × 0.162″) nails 3-(3″ × 0.131″) nails	6″ o.c. face nail
		Wall	
12	Adjacent full-height stud to end of header	3-16d common (3½″ × 0.162″) nails 4-16d box (3½″ × 0.135″) nails 4-10d box (3″ × 0.128″) nails 4-(3″ × 0.131″) nails	End nail

CHANGE SIGNIFICANCE: *California Residential Code* (CRC) Table R602.3(1) and *California Building Code* (CBC) Table 2304.10.1 are essentially the same table. Although the fastener tables are closely aligned, there are variations in the prescribed fasteners within the two tables. Some fastener options are offered only in the CRC table and other options are offered in the CBC table and not the CRC table. Changes to the 2022 codes attempt to harmonize fastener options in the two tables. Item 1 of the table shows such changes with addition of nailing options and clarifying text describing blocking attachment to specific roof elements.

King studs nailed to header.

The required nailing of the first full-height stud adjacent to a header is added to the fastening schedule table in Item 12 for wall connections, where it can be located quickly. Additional full-height studs are fastened to each other in accordance with Item 8 of Table R602.3(1), Stud to stud (not at braced wall panels) or Item 9, Stud to stud and abutting studs at intersecting wall corners (at braced wall panels).

CHANGE TYPE: Modification

CHANGE SUMMARY: Additional fastener options are added to the fastener table in the roof sheathing section while maximum field nailing is reduced.

2022 CODE TEXT:

Table R602.3(1)

Fasteners – Roof Sheathing

EXCERPT OF TABLE R602.3(1) Fastening Schedule

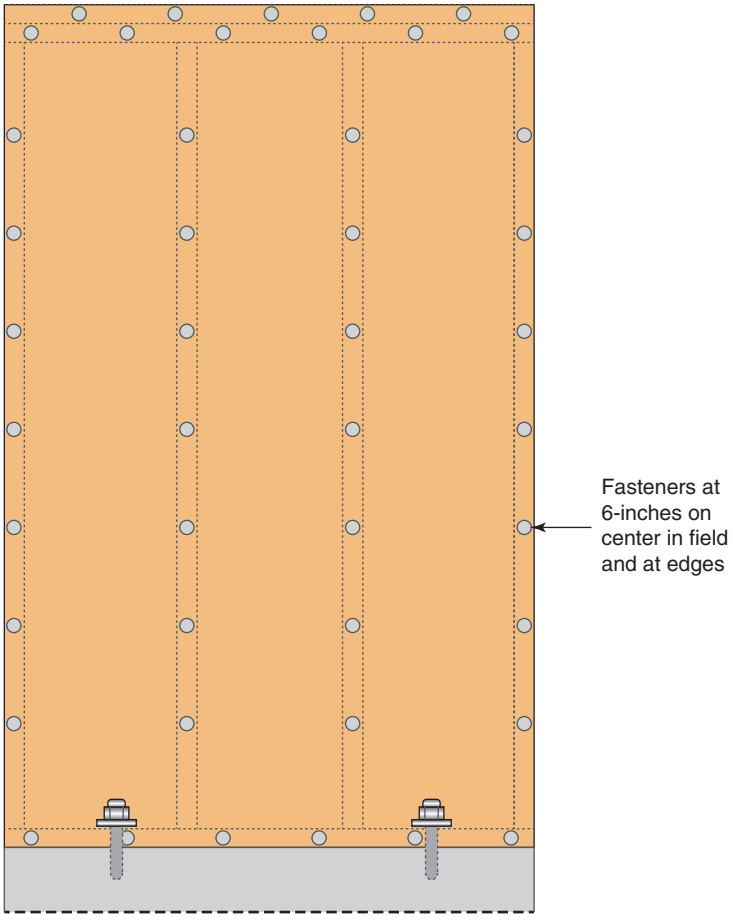
Item	Description of Building Elements	Number and Type of Fastener[a,b,c]	Spacing of Fasteners: Edges[h] (inches)	Spacing of Fasteners: Intermediate Supports[c,e] (inches)
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing				
~~30~~ 31	⅜″ – ½″	6d common or deformed (2″ × 0.113″ × 0.266″ head) ~~(subfloor, wall)~~[i]; 2⅜″ × 0.113″ × 0.266″ head nail (subfloor, wall)[i]	6[f]	~~12~~ 6[f]
		8d common (2½″ × 0.131″) (roof) RSRS-01 (2⅜″ × 0.113″) nail (roof)[jb]	6[f]	~~12~~ 6[f]
~~31~~ 32	~~1″~~ 19/32″ – ~~1″~~ ¾″	8d common (2 – 2½″ × 0.131″) (subfloor, wall) Deformed 2⅜″ × 0.113″ × 0.266″ head (wall or subfloor)	6	12
		8d common (2½″ × 0.131″) nail (roof) RSRS-01 (2⅜″ × 0.113″) nail (roof)[jb]	6[f]	~~12~~ 6[f]
~~32~~ 33	~~1⅛″~~ ⅞″ – 1¼″	10d common (3″ × 0.148″) nail ~~8d~~ (2½″ × 0.131″ × 0.281″ head) deformed nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at ~~6~~ 4 inches on center where the ultimate design wind speed is ~~less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph~~ greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.

CHANGE SIGNIFICANCE: CRC Table R602.3(1) and CBC Table 2304.10.1 are essentially the same table in terms of structural connections. Although the connections are closely aligned, there are variations in the prescribed fasteners within the two tables. Some fastener options are offered only in the CRC table and not in the CBC table and other options are offered in the CBC table and not the CRC table. These changes harmonize fastener options in the two tables. In addition, where additional information exists in one table and not the other, it is added.

Roof sheathing nailing is updated in Table R602.3(1) based on wind load values from ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. The table changes are also consistent with the roof sheathing nailing requirements in the *2018 Wood Frame Construction Manual* (WFCM). Wind uplift nailing requirements for common



Method WSP fasteners are now required to be a maximum of 6 inches on center.

species of roof framing with specific gravities of 0.42 or greater, for example SPF and Hem-Fir, are the basis of the new nail spacing requirements in Table R602.3(1) intended to be easy to specify for roof nailing.

The basic roof sheathing nailing schedule is 6 inches on center at panel edges and 6 inches on center at intermediate supports of the panel. As shown in WFCM Table 3.10A for the common case of roof framing spaced at 24 inches on center, nailing at intermediate supports in the interior portions of the roof is 6 inches on center for wind speeds within the scope of CRC. The 6 inches on center spacing is also appropriate for edge zones except where ultimate wind speeds equal or exceed 130 mph in Exposure B and 110 mph in Exposure C where nailing at 4 inches on center for panel edges and intermediate supports is required. This special case is addressed by the modification to footnote f.

CHANGE TYPE: Clarification

CHANGE SUMMARY: Table R602.3(2) footnote g is updated for clarity.

2022 CODE TEXT:

Table R602.3(2)
Alternate Attachments

TABLE R602.3(2) Alternate Attachments to Table R602.3(1)

Nominal Material Thickness (inches)	Description[a,b] of Fastener and Length (inches)	Spacing[c] of Fasteners	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels subfloor, roof[g] and wall sheathing to framing and particleboard wall sheathing to framing[f]			
	.		
	.		
	.		

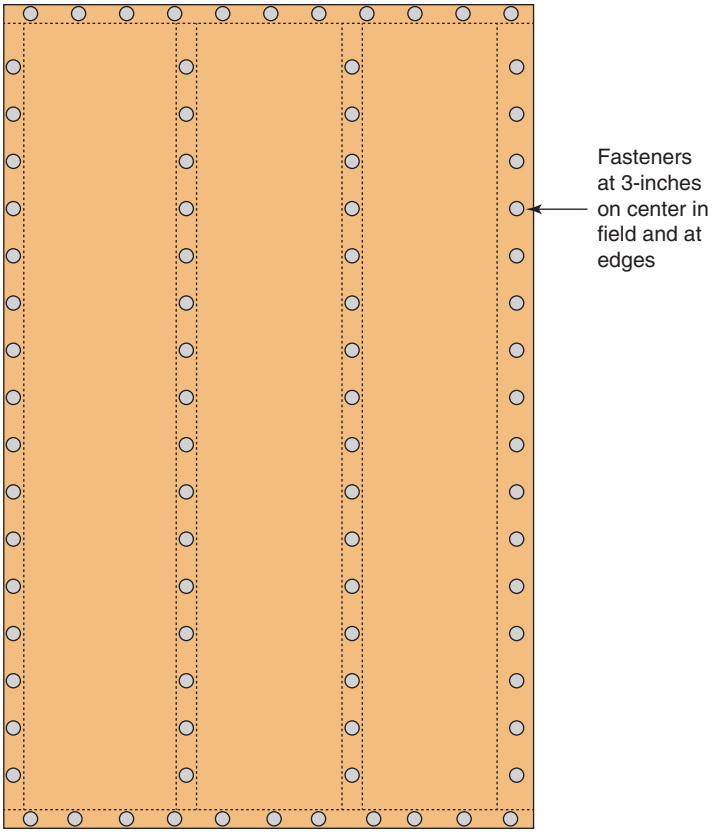
Nominal Material Thickness (inches)	Description[a,b] of Fastener and Length (inches)	Spacing[c] of Fasteners	
		Edges (inches)	Body of panel[d] (inches)
	.		
	.		
	.		

b. Staples shall have a minimum crown width of 7/16-inch ~~on diameter~~ except as noted.

g. ~~Specified alternate attachments for roof sheathing shall be permitted where~~ Alternate fastening is only permitted for roof sheathing where the ultimate design wind speed is less than or equal to 110 mph, and where fasteners are installed 3 inches on center at all supports ~~130 mph. Fasteners attaching wood structural panel roof sheathing to gable end wall framing shall be installed using the spacing listed for panel edges~~.

(No changes to table values)

CHANGE SIGNIFICANCE: Footnote g is updated in Table R602.3(2), Alternate attachments, based on uplift load requirements in ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structure* for the alternative fasteners. To keep specification of roof sheathing to relatively simple attachment schedules, reference calculations use a 0.099-inch and 0.113-inch diameter nail at 3-inch on center spacing at all locations. This value is based on the nail shank withdrawal capacity in wood framing with a specific gravity equal to 0.42 (e.g., SPF lumber) and pre-calculated wind uplift loads from Table 3.10 of the *Wood Frame Construction Manual* (WFCM). The use of 3-inch spacing at all supports was extended to staples based on the assumption that the ASCE 7-16 load increase would similarly require reduced spacing. This assumption was applied to staples because a withdrawal value is not available for staples in the *National Design Specification* (NDS) *for Wood Construction*.



Fasteners are now required to be 3 inches on center on roof sheathing.

Therefore, with this change a narrower nail or a staple used in roof sheathing must be placed using a maximum 3-inch on center spacing. These fasteners are only allowed in regions with a wind speed less than or equal to 110 mph. In areas with higher wind speeds, the alternate attachment table may not be used for roof sheathing.

R602.9
Cripple Walls

CHANGE TYPE: Clarification

CHANGE SUMMARY: Cripple wall requirements apply only to exterior cripple walls.

2022 CODE TEXT: **R602.9 Cripple walls.** Foundation cripple walls shall be framed of studs not smaller than the studding above. Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional story.

~~Cripple~~ Exterior cripple walls with a stud height less than 14 inches (356 mm) shall be continuously sheathed on one side with wood structural panels fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking.

Cripple walls shall be supported on continuous foundations.

CHANGE SIGNIFICANCE: The CRC and CBC require foundation cripple walls, below exterior walls, with studs less than 14 inches tall to be "continuously-sheathed" in all seismic regions. This requirement is not related to wall bracing which is covered in Section R602.10. The requirement for continuous sheathing on cripple wall studs with a height less than 14 inches (or solid-blocking) is intended to ensure the integrity of the studs when nails are end-nailed into top and bottom plates by face-nailing sheathing into the top and bottom plates as well as studs.

Cripple wall along exterior of house – sheathed.

Cripple wall along exterior of house – unsheathed.

In regions with shallow frost-depth it is common to have shallow crawl spaces. Typically, a concrete stem wall forms the exterior foundation walls and directly supports the floor. The interior walls, typically 2 to 4 feet tall, are cripple walls laid on a strip footing. These walls move with the exterior concrete walls during an earthquake and have few issues. Therefore, continuous blocking or sheathing is not required for these interior walls when the exterior foundation is concrete up to the floor framing and bottom plate. Continuous sheathing on these short walls in a crawl space also creates issues for ventilation, under-floor mechanical systems, plumbing and access.

Interior cripple wall.

In past earthquakes, exterior cripple walls have been very vulnerable to out-of-plane movement with the cripple wall losing its ability to support the walls above causing the cripple wall to rock out of plumb and collapse. As exterior cripple walls need protection and interior cripple walls simply need to be nailed appropriately, the requirement for a cripple wall to be continuously sheathed is updated from a provision for all cripple walls to a requirement for exterior walls only in the 2022 CRC.

R602.10.1.2

Location of Braced Wall Lines

CHANGE TYPE: Modification

CHANGE SUMMARY: Section R602.10.1.2 limits placement of a braced wall line.

2022 CODE TEXT: **R602.10.1.2 ~~Offsets along a~~ Location of braced wall lines and permitted offsets.** Each braced wall line shall be located such that no more than two-thirds of the required braced wall panel length is located to one side of the braced wall line. Braced wall panels shall be permitted to be offset up to 4 feet (1219 mm) from the designated braced wall line. Braced wall panels parallel to a braced wall line shall be offset not more than 4 feet (1219 mm) from the designated braced wall line location as shown in Figure R602.10.1.1.

Exterior walls parallel to a braced wall line shall be offset not more than 4 feet (1219 mm) from the designated braced wall line location as shown in Figure R602.10.1.1.

Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a braced wall line through the interior of the building as shown in Figure R602.10.1.1.

CHANGE SIGNIFICANCE: Over a series of code cycles, changes to CRC Section R602.10 wall bracing provisions have caused some of the important concepts fundamental to the development of the bracing provisions to be lost. In earlier editions, braced wall panels were required on exterior walls with additional interior braced wall lines where needed to meet braced wall line spacing requirements. The concept that exterior walls are to be braced is not specifically stated in the 2010 CRC forward. Rather, a line is drawn on plans with braced wall panels on walls counted as part of a braced wall line when the panels are within 4 feet of the line drawn on the plans.

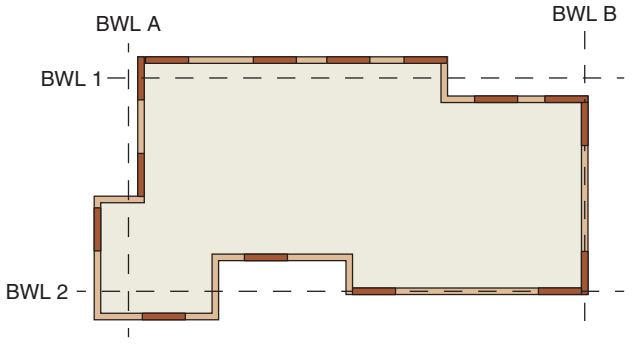
This sounds reasonable. It allows the designer to break up the exterior walls pushing some out and others inward along the front of a building. But what about when the front of a house is one single continuous wall? Can the designer still draw the braced wall line 4 feet inward of the actual wall?

The CRC did not address this issue leaving each jurisdiction to decide and designers arguing their case with each jurisdiction. In fact, most jurisdictions feel that the braced wall line must be on a physical wall when the wall line forms a single unbroken line.

For the 2022 edition, the CRC requires that at least one-third of all braced wall panels be either on a braced wall line or on the opposite side of the braced wall line from the other braced wall panels. Braced wall panels continue to be required to be within 4 feet of the braced wall line. For the case where a single wall forms the entire braced wall line, all braced wall panels must be on the braced wall line. In other words, the braced wall line must be drawn at the physical wall.

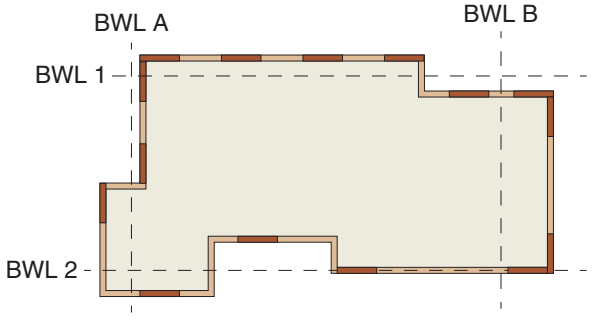
Braced wall line (BWL) examples:
— — — Braced Wall Line
Braced Wall Panel (BWP)

Example 1:



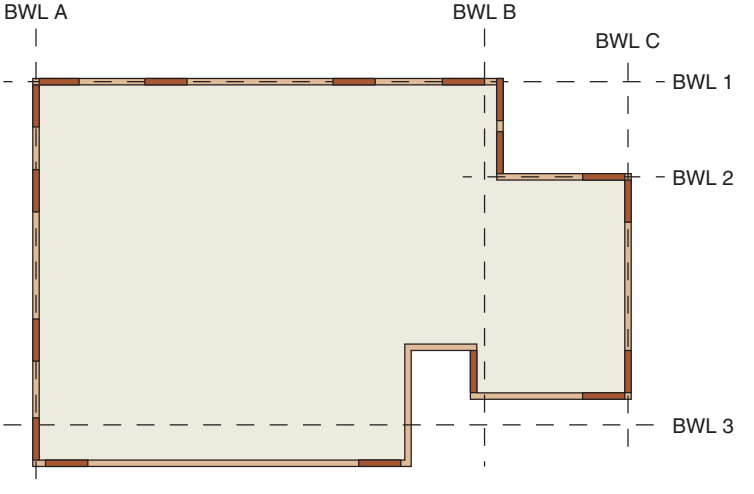
BWL 1: line runs between two walls, 4 of 6 panels on outside side of line, 2 of 6 panels on opposite side of line = OK
BWL 2: line runs between three walls, 1 of 4 panels outside line, 2 of 4 panels on BWL and 1 of 4 panels inside line = OK
BWL A: line runs between two walls, 2 of 3 panels on one side of line, 1 of 3 panels on opposite side of line = OK
BWL B: line runs on one wall = OK

Example 2:



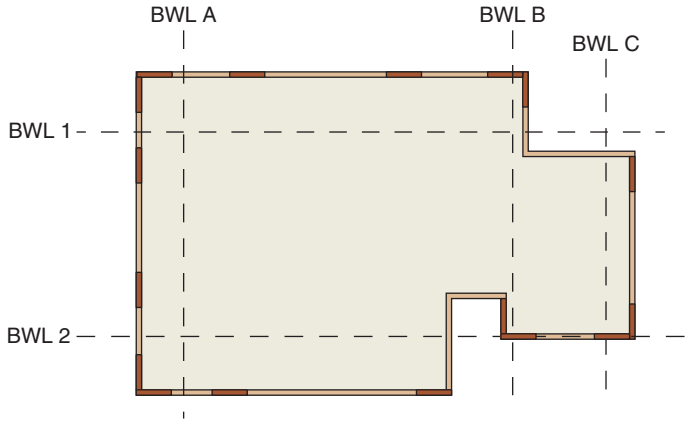
BWL 1: line runs between two walls, 4 of 6 panels on outside side of line, 2 of 6 panels on opposite side of line = OK
BWL 2: line runs between three walls, 1 of 4 panels outside line, 2 of 4 panels on BWL and 1 of 4 panels inside line = OK
BWL A: line runs between two walls, 2 of 3 panels on one side of line, 1 of 3 panels on opposite side of line = OK
BWL B: line runs inside single wall, 2 of 2 panels outside BWL = **No Good**

Example3:



BWL 1: line runs along a single wall, 4 of 4 panels are on the BWL = OK
BWL 2: line runs along a single wall, 1 of 1 panel is on the BWL = OK
BWL 3: line runs between two walls, 2 of 3 panels on one side of line, 1 of 3 panels on opposite side of line = OK
BWL A: line runs along a single wall, 4 of 4 panels are on the BWL = OK
BWL B: line runs between two walls, 2 of 3 panels on one side of line, 1 of 3 panels on opposite side of line = OK
BWL C: line runs along a single wall, 2 of 2 panels are on the BWL = OK

Example 4:



BWL 1: line runs between two walls, 4 of 5 panels on one side of line, 1 of 5 panels on opposite side of line = **No Good**, as more than 2/3 of panels are on one side of the BWL.
BWL 2: line runs on one wall, 3 of 5 panels on one side of line, 2 of 5 panels on the wall = **No Good**
BWL A: line inside of a single wall, 4 of 4 panels are on one side of the BWL = **No Good**
BWL B: line runs between two walls, 1 of 2 panels on one side of line, 1 of 2 panels on opposite side of line = OK
BWL C: line inside of a single wall, 2 of 2 panels are on the inside of the BWL = **No Good**

From the examples, it is clear that when a single wall contains all the braced wall panels in a braced wall line, the BWL must be drawn on the wall. When there are multiple braced wall panels in a BWL, one-third of the panels need to be on one side of the line. This can mean that a long wall with a short wall will need to have the braced wall line placed on the long wall as seen in Example 4's BWL 1. In some cases, the braced wall line will be broken into two separate wall lines like Example 3's BWL 1 and 2.

R602.10.2.2

Location of Braced Wall Panels (BWPs)

CHANGE TYPE: Clarification

CHANGE SUMMARY: Section R602.10.2.2 is clarified for the starting point of the first braced wall panel when not placed at the corner of the structure.

2022 CODE TEXT: **R602.10.2.2 Locations of braced wall panels.** A braced wall panel shall begin within 10 feet (3810 mm) from each end of a braced wall line as determined in Section R602.10.1.1. The distance between adjacent edges of braced wall panels along a braced wall line shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.

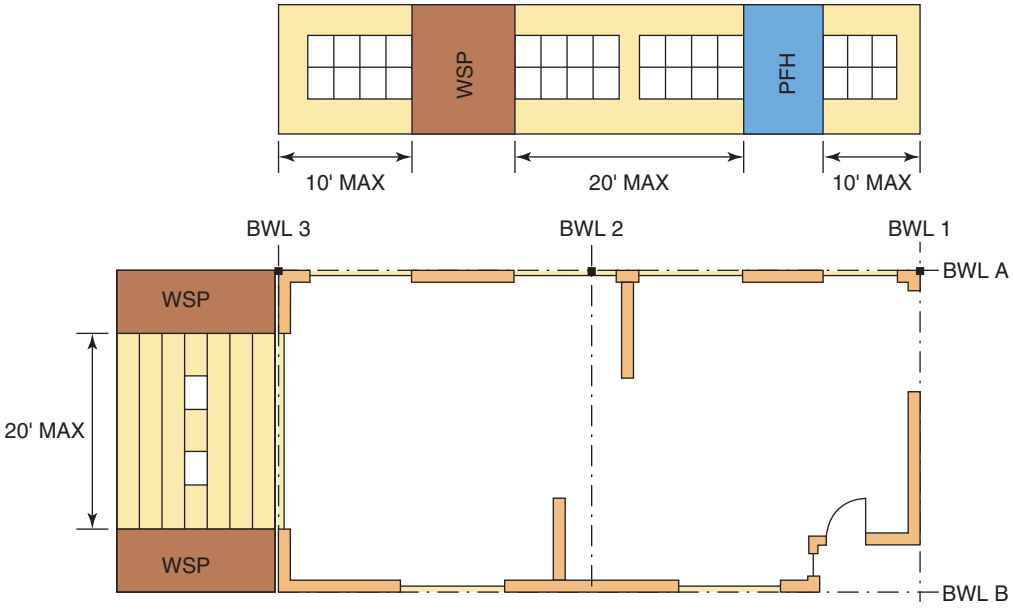
Exceptions:

1. Braced wall panels in Seismic Design Categories D_0, D_1 and D_2 shall comply with Section R602.10.2.2.1.
2. Braced wall panels with continuous sheathing in Seismic Design Categories A, B or C shall comply with Section R602.10.7.

R602.10.2.2.1 Location of braced wall panels in Seismic Design Categories D_0, D_1 and D_2. Braced wall panels shall be located at each end of a braced wall line.

~~Exception~~ Exceptions:

1. Braced wall panels constructed of Method WSP or BV-WSP and continuous sheathing methods as specified in Section R602.10.4 shall be permitted to begin not more than 10 feet (3048 mm) from each end of a braced wall line provided that each end complies with one of the following:
   - ~~1.~~ 1.1. A minimum 24-inch-wide (610 mm) panel for Methods WSP, CS-WSP, CS-G and CSPF is applied to each side of the building corner as shown in End Condition 4 of Figure R602.10.7.
   - ~~2.~~ 1.2. The end of each braced wall panel closest to the end of the braced wall line shall have an 1,800 lb (8 kN) hold-down device fastened to the stud at the edge of the braced wall panel closest to the corner and to the foundation or framing below as shown in End Condition 5 of Figure R602.10.7.
2. Braced wall panels constructed of Method PFH or ABW, or of Method BV-WSP where a hold-down is provided in accordance with Table R602.10.6.5.4, shall be permitted to begin not more than 10 feet from each end of a braced wall line.



Method PFH panels may start 10 feet from the end of the BWL.

CHANGE SIGNIFICANCE: Section R602.10.2.2 deals with placement of braced wall panels on a braced wall line. The main requirement in this section is that the first braced wall panel must begin within 10 feet from the end of the braced wall line. There are two exceptions to this requirement.

1. In Seismic Design Categories (SDC) D_0, D_1 and D_2 additional bracing is required at the corner. Either a hold-down at the BWP or a 2-foot strip of sheathing using wood structural panel at the corner is required.
2. When continuous sheathing methods are used, additional bracing is also required at a corner per Section R602.10.7. Again, either a 2-foot strip of sheathing on each side of the corner or a hold-down at the BWP is installed.

The purpose of the corner sheathing and hold-down options in this section is to restrain the first braced wall panel from overturning, either by having it located at a corner, or by providing a hold-down. When bracing methods already have a hold-down to restrain the panel from overturning, they can be located away from the corner.

Section R602.10.2.2.1 covers bracing in SDC D_0, D_1 and D_2. Braced wall panels may be located up to 10 feet from the corner when the braced wall panel has an 1800-pound hold-down. There are alternate braced wall panels that already have a hold-down of this capacity or higher. Method ABW requires a hold-down with a minimum capacity of 1800 pounds, and Method PFH requires a hold-down with a minimum capacity of 3500 pounds. Generally, Method BW-WSP requires a hold-down with a capacity in excess of 1800 pounds as well. However, there is one case where Method BV-WSP does not require a hold-down, which is considered by adding the text "where a hold-down is provided in accordance with Table R602.10.6.5.4." All three of these methods may be placed up to 10 feet from the end of the braced wall line as the first panel in the wall line.

R602.10.3(1)

Bracing for Winds

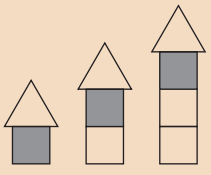
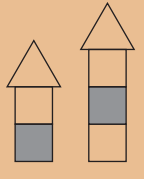
CHANGE TYPE: Modification

CHANGE SUMMARY: Rows are added to the wind bracing requirements table for 95 mph wind speeds.

2022 CODE TEXT:

TABLE R602.10.3(1) Bracing Requirements Based on Wind Speed

- Exposure Category B
- 30-foot Mean Roof Height
- 10-foot Wall Height
- 2 Braced Wall Lines

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line[c] (feet)	Minimum Total Length (feet) of Braced Wall Panels Required Along Each Braced Wall Line[a] Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFG, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤ 95 mph		10	2.5	2.5	1.5	1.5
		20	4.5	4.5	2.5	2.5
		30	6.5	6.5	4.0	3.5
		40	8.5	8.5	5.0	4.0
		50	10.5	10.5	6.0	5.0
		60	12.5	12.5	7.0	6.0
		10	5.0	5.0	3.0	2.5
		20	8.5	8.5	5.0	4.5
		30	12.5	12.5	7.0	6.0
		40	16.0	16.0	9.5	8.0
		50	20.0	20.0	11.5	10.0
		60	23.5	23.5	13.5	11.5
		10	NP	7.0	4.0	3.5
		20	NP	13.0	7.5	6.5
		30	NP	18.5	10.5	9.0
		40	NP	24.0	13.5	11.5
		50	NP	29.5	17.0	14.5
		60	NP	35.0	20.0	17.0

(All changes to text or footnotes are shown.)

CHANGE SIGNIFICANCE: With update of the wind map in Figure R301.2(2), rows for lower wind speeds are needed in Table R602.10.3(1), Bracing requirements based on wind speed. The *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16) wind maps include many areas of the country where wind speeds decrease below 110 mph. This limit was the lower wind speed limit for the western United States in the 2019 CRC. To coordinate the CRC with these new less conservative wind speeds in ASCE 7, existing wind provisions are modified to account for the lower speeds. To see additional explanation about the wind map changes, go to the significant change discussion of Section R301.2.

Wind damage to roof and walls.

For Table R602.10.3(1), bracing requirements based on wind speed, new regions have wind speed as low as 90 mph. The 2019 CRC table began with a wind speed of 110 mph. Continuing to use 110 mph for regions with design wind speeds ranging from 90 to 110 mph is unnecessarily conservative. Because the lowest wind speeds are between 90 and 95 mph, a new category is created. When a design wind speed is less than 95 mph, in other words in western Washington, Oregon or California, the less than 95 mph rows can be used to determine minimum bracing lengths. At this time there are not additional rows for wind speeds less than 100 or 105 mph. Buildings in most areas of Washington, Oregon and California will continue to use 110 mph design wind speed rows in Table R602.10.3(1). Buildings in the mountain states and mid-west will use either 110 or 115 mph design wind speed rows. Areas that are special wind regions will continue to use the wind speeds designated by the state or local jurisdiction.

To identify local wind speeds, the easiest course is to use software currently available from the Applied Technology Council (ATC) or the American Society of Civil Engineers (ASCE). ATC's website is hazards.atcouncil.org and ASCE's website is https://asce7hazardtool.online. Type in an address or GPS coordinates, and it is possible to determine the ground snow load, wind speed, seismic design category and tornado risk in one location. The ATC website remains free to users, while the ASCE website charges a nominal yearly fee and offers wind speeds and tsunami hazard zones for free.

Table R602.10.3(3)

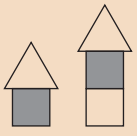
Seismic Wall Bracing

CHANGE TYPE: Clarification

CHANGE SUMMARY: Table R602.10.3(3) labeling and footnotes are updated to clarify use of the table.

2022 CODE TEXT:

TABLE R602.10.3(3) Bracing Requirements Based on Seismic Design Category

• ~~SOIL CLASS D~~[b] • Wall Height = 10 feet • 10 PSF Floor Dead Load • 15 PSF Roof/Ceiling Dead Load • Braced Wall Line Spacing ≤ 25 feet		Minimum Total Length (Feet) of Braced Wall Panels Required along each Braced Wall Line[a,f,g]					
Seismic Design Category[b]	Story Location	Braced Wall Line Length (feet)[c]	Method LIB[d]	Method GB	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB[e]	Methods WSP, PFH[f], PFG[e,f] and ABW[f]	Methods CS-WSP, CS-G, CS-PF
D_2[h]	 Cripple wall below one- or two-story dwelling	10	NP	4	4	2.5	2.1
		20	NP	8	8	5	4.3
		30	NP	12	12	7.5	6.4
		40	NP	16	16	10	8.5
		50	NP	20	20	12.5	10.6
		10	NP	7.5	7.5	5.5	4.7
		20	NP	15	15	11	9.4
		30	NP	22.5	22.5	16.5	14
		40	NP	30	30	22	18.7
		50	NP	37.5	37.5	27.5	23.4
		10	NP	NP	NP	7.5	6.4
		20	NP	NP	NP	15	12.8
		30	NP	NP	NP	22.5	19.1
		40	NP	NP	NP	30	25.5
		50	NP	NP	NP	37.5	31.9

b. ~~Wall bracing lengths are based on a soil site class "D."~~ Interpolation of bracing length between the S_{DS} values associated with the seismic design categories shall be permitted when a site-specific S_{DS} value is determined in accordance with Section 1613.2 of the *California Building Code*.

f. Methods PFH, PFG and ABW are only permitted on a single story or a first of two stories.

~~f.~~g. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.

h. One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories shall be designed in accordance with accepted engineering practice.

(All changes to text or footnotes are shown.)

CHANGE SIGNIFICANCE: Changes were made to the fundamental structure of the bracing requirements for seismic forces table. The SDCs are no longer based exclusively on Class D soils. This attribute is deleted from the list in the upper left corner of the table. When the site does not have a geotechnical survey, the site soil class may end up based on either Class C or Class D soils. For additional discussion of the changes to soil class see Section R301.2.2 in the *Significant Changes to the 2019 CRC*.

Damage due to ground movement.

The itemized bracing methods in Table R602.10.3(3) are revised to include all permissible bracing methods. Missing methods included intermittent bracing methods ABW, PFH and PFG; these methods are currently listed in Table R602.10.3(1) for wind forces. Table R602.10.3(3) footnote f is added to identify bracing methods permitted only at the ground floor; in other words, only in single story buildings or on the first floor of two-story buildings. Two of these bracing methods require a hold-down cast in a concrete basement or stem wall or turned down slab edge. Bracing methods with hold-downs limited to the bottom of a two-story building are Methods ABW and PFH. Method PFG is also limited to the bottom of two-stories. Each of these methods was tested in a laboratory to prove its equivalence to Method WSP. In testing, loads used were equivalent to a two-story building's weight. The methods haven't been tested with loads equivalent to a three-story building.

Table R602.10.3(3) footnote h is added to emphasize the two-story height limit for buildings in SDC D_2. If a building is three stories in SDC D_2, an engineered design is required for the building's lateral design. In other words shear walls must be used rather than braced wall panels and diaphragm, beam and column connections are checked for their ability to resist earthquake loads.

Table R602.10.3(4)

Adjustment Factors – Seismic

CHANGE TYPE: Clarification

CHANGE SUMMARY: Table R602.10.3(4) is updated to clarify the limits of brick veneer use and when additional bracing must be used on the building in SDC D_0, D_1 and D_2.

2022 CODE TEXT:

TABLE R602.10.3(4) Seismic Adjustment Factors to the Required Length of Wall Bracing

Item Number	Adjustment Based On	Story[g]	Condition	Adjustment Factor [Multiply length from Table R602.10.3(3) by this factor]	Applicable Methods
7	Walls with stone or masonry veneer, detached one- or two-family dwellings in SDC D_0-D_2	Any Story	See Section R602.10.6.5.4 ~~Table R602.10.6.5~~		BV-WSP
8	Walls with stone or masonry veneer, detached one- or two-family dwellings in SDC D_0-D_2	First and second story of two-story dwelling	Limited Brick Veneer on Second Story. See Section R602.10.6.5.3. ~~Table R602.10.6.5~~	1.2	WSP, CS-WSP
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, PBS, CS-WSP

g. One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories shall be designed in accordance with accepted engineering practice.

(All changes to text or footnotes are shown.)

CHANGE SIGNIFICANCE: For wall bracing on dwellings with brick veneer, adjustment factors in Table R602.10.3(4) need to be used. Bracing methods available for use with brick veneer exceeding the first story in high seismic regions include Method BV-WSP, Method WSP and Method CS-WSP.

1. If brick veneer is only on the first story and doesn't extend into gable ends, no additional wall bracing is required—use the minimum bracing length from Table R602.10.3(3).

Example 1:

One-story house with bonus room in Seattle, WA
Brick veneer columns at garage and under front windows only

Veneer on upper story.

Brick does not extend above the first story, minimum wall bracing length for seismic forces is determined per Table R602.10.3(3) only.

2. If brick veneer extends into the gable-end walls or into an upper story, Method WSP or CS-WSP may be used, if limited brick veneer is placed on the second story. Limited veneer can mean veneer only on the front side of the house at the second story or total veneer area that is less than 25 percent of the second story floor area. With this option, there is a 20 percent increase in the bracing length required by Table R602.10.3(3) using Item 8 of Table R602.10.3(4). Section R602.10.6.5.3 contains the limits for use of these bracing methods.

Example 2:

Two-story house in Portland, OR
Brick veneer across entire front side of building, no veneer on sides or back of building

Veneer above first story on one side of the building.

Brick exists only on the front of the building. Minimum wall bracing length for seismic forces is determined per Table R602.10.3(3) using Method WSP or Method CS-WSP and increasing the required length by 20 percent per Item 8 of Table R602.10.3(4) or use Method BV-WSP.

3. If brick veneer is used to sheathe the full height of multiple second story walls or more than 25 percent of all four second story walls, then Method BV-WSP is the only option. The minimum required length of Method BV-WSP is found in Section R602.10.6.5.4 and Table R602.10.6.5.4.

Example 3:

Two-story house in Memphis, TN
Brick veneer on entire exterior

Brick exists on all sides of the building, minimum wall bracing length for seismic forces is determined per Table R602.10.6.5.4 using Method BV-WSP.

In Table R602.10.3(4), footnote g is added to the Story column to reinforce the two-story limit for brick veneer. A three-story single- or two-family dwelling will require engineering for the lateral system when the building is in SDC D_2. This footnote mirrors the note in Table R602.10.3(3) for clarity.

R602.10.6.5

Stone and Masonry Veneer

CHANGE TYPE: Clarification

CHANGE SUMMARY: Veneer applications in high seismic areas are broken into first story and veneer above the first story applications.

2022 CODE TEXT: **R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer in Seismic Design Categories D_0, D_1 and D_2.** Townhouses in Seismic Design Categories D_0, D_1 and D_2 with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.

One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories and having stone or masonry veneer shall be designed in accordance with accepted engineering practice.

Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior braced wall lines and braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.

R602.10.6.5.1 Veneer on first story only. Where dwellings in Seismic Design Categories D_0, D_1 and D_2 have stone or masonry veneer installed in accordance with Section R703.8, and the veneer does not exceed the first-story height, wall bracing shall be in accordance with Section R602.10, exclusive of Section R602.10.6.5.

Veneer above first story.

R602.10.6.5.2 Veneer exceeding first story height. Where detached one- or two-family dwellings in Seismic Design Categories D_0, D_1 and D_2 have stone or masonry veneer installed in accordance with Section R703.8, and the veneer exceeds the first-story height, wall bracing at exterior braced wall lines and braced wall lines on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and Figure R602.10.6.5.2. Cripple walls shall not be permitted and required interior braced wall lines shall be supported on continuous foundations.

R602.10.6.5.3 Limited veneer exceeding first story height. Where detached one- or two-family dwellings in Seismic Design Categories D_0, D_1 and D_2 have exterior veneer installed in accordance with Section R703.8 and brick veneer installed above the first story height meets the following limitations, bracing in accordance with Method WSP or CS-WSP shall be permitted provided that the total length of braced wall panels specified by Table R602.10.3(3) is multiplied by 1.2 for each first- and second-story braced wall line.

1. The dwelling does not extend more than two stories above grade plane.
2. The veneer does not exceed 5 inches (127 mm) in thickness.
3. The height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation.
4. Where veneer is installed on multiple walls above the first story, the total area of the veneer on the second-story exterior walls shall not exceed 25 percent of the occupied second floor area.
5. Where the veneer is installed on one entire second-story exterior wall, including walls on bay windows and similar appurtenances, brick veneer shall not be installed on any of the other walls on that floor.

R602.10.6.5.4 Length of bracing. The length of bracing along each braced wall line shall be the greater of that required by the ultimate design wind speed and braced wall line spacing in accordance with Table R602.10.3(1) as adjusted by the factors in Table R602.10.3(2) or the seismic design category and braced wall line length in accordance with either Table R602.10.6.5.4 when using Method BV-WSP, or Table R602.10.3(3) as adjusted by the factors in Table R602.10.3(4) when using Method WSP or CS-WSP. Angled walls shall be permitted to be counted in accordance with Section R602.10.1.4, and braced wall panel location shall be in accordance with Section R602.10.2.2. Spacing between braced wall lines shall be in accordance with Table R602.10.1.3. The seismic adjustment factors in Table R602.10.3(4) shall not be applied to the length of bracing determined using Table R602.10.6.5.4, except that the bracing amount increase for braced wall line spacing greater than 25 feet (7620 mm) in accordance with Table R602.10.1.3 shall be required. The minimum total length of bracing in a braced wall line, after all adjustments have been taken, shall be not less than 48 inches (1219 mm) total.

(Deleted text not shown for clarity and brevity)

CHANGE SIGNIFICANCE: Section R602.10.6.5 now begins with two limitations. Townhouses with brick veneer height exceeding the top of the first story require engineering when in SDC D_0, D_1 and D_2. Three-story buildings with brick veneer for one- and two-families in SDC D_2 also require engineering. Note, all three-story one- and two-family dwellings in SDC D_2 require engineering of the lateral force-resisting system.

CRC Section	Maximum Veneer Height	Extent Allowed	Bracing Methods Allowed
R602.10.6.5.1	Veneer in first story only	Throughout first story	Any
R602.10.6.5.2	Veneer throughout second story	Throughout first and second stories	Method BV-WSP
R602.10.6.5.3	Veneer in gable or into portion of second story	Throughout first story, limited area in second story	Method WSP, Method CS-WSP, Method BV-WSP

Subsections are now organized so veneer on the building is dealt with in terms of the maximum height and extent of the veneer.

In the 2019 CRC, a section was added to permit limited brick veneer on the second story without triggering the use of Method BV-WSP; meanwhile there has been confusion as to how the provision should be applied. Table R602.10.3(4) is modified to refer to Section R602.10.6.5.3 where the limitations for Methods WSP and CS-WSP reside describing how much brick veneer may extend into a second story. To determine minimum bracing lengths for Methods WSP and CS-WSP, Table R602.10.3(3) is used, adjusted by the 1.2 factor in Table R602.10.3(4). For details on determining whether a building requires Method BV-WSP or may use Methods WSP or CS-WSP, see Significant Change R602.10.3(4).

When brick veneer extends to multiple walls of a second story, Table R602.10.6.5.4 gives the minimum wall bracing required for Method BV-WSP. Method BV-WSP continues to require a hold-down at each end of the braced wall panel from the top story down through the building to the foundation. The method may be used when veneer is only on the first story or when it runs up into a gable end wall; but is only required when all other options are not allowed, in other words, when more than 25 percent of the second story is covered in veneer.

R609.4.1

Garage Doors

CHANGE TYPE: Addition

CHANGE SUMMARY: All garage doors must have a permanent label identifying wind pressure ratings among other information.

2022 CODE TEXT: **R609.4.1 Garage door labeling.** Garage doors shall be labeled with a permanent label provided by the garage door manufacturer. The label shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

CHANGE SIGNIFICANCE: Since 2005, there has been a push toward considering sustainability in the way our buildings are constructed. If this goal is to be successful, as building owners and occupants increasingly want more information about the sustainability of the buildings they occupy, information to determine how critical components are expected to perform in buildings must be readily available. Some manufacturers already include permanent labels on their products that provide traceability to the manufacturer and the product characteristics.

Garage doors are important components of the building envelope and their performance is critical in preventing wind and water infiltration as well as to maintaining the overall structural integrity of the building. The 2019 CRC did not require garage doors to have a permanent label to provide homeowners, insurers and builders information on a door's wind performance characteristics. For products that do not have permanent labels, it becomes nearly impossible for the owner to determine an installed garage door's structural wind load resistance or energy efficiency. New Section R609.4.1 requires a permanent label on the garage door indicating the manufacturer and model/series number and performance characteristics.

Insurance incentives are now being offered in some states for homes, new and existing, that comply with certain levels of the Fortified program administered by the Insurance Institute for Business and Home Safety

Garage doors must be labeled.

(IBHS). The Fortified program is a set of engineering and building standards designed to help strengthen new and existing homes through system-specific building upgrades to minimum building code requirements that will reduce damage from natural hazards. Fortified offers three different levels of designation depending on the extent of the recommended upgrades to the building's wind resistance. To qualify for a designation, the home is inspected. Without a permanent label indicating the manufacturer and product model/series number, the performance characteristics of garage doors often cannot be determined, and Fortified designations become more difficult to achieve.

R703.2, R703.7.3

Water-Resistive Barriers

CHANGE TYPE: Modification

CHANGE SUMMARY: Language for water-resistive barriers is clarified with wet or dry climates specifically considered.

2022 CODE TEXT: **R703.2 Water-resistive barrier.** Not fewer than one layer of water-resistive barrier shall be applied over studs or sheathing of all exterior walls with flashing as indicated in Section R703.4, in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer. The water-resistive barrier material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

Water-resistive barrier materials shall comply with one of the following:

1. No. 15 felt complying with ASTM D226, Type 1
2. ASTM E2556, Type I or II
3. ASTM E331 in accordance with Section R703.1.1
4. Other approved materials installed in accordance with the manufacturer's installation instructions.

No. 15 asphalt felt and water-resistive barriers complying with ASTM E2556 shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm), and where joints occur, shall be lapped not less than 6 inches (152 mm).

House wrap installed as a continuous water barrier.

R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall comply with Section R703.7.3.1 or R703.7.3.2.

R703.7.3.1 Dry climates. In Dry (B) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. The water-resistive barrier shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of a water-resistive barrier complying with ASTM E2556, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier, shall be directed between the layers.
2. The water-resistive barrier shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of a water-resistive barrier complying with ASTM E2556, Type II. The water-resistive barrier shall be separated from the stucco by a layer of foam plastic insulating sheathing or other non-water-absorbing layer or a designed drainage space.

R703.7.3.2 Moist or marine climates. In the Moist (A) or Marine (C) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:

1. In addition to complying with Section R703.7.3.1, a space or drainage material not less than 3⁄16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.
2. In addition to complying with Section R703.7.3.1, Item 2, drainage on the exterior side of the water-resistive barrier shall have a drainage efficiency of not less than 90 percent, as measured in accordance with ASTM E2273 or Annex A2 of ASTM E2925.

(Deleted text not shown for brevity and clarity.)

CHANGE SIGNIFICANCE: Walls must be designed to prevent accumulation of water within wall assemblies. This is accomplished by providing a water-resistant barrier behind exterior cladding with a means of draining to the exterior any water that enters the assembly. A vapor retarder is provided on the interior side of exterior framed walls to resist passage of condensation into wall assemblies from the building interior.

The most common way to provide a drainage plane is to install weather-resistant materials in shingle fashion beneath a wall covering. A water-resistive barrier must provide a path for water flow if it migrates through a wall covering. Siding and veneers are typically not impervious to wind-driven rain. Water-resistive barriers in combination with flashing complete a weather protective system to move moisture out of a wall assembly. A water-resistive barrier must be continuous from the base of a building to the top of its walls.

There is a broad range of water-resistive barriers available in addition to traditional No. 15 asphalt felt. Sheet-type water-resistive barriers complying with ASTM D226, ASTM E331 or ASTM E2556 may be used. Nonsheet-style materials that provide equivalent protection may also be used. Section R703.2 now lists materials which may be used and testing

standards that alternative materials must meet to be used as water-resistive barriers.

Section R703.7.3, water-resistive barriers for stucco, is reorganized into subsections that focus on different methods of complying with requirements based on wet or dry climatic conditions. It is critical to determine the local climate and tendency of moisture to infiltrate walls. These considerations were not accounted for in earlier code editions when stucco was assumed to be typically applied in dry, warm climates. Today, stucco is used throughout the United States and climate consideration is needed to avoid increased risk of moisture problems in climates that are moist or frequently rainy. This revision helps resolve performance issues due to moisture when stucco is placed over wood-based sheathing and does not affect construction methods in dry climates such as the southwestern region of the United States where stucco has performed well.

CHANGE TYPE: Modification

CHANGE SUMMARY: Larger air gaps are allowed behind veneer to accommodate thicker continuous insulation.

Table R703.8.4(1)
Veneer Attachment

2022 CODE TEXT:

TABLE R703.8.4(1) Tie Attachment and Airspace Requirements

Backing and Tie	Minimum Tie	Minimum Tie Fastener[a]	Airspace[b]	
Wood stud backing with corrugated sheet metal	22 U.S. gage (0.0299 in.) × ⅞ in. wide	8d common nail[bc] (2½ in. × 0.131 in.)	Nominal 1 in. between sheathing and veneer	
Wood stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint[d]	8d common nail[bc] (2½ in. × 0.131 in.)	Minimum nominal 1 in. between sheathing and veneer	Maximum ~~4½~~ 4⅝ in. between backing and veneer
Wood stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint[e,f]	8d common nail[c] (2½ in. × 0.131 in.)	Greater than 4⅝ in. between backing and veneer	Maximum 6⅝ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint[d]	No. 10 screw extending through the steel framing a minimum of three exposed threads	Minimum nominal 1 in. between sheathing and veneer	Maximum ~~4½~~ 4⅝ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint[e,f]	No. 10 screw extending through the steel framing a minimum of three exposed threads	Greater than 4⅝ in. between backing and veneer	Maximum 6⅝ in. between backing and veneer

~~b.~~a. All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used or be manufactured from material not susceptible to corrosion.

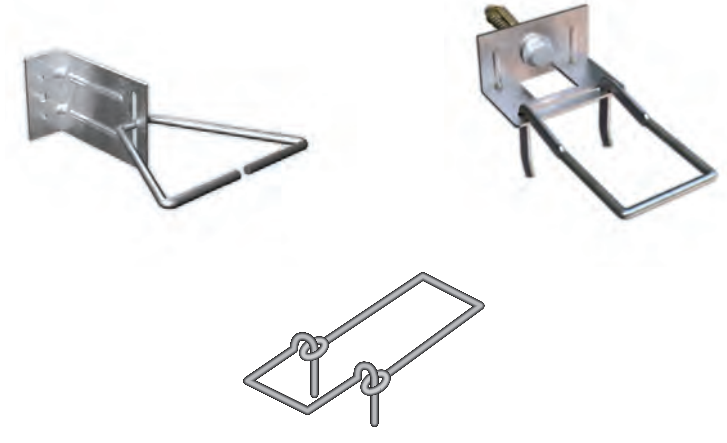
~~c.~~b. An airspace that provides drainage shall be permitted to contain mortar from construction.

~~a.~~c. In Seismic Design Category D_0, D_1 or D_2, the minimum tie fastener shall be an 8d ring-shank nail (2½ in. × 0.131 in.) ~~or a No. 10 screw extending through the steel framing a minimum of three exposed threads~~.

d. Adjustable tie pintles shall include not fewer than 1 pintle leg of wire size W2.8 (MW18) with a maximum offset of 1¼ in.

e. Adjustable tie pintles shall include not fewer than 2 pintle legs with a maximum offset of 1¼ in. Distance between inside face of brick and end of pintle shall be a maximum of 2 in.

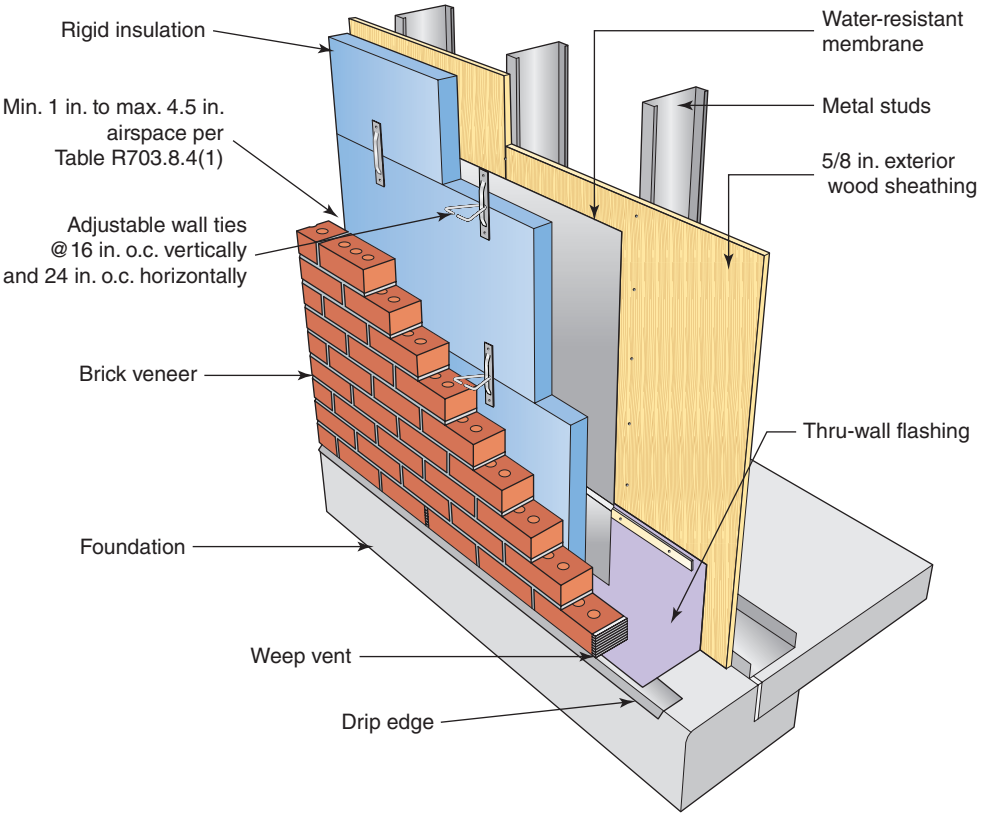
f. Adjustable tie backing attachment components shall consist of one of the following: eyes with minimum wire W2.8 (MW18), barrel with minimum ¼ in. outside dia., or plate with minimum thickness of 0.074 in. and minimum width of 1¼ in.



Veneer anchor examples.

CHANGE SIGNIFICANCE: CRC tie and airspace provisions now match *California Building Code* (CBC) requirements through reference to the anchored masonry veneer provisions of TMS 402, *Building Code Requirements for Masonry Structures*.

Energy conservation techniques using exterior foam sheathing require larger airspaces constructed between anchored masonry veneer and its backing in order to accommodate thicker continuous insulation used in colder climate zones. Masonry veneer with airspaces up to a maximum of 4⅝ inches may be constructed using traditional tie configurations. Airspaces up to 6⅝ inches must be constructed using stiffer tie configurations. These ties use thicker pintles with double legs or an eye, barrel or plate arrangement for greater strength.



Veneer attachment to wood-frame construction.

R703.11.2

Vinyl Siding Installation Over Foam Plastic Sheathing

CHANGE TYPE: Modification

CHANGE SUMMARY: Wind pressure ratings for vinyl siding are decreased.

2022 CODE TEXT: **R703.11.2 Installation over foam plastic sheathing.** Where vinyl siding or insulated vinyl siding is installed over foam plastic sheathing, the vinyl siding shall comply with Section R703.11 and shall have a wind load design ~~wind~~ pressure ~~resistance~~ rating in accordance with Table R703.11.2.

Exceptions:

1. Where the foam plastic sheathing is applied directly over wood structural panels, fiberboard, gypsum sheathing or other approved backing capable of independently resisting the design wind pressure, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.
2. Where the vinyl siding manufacturer's product specifications provide an approved wind load design ~~wind~~ pressure rating for installation over foam plastic sheathing, use of this wind load design ~~wind~~ pressure rating shall be permitted and the siding shall be installed in accordance with the manufacturer's installation instructions.
3. Where the foam plastic sheathing and its attachment have a design wind pressure resistance complying with Sections R316.8 and R301.2.1, the vinyl siding shall be installed in accordance with Sections R703.3.3 and R703.11.1.

Vinyl siding over foam plastic sheathing.

TABLE R703.11.2 ~~Adjusted~~ Required Minimum Wind Load Design ~~Wind~~ Pressure ~~Requirement~~ Rating for Vinyl Siding Installed over Foam Plastic Sheathing Alone

Ultimate Design Wind Speed (mph)	Adjusted Minimum Design Wind Pressure (ASD) (psf)[a,b]					
	Case 1: With interior gypsum wallboard[c]			Case 2: Without interior gypsum wallboard[c]		
	Exposure			Exposure		
	B	C	D	B	C	D
≤95	−30.0	−33.2	−39.4	−33.9	−47.4	−56.2
100	−30.0	−36.8	−43.6	−37.2	−52.5	−62.2
105	−30.0	−40.5	−48.1	−41.4	−57.9	−68.6
110	~~−44.0~~ −31.8	~~−61.6~~ −44.5	~~−73.1~~ −52.8	~~−62.9~~ −45.4	~~−88.1~~ −63.5	~~−104.4~~ −75.3
115	~~−49.2~~ 35.5	~~−68.9~~ −49.7	~~−81.7~~ −59.0	~~−70.3~~ −50.7	~~−98.4~~ −71.0	~~−116.7~~ −84.2
120	~~−51.8~~ −37.4	~~−72.5~~ −52.4	~~−86.0~~ −62.1	~~−74.0~~ −53.4	~~−103.6~~ −74.8	~~−122.8~~ −88.6
130	~~−62.2~~ −44.9	~~−87.0~~ −62.8	~~−103.2~~ −74.5	~~−88.8~~ −64.1	~~124.3~~ −89.7	~~−147.4~~ −106
>130	See Footnote d ~~Not Allowed~~[d]					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. Linear interpolation is permitted.

b. The table values are based on a maximum 30-foot mean roof height, and effective wind area of 10 square feet Wall Zone 5 (corner), and the ASD design component and cladding wind pressure from Table R301.2.1(1), adjusted for exposure in accordance with Table R301.2.1(2), multiplied by the following adjustment factors: ~~2.6~~ 1.87 (Case 1) and ~~3.7~~ 2.67 (Case 2) ~~for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph~~.

c. Gypsum wallboard, gypsum panel product or equivalent.

d. For the indicated wind speed condition, and where foam sheathing is the only sheathing on the exterior of frame walls with vinyl siding, ~~is not allowed unless the vinyl siding complies with an adjusted minimum design wind pressure requirement as determined in accordance with Note b and~~ the wall assembly ~~is~~ shall be capable of resisting an impact without puncture at least equivalent to that of a wood frame wall with minimum 7/16-inch OSB sheathing as tested in accordance with ASTM E1886. The vinyl siding shall comply with an adjusted design wind pressure requirement in accordance with Note b, using an adjustment factor of 2.67.

CHANGE SIGNIFICANCE: Table R703.11.2 is updated so adjusted vinyl siding design wind pressure ratings are consistent with requirements in ASTM D3679, *Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding*. The ASTM D3679 pressure equalization factor for determining design wind pressure ratings of vinyl siding was recently revised. Because the pressure equalization factor in ASTM D3679 is now more conservative (changed from 0.36 to 0.5), adjustments for vinyl siding applications over foam sheathing are adjusted downward by multiplying existing tabulated values by 0.36/0.5 = 0.72. Consistency with ASTM D3679 is also provided by using the term wind load design pressure rating.

R704
Soffits

CHANGE TYPE: Addition

CHANGE SUMMARY: Requirements for soffit material and installation are expanded.

2022 CODE TEXT: **R703.3.1 Soffit installation.** Soffits shall comply with Section R704.~~R703.3.1.1, Section R703.3.1.2 or the manufacturer's installation instructions~~.

SECTION R704 SOFFITS

R704.1 General wind limitations. Where the design wind pressure is 30 pounds per square foot (1.44 kPa) or less, soffits shall comply with Section R704.2. Where the design wind pressure exceeds 30 pounds per square foot (1.44 kPa), soffits shall comply with Section R704.3. The design wind pressure on soffits shall be determined using the component and cladding loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet and adjusted for height and exposure in accordance with Table R301.2.1(2).

R704.2 Soffit installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44 kPa) or less, soffit installation shall comply with Section R704.2.1, Section R704.2.2, Section R704.2.3, or Section R704.2.4. Soffit materials not addressed in Sections R704.2.1 through R704.2.4 shall be in accordance with the manufacturer's installation instructions.

R704.2.1 Vinyl soffit panels. Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascial component in accordance with Figure R704.2.1(1). Where the unsupported span of soffit panels is greater than 16 inches, intermediate nailing strips shall be provided in accordance with Figure R704.2.1(2). Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.

R704.2.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall be a minimum of ¼-inch in thickness and shall comply with the requirements of ASTM C1186, Type A, minimum Grade II or ISO 8336, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's installation instructions.

R704.2.3 Hardboard soffit panels. Hardboard soffit panels shall be not less than 7/16-inch in thickness and shall be fastened to framing or nailing strips with 2½″ × 0.113″ (64 mm × 2.9 mm) siding nails spaced not more than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

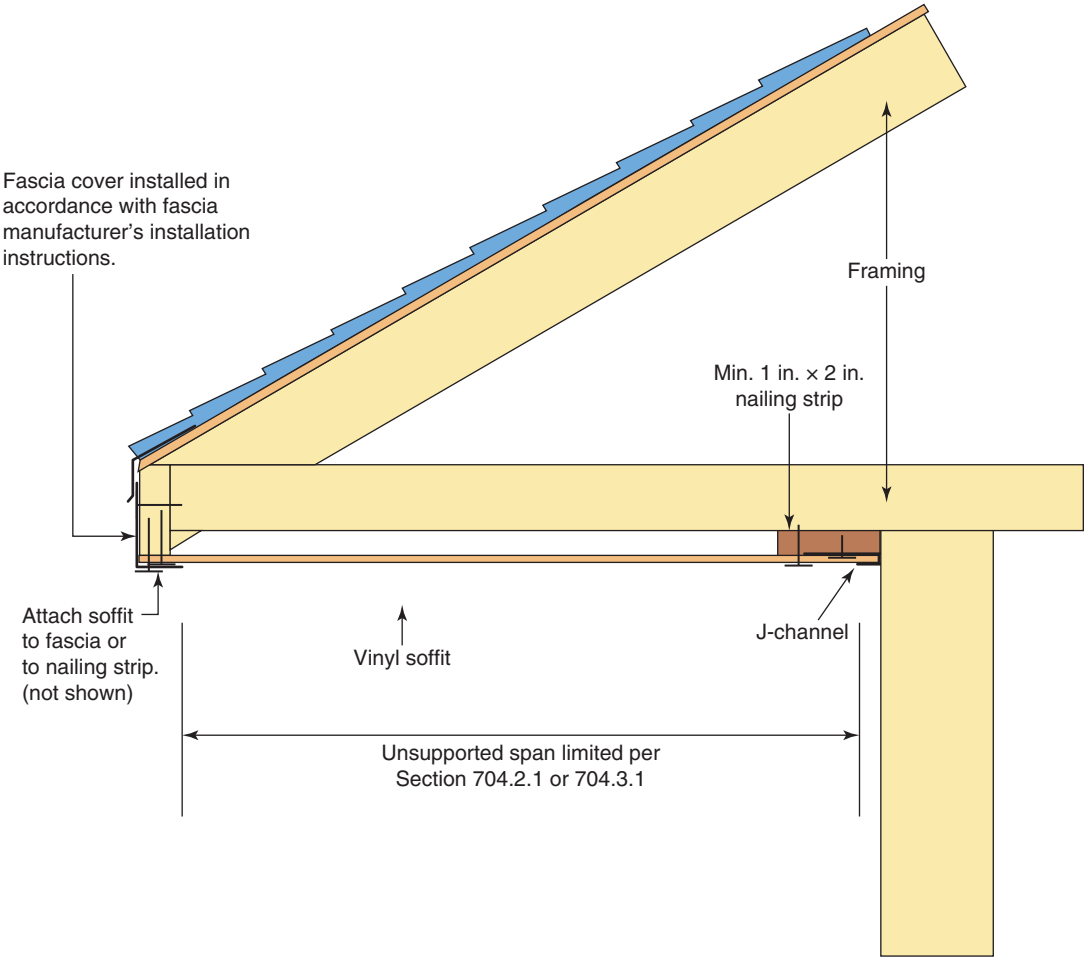
~~R703.3.1.1~~ R704.2.4 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be ⅜-inch (9.5

Fiber-cement soffit.

mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm × 2.5 mm) nails. Fasteners shall be spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.

R704.3 Soffit installation where the design wind pressure exceeds 30 psf. Where the design wind pressure is greater than 30 psf, soffit installation shall comply with Section R704.3.1, Section R704.3.2, Section R704.3.3, or Section R704.3.4. Soffit materials not addressed in Sections R704.3.1 through R704.3.4 shall be in accordance with the manufacturer's installation instructions.

R704.3.1 Vinyl soffit panels. Vinyl soffit panels and their attachments shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with Table R301.2.1(2). Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with Figure R704.2.1(1). Where the unsupported span of soffit panels is greater than 12 inches (305 mm), intermediate nailing strips shall be provided in accordance with Figure R704.2.1(2). Vinyl soffit panels shall be installed



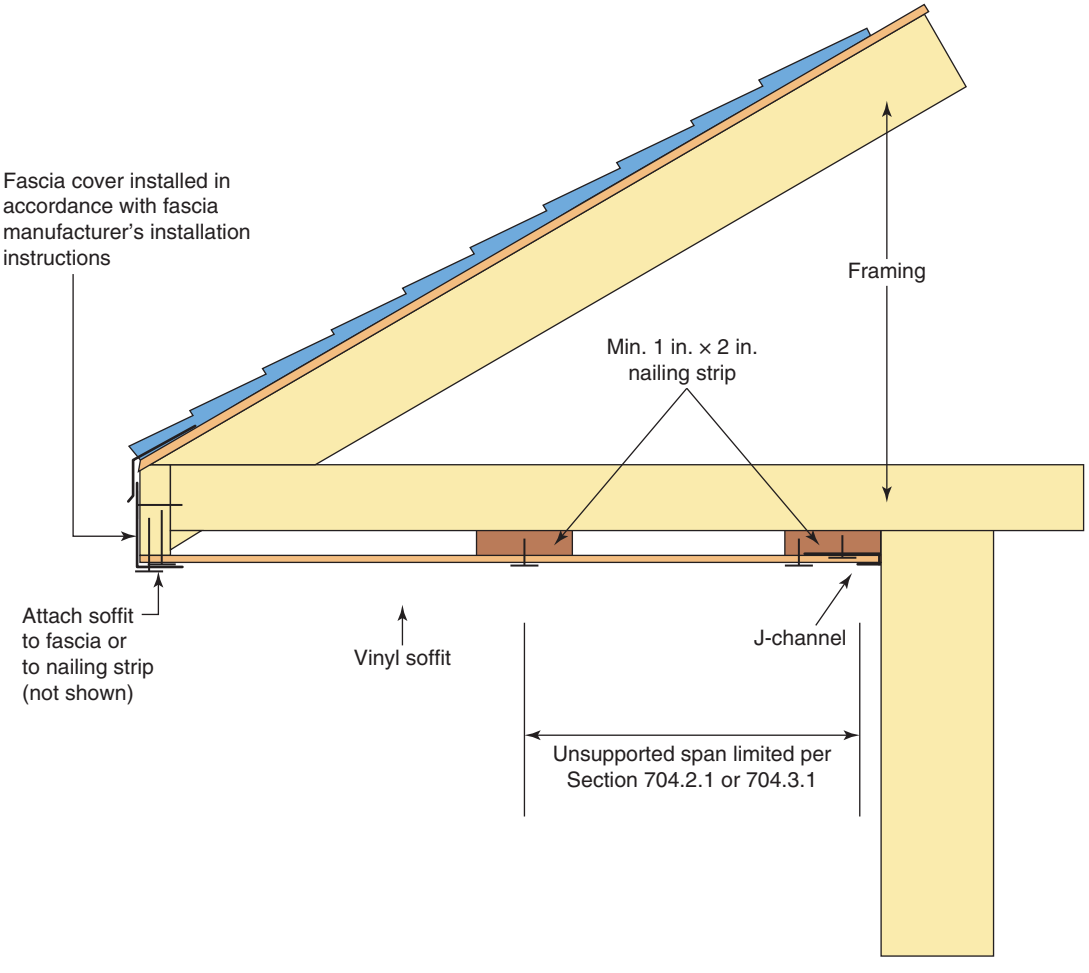
Soffit support: Single span.

in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.

R704.3.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section R704.2.2 and shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with Table R301.2.1(2).

R704.3.3 Hardboard soffit panels. Hardboard soffit panels shall comply with the manufacturer's installation instructions and shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with Table R301.2.1(2).

R704.3.4 Wood structural panel soffit. Wood structural panel soffits shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with Table R301.2.1(2). Alternatively, wood structural panel soffits shall be installed in accordance with Table R704.3.4.



Soffit support: Double span.

TABLE R704.3.4 Prescriptive Alternative for Wood Structural Panel Soffit[b,c,d,e]

Maximum Design Pressure (+ or – psf)	Minimum Panel Span Rating	Minimum Panel Performance Category	Nail Type and Size	Fastener[a] Spacing Along Edges and Intermediate Supports	
				Galvanized Steel	Stainless Steel
30	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	6[f]	4
40	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	6	4
50	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	4	4
			8d common (2½ × 0.131 × 0.281 head diameter)	6	6
60	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	4	3
			8d common (2½ × 0.131 × 0.281 head diameter)	6	4
70	24/16	7/16	8d common (2½ × 0.131 × 0.281 head diameter)	4	4
			10d box (3 × 0.128 × 0.312 head diameter)	6	4
80	24/16	7/16	8d common (2½ × 0.131 × 0.281 head diameter)	4	4
			10d box (3 × 0.128 × 0.312 head diameter)	6	4
90	32/16	15/32	8d common (2½ × 0.131 × 0.281 head diameter)	4	3
			10d box (3 × 0.128 × 0.312 head diameter)	6	4

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

a. Fasteners shall comply with Sections R703.3.2 and R703.3.3.

b. Maximum spacing of soffit framing members shall not exceed 24 inches.

c. Wood structural panels shall be of an exterior exposure grade.

d. Wood structural panels shall be installed with strength axis perpendicular to supports with not fewer than two continuous spans.

e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2 × 3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.

f. Spacing at intermediate supports shall be not greater than 12 inches on center.

CHANGE SIGNIFICANCE: Specific material requirements are added for soffits to clarify their wind performance when using CRC installation provisions for common manufactured soffit types. New Section R704 also provides a prescriptive alternative for wood structural panel soffits that complies with design wind pressures specified in the CRC and ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. This section refines and further clarifies provisions adopted into the 2019 CRC and adds new provisions to address soffit installation in high wind regions. Provisions move to new Section R704 to better distinguish soffit requirements from exterior wall covering provisions in Section R703.

Observations during damage assessments of Hurricane Harvey in Texas and Hurricane Irma in Florida revealed frequent soffit damage in both new and existing construction. In Florida, vinyl and metal soffits were damaged, but vinyl soffit panels were the most common product observed, particularly in the Florida Keys where vinyl soffit damage was widespread. In Texas, many soffits lacked adequate wind resistance due to use of improper materials, a lack of fasteners, or inadequate framing leading to water intrusion inside the building envelope. Based on estimated wind speeds at the sites visited, failure occurred to soffit components at wind speeds well below design wind speeds for the area. Loss of soffit vents can allow hurricane winds to drive large amounts of water through resulting openings and soak insulation, which can lead to mold growth and, in some cases, ceiling collapse.

In many cases, inadequate support and attachment at soffit panel ends led to failure. There were cases where soffits appeared to have been fastened by a single nailing strip across the midpoint of the framing above. New Section R704.2.1 clarifies that vinyl soffit panels are required to be fastened at each end and an unsupported span cannot exceed 16 inches unless permitted by the manufacturer's product approval.

Provisions in this section are applied based on component and cladding design wind pressures from Table R301.2.1(1) and Table R301.2.1(2) with an assumed 30 psf design wind pressure. For most of the country, design wind pressures will be 30 psf or less, even in Exposure Category D areas, requiring connections similar to those in the 2019 CRC. For higher wind regions, enhanced soffit construction will be required where the design wind pressure exceeds 30 psf.

R802

Wood Roof Framing

CHANGE TYPE: Modification

CHANGE SUMMARY: Revised provisions clarify ridge beam and ceiling joist requirements.

2022 CODE TEXT: **R802.3 Ridge.** A ridge board used to connect opposing rafters shall be not less than 1 inch (25 mm) nominal thickness and not less in depth than the cut end of the rafter. Where ceiling joist or rafter ties do not provide continuous ties across the structure as required by Section R802.5.2, the ~~a~~ ridge shall be supported by a wall or ridge beam designed in accordance with accepted engineering practice ~~shall be provided~~ and supported on each end by a wall or column ~~girder~~.

R802.5 Ceiling joists. Ceiling joists shall be continuous across the structure or securely joined where they meet over interior partitions in accordance with ~~Table R802.5.2~~ Section R802.5.2.1. Ceiling joists shall be fastened to the top plate in accordance with Table R602.3(1).

R802.5.2 Ceiling joist and rafter connections. Where ceiling joists run parallel to rafters, and are located ~~they shall be connected to rafters at the top wall plate in accordance with Table R802.5.2. Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed~~ in the bottom third of the rafter height, they shall be installed in accordance with Figure R802.4.5 and fastened to rafters in accordance with Table R802.5.2(1). Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be designed as a beam in accordance with Section R802.3. Where ceiling joists do not run parallel to rafters, ~~the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each~~ rafters shall be tied across the structure with a rafter tie in accordance with Section R802.5.2.2, or the ridge shall be

Wood-framed roof line.

designed as a beam in accordance with R802.3. ~~or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to Table R802.5.2.~~

R802.5.2.1 Ceiling joists lapped. Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide the continuous tie across the building ~~resistance to rafter thrust~~, lapped joists shall be nailed together in accordance with Table R802.5.2(1) and butted joists shall be tied together with a connection of equivalent capacity ~~in a manner to resist such thrust~~. Laps in joists ~~Joists~~ that do not ~~resist thrust~~ provide the continuous tie across the building shall be permitted to be nailed in accordance with Table R602.3(1). ~~Wood structural panel roof sheathing, in accordance with Table R503.2.1.1(1), shall not cantilever more than 9 inches (229 mm) beyond the gable end-wall unless supported by gable overhang framing.~~

R802.5.2.2 Rafter ties. Wood rafter ties shall be not less than 2 inches by 4 inches (51 mm × 102 mm) installed in accordance with Table R802.5.2(1) ~~at each rafter~~ a maximum of 24 inches (610 mm) on center. Other approved rafter tie methods shall be permitted.

R802.5.2.3 Blocking. Blocking shall be not less than utility grade lumber.

CHANGE SIGNIFICANCE: Requirements for connection of rafters and ceiling joists are clarified. Section R802.5 establishes the concept of a continuous tie across lower portions of rafters, using either ceiling joists or rafter ties, so rafters under roof loads do not push out exterior bearing walls—an action referred to as rafter thrust. Rafters and ceiling joists form a triangle, which is a stable shape as long as member ends are connected together. When the lower ends of rafters are not connected to rafter ties or ceiling joists to resist thrust, the only way to prevent thrust is to support them at the peak by a ridge beam.

Ceiling joists are installed in the lower portion of an attic and fastened in a specific manner to create a rafter tie. However, ceiling joists may be installed higher in an attic or perpendicular to rafters. Occasionally, there may not be any ceiling joists, such as in a cathedral ceiling. When ceiling joists are not located at the top of a bearing wall, ties are required to meet the provisions of Section R802.5.2 to ensure that rafters do not push (thrust) walls outward. In these cases, either a tie can be provided, or a ridge beam should be designed in accordance with accepted engineering practice.

Table R802.5.2(1)

Heel Joint Connections

CHANGE TYPE: Modification

CHANGE SUMMARY: The heel joint connection table is updated for roof spans of 24 and 36 feet and a 19.2-inch rafter spacing.

2022 CODE TEXT:

TABLE R802.5.2(1) Rafter/Ceiling Joist Heel Joint Connections[g]

Rafter Slope	Rafter Spacing (inches)	Ground Snow Load (psf)											
		20[e]			30			50			70		
		Roof span (feet)											
		12	24	36	12	24	36	12	24	36	12	24	36
		Required number of 16d common nails per heel joint splice[a,b,c,d,f]											
3:12	12	3	5	8	3	6	9	5	9	13	6	12	17
	16	4	7	10	4	8	12	6	12	17	8	15	23
	19.2	4	8	12	5	10	14	7	14	21	9	18	27
	24	5	10	15	6	12	18	9	17	26	12	23	34
4:12	12	3	4	6	3	5	7	4	7	10	5	9	13
	16	3	5	8	3	6	9	5	9	13	6	12	17
	19.2	3	6	9	4	7	11	6	11	16	7	14	21
	24	4	8	11	5	9	13	7	13	19	9	17	26
5:12	12	3	3	5	3	4	6	3	6	8	4	7	11
	16	3	4	6	3	5	7	4	7	11	5	9	14
	19.2	3	5	7	3	6	9	5	9	13	6	11	17
	24	3	6	9	4	7	11	6	11	16	7	14	21
7:12	12	3	3	4	3	3	4	3	4	6	3	5	8
	16	3	3	5	3	4	5	3	5	8	4	7	10
	19.2	3	4	5	3	4	6	3	6	9	4	8	12
	24	3	5	7	3	5	8	4	8	11	5	10	15
9:12	12	3	3	3	3	3	3	3	3	5	3	4	6
	16	3	3	4	3	3	4	3	4	6	3	5	8
	19.2	3	3	4	3	4	5	3	5	7	3	6	9
	24	3	4	5	3	4	6	3	6	9	4	8	12
12:12	12	3	3	3	3	3	3	3	3	4	3	3	5
	16	3	3	3	3	3	3	3	3	5	3	4	6
	19.2	3	3	3	3	3	4	3	4	6	3	5	7
	24	3	3	4	3	3	5	3	5	7	3	6	9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. 10d common (3″ × 0.148″) nails shall be permitted to be substituted for 16d common (3½″ × 0.162″) nails where the required number of nails is taken as 1.2 times the required number of 16d common nails, rounded up to the next full nail. ~~40d box nails shall be permitted to be substituted for 16d common nails.~~

~~b. Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.~~

b.~~c.~~ Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.

c.~~d.~~ Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.

d.~~e.~~ Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.

e.~~f.~~ Applies to roof live load of 20 psf or less.

f.~~g.~~ Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the adjustment factors in Table R802.5.2(2).

g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

TABLE R802.5.2(2) Heel Joint Connection Adjustment Factors

H_C/H_R[a,b]	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

a. H_C = Height of ceiling joists or rafter ties measured vertically ~~above~~ from the top of the rafter support walls to the bottom of the ceiling joists or rafter ties; H_R = Height of roof ridge measured vertically ~~above~~ from the top of the rafter support walls to the bottom of the roof ridge.

b. Where H_C/H_R exceeds 1/3, connections shall be designed in accordance with accepted engineering practice.

(Deleted text in table not shown for brevity and clarity.)

Heel joint connection.

CHANGE SIGNIFICANCE: Table R802.5.2(1) is updated to be consistent with the calculation basis of the American Wood Council's (AWC) *2018 Wood Frame Construction Manual* (WFCM) heel joint nailing requirements which are based on the AWC *2018 National Design Specification for Wood Construction* (NDS) provisions for nailed connections. A reduction in the required number of 16d common nails required in rafter tie connections by approximately 15 percent is due to changes based on a penetration factor and load duration. Previously, a 0.77 penetration factor (based on the 1991 and 1997 NDS) was used for 16d common nails with less than 12d penetration in the main member and a load duration factor of 1.25.

Revised nailing requirements are based on a 1.15 load duration factor for snow load cases, 1.25 load duration factor for roof live load cases, and an effective penetration factor equal to 1.0 per the current NDS where

lateral design value calculations for nails are based on the actual penetration in the wood member. The ratio of nail design values for snow cases originally used to develop nailing requirements to the current nail design values for snow cases is $(Z \times 0.77 \times 1.25) / (Z \times 1.0 \times 1.15) = 0.84$ and explains the reduced number of nails now required in the table. Due to revised NDS nail design provisions, clinched nails are no longer recognized for this application. A 10d common nail option is added based on NDS lateral design value calculations.

Lastly, a sentence is added to footnote f, now Table R802.5.2(2), to clarify that rafter tie connections higher than the bottom third of the attic space ($H_C/H_R > 1/3$) must be engineered while the definitions of H_C and H_R are clarified to show how the variables should be measured.

R802.6

Rafter and Ceiling Joist Bearing

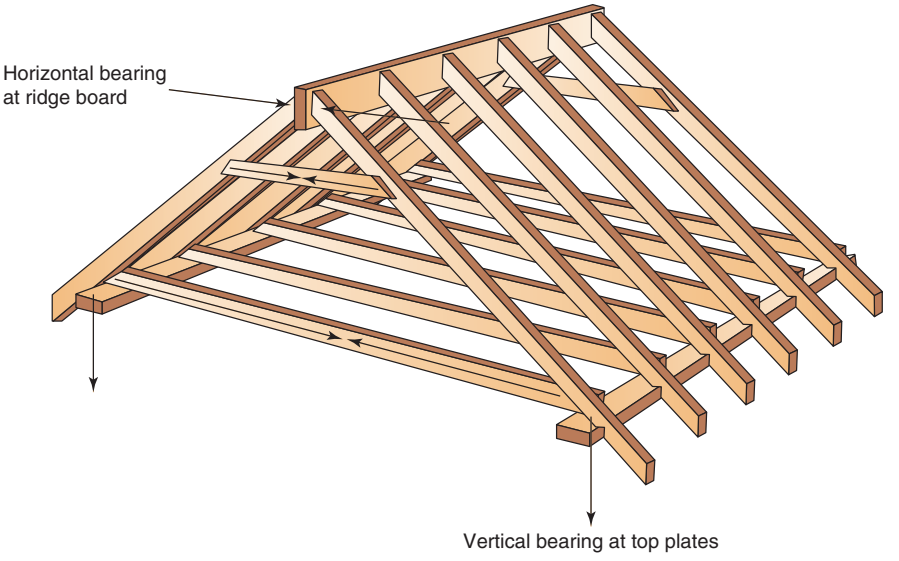
CHANGE TYPE: Modification

CHANGE SUMMARY: Text is added to clarify when a ridge board connection is sufficient for bearing.

2022 CODE TEXT: **R802.6 Bearing.** The ends of each rafter or ceiling joist shall have not less than 1½ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch (51 mm) minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing area of 48 square inches (30 865 mm^2). Where the roof pitch is greater than or equal to 3 units vertical in 12 units horizontal (25-percent slope), and ceiling joists or rafter ties are connected to rafters to provide a continuous tension tie in accordance with Section R802.5.2, vertical bearing of the top of the rafter against the ridge board shall satisfy this bearing requirement.

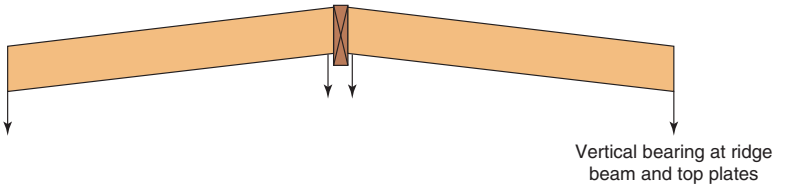
CHANGE SIGNIFICANCE: Changes to Section R802.6 clarify acceptable bearing area, or contact, for rafters, specifically at the top ends of rafters. Section R802.6 requires that the ends of each rafter or ceiling joist have at least 1½ inches of bearing on wood or metal. Bearing typically occurs when one component of an assembly rests on a horizontal surface, such as a top plate, beam or hanger of another element in an assembly to resist vertical loads. However, for a rafter system that has collar ties (or straps) at the top and a continuous tension tie at the bottom of the roof assembly provided by ceiling joists or rafter ties, the downward (gravity) force is transferred to the lower ends of the rafters, and a horizontal bearing force occurs at the top of the rafter toward the ridge board.

Rafters bearing on exterior side wall.



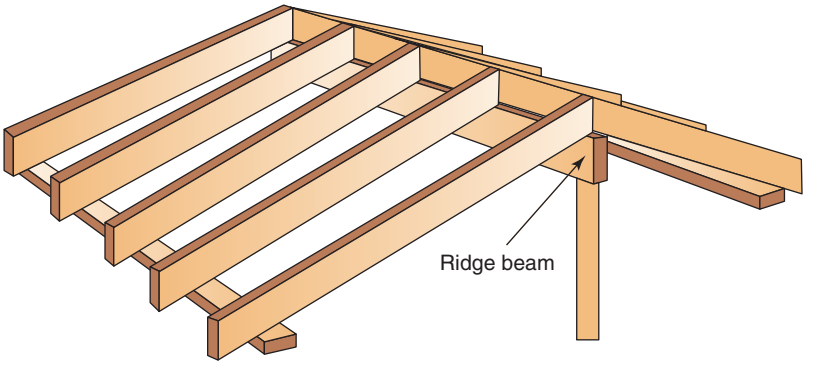
Forces in a stick-built roof.

When a roof slope is shallow, a structural ridge beam is required to manage horizontal and vertical forces per Section R802.4.4. In this case, the ridge beam provides vertical support for the top end of the rafters, and a connection with vertical capacity is required. An example is a joist hanger that provides a horizontal bearing surface for the end of the rafter.



Forces in a low-slope roof.

Cathedral ceilings, while typically having a higher slope, normally do not have ceiling joists or collar ties. Since a horizontal tie is not provided at the bottom of the rafters, a load-bearing ridge beam is required per Section R802.5.2. A ridge beam provides vertical support (bearing) for the top end of the rafter.



Cathedral ceilings require a ridge beam to resist vertical forces.

CHANGE TYPE: Modification

CHANGE SUMMARY: Connections for cold-formed steel (CFS) roof framing members are updated and clarified.

Table R804.3
CFS Roof Framing Fasteners

2022 CODE TEXT:

TABLE R804.3 Roof Framing Fastening Schedule[a,b]

Description of Building Elements	Number and Size of Fasteners[a]	Spacing of Fasteners
Roof sheathing (oriented strand board or plywood) to rafter	No. 8 screws	6″ o.c. on edges and 12″ o.c. at interior supports. 6″ o.c. at gable end truss
Gypsum board to ceiling joists	No. 6 screws	12″ o.c.
Gable end truss to endwall top track	No. 10 screws	12″ o.c.
Rafter to ceiling joist and to ridge member	Minimum No. 10 screws, in accordance with Table R804.3.1.1(3)	Evenly spaced, not less than ½″ from all edges.

Description of Building Elements	Ceiling Joist or Truss Spacing (in.)	Roof Span (ft)	Ultimate Design Wind Speed (mph) and Exposure Category: 130B 115C	<139B 120C	130C	<139C	Spacing of Fasteners
Ceiling joist or roof truss to top track of bearing wall[b]	16	24	3	3	4	5	Each ceiling joist or roof truss
		28	3	3	4	5	
		32	3	4	5	6	
		36	4	4	5	6	
		40	4	4	6	7	
	24	24	4	5	6	7	
		28	4	5	6	8	
		32	4	6	7	8	
		36	4	6	8	9	
		40	6	6	8	10	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mil = 0.0254 mm.

a. Screws are a minimum No. 10 unless noted otherwise.

b. Indicated number of screws shall be applied through the flanges of the truss or ceiling joist or through each leg of a 54-mil clip angle. See Section R804.3.8 for additional requirements to resist uplift forces.

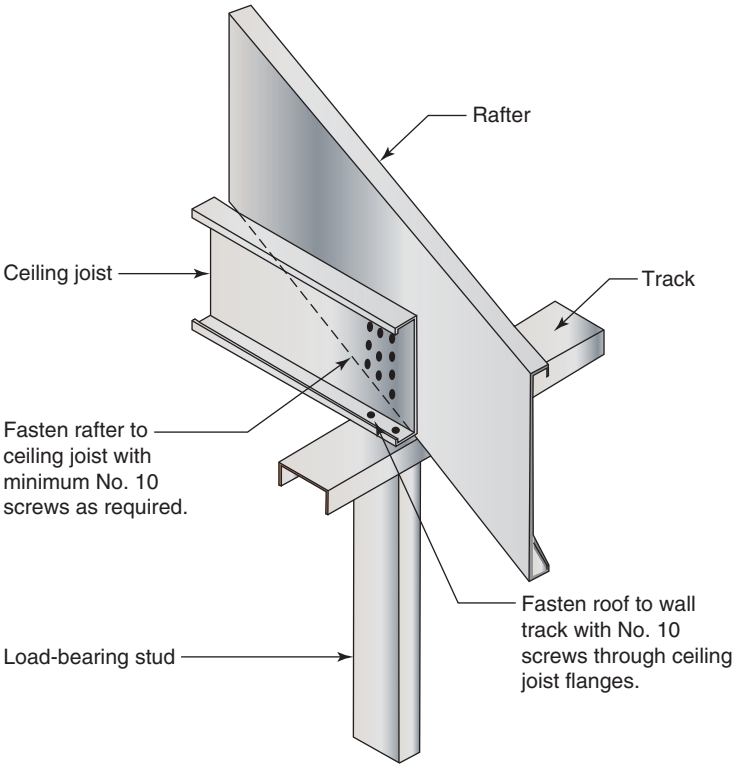
(Deleted text not shown for clarity.)

TABLE R804.3.2.1(2) Ultimate Design Wind Speed to Equivalent Snow Load Conversion

Ultimate Wind Speed and Exposure		Equivalent Ground Snow Load (psf)									
		Roof slope									
Exposure	Wind speed (mph)	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
B	115	20	20	20	20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~50~~ 20
	120	20	20	20	20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~50~~ 20
	130	20	20	20	20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~50~~ 20	~~50~~ 20	~~50~~ 20
	<140	20	20	20	20	~~30~~ 20	~~50~~ 20	~~50~~ 20	~~50~~ 30	~~50~~ 30	~~50~~ 30
C	115	20	20	20	20	~~30~~ 20	~~30~~ 20	~~30~~ 20	~~50~~ 20	~~50~~ 30	~~50~~ 30
	120	20	20	20	20	~~30~~ 20	~~30~~ 20	~~50~~ 20	~~50~~ 30	~~50~~ 30	50
	130	20	20	~~20~~ 30	30	30	~~50~~ 30	~~50~~ 30	~~50~~ 30	50	~~70~~ 50
	<140	30	30	~~30~~ 50	50	~~50~~ 30	~~50~~ 30	~~70~~ 50	~~70~~ 50	~~70~~ 50	— 50

For SI: 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

R804.3.2.1.2 Rake overhangs. Rake overhangs shall not exceed ~~12 inches (305 mm) measured horizontally.~~ the limitations provided for Option 1 or Option 2 in Figure R804.3.2.1.2. Outlookers at gable endwalls shall be installed in accordance with Figure R804.3.2.1.2. The required strength for uplift connectors required for Option 1 shall be determined in accordance with AISI S230 Table F3-4.



Minimum 3 to 10 screws in each CFS ceiling joist to wall track connection.

CHANGE SIGNIFICANCE: The cold-formed steel framing provisions of the *California Residential Code* (CRC) are updated to parallel requirements in the latest edition of AISI S230 - *Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings* (AISI S230-18). The 2018 edition of AISI S230 has updated prescriptive provisions conforming to loading criteria of ASCE 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. The cold-formed steel provisions affected by the latest edition of ASCE 7 are located in CRC Section 804 – Roof Framing. Wind pressure coefficients on roof surfaces have increased (see the significant change article for Table R301.2.1(1) for more detail). AISI S230-18 also reduced required bottom flange bracing spacing from 8 feet to 4 feet to minimize changes in the allowable roof span tables due to increased wind loading.

Table R804.3 adds fastening requirements for gypsum board to ceiling joist connections and rafter to ridge connections. Fastening requirements for wind resistance of the ceiling joist or truss to wall track are expanded with fastening increase with higher wind speeds or exposure category.

Table R804.3.2.1(2) updates the wind to ground snow load table for steeper pitched roofs. For example, the equivalent ground snow load is decreased from 30 psf to 20 psf for a roof pitch of 7:12 in a 115-mph region. Lastly, the rake overhang section is clarified by referencing limits in Figure R804.3.2.1.2 and minimum uplift connector capacity in AISI S230 Table F3-4.

R806.1.1

Vents in the Wildland-Urban Interface (WUI)

CHANGE TYPE: Addition

CHANGE SUMMARY: Section R806.1.1 has been added to ensure that vents in the Wildland-Urban Area adequately protect enclosed attics, soffits, rafter spaces and other spaces from the intrusion of burning embers and flame.

2022 CODE TEXT: ***R806.1.1 Vents in the Wildland Urban Interface (WUI).*** *Where provided, ventilation openings for enclosed attics, gable ends, ridge ends, under eaves and cornices, enclosed eave soffit spaces, enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters, underfloor ventilation, foundations and crawl spaces, or any other opening intended to permit ventilation, either in a horizontal or vertical plane, shall be in accordance with Sections R337.6.1 through R337.6.2 to resist building ignition from the intrusion of burning embers and flame through the ventilation openings.*

CHANGE SIGNIFICANCE: Section R806, Roof Ventilation, requires ventilation of enclosed attics and enclosed rafter spaces. However, the previous code did not have requirements for these vents within the Wildland-Urban Areas. Therefore, Section R806.1.1 has been added to ensure that these required vents have the necessary protection to resist building ignition from the intrusion of burning embers and flame through these openings as defined in Sections R337.6.1 and R337.6.2. While the requirements of Sections R337.6.1 and R337.6.2 have been contained within the *California Residential Code*, the language added to Section R806.1.1 clarifies the locations that the requirements for vents applies to and identifies the code sections to which the vents shall be in accordance with.

Fire damage from an unprotected structure in the WUI.

R905.4.4.1

Metal Roof Shingle Wind Resistance

CHANGE TYPE: Addition

CHANGE SUMMARY: Requirements for metal shingle wind resistance are added to Section R905.4.

2022 CODE TEXT: **R905.4.4.1 Wind resistance of metal roof shingles.** Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580 or UL 1897. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table R905.4.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1.

TABLE R905.4.4.1 Classification of Steep Slope Metal Roof Shingles Tested In Accordance With ASTM D3161

Maximum Ultimate Design Wind Speed, V_{ULT} From Figure R301.2(2) (mph)	Maximum Basic Wind Speed, V_{ASD} From Table R301.2.1.3 (mph)	ASTM D3161 Shingle Classification
110	85	A, D or F
116	90	A, D or F
129	100	A, D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

For SI: 1 mile per hour = 1.609 kph.

CHANGE SIGNIFICANCE: Under wind loads, metal roof shingles do not behave in the same manner as asphalt roof shingles defined in Section R905.2.4.1. Nonetheless, a classification similar to the asphalt shingle classification Table R905.2.4.1 is appropriate and was adapted for Section R905.4.4.1.

For metal roof components, wind uplift testing is currently addressed by multiple standards that determine compliance through uplift ratings. Metal roof shingle performance is not correctly represented by these current tests due to the air permeability inherent in the design of shingle units. A fan-induced test method was developed through ASTM as an alternative to metal roof panel uplift resistance testing.

ASTM D3161, *Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method)*, was originally created for asphalt shingles. The standard was expanded in 2013 to evaluate wind resistance of discontinuous, air-permeable, steep-slope roofing products with or without contribution from adhesives or mechanical interlocking to hold down the leading tab edge. ASTM D3161 is not limited to asphalt shingles and removes difficulties for metal shingle manufacturers previously required to test their products in accordance with UL 1897 or UL 580

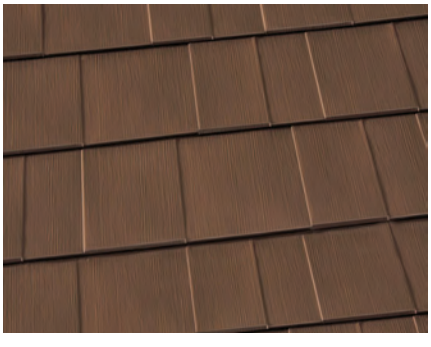


Photo courtesy of Metal Roof Alliance

Metal roof shingles.

via a nonair-permeable method not representative of the product. UL has provided metal shingle wind classifications for many years and currently has ASTM D3161-related listings in its Online Classification Directory. The ASTM test method is applicable to many other steep-slope roofing products and is used to evaluate the wind resistance of those products by testing and certification laboratories.

PART 4

Appendices

Appendices AA through AW

- **Appendices AF** Radon
- **Appendices AG–AT** No changes addressed
- **Appendix AU** Cob Construction
- **Appendix AV** Board of Appeals No changes addressed
- **Appendix AW** 3D Printed Buildings

As stated in Chapter 1 of the CRC, provisions in the appendices do not apply unless specifically referenced in the adopting ordinance. The appendices are developed in much the same manner as the main body of the model code. However, the appendix information is judged to be outside the scope and purpose of the code at the time of code publication. Many times an appendix offers supplemental information, alternative methods, or recommended procedures. The information may also be specialized and applicable or of interest to only a limited number of jurisdictions. Although an appendix may provide some guidelines or examples of recommended practices or assist in the determination of alternative materials or methods, it will have no legal status and cannot be enforced until it is specifically recognized in the adopting legislation. Appendix chapters or portions of such chapters that gain general acceptance over time can move into the main body of the model code through the code-development process. The 2022 CRC introduces a new Appendix U for cob construction, also called monolithic adobe construction, as well as provisions for 3D printing in Appendix W. ■

AF104

Radon Testing

APPENDIX AU

Cob Construction

APPENDIX AW

3D Printed Buildings

AF104

Radon Testing

CHANGE TYPE: Addition

CHANGE SUMMARY: Procedures for radon testing are added to Appendix F.

2022 CODE TEXT:

SECTION AF104
TESTING

AF104 Testing. Where radon-resistant construction is required, radon testing shall be as specified in Items 1 through 11:

1. Testing shall be performed after the dwelling passes its air tightness test.
2. Testing shall be performed after the radon control system and HVAC installations are complete. The HVAC system shall be operating during the test. Where the radon system has an installed fan, the dwelling shall be tested with the radon fan operating.

Radon testing apparatus.

3. Testing shall be performed at the lowest occupied floor level, whether or not that space is finished. Spaces that are physically separated and served by different HVAC systems shall be tested separately.
4. Testing shall not be performed in a closet, hallway, stairway, laundry room, furnace room, bathroom or kitchen.
5. Testing shall be performed with a commercially available radon test kit or testing shall be performed by an approved third party with a continuous radon monitor. Testing with test kits shall include two tests, and the test results shall be averaged. Testing shall be in accordance with this section and the testing laboratory kit manufacturer's instructions.
6. Testing shall be performed with the windows closed. Testing shall be performed with the exterior doors closed, except when being used for entrance or exit. Windows and doors shall be closed for at least 12 hours prior to the testing.
7. Testing shall be performed by the builder, a registered design professional, or an approved third party.
8. Testing shall be conducted over a period of not less than 48 hours or not less that the period specified by the testing device manufacturer, whichever is longer.
9. Written radon test results shall be provided by the test lab or testing party. The final written test report with results less than 4 picocuries per liter (pCi/L) shall be provided to the code official.
10. Where the radon test result is 4 pCi/L or greater, the fan for the radon vent pipe shall be installed as specified in Sections AF103.9 and AF103.12.
11. Where the radon test result is 4 pCi/L or greater, the system shall be modified and retested until the test result is less than 4 pCi/L.

Exception: Testing is not required where the occupied space is located above an unenclosed open space.

CHANGE SIGNIFICANCE: Radon is a tasteless colorless radioactive gas that can cause lung cancer. Soil under residences can contain no, low, moderate or high levels of radon. If a jurisdiction decides radon-resistant construction is required, it may adopt *California Residential Code* (CRC) Appendix F. Generally, adoption of Appendix F occurs in Radon Zone 1 and testing of indoor air after the building is completed identifies whether radon levels exceed the established action level. Control systems specified in Appendix F are intended to limit radon entering a residence, but testing is required to determine if further mitigation is needed. Homeowners, potential renters and builders want to know that a radon mitigation system is functional.

The test procedure allows use of either a radon test kit sent to a lab for analysis or a continuous radon monitor. The new test procedures outline when and where testing should occur, whether multiple locations should be tested within a building due to installation of multiple HVAC systems and when retesting is required.

Where radon reduction systems are required, the test procedure serves as the radon system's commissioning process. If a test result is below 4 pCi/L, the level of radon in the building is deemed to be below the action level and further mitigation is not required. Written test results provide a building official and the homeowner with confirmation that a building's radon level is within the prescribed limits. Many buildings pass testing without fan installation, described in Appendix F, by use of a passive radon system. When a passive system does not meet the 4 pCi/L limit, adding a fan typically lowers the radon level below the specified limit.

Appendix AU
Cob Construction

CHANGE TYPE: Addition

CHANGE SUMMARY: Appendix AU adds a new section on cob construction which has requirements that differ from light straw-clay and strawbale construction.

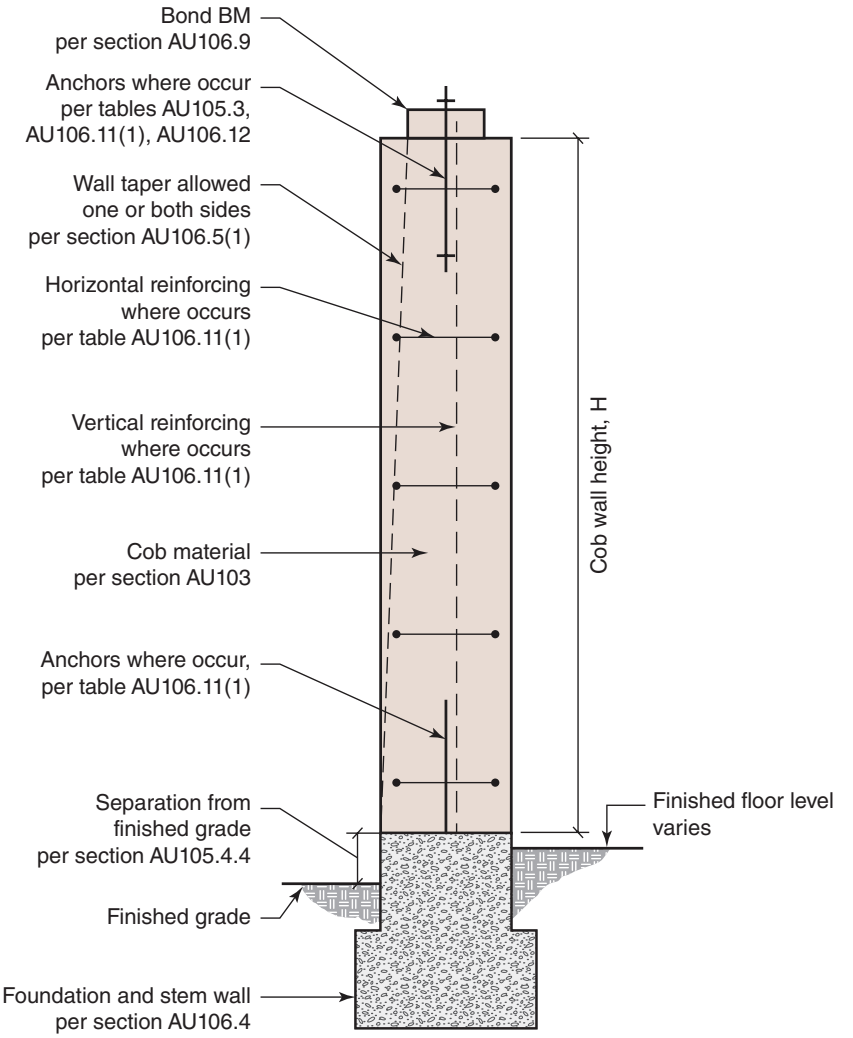
2022 CODE TEXT:

APPENDIX AU
Cob Construction (Monolithic Adobe)

SECTION AU101
GENERAL

AU101.1 Scope. This appendix provides prescriptive and performance-based requirements for the use of natural cob as a building material. Buildings using cob walls shall comply with this code except as otherwise stated in this appendix.

Cob construction with clay exterior finish.



Typical cob wall.

AU101.2 Intent. In addition to the intent described in Section R101.3, the purpose of this appendix is to establish minimum requirements for cob structures that provide flexibility in the application of certain provisions of the code to permit the use of site-sourced and local materials, and to permit combinations of proven historical and modern techniques.

(Only a portion of the appendix is show for brevity and clarity.)

CHANGE SIGNIFICANCE: Cob is an earthen material mix of clay-soil, sand, straw and water, placed onto a wall in layers to create a monolithic wall. Because the material mix and density of cob are very similar to those of adobe bricks, cob is sometimes known as monolithic adobe. Used for thousands of years around the world, the term cob derives from an Old English word for lump, since historical structures were often constructed one handful at a time. Today, cob is often mixed mechanically using a tractor or mortar mixer, but wall construction is still generally manual.

Cob buildings typically feature raised impermeable foundations and extended roof eaves to protect walls from moisture and weather. Walls are often plastered with clay, lime or gypsum plasters that protect the cob without leading to moisture problems associated with less vapor-permeable finishes such as cement stucco, more common on historic adobe structures.

Since the 1990s, there has been interest in cob construction in the United States and much of the world. Cob is highly recyclable, and with good design, construction and maintenance, can withstand centuries of use. Constituent materials are inexpensive compared with lumber, steel, concrete and other commonly used building materials. Cob is noncombustible and nontoxic in all stages of construction and use. The thermal mass and moisture management properties modulate interior temperature and humidity, creating a healthy building.

The cob construction appendix is based on New Zealand's earthen building standards, on U.S. standards for related earthen building systems of adobe and straw-clay and on the experience and testing of cob buildings since the late 1990s.

Appendix AW

3D Printed Buildings

CHANGE TYPE: Addition

CHANGE SUMMARY: Appendix AW adds requirements for 3D printed homes.

2022 CODE TEXT:

Appendix AW
3D PRINTED BUILDING CONSTRUCTION

SECTION AW101
GENERAL

AW101 Scope. Buildings, structures and building elements fabricated in whole or in part using 3D printed construction techniques shall be designed, constructed and inspected in accordance with the provisions contained in this Appendix and other applicable requirements in this code.

AW102.1 Definitions. The words and terms in Section AW102 shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions.

SECTION AW102
DEFINITIONS

3D-PRINTED BUILDING CONSTRUCTION. A process for fabricating buildings, structures and building elements from 3D model data using automated equipment that deposits construction material in a layer-upon-layer fashion.

Photo courtesy of ICON

3D printing of a home.

ADDITIVE MANUFACTURING MATERIALS. Materials used by the 3D printer to produce the building structure or system components of the building.

FABRICATION PROCESS. Preparation of the job site and construction material, and the deposition, curing, finishing, insertion of components and other methods used to construct building elements such as walls, partitions, roof assemblies and structural components, and the means used to connect assemblies together.

PRODUCTION EQUIPMENT. The equipment, including 3D printer, its settings, nozzles and other accessories used in the fabrication process.

SYSTEM COMPONENTS. Devices, equipment and appliances that are installed in the building elements as part of the wiring, plumbing, HVAC and other systems. These include, but are not limited to, electrical outlet boxes, conduit, wiring, piping, tubing, and HVAC ducts, each of which is covered by a product standard or installation code requirement.

SECTION AW103
BUILDING DESIGN

AW103.1 Design organization. 3D printed buildings, structures and building elements shall be designed by an organization certified in accordance with UL 3401 by an approved agency and approved by the building official in accordance with this section.

AW103.2 Design approval. The structural design, construction documents, and UL 3401 report of findings shall be submitted for review and approval in accordance with Section 104.11 of this code.

SECTION AW104
BUILDING CONSTRUCTION

AW104.1 Construction. 3D printed buildings, structures and building elements shall be constructed in accordance with this section.

AW104.2 Construction method. The building construction method, consisting of the manufacturer's production equipment and fabrication process shall be in accordance with the UL 3401 report of findings. The unique identifier of the construction method used shall match the identifier in the UL 3401 report of findings.

AW104.3 Additive manufacturing materials. Only the listed additive manufacturing materials identified in the UL 3401 report of findings shall be used to fabricate the building structure or system components. Containers of the additive manufacturing materials shall be labeled.

AW104.4 Depositing of manufacturing materials. Manufacturing materials shall only be deposited where ambient temperature and environmental conditions at the job site are within limits specified in the UL 3401 report of findings. The maximum number of layers permitted, specified curing time and any surface preparation or finishing shall be performed as specified in the UL 3401 report of findings.

SECTION AW105
SPECIAL INSPECTIONS

AW105.1 Initial inspection. An initial inspection of the production equipment, including 3D printer, and the fabrication process shall be performed after the production equipment is located onsite and before building fabrication has begun. The inspection shall be conducted by representatives of the approved agency that evaluated the fabrication process for compliance with UL 3401. The inspection shall verify that the fabrication process, including production equipment, 3D printing parameters and additive manufacturing materials are in accordance with the UL 3401 report of findings, and the proprietary information in the UL 3401 detailed report of findings.

Exception: Where approved by the building official, inspections of the production equipment, including 3D printer, and the fabrication process used in a single housing tract shall be conducted on the first building to be constructed, and on a selected number of subsequent buildings, where the same equipment, equipment operators and fabrication process are used on all buildings. The number of inspections to be performed shall be determined by the building official.

SECTION AW106
REFERENCED STANDARDS

AW106.1 General. See Table AW106.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix that reference the standard.

TABLE AW106.1 Referenced Standards

Standard Acronym	Standard Name	Sections Herein Referenced
UL 3401-19	Outline of Investigation for 3D Printed Building Construction	AW103.2, AW104.2, AW104.3, AW104.4, AW105.1

CHANGE SIGNIFICANCE: 3D building construction has moved from a conceptual stage to reality, and projects are being proposed in an increasing number of jurisdictions. CRC prescriptive design and construction requirements are not applicable to 3D printed fabrication techniques, so code officials have to approve this construction based on limited

equivalency evaluations that may not take into account variations in material properties introduced by the 3D printing process, or variation in the physical characteristics of the construction materials used.

UL 3401, *Outline of Investigation for 3D Printed Building Construction*, was developed to evaluate critical aspects of this construction process so that 3D-printed building techniques comply with an equivalent level of safety and performance as legacy construction techniques in the building code.

Appendix AW includes definitions and requirements for 3D-printed building design, construction and special inspections, which rely on designs being evaluated in advance by an approved agency for compliance with UL 3401. Resulting compliance reports include information needed by contractors and code officials to verify applicable code compliance and that the 3D-printing process and on-site materials are the same as those indicated during UL 3401 evaluation and testing. Special inspection is required as portions of the fabrication process such as 3D printer settings, deposition rates and thicknesses and curing processes require special evaluation expertise, particularly when proprietary formulations, equipment and settings are included.

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A user-friendly, concise approach that facilitates understanding of the essential code provisions. These invaluable companion guides contain detailed full-color illustrations to enhance comprehension, references to corresponding code sections, and a glossary of code and construction terms that clarify their meaning in the context of the code.

Building Code Essentials: Based on the 2021 IBC	Search #4031S21
Residential Code Essentials: Based on the 2021 IRC	Search #4131S21
Fire Code Essentials: Based on the 2021 IFC	Search #4431S21
Energy Code Essentials: Based on the 2021 IECC	Search #4831S21
Existing Building Code Essentials: Based on the 2021 IEBC	Search #4552S21
Plumbing Code Essentials: Based on the 2021 IPC	Search #4231S21
Mechanical Code Essentials: Based on the 2021 IMC	Search #4031S21

Study Companions

The ideal learning tool for exam prep or everyday application

These comprehensive study guides provide practical learning assignments helpful for independent study or instructor-led programs in the workplace, college courses, or vocational training programs. Each book is organized into study sessions with clear learning objectives, key points for review, code text and commentary applicable to the specific topic, and hundreds of illustrations. A helpful practice quiz at the end of each session allows you to measure your progress along the way. The answer key lists the code section referenced in each question for further information.

2021 International Building Code Study Companion	Search #4017S21
2021 International Residential Code Study Companion	Search #4117S21
2021 International Fire Code Study Companion	Search #4407S21
2021 International Plumbing Code Study Companion	Search #4217S21
2021 International Mechanical Code Study Companion	Search #4317S21
2021 International Fuel Gas Code Study Companion	Search #4607S21
2021 International Energy Conservation Code Study Companion	Search #4807S21
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