Reason: To clarify the Code regarding the design of precast foundation wall systems.

These changes insure that precast foundation walls are designed to recognized engineering standards, manufactured in a plant under verified quality control, when installed will meet required performance criteria, and is neutral regarding the various design approaches and systems. The section addresses the design requirements for precast concrete foundation systems. The committee made reference to Section 404 which addresses cast-in-place concrete walls and is not appropriate for precast concrete foundation systems. Precast foundations systems are pre-engineered products based on several design approaches including, but are not limited to, stud and cavity, solid wall panel, composite panel and hollow core systems, all of which are not included in Section 404. This submission 404.6 provides minimum performance design criteria that all precast concrete foundation systems shall meet. This allows the IRC to remain non-proprietary in nature by not specifying or excluding any specific system. This section also requires manufacturers to provide key information for building officials.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: Disapproved

Committee Reason: The proposal is incomplete and additional information is needed. Clarification is needed for what the applied loads are. It is written more like a design manual rather than code and is not in mandatory language. The design criteria does not include all loads necessary, i.e. seismic and wind, to design a foundation. The proposal has not included provisions that refer to or delete Sections R402.3 and R402.3.1. It does not specify how , when or by whom the third party inspection is to be enforced. Making the panel design drawings available to the building official implies something is to be done with them but it does not specify what. This should be reworked and brought back.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Evan Gurley, National Precast Concrete Association, requests Approval as Modified by this Public Comment.

R404.6 Precast concrete foundation walls. ~~Precast concrete foundation walls shall be manufactured and installed in accordance with Section R 404.6.~~

R404.6.1 Design. ~~The design and manufacture of precast foundation systems shall be in accordance with Section R404.6.2 and ACI 318. The system design shall be sealed by a registered professional engineer. Individual projects built from the system design, drawings, manuals and fabrication procedures shall not be required to bear the seal of the architect or engineer unless otherwise required by state law of the jurisdiction having authority. Fabrication plants shall be inspected annually by an approved third-party inspection agency.~~
Precast concrete foundation walls shall be designed in accordance with accepted engineering practice. The design and manufacture of precast concrete foundation wall panels shall comply with the materials requirements of Section R402.3 or ACI 318. The panel design drawings shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1.

R404.6.2 ~~Minimum design criteria for precast concrete foundation walls~~ Precast concrete foundation design drawings.
~~1. Total uniform load applied to the top of foundation walls, 5300 lbs/ft (7886 kg/m)~~
~~2. Lateral earth pressure 60 lbs/ft2/ft of depth (9.42 kPa/mm)~~
~~3. Accommodate concentrated loads in excess of the uniform load~~

Precast concrete foundation wall design drawings shall be submitted to the building official and approved prior to installation. Drawings shall include, at a minimum, the information specified below:

1. Design loading as applicable
2. Footing design and material
3. Concentrated loads and their points of application
4. Soil bearing capacity
5. Maximum allowable total uniform load
6. Seismic design category
7. Basic wind speed

R404.6.3 ~~Precast concrete foundation wall design drawings~~. Identification. ~~Precast concrete panel systems used as foundations shall be pre-engineered systems and shall have all applicable design criteria and rated capacities noted on the panel design drawings. The panel design drawings shall be available to the building official. Precast concrete panel design drawings shall include at a minimum, the information specified below:~~

~~1. Soil bearing capacity (psf)~~
~~2. Footing design and material~~
~~3. Maximum allowable total uniform load (lbs/linear foot)~~
~~4. Concentrated loads and their points of application~~

Precast concrete foundation wall panels shall be identified by a certificate of inspection label issued by an approved third party inspection agency.

Commenter's Reason: The purpose of the code change is to clarify the Code regarding the design of precast concrete foundation wall systems. This change addresses the committee's concerns by providing additional clarification to the code change, inclusion of additional design factors, and revising the code change wordage.

Justification: These changes insure that precast foundation walls are designed to recognized engineering standards, manufactured in a plant under verified quality control, when installed will meet required performance criteria, and is neutral regarding the various design approaches and systems.

The section addresses the design requirements for precast concrete foundation systems. The committee made reference to Section 404 which addresses cast-in-place concrete walls and is not appropriate for precast concrete foundation systems. Precast foundations systems are engineered products based on several design approaches including, but are not limited to, stud and cavity, solid wall panel, composite panel and hollow core systems, all of which are not included in Section 404. This submission 404.6 provides minimum performance design criteria that all precast concrete foundation systems shall meet. This allows the IRC to remain non-proprietary in nature by not specifying or excluding any specific system. This section also requires manufacturers to provide key information for building official's review.

Final Action: AS AM AMPC____ D

RB106-07/08
R402.3

Proposed Change as Submitted:

Proponent: Gregory A. Stutz, National Precast Concrete Association

Revise as follows:

R402.3 (Supp) Precast concrete. Precast concrete foundations shall be designed in accordance with Section R404.6 and meet the ~~minimum~~ material requirements of Section R402.3.1 and shall be installed in accordance with the provisions of this code and the manufacturer's installation instructions.

Reason: To clarify the Code regarding the design and installation of precast foundation wall systems.

These proposed changes clarify that precast foundation walls will meet the more rigorous precast material requirements regarding low water cement ratio of section 402.3.1 and similar practices. The changes will assure that precast foundation walls meet the precast design and manufacturing requirements of section 404.6.

Further clarification with this section is necessary to emphasize the material requirements as stated in the first sentence of R402.3.1. The standards mentioned within the same section are requirements for compliance and should not be considered minimums.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: Based on the committee's previous action on RB105-07//08. There currently is no Section R404.6 for precast concrete walls.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Evan Gurley, National Precast Concrete Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R402.3 Precast concrete. Precast concrete foundations shall be designed in accordance with Section R404.6 ~~and meet the material r equirements of Section R402.3.1~~ and shall be installed in accordance with the provisions of this code and the manufacturer's installation instructions.

Commenter's Reason: The purpose of the code change is to clarify the Code regarding the design and installation requirements of precast concrete foundations. This change addresses the committee's concerns by eliminating the minimum material requirements of Section R402.3.1. The language in the definition has been simplified.

Purpose: To clarify the Code regarding the design and installation of precast foundation wall systems.

This new language eliminates the unnecessary reference to the material requirements of Section R402.3.1 and points the code official to Section R404.6 for critical information for Design, Drawing and Identification requirements that are unique to precast foundation wall systems

Final Action: AS AM AMPC____ D

RB108-07/08
R406.4

Proposed Change as Submitted:

Proponent: Gregory A. Stutz, National Precast Concrete Association

Revise as follows:

R406.4 (Supp) Precast concrete foundation system dampproofing. Except where required by Section R406.2 to be waterproofed, precast concrete foundation walls enclosing habitable or useable spaces located below grade shall be dampproofed in accordance with Section R406.1.

> **Exception:** Precast concrete foundations that are manufactured in accordance with the durability requirements of Tables 4.2.1 and 4.2.2 of ACI 318.

Reason: To clarify the Code regarding the dammproofing of precast foundation wall systems.

Consensus built research, standards and practices exist through organizations such as American Concrete Institute and the Portland Cement Association that address durability and permeability attributes of concrete. This information as well as a long history of successful building industry field application warrants clarifying the Code to represent and acknowledge these findings.

There is extensive research into the durability of concrete and the role that porosity and permeability play in durability. The performance advantages of low water/cementitious materials ratios and proper air entrainment are well established in the professional literature, and incorporated into the Code by tables such as ACI 318-05 (Building Code Requirements for Structural Concrete) - Table 4.2.1 (Total Air Content for Frost Resistant Concrete) and Table 4.2.2 (Requirements for Special Exposure Conditions). The specification for precast concrete products in IRC Section R402.3.1 meets the requirements of those tables.

In "Design and Control of Concrete Mixtures", Engineering Bulletin 001 (EB001.14) 14th Edition, Figure 1-19, 1-20, 1-21 and 1-26, the Portland Cement Association makes a clear case for the performance benefits of low water-cement ratios (<0.50) and air entrainment in lowering permeability and increasing durability.

Section R406 currently addresses dampproofing and waterproofing materials applied over all below-grade exterior foundation walls. It should be noted that section R406.4 does not address the benefits of mix design and quality assurance practices experienced through precast concrete processes. Some projects may specify concrete compressive strengths (f'**c**) in the range of 2500 to 4000 psi with corresponding water/cementitious materials ratios (w/cm) of 0.75 to 0.50 respectively. In IRC Section R402.3.1 the minimum required compressive strength of precast concrete is 5000psi, which correlates to a maximum w/cm of 0.40. This low ratio is far superior to conventional mix design criteria and is proven to eliminate the need for topical application of dampproofing materials for below-grade precast foundation wall components.

Bibliography:

ACI, American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48333-9094; Standard Referenced: ACI 318-05 (Building Code Requirements for Structural Concrete); ACI Manual of Concrete Practice 2007 – Part 3; ISSN 0065-7875; Cerl R. Bischof, Editor.

PCA, Portland Cement Association, 5420 Old Orchard Road, Skokie IL 60077, Engineering Bulletin 001 (EB001.14) 14th Edition, Design and Control of Concrete Mixtures, ISBN 0-89312-217-3, Steven H. Kosmatka, Beatrix Kerkhoff, and William C. Panerese; PCA R&D Serial Number SN2561.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: Precast concrete should not be exempt from dampproofing. Cast in place concrete could also be made to the same durability requirements.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Evan Gurley, National Precast Concrete Association, requests Approval as Submitted.

Commenter's Reason: RB108-07/08 is to be re-submitted as previously submitted. No changes to the original RB108-07/08 proposal are requested since the wordage and terminology has not changed. The re-submittal of RB108-07/08 is needed since it is connected with RB104-07/08 and RB105-07/08, which have been re-submitted with changed wordage.

Final Action: AS AM AMPC____ D

RB110-07/08
R403.1

Proposed Change as Submitted:

Proponent: J. Edward Sauter, Concrete Foundations Association of North America; Daniel Falconer, American Concrete Institute; Erin Ashley, National Ready-Mix Concrete Association

Revise as follows:

R403.1 (Supp) General. All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, crushed stone footings, wood foundations, or other approved structural systems which shall be of sufficient design to accommodate all loads according to Section R301 and to transmit the resulting loads to the soil within the limitations as determined from the character of the soil. Footings shall be supported on undisturbed natural soils or engineered fill. Concrete footings shall be designed and constructed in accordance with the provisions of Section R403 or in accordance with ACI 332 or other approved structural standards.

Reason: The addition of language to Section R403.1 to reference ACI's Residential Concrete Code provides additional technical details for the design and construction of footing conditions not found in the IRC such as discontinuous footings and wall steps. The reference to ACI 332 in this section is in keeping with the reference made in Section R
404 for foundation walls.

The principal purpose of this code change is to permit the legal reference to footing and foundation constructions that eliminate excessive material and labor is used to create structural components that do not contribute to the stability and performance of residential foundations.

The provisions made to the 2007 version of this concrete code incorporate seismic references unavailable in the 2004 version.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: The updated ACI 332 is not available now. Also, the added text would create a conflict with "other approved structural systems" in the first sentence.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ed Sauter, Concrete Foundations Association, Dan Falconer, American Concrete Institute, Erin Ashley, National Ready-Mixed Concrete Association, request Approval as Modified by this Public Comment.

Modify proposal as follows:

R403.1 (Supp) General. All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, crushed stone footings, wood foundations, or other approved structural systems which shall be of sufficient design to accommodate all loads according to Section R301 and to transmit the resulting loads to the soil within the limitations as determined from the character of the soil. Footings shall be supported on undisturbed natural soils or engineered fill. Concrete footings shall be designed and constructed in accordance with the provisions of Section R403 or in accordance with ACI 332 ~~or other approved structural standards~~.

Commenter's Reason: The Committee recommendation for disapproval of RB110-07/08 was based on ACI 332-08 not being published at the time of the hearings in Palm Springs, CA. Publication of the proposed reference document (ACI Standard 332-08, Code Requirements for Residential Structural Concrete and Commentary) had been delayed because last minute changes were made to the document in response to the public review comment phase for the standard. All public comments were resolved and the document is published and available to the public. In addition, the proposal has been modified to remove the language "*or other approved structural standards*" to eliminate the potential conflict identified by the IRC Code Committee. Based on publication of the document and the modification, we recommend that the committee action for Disapproved be voted down and a motion for Approved As Modified for RB110-07/08 be approved by the membership.

The proposed wording has been modified to avoid the conflict referenced.

Final Action: AS AM AMPC____ D

RB112-07/08
R403.1.3

Proposed Change as Submitted:

Proponent: Tim Nogler, Washington State, representing Washington State Building Code Council

Revise as follows:

R403.1.3 Seismic reinforcing in Seismic Design Categories D_0, D_1 and D_2. Concrete footings of buildings located in Seismic Design Categories D_0, D_1 and D_2, ~~as established in Table R301.2(1),~~ shall comply with this section and have minimum reinforcement as specified by Section R403.1.3.1 or R403.1.3.2. Bottom reinforcement shall be located a minimum of 3 inches (76 mm) ~~clear~~ to 4-inches (102 mm) from the bottom of the footing.

~~In Seismic Design Categories D_0, D_1 and D_2~~ Where a construction joint is created between a concrete footing and a concrete stem wall, ~~a~~ minimum vertical reinforcement of one No. 4 bar shall be ~~installed~~ provided at not more than 4 feet (1219 mm) on center. The ~~vertical bar~~ bars shall extend to 3 inches (76 mm) clear of the bottom of the footing, have a standard hook and extend ~~a minimum of 14 inches (357 mm)~~ into the stem wall the lesser of 2 inches (49 mm) clear of the top of the wall and 14 inches (357 mm).

~~In Seismic Design Categories D_0, D_1 and D_2~~ Where a solidly grouted masonry stem wall is supported on a concrete footing ~~and stem wall~~, ~~a~~ minimum vertical reinforcement of one No. 4 bar shall be ~~installed~~ provided at not more than 4 feet on center. The ~~vertical bar~~ bars shall extend to 3 inches (76 mm) clear of the bottom of the footing, ~~and~~ have a standard hook, and extend into the stem wall to 2 inches (49 mm) clear of the top of the wall.

~~In Seismic Design Categories D_0, D_1 and D_2~~ Masonry stem walls without solid grout and vertical reinforcing are not permitted.

Concrete and masonry stem walls shall comply with the requirements of Section R404 for foundation walls.

Exception: In detached one- and two-family dwellings ~~which are~~ of light-framed construction and three stories or less ~~in height~~ above grade, ~~and constructed with stud bearing walls,~~ plain concrete footings ~~without longitudinal reinforcement supporting walls and isolated plain concrete footings~~ supporting walls, columns or pedestals are permitted.

Reason: The purpose of this code change proposal is to clarify the code. The revision to the title of Section R403.1.3 is proposed to enable the deletion of duplicate references to the Seismic Design Categories D_0, D_1 and D_2. The change from a "minimum of 3 inches" to "3 inches to 4 inches" is proposed for consistency with similar language in Section R403.1.3.1. The reference to Table R301.2(1) is deleted because it is superfluous.

The addition of "concrete" and "vertical reinforcement" in the second paragraph of Section R403.1.3 is proposed to clarify the intent of the requirements. The changes at the end of the second and third paragraphs are proposed because a minimum extension of 14 inches may not be possible in a shallow stem wall. The other revisions to the third paragraph are proposed to clarify the intent of the requirements. Note that the current requirements are limited to masonry stem walls supported on concrete footings and stem walls, which excludes a masonry stem wall supported on a concrete footing unless there is an additional stem wall. Note also that masonry walls with solid grout are not permitted according to the fourth paragraph. The addition of the fifth paragraph is proposed to establish technical requirements for the construction of stem walls, which currently do not exist in the IRC.

The revisions to the Exception to Section R403.1.3 are proposed to clarify its intent. The addition of "light-frame construction" is proposed to employ a term currently defined in Section R202.

Cost Impact: The code change will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: This proposal does not provide any extra information. Also, there is a lack of substantiation and technical data to support the change.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Tim Nogler, Washington State Building Code Council, representing the Washington Association of Building Officials, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R403.1.3 Seismic reinforcing in Seismic Design Categories D_0, D_1 and D_2. Concrete footings of buildings located in Seismic Design Categories D_0, D_1 and D_2 shall comply with this section and have minimum reinforcement as specified by Section R403.1.3.1 or R403.1.3.2. Bottom reinforcement shall be located a minimum of 3 inches (76 mm) to 4-inches (102 mm) from the bottom of the footing.

Where a construction joint is created between a concrete footing and a concrete stem wall, minimum vertical reinforcement of one No. 4 bar shall be provided at not more than 4 feet (1219 mm) on center. The bars shall extend to 3 inches (76 mm) clear of the bottom of the footing, have a standard hook and extend into the stem wall the lesser of 2 inches (49 mm) clear of the top of the wall and 14 inches (357 mm).

Where a solidly grouted masonry stem wall is supported on a concrete footing, minimum vertical reinforcement of one No. 4 bar shall be provided at not more than 4 feet on center. The bars shall extend to 3 inches (76 mm) clear of the bottom of the footing, have a standard hook, and extend into the stem wall to 2 inches (49 mm) clear of the top of the wall.

Masonry stem walls without solid grout and vertical reinforcing are not permitted.

Concrete and masonry stem walls shall comply with the requirements of Section R404 for foundation walls.

Exception: In detached one- and two-family dwellings of light-framed construction and three stories or less above grade, plain concrete footings without longitudinal reinforcement supporting walls and insolated plain concrete footings supporting ~~walls,~~ columns or pedestals are permitted.

Commenter's Reason: The intent of this proposal is to clarify the code. Duplicating language is eliminated, and terminology is made consistent. The committee in Palm Springs stated that the change did not add anything to the code; the intent is not to add anything but to simplify and clarify this section. A concern was raised at the hearing that the proposed amendment would allow plain concrete foots and stem walls where vertical reinforcement would otherwise be required. The modifications restores the phrase in the exception to specify that plain concrete footings are allowed only where no reinforcement is in place for walls.

Final Action: AS AM AMPC____ D

RB113-07/08

Table R301.2(1), R403.1.4, R403.1.4.1, Table R403.1.4 (New)

Proposed Change as Submitted:

Proponent: Gary J. Ehrlich, National Association of Home Builders (NAHB)

1. Revise as follows:

TABLE R301.2(1) (Supp)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

(No change to table entries)
For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.
a. (No change)
b. ~~The frost line depth may require deeper footings than indicated in Figure R403.1(1).~~ The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade as determined in accordance with Section R403.1.4.
c. through k. (No change)

R403.1.4 Minimum depth. Exterior footings shall extend to or below the frost line as determined using Table R403.1.4 and either Figure R403.3(2) or Table R403.3(2). ~~All~~ Exterior footings shall be placed at least 12 inches (305 mm) below the undisturbed ground surface. Where applicable, the depth of footings shall also conform to Sections R403.1.4.1 through R403.1.4.2.

R403.1.4.1 Frost protection. ~~Except where otherwise protected from frost,~~ Foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. ~~Extended~~ Extending to or below the frost line specified in Table R301.2.(1);
2. Constructing in accordance with Section R403.3;
3. Constructing in accordance with ASCE 32; or
4. ~~Erected~~ Erecting on solid rock.

Exceptions:

1. Protection of freestanding accessory structures with an area of 600 square feet (56 m2) or less, of light-framed construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
2. Protection of freestanding accessory structures with an area of 400 square feet (37m2) or less, of other than light-framed construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
3. Decks not supported by a dwelling need not be provided with footings that extend below the frost line.

Footings shall not bear on frozen soil unless the frozen condition is permanent.

2. Add new table as follows:

TABLE R403.1.4
FROST LINE DEPTH[a]

100-YEAR AIR-FREEZING INDEX [Figure R403.3(2) or Table R403.3(2)]	FROST LINE DEPTH (inches)
≤ 350	12
500	16
1000	24
1500	32
2000	40
2500	45
3000	52
3500	57
4000	62
4250	65

For SI: 1 inch = 25.4 mm

a. These design frost depths are intended to be used for protection of building foundations against frost heave and are not applicable to site or street utilities or other non-building applications.

Reason: National model building codes currently defer the user to local experience or applicable local building codes when using "frost-depth" to protect foundations, unless approved thermal insulation is provided per the frost-protected shallow foundation requirements of the IRC or ASCE 32. The manner of establishing frost depths by this means (local experience) varies somewhat inconsistently with newer frost depth data and hazard predictions. Therefore, this revision addresses this "gap" in current U.S. building code provisions by including newer frost depth risk data, calibrating this data to existing local practice, and correlating recommended frost depths to the 100-year AFI Map. This design guidance is needed for foundations or foundation portions that are intended to extend below a design frost depth as part of an overall frost-protection strategy. It will ensure that equivalent performance is more consistently achieved with all methods of frost-protection addressed in the standard and in practice.

This provision has been successfully balloted as an addition to ASCE 32, the Frost Protected Shallow Foundation standard and will appear in the next edition. By bringing this forward here and now as a prescriptive option, the IRC will align with the FPSF standard. NAHB asks for your support of this proposal.

Bibliography:
HUD, *Development of Frost Depth Maps for the United States*, U.S. Department of Housing and Urban Development, Washington, DC (July 2001).

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: The determination of the frost line depth should remain with the local jurisdiction. Also, the proposed frost line depth table is part of the revised ASCE 32, which has not been finalized.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Ehrlich, P.E., National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R403.1.4 Minimum depth. ~~Exterior footings shall extend to or below the frost line as determined using Table R403.1.4 and either Figure R403.3(2) or Table R403.3(2).~~ Exterior footings shall be placed at least 12 inches (305 mm) below the undisturbed ground surface. Where applicable, the depth of footings shall also conform to Sections R403.1.4.1 through R403.1.4.2.

R403.1.4.1 Frost protection. Exterior **f**oundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extending to or below the frost line specified in Table R301.2.(1); The frost line depth shall be determined by the authority having jurisdiction or shall be permitted to be determined using Table R403.1.4 and either Figure R403.3(2) or Table R403.3(2).
2. Constructing in accordance with Section R403.3;
3. Constructing in accordance with ASCE 32; or
4. Erecting on solid rock.

Exceptions:

1. Protection of freestanding accessory structures with an area of 600 square feet (56 m2) or less, of light-framed construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
2. Protection of freestanding accessory structures with an area of 400 square feet (37m2) or less, of other than light-framed construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
3. Decks not supported by a dwelling need not be provided with footings that extend below the frost line.

Footings shall not bear on frozen soil unless the frozen condition is permanent.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The primary reason this proposal was disapproved was that the update process for ASCE 32 was not complete. The standard has been posted for public comment. We anticipate the process to be complete in time for the Final Action Hearings. We believe this table is based on sound, up-to-date science and that it's inclusion in the IRC is technically justified. However, we recognize that many jurisdictions may want to evaluate frost depths based on their specific local conditions. We do not wish to override the ability of these jurisdictions to conduct a local study and to set frost depths based on their own historical records. Thus, we have modified the original proposal to make the use of the proposed Table R403.1.4 an option. NAHB asks for your support in approving the proposal as modified, overturning the committee's action.

Final Action: AS AM AMPC____ D

RB114-07/08
R403.1.6

Proposed Change as Submitted:

Proponent: Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Committee on Wall Bracing

Revise as follows:

R403.1.6 Foundation anchorage. Sill plates and ~~When braced~~ walls ~~panels are~~ supported directly on continuous foundations~~, the wall wood sill plate or cold-formed steel bottom track~~ shall be anchored to the foundation in accordance with this section.

~~The~~ Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of braced wall panels at building interiors on monolithic slabs, and all wood sill plates shall be anchored to the foundation with anchor bolts spaced a maximum of 6 feet (1829 mm) on center. Bolts shall be at least 1/2 inch (12.7 mm) in diameter and shall extend a minimum of 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. A nut and washer shall be tightened on each anchor bolt. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. ~~In Seismic Design Categories D_0, D_1 and D_2, anchor bolts shall be spaced at 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section at interior braced wall lines when required by Section R602.10.9 to be supported on a continuous foundation. Bolts shall be at least 1/2 inch (13 mm) in diameter and shall extend a minimum of 7 inches (178 mm) into masonry or concrete.~~ Interior bearing wall sole plates on monolithic slab foundation that are not part of a braced wall panel shall be positively anchored with approved fasteners. ~~A nut and washer shall be tightened on each bolt of the plate.~~ Sill~~s~~ plates and sole plates shall be protected against decay and termites where required by Sections R319 and R320. Cold-formed steel framing systems shall be fastened to ~~the~~ wood sill plates or anchored directly to the foundation as required in Section R505.3.1 or R603.1.1.

Exceptions:

1. Foundation anchorage, spaced as required to provide equivalent anchorage to 1/2-inch-diameter (13 mm) anchor bolts.
2. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with a minimum of one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels per Figure ~~R602.10.5~~ R602.10.4.3(1) at corners.
3. Walls 12 inches (305 mm) total length or shorter connecting offset braced wall panels shall be permitted to be connected to the foundation without anchor bolts. The wall shall be attached to adjacent braced wall panels per Figure ~~R602.10.5~~ R602.10.4.3(1) at corners.

Reason: The ICC Ad-Hoc Committee on Wall Bracing is proposing fourteen technical and non-technical code changes as we work through the process of making Section R602.10 of the 2009 IRC technically correct and easier to understand. The individual code changes are designed to stand alone if necessary, but the total body of work is respectively submitted as a comprehensive continuation of cycle 1 changes for the 2009 IRC. To see how the individual changes are intended to meld together, please visit the ICC web site, and review the composite document on the

Ad hoc Committee on Wall Bracing page: http://www.iccsafe.org/cs/cc/ahc-wb/index.html.

This non-technical change applies to anchorage of braced wall panels. These changes will:

•Editorially rearrange sentences to be clearer;
•Delete redundant language;
•Specify that anchor bolts must be installed into grouted cells in CMU foundation walls;
•Specify anchorage of interior braced wall panels;
•And correct a figure reference that was changed during the 06/07 code change cycle.

The ICC Ad Hoc Committee on Wall Bracing reviewed this section and found it possibly confusing and redundant as written. Also, the Committee believes that anchorage of braced wall panels, whether they be interior or exterior, is very important.

- The committee argues that all walls need to be anchored, not just braced wall panels. All anchor bolts along the line of the bottom plate resist the shear from the braced wall panel, not just the bolts directly at the braced wall panel.
- Braced wall panels at building interior are designed to resist shear forces equal to braced wall panels at building exteriors, so equal anchorage must be specified.
- Several sentences are relocated so that sentences that apply to similar subjects are adjacent to each other.
- The sentence on nut and washers was slightly revised to read better.
- The sentence on anchor bolts for interior braced wall lines in Seismic Design Categories D_0, D_1 and D_2 is deleted because the exact same requirement exists in Section R403.1.6.1. Although Section R403.1.6.1 only applies to wood light-frame structures, cold formed steel light-framed structures are required to comply with the AISI COFS/PM prescriptive method in Seismic Design Categories D_0, D_1 and D_2, so there is no reduction in requirements.
- The sentence on interior bearing walls was revised to specify that only sole plates on slabs that are not part of a braced wall panel could be anchored to the slab with “approved fasteners”. That particular wording is maintained because members of the ICC Ad Hoc Wall Bracing committee felt that the current requirement was working well. Interior braced wall anchorage on wood foundation will be covered in a separate code change.
- Reference to Figure R602.10.5 was changed to R602.10.4.3(1) because that figure was renamed during the 06/07 code cycle.
- The specification for installation of anchor bolts was clarified that the bolts must be installed in filled cells of concrete masonry units. The committee has found that anchor bolts installed into brick do not have sufficient load carrying capacity to support shear loads from braced wall panels.

Cost Impact: This code change proposal may increase the cost of construction if anchor bolts are currently being installed in brick foundations or if interior braced wall panels are not currently being positively anchored to slab foundations.

Committee Action: **Approved as Submitted**

Committee Reason: This change provides better clarification of the code as stated in the proponent's published reason.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Ehrlich, P.E., National Association of Home Builders (NAHB), requests Disapproval.

Commenter's Reason: The intent of this proposal was to insure that anchors were provided on braced wall panels inside a dwelling sufficient to transfer lateral loads to either monolithic (thickened) slab foundations or continuous footings. While we agree that providing a continuous load path is important, the proposal carries a number of unintended consequences. The changes to the first sentence will effectively require ALL walls REGARDLESS of material to be anchored per this section, not just light-frame walls. The change also requires a non-bearing interior partition that is not part of a braced wall line but which just happens to sit atop a foundation wall or continuous foundation (e.g. at a partial basement or crawlspace) to be provided with anchor bolts per this section. Finally, even though the exemption is retained, we are not sure the new language (in particular the change for walls on interior monolithic slabs) still explicitly permits anchor bolts to be replaced by wedge anchors, expansion bolts, mudsill straps, or other equivalent anchorage.

Whole-building structural tests have shown that our current methods of construction are stronger than current engineering practice and engineering design standards give them credit for. An actual house in the field tested by researchers in New Zealand performed 50% better than predicted by engineering design, even with sill plates attached only by single nails, rather than anchor bolts. By implementing a requirement for additional anchor bolts on braced wall lines inside our structures we are essentially contradicting 40 years of research into light-frame wood construction. Additionally, we are not aware of any racking failures on interior braced wall lines that would justify adding bolts to these lines. NAHB asks for your support in disapproving this proposal and overturning the committee’s action.

Final Action: AS AM AMPC____ D

RB118-07/08
R407.3

Proposed Change as Submitted:

Proponent: James D. McCue, representing the Akron Products Company

Revise as follows:

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall not be less in nominal size than 4 inches by 4 inches (102 mm by 102 mm) ~~and~~. Steel columns shall not be less than 3-inch-diameter (76 mm) ~~standard pipe or approved equivalent~~ Schedule 40 Pipe manufactured in accordance with ASTM A53 Grade B.

> **Exception:** In Seismic Design Categories A, B and C columns no more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement requirement within underfloor areas enclosed by a continuous foundation.

Reason: The proposed modifications are intended as a clarification. The reference to "standard pipe" has been generally interpreted as a generic term, without implication of wall thickness, material grade, or load capacity. The Akron Products Company polled in excess of 150 local inspection departments in 12 states, and without exception, there was no awareness of minimum standards for steel columns. The majority of inspectors were checking for the presence of a 3-inch tube in the designated location, and the remaining admitted to not checking the columns at all. The reference to standard pipe (confirmed by ICC-ES engineering staff) was originally a reference to ASTM A53, Grade B pipe, which has a 3-inch INSIDE DIAMETER, Schedule 40 wall (.211 inches) of Grade B (46 ksi) steel, and an outside diameter of 3.5-inches. The comprehensive misinterpretation of the reference to "standard pipe" has resulted in a primary load bearing component of the home invalidated and is clearly outside the intent of the IRC.

Cost Impact: The code changed proposed is a clarification and will not result in a change in the cost of construction for those currently in compliance.

Committee Action: **Approved as Submitted**

Committee Reason: This is a much needed change and it will eliminate confusion. Standard pipe is schedule 40 pipe.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Bonnie Manley, American Iron and Steel Institute, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall not be less in nominal size than 4 inches by 4 inches (102 mm by 102 mm). Steel columns shall not be less than 3-inch-diameter (76 mm) Schedule 40 Pipe manufactured in accordance with ASTM A53 Grade B or approved equivalent.

> **Exception:** In Seismic Design Categories A, B and C columns no more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement requirement within underfloor areas enclosed by a continuous foundation.

Commenter's Reason: This Public Comment simply adds back in the "or approved equivalent" language, which was deleted in the original public proposal. This is recommended because other ASTM pipe might be appropriate in this situation as well.

Final Action: AS AM AMPC____ D

RB122-07/08
R202 (New), R319.5 (New), R502.1.8 (New), Chapter 43 (New)

Proposed Change as Submitted:

Proponent: Marcelo M. Hirschler, GBH International, representing the American Fire Safety Council

1. Add new text as follows:

SECTION R202
GENERAL DEFINITIONS

PLASTIC LUMBER. A manufactured product composed of more than 50 weight percent resin, and in which the product generally is rectangular in cross-section and typically supplied in sizes that correspond to traditional lumber board and dimensional lumber sizes, may be filled or unfilled, and may be composed of single or commingled resins.

R319.5 Plastic lumber. Plastic lumber used in exterior deck boards shall bear a label indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 6662.

R502.1.8 Exterior plastic lumber deck boards. Plastic lumber used in exterior deck boards shall comply with the provisions of Section R319.5.

2. Add standard to Chapter 43 as follows:

ASTM
D 6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards

Reason: Wood plastic composites (covered by R319.4 and R502.1.7) are composites made of wood pulp (or cellulosic materials) and plastic, and so is plastic lumber. Parallel requirements are proposed for plastic lumber as exist for wood plastic composites in the code for use as exterior deck boards. The principal difference between wood plastic composites and plastic lumber is the fraction of plastic material included. ASTM D 7032, Standard Specification for Establishing Performance Ratings For Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), addresses wood plastic composites, while ASTM D 6662, Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards, addresses plastic lumber (which has at least 50% plastic). Both standards include all needed requirements in terms of fire properties and in terms of physical properties for use as decking materials. In both standards the fire test requirement is that the composite material must meet a flame spread index of 200 when tested in accordance with ASTM E 84, which is the same as wood decking must meet. In fact, ASTM D 6662 has an additional requirement over ASTM D 7032: it states that plastic lumber test specimens must be self-supporting specimens, meaning that they must remain in place during the test. The wording is:" The test specimen shall either be self-supporting by its own structural characteristics or held in place by added supports along the test specimen surface." ASTM D 6662 also has requirements for flexural testing and for checking that the properties are retained after exposure to water and to light (including ultraviolet light).

The definition of plastic lumber has been taken word by word from ASTM D 6662.

Cost Impact: This proposal should not affect the cost of construction.

Analysis: Review of proposed new standard ASTM D6662-07 indicated that, in the opinion of ICC Staff, the standard did comply with ICC standards criteria.

Committee Action: **Disapproved**

Committee Reason: The definition of the term "PLASTIC LUMBER" is too confusing. The 50 weight percent can lead to misinterpretation. The proponent needs to rework this and bring it back.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Marcelo M. Hirschler, GBH International, representing the American Fire Safety Council, requests Approval as Modified by this Public Comment.

Replace proposal with the following:

SECTION R202
GENERAL DEFINITIONS

PLASTIC LUMBER. A material, generally rectangular in cross-section and typically supplied in sizes that correspond to traditional lumber board and dimensional lumber sizes, filled or unfilled, composed of plastic, potentially filled with wood or cellulosic materials.

R319.4 (Supp) Wood plastic composites. Wood plastic composites, and plastic lumber, used in exterior deck boards, handrails and guardrail systems shall bear a label indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032.

R502.1.7 (Supp) Exterior wood plastic composite deck boards. Wood plastic composites, and plastic lumber, used in exterior deck boards shall comply with the provisions of Section R319.4.

Commenter's Reason: Wood plastic composites are composites made of wood pulp (or cellulosic materials) and plastic, and so is plastic lumber. Both are recognized for use as decking materials by the ICC ES ACCEPTANCE CRITERIA FOR DECK BOARD SPAN RATINGS AND GUARDRAIL SYSTEMS (GUARDS AND HANDRAILS) AC174. Plastic lumber is generally rectangular in cross-section and is typically supplied in sizes that correspond to traditional lumber board and dimensional lumber sizes. Typically, the other principal difference between wood plastic composites and plastic lumber is the fraction of plastic material included, where plastic lumber usually contains a higher fraction of plastic. ASTM D 7032, Standard Specification for Establishing Performance Ratings For Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), contains requirements for the following physical and mechanical properties, which have been assessed by ICC ES as important for use of the materials in decks: flexural performance (section 4.4), ultraviolet resistance (section 4.5), freeze-thaw resistance (section 4.6), termite and decay resistance (section 4.7), resistance to temperature and moisture (sections 5.4.1 and 5.4.2), deck board performance (section 5.2 through 5.6).

Moreover, in terms of fire performance, ASTM D 7032 requires that materials comply with a flame spread index not exceeding 200, when tested in accordance with ASTM E 84 (just like wood materials do).

Final Action: AS AM AMPC____ D

RB127-07/08

R505, M1308.1, M2101.6, P2603.2, Chapter 43

Proposed Change as Submitted:

Proponent: Bonnie Manley, American Iron and Steel Institute

1. Revise as follows:

R505.1.1 Applicability limits. The provisions of this section shall control the construction of cold-formed steel floor framing for buildings not greater than 60 feet (18,288 mm) in length perpendicular to the joist span, not greater than 40 feet (12 192 mm) in width parallel to the joist span, and ~~not greater~~ less than ~~two~~ or equal to three stories in height. Cold-formed Steel floor framing constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 110 miles per hour (49 m/s), Exposure A, B, or C, and a maximum ground snow load of 70 psf (3.35 kPa).

R505.1.2 In-line framing. When supported by cold-formed steel framed walls in accordance with Section R603, cold-formed steel floor framing shall be constructed with floor joists located ~~directly~~ in-line with load-bearing studs located below the joists in accordance with Figure R505.1.2 and the tolerances specified as follows:

1. ~~with a~~ The maximum tolerance shall be ~~of~~ 3/4 inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member ~~between the center lines of the joist and the stud~~
2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be 1/8 inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

R505.1.3 Floor trusses. ~~The design, quality assurance, installation and testing of~~ Cold-formed steel trusses shall be designed, braced and installed in accordance with the ~~AISI Standard for Cold-formed Steel Framing-Truss Design (COFS/Truss)~~AISI S100, Section D4. Truss members shall not be notched, cut or altered in any manner without an approved design.

R505.2 Structural framing. Load-bearing floor framing members shall comply with Figure R505.2(1) and with the dimensional and minimum thickness requirements specified in Tables R505.2(1) and R505.2(2). Tracks shall comply with Figure R505.2(2) and shall have a minimum flange width of 11/4 inches (32 mm). The maximum inside bend radius for members shall be the greater ~~larger~~ of 3/32 inch (2.4 mm) or twice the ~~uncoated~~ base steel thickness. ~~Holes in joist webs shall comply with all of the following conditions:~~

~~1. Holes shall conform to Figure R505.2(3);~~
~~2. Holes shall be permitted only along the centerline of the web of the framing member;~~
~~3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm);~~
~~4. Holes shall have a web hole width not greater than 0.5 times the member depth, or 21/2 inches (64.5 mm);~~

~~5. Holes shall have a web hole length not exceeding 41/2 inches (114 mm); and~~
~~6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).~~

~~Framing members with web holes not conforming to the above requirements shall be patched in accordance with Section R505.3.6 or designed in accordance with accepted engineering practices.~~

R505.2.1 Material. Load-bearing cold-formed steel framing members ~~used in steel floor construction~~ shall be cold-formed to shape from structural quality sheet steel complying with the requirements of one of the following:

1. ASTM A 653: Grades 33, ~~37, 40~~ and 50 (Class 1 and 3).
2. ASTM A 792: Grades 33, ~~37, 40~~ and 50A.
3. ~~ASTM A 875: Grades 33, 37, 40 and 50 (Class 1 and 3).~~
4. ASTM A 1003: Structural Grades 33 Type H, ~~37, 40~~ and 50 Type H.

R505.2.2 Identification. Load-bearing cold-formed steel framing members shall have a legible label, stencil, stamp or embossment with the following information as a minimum:

1. Manufacturer's identification.
2. Minimum ~~uncoated~~ base steel thickness in inches (mm).
3. Minimum coating designation.
4. Minimum yield strength, in kips per square inch (ksi) (kPa).

R505.2.3 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic coating complying with ASTM A 1003 and one of the following:

1. A minimum of G 60 in accordance with ASTM A 653.
2. A minimum of AZ 50 in accordance with ASTM A 792.
3. ~~A minimum of GF 60 in accordance with ASTM A 875.~~

R505.2.4 Fastening requirements. Screws for steel-to-steel connections shall be installed with a minimum edge distance and center-to-center spacing of ~~0.5~~ 1/2 inch (12.7 mm), shall be self-drilling tapping, and shall conform to ~~SAE J78~~ASTM C1513. Floor sheathing shall be attached to cold-formed steel joists with minimum No. 8 self-drilling tapping screws that conform to ~~SAE J78~~ASTM C1513. Screws attaching floor-sheathing to cold-formed steel joists shall have a minimum head diameter of 0.292 inch (7.4 mm) with countersunk heads and shall be installed with a minimum edge distance of 0.375 inch (9.5 mm). Gypsum board ceilings shall be attached to cold-formed steel joists with minimum No. 6 screws conforming to ASTM C 954 or ASTM C1513 with a bugle head style and shall be installed in accordance with Section R702. For all connections, screws shall extend through the steel a minimum of three exposed threads. All ~~self-drilling tapping screws conforming to SAE J78~~fasteners shall have ~~a Type II coating in accordance with ASTM B 633~~rust inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.

Where No. 8 screws are specified in a steel-to-steel connection, the required number of screws in the connection is permitted to be reduced in accordance with the reduction factors in Table R505.2.4 when larger screws are used or when one of the sheets of steel being connected is thicker than 33 mils (0.84 mm). When applying the reduction factor, the resulting number of screws shall be rounded up.

2. Add new text as follows:

R505.2.5 Web holes, web hole reinforcing, and web hole patching. Web holes, web hole reinforcing, and web hole patching shall be in accordance with this section.

R505.2.5.1 Web holes. Web holes in floor joists shall comply with all of the following conditions:

1. Holes shall conform to Figure R505.2.5.1;
2. Holes shall be permitted only along the centerline of the web of the framing member;
3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm);
4. Holes shall have a web hole width not greater than 0.5 times the member depth, or 21/2 inches (64.5 mm);
5. Holes shall have a web hole length not exceeding 41/2 inches (114 mm); and
6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).

Framing members with web holes not conforming to the above requirements shall be reinforced in accordance with Section R505.2.5.2, patched in accordance with Section R505.2.5.3, or designed in accordance with accepted engineering practices.

R505.2.5.2 Web hole reinforcing. Web holes in floor joists not conforming to the requirements of Section R505.2.5.1 shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65% of the flat width of the web. The reinforcing shall be a steel plate or C-shape section with a hole that does not exceed the web hole size limitations of Section R505.2.5.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend at least 1 inch (25.4 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No.8 screws spaced no greater than 1 inch (25.4 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (12.7 mm).

R505.2.5.3 Hole patching. Web holes in floor joists not conforming to the requirements in Section R505.2.5.1 shall be permitted to be patched in accordance with either of the following methods:

1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed the following size limits:
   1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web; or
   1.2. The length of the hole measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
2. Web holes not exceeding the dimensional requirements in Section R505.2.5.3, Item 1, shall be patched with a solid steel plate, stud section, or track section in accordance with Figure R505.2.5.3. The steel patch shall, as a minimum, be of the same thickness as the receiving member and shall extend at least 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No.8 screws spaced no greater than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (13 mm).

3. Revise as follows:

R505.3 Floor construction. Cold-formed steel floors shall be constructed in accordance with this section ~~and Figure R505.3~~.

R505.3.1 Floor to foundation or load-bearing wall connections. Cold-formed steel framed floors shall be anchored to foundations, wood sills or load-bearing walls in accordance with Table R505.3.1(1) and Figure R505.3.1(1), R505.3.1(2), R505.3.1(3), R505.3.1(4), R505.3.1(5) or R505.3.1(6). Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks. Continuous cold-formed steel joists supported by interior load-bearing walls shall be constructed in accordance with Figure R505.3.1(7). Lapped cold-formed steel joists shall be constructed in accordance with Figure R505.3.1(8). End floor joists constructed on foundation walls parallel to the joist span shall be doubled unless a C-shaped bearing stiffener, sized in accordance with Section R505.3.4, is installed web-to-web with the floor joist beneath each supported wall stud, as shown in Figure R505.3.1(9). Fastening of cold-formed steel joists to other framing members shall be in accordance with Section R505.2.4 and Table R505.3.1(2).

4. Delete and substitute as follows:

R505.3.2 ~~Allowable joist spans~~ Minimum floor joist sizes. ~~The clear span of cold-formed steel floor joists shall not exceed the limits set forth in Tables R505.3.2(1), R505.3.2(2), and R505.3.2(3). Floor joists shall have a minimum bearing length of 1.5 inches (38 mm). When continuous joists are used, the interior bearing supports shall be located within 2 feet (610mm) of mid span of the steel joists, and the individual spans shall not exceed the span in Tables R505.3.2(2) and R505.3.2(3). Bearing stiffeners shall be installed at each bearing location in accordance with Section R505.3.4 and as shown in Figure R505.3.~~ Floor joist size and thickness shall be determined in accordance with the limits set forth in Table R505.3.2(1) for single spans, and Tables R505.3.2(2) and R505.3.2(3) for multiple spans. When continuous joist members are used, the interior bearing supports shall be located within two feet (0.61 m) of mid-span of the cold-formed steel joists, and the individual spans shall not exceed the spans in Table R505.3.2(2) or R505.3.2(3) as applicable. Floor joists shall have a bearing support length of not less than 1.5 inches (38 mm) for exterior wall supports and 3.5 inches (89 mm) for interior wall supports. Tracks shall be a minimum of 33 mils (0.84 mm) thick except when used as part of floor header or trimmer in accordance with Section R505.3.8. Bearing stiffeners shall be installed in accordance with Section R505.3.4

~~Blocking is not required for continuous back-to-back floor joists at bearing supports. Blocking shall be installed between the joists for single continuous floor joists across bearing supports. Blocking shall be spaced at a maximum of 12 feet (3660 mm) on center. Blocking shall consist of C-shape or track section with a minimum thickness of 33 mils (0.84 mm). Blocking shall be fastened to each adjacent joist through a 33-mil (0.84 mm) clip angle, bent web of blocking or flanges of web stiffeners with two No. 8 screws on each side. The minimum depth of the blocking shall be equal to the depth of the joist minus 2 inches (51 mm). The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm).~~

5. Revise as follows:

R505.3.3 Joist bracing and blocking. Joist bracing and blocking shall be in accordance with this section.

R505.3.3.1 Joist top flange bracing. The top flanges of cold-formed steel joists shall be laterally braced by the application of floor sheathing fastened to the joists in accordance with Section R505.2.4 and Table R505.3.1(2).

R505.3.3.2 Joist bottom flange bracing/blocking. Floor joists with spans that exceed 12 feet (3658 mm) shall have the bottom flanges laterally braced in accordance with one of the following:

1. Gypsum board installed with minimum No. 6 screws in accordance with Section R702.
2. Continuous steel straps~~sping~~ installed in accordance with Figure R505.3.3.2(1). Steel straps shall be spaced at a maximum of 12 feet (3.66 m) on center and shall be at least 1.5 inches (38 mm) in width and 33 mils (0.84 mm) in thickness. Straps shall be fastened to the bottom flange ~~at~~ of each joist with ~~at least~~ one No. 8 screw, ~~and shall be~~ fastened to blocking with ~~at least~~ two No. 8 screws, and fastened at each end (of strap) with two No. 8 screws. Blocking in accordance with Figure R505.3.3.2(1) or Figure R505.3.3.2(2)~~or bridging (X-bracing)~~ shall be installed between joists ~~in line with straps~~ at each end of the continuous strapping and at a maximum spacing of 12 feet (3658 mm) measured along the continuous strapping (perpendicular to the joist run). Blocking shall also be located ~~and~~ at the termination of all straps. As an alternative to blocking at the ends, the strap shall be permitted to be anchored to a stable building component with two No. 8 screws.

6. Add new text as follows:

R505.3.3.3 Blocking at interior bearing supports. Blocking is not required for continuous back-to-back floor joists at bearing supports. Blocking shall be installed between every other joist for single continuous floor joists across bearing supports in accordance with Figure R505.3.1(7). Blocking shall consist of C-shape or track section with a minimum thickness of 33 mils (0.84 mm). Blocking shall be fastened to each adjacent joist through a 33-mil (0.84 mm) clip angle, bent web of blocking or flanges of web stiffeners with two No. 8 screws on each side. The minimum depth of the blocking shall be equal to the depth of the joist minus 2 inches (51 mm). The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm).

R505.3.3.4 Blocking at cantilevers. Blocking shall be installed between every other joist over cantilever bearing supports in accordance with Figures R505.3.1(4), R505.3.1(5) or R505.3.1(6). Blocking shall consist of C-shape or track section with minimum thickness of 33 mils (0.84 mm). Blocking shall be fastened to each adjacent joist through bent web of blocking, 33 mil clip angle or flange of web stiffener with two No.8 screws at each end. The depth of the blocking shall be equal to the depth of the joist. The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm). Blocking shall be fastened through the floor sheathing and to the support with three No.8 screws (top and bottom).

7. Delete and substitute as follows:

R505.3.4 Bearing stiffeners. ~~Bearing stiffeners shall be installed at all bearing locations for steel floor joists. A bearing stiffener shall be fabricated from a minimum33mil (0.84 mm) C-section or 43 mil (1.09 mm) track section. Each stiffener shall be fastened to the web of the joist with a minimum of four No. 8 screws equally spaced as shown in Figure R505.3.4. Stiffeners shall extend across the full depth of the web and shall be installed on either side of the web.~~ Bearing stiffeners shall be installed at each joist bearing location in accordance with this section, except for joists lapped over an interior support not carrying a load-bearing wall above. Floor joists supporting jamb studs with multiple members shall have two bearing stiffeners in accordance with Figure R505.3.4(1). Bearing stiffeners shall be fabricated from a C-shaped, track or clip angle member in accordance with the one of following:

1. C-shaped Bearing Stiffeners:
   - 1.1. Where the joist is not carrying a load-bearing wall above, the bearing stiffener shall be a minimum 33 mil (0.84 mm) thickness.
   - 1.2. Where the joist is carrying a load-bearing wall above, the bearing stiffener shall be at least the same designation thickness as the wall stud above.
2. Track Bearing Stiffeners:
   - 2.1. Where the joist is not carrying a load-bearing wall above, the bearing stiffener shall be a minimum 43 mil (1.09 mm) thickness.
   - 2.2. Where the joist is carrying a load-bearing wall above, the bearing stiffener shall be at least one designation thickness greater than the wall stud above.

3. Clip Angle Bearing Stiffeners: Where the clip angle bearing stiffener is fastened to both the web of the member it is stiffening and an adjacent rim track using the fastener pattern shown in Figure R505.3.4(2), the bearing stiffener shall be a minimum 2-inch x 2-inch (51 mm x 51 mm) angle sized in accordance with Tables R505.3.4(1),R505.3.4(2),R505.3.4(3), and R505.3.4(4).

The minimum length of a bearing stiffener shall be the depth of member being stiffened minus 3/8 inch (9.5 mm). Each bearing stiffener shall be fastened to the web of the member it is stiffening as shown in Figure R505.3.4(2). Each clip angle bearing stiffener shall also be fastened to the web of the adjacent rim track using the fastener pattern shown in Figure R505.3.4(2). No. 8 screws shall be used for C-shaped and track members of any thickness and for clip angle members with a designation thickness less than or equal to 54. No. 10 screws shall be used for clip angle members with a designation thickness greater than 54.

8. Revise as follows:

R505.3.5Cutting and notching. Flanges and lips of load-bearing cold-formed steel floor framing members shall not be cut or notched.

9. Delete without substitution:

~~**R505.3.6 Hole patching.** Web holes not conforming to the requirements in Section R505.2 shall be designed in accordance with one of the following:~~

~~1. Framing members shall be replaced or designed in accordance with accepted engineering practices when web holes exceed the following size limits:~~
~~1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web; or~~
~~1.2. The length of the hole measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.~~
~~2. Web holes not exceeding the dimensional requirements in Section R505.3.6, Item 1, shall be patched with a solid steel plate, stud section, or track section in accordance with Figure R505.3.6. The steel patch shall, as a minimum, be of the same thickness as the receiving member and shall extend at least 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No.8 screws spaced no greater than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of 1/2 inch (13 mm).~~

10. Delete, substitute and renumber as follows:

R505.3.6~~7~~ Floor cantilevers. ~~Floor cantilevers shall not exceed 24 inches (610 mm) as illustrated in Figure R505.3. The cantilever back-span shall extend a minimum of 6 feet (1830 mm) within the building, and shall be fastened to a bearing condition in accordance with Section R505.3.1. Floor cantilevers shall be permitted only on the second floor of a two-story building or the first floor of a one-story building. Floor framing that is cantilevered and supports the cantilevered floor only shall consist of single joist members in accordance with Section R505.3.2. Floor framing that is cantilevered and supports the cantilevered floor and the roof framing load above shall consist of double joist members of the same size and material thickness as that for single joist members in accordance with Section R505.3.2, and shall be fastened web to web with minimum No. 8 screws at 24 inches (610 mm) maximum on center spacing top and bottom. Built-up floor framing consisting of a C-section inside a track section, fastened at the top and bottom flanges by minimum No. 8 screws at 24 inches (610 mm) maximum on center spacing, is permitted in lieu of the web-to-web double joist method.~~ Floor cantilevers for the top floor of a two or three story building or the first floor of a one-story building shall not exceed 24 inches (610 mm). Cantilevers, not exceeding 24 inches (610 mm) and supporting two stories and roof (i.e., first floor of a two-story building), shall also be permitted provided that all cantilevered joists are doubled (nested or back-to-back). The doubled cantilevered joists shall extend a minimum of 6 feet (1.83 m) toward the inside and shall be fastened with a minimum of two No.8 screws spaced at 24 inches (610 mm) on center through the webs (for back-to-back) or flanges (for nested joists).

11. Revise as follows:

R505.3.7~~8~~ Splicing. Joists and other structural members shall not be spliced. Splicing of tracks shall conform with Figure R505.3.7~~8~~.

R505.3.8~~9~~ Framing of floor openings. Openings in floors ~~framing~~ shall be framed with header and trimmer joists. Header joist spans shall not exceed 6 feet (1830 mm) or 8 feet (2438 mm) in length in accordance with Figures R505.3.8(1) or R505.3.8(2), respectively. Header and trimmer joists shall be fabricated from joist and track members ~~sections~~, ~~which shall be of~~ having a minimum size and thickness ~~as~~ at least equivalent to the adjacent floor joists and

shall be installed in accordance with Figures ~~R505.3~~R505.3.8(1), R505.3.8(2), R505.3.8(3), and R505.3.8(4). Each header joist shall be connected to trimmer joists with ~~a minimum of~~ four 2-inch-by-2-inch (51mm by 51 mm) clip angles. Each clip angle shall be fastened to both the header and trimmer joists with four No. 8 screws, evenly spaced, through each leg of the clip angle. The clip angles shall have a ~~steel~~ thickness not less than that of the floor joist. Each track section for a built-up header or trimmer joist shall extend the full length of the joist (continuous).

TABLE R505.2(2)
MINIMUM THICKNESS OF COLD-FORMED STEEL MEMBERS

DESIGNATION THICKNESS (mils)	MINIMUM BASE STEEL ~~UNCOATED~~ THICKNESS (inches)	~~REFERENCE GAGE NUMBER~~
33	0.0329~~3~~	~~20~~
43	0.0428~~3~~	~~18~~
~~54~~	0.0538~~4~~	~~16~~
68	0.0677~~8~~	~~14~~
97	0.0966	

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm.

12. Delete existing table and substitute as follows:

TABLE R505.3.1(1)
FLOOR TO FOUNDATION OR BEARING WALL CONNECTION REQUIREMENTS [a,b]

FRAMING CONDITION	BASIC WIND SPEED (mph) AND EXPOSURE	
	85 MPH EXPOSURE C OR LESS THAN 110MPH EXPOSURE A/B-	LESS THAN 110 MPH EXPOSURE C
Floor joist to wall track of exterior wall per Figure R505.3.1(1)	2-No.8 screws	3-No.8 screws
Rim track or end joist to load-bearing wall top track per Figure R505.3.1(1)	1-No.8 screw at 24" o.c.	1-No.8 screw at 24" o.c.
Rim track or end joist to wood sill per Figure R505.3.1(2)	Steel plate spaced at 4' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails
Rim track or end joist to foundation per Figure R505.3.1(3)	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8-No.8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8-No.8 screws
Cantilevered joist to foundation per Figure R505.3.1(4)	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8-No.8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8-No.8 screws
Cantilevered joist to wood sill per Figure R505.3.1(5)	Steel plate spaced at 4' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c. with 4-No.8 screws and 4-10d or 6-8d common nails
Cantilevered joist to exterior load-bearing wall track per Figure R505.3.1(6)	2-No.8 screws	3-No.8 screws

For SI: 1 inch = 25.4 mm, 1 pounds per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm

[a] Anchor bolts are to be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks (e.g. at door openings or corners). Bolts extend a minimum of 15 inches into masonry or 7 inches into concrete. Anchor bolts connecting cold-formed steel framing to the foundation structure are to be installed so that the distance from the center of the bolt hole to the edge of the connected member is not less than one and one-half bolt diameters.

[b] All screw sizes shown are minimum.

13. Revise as follows:

TABLE R505.3.2(1)
ALLOWABLE SPANS FOR COLD-FORMED STEEL JOISTS—SINGLE SPANS[a, b, c, d] 33 ksi STEEL

(No change to table contents)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479kPa.
a. Deflection criteria: *L*/480 for live loads, *L*/240 for total loads.
b. Floor dead load = 10 psf.
c. Table provides the maximum clear span in feet and inches.
d. Bearing stiffeners are to be installed at all support points and concentrated loads.

TABLE R505.3.2(2)
ALLOWABLE SPANS FOR COLD-FORMED STEEL JOISTS—MULTIPLE SPANS[a, b, c, d, e, f] 33 ksi STEEL

(No change to table contents)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479kPa.
a. Deflection criteria: *L*/480 for live loads, *L*/240 for total loads.
b. Floor dead load = 10 psf.
c. Table provides the maximum clear span in feet and inches to either side of the interior support.
d. Interior bearing supports for multiple span joists consist of structural (bearing) walls or beams.
e. Bearing stiffeners are to be installed at all support points and concentrated loads.
f. Interior supports shall be located within two feet (0.61 m) of mid span provided that each of the resulting spans does not exceed the appropriate maximum span shown in the table above.

TABLE R505.3.2(3)
ALLOWABLE SPANS FOR COLD-FORMED STEEL JOISTS—MULTIPLE SPANS [a, b, c, d, e, f] 50 ksi STEEL

(No change to table contents)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479kPa.
a. Deflection criteria: *L*/480 for live loads, *L*/240 for total loads.
b. Floor dead load = 10 psf.
c. Table provides the maximum clear span in feet and inches to either side of the interior support.
d. Interior bearing supports for multiple span joists consist of structural (bearing) walls or beams.
e. Bearing stiffeners are to be installed at all support points and concentrated loads.
f. Interior supports shall be located within two feet (0.61 m) of mid span provided that each of the resulting spans does not exceed the appropriate maximum span shown in the table above.

14. Add new table as follows:

TABLE R505.3.4(1)
CLIP ANGLE BEARING STIFFENERS
20 psf Equivalent Snow Load

JOIST DESIGNATION	MINIMUM THICKNESS (mils) OF 2-INCH x 2-INCH (50.8 MM x 50.8 MM) CLIP ANGLE											
	TOP FLOOR				BOTTOM FLOOR IN 2 STORY MIDDLE FLOOR IN 3 STORY				BOTTOM FLOOR IN 3 STORY			
	JOIST SPACING (inches)				JOIST SPACING (inches)				JOIST SPACING (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	43	43	43	43	43	54	68	68	68	97	97	-
800S162-43	43	43	43	43	54	54	68	68	97	97	97	97
800S162-54	43	43	43	43	43	54	68	68	68	97	97	-
800S162-68	43	43	43	43	43	43	54	68	54	97	97	-
800S162-97	43	43	43	43	43	43	43	43	43	43	54	97
1000S162-43	43	43	43	43	54	68	97	97	97	-	-	-
1000S162-54	43	43	43	43	54	68	68	97	97	97	-	-
1000S162-68	43	43	43	43	54	68	97	97	97	-	-	-
1000S162-97	43	43	43	43	43	43	43	54	43	68	97	-
1200S162-43	43	54	54	54	97	97	97	97	-	-	-	-
1200S162-54	54	54	54	54	97	97	97	97	-	-	-	-
1200S162-68	43	43	54	54	68	97	97	97	-	-	-	-
1200S162-97	43	43	43	43	43	54	68	97	97	-	-	-

For SI: 1 in = 25.4 mm.

TABLE R505.3.4(2)
CLIP ANGLE BEARING STIFFENERS
30 psf Equivalent Snow Load

JOIST DESIGNATION	MINIMUM THICKNESS (mils) OF 2-INCH x 2-INCH (50.8 MM x 50.8 MM) CLIP ANGLE											
	TOP FLOOR				BOTTOM FLOOR IN 2 STORY MIDDLE FLOOR IN 3 STORY				BOTTOM FLOOR IN 3 STORY			
	JOIST SPACING (inches)				JOIST SPACING (inches)				JOIST SPACING (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	43	43	43	43	54	68	68	97	97	97	97	-
800S162-43	43	43	43	54	68	68	68	97	97	97	97	-
800S162-54	43	43	43	43	54	68	68	97	97	97	-	-
800S162-68	43	43	43	43	43	54	68	97	68	97	97	-
800S162-97	43	43	43	43	43	43	43	43	43	43	68	97
1000S162-43	54	54	54	54	68	97	97	97	97	-	-	-
1000S162-54	54	54	54	54	68	97	97	97	97	-	-	-
1000S162-68	43	43	54	68	68	97	97	-	97	-	-	-
1000S162-97	43	43	43	43	43	43	54	68	54	97	-	-
1200S162-43	54	68	68	68	97	97	97	-	-	-	-	-
1200S162-54	68	68	68	68	97	97	-	-	-	-	-	-
1200S162-68	68	68	68	68	97	97	97	-	-	-	-	-
1200S162-97	43	43	43	43	54	68	97	-	97	-	-	-

For SI: 1 in = 25.4 mm.

TABLE R505.3.4(3)
CLIP ANGLE BEARING STIFFENERS
50 psf Equivalent Snow Load

JOIST DESIGNATION	MINIMUM THICKNESS (mils) OF 2-INCH x 2-INCH (50.8 MM x 50.8 MM) CLIP ANGLE											
	TOP FLOOR				BOTTOM FLOOR IN 2 STORY MIDDLE FLOOR IN 3 STORY				BOTTOM FLOOR IN 3 STORY			
	JOIST SPACING (inches)				JOIST SPACING (inches)				JOIST SPACING (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	54	54	54	54	68	97	97	97	97	-	-	-
800S162-43	68	68	68	68	97	97	97	97	-	-	-	-
800S162-54	54	68	68	68	97	97	97	97	-	-	-	-
800S162-68	43	43	54	54	68	97	97	97	97	-	-	-
800S162-97	43	43	43	43	43	43	43	54	54	68	97	-
1000S162-43	97	68	68	68	97	97	97	97	-	-	-	-
1000S162-54	97	97	68	68	97	97	97	-	-	-	-	-
1000S162-68	68	97	97	97	97	-	-	-	-	-	-	-
1000S162-97	43	43	43	43	54	68	97	97	-	-	-	-
1200S162-43	97	97	97	97	-	-	-	-	-	-	-	-
1200S162-54	-	97	97	97	-	-	-	-	-	-	-	-
1200S162-68	97	97	97	97	-	-	-	-	-	-	-	-
1200S162-97	54	68	68	97	97	-	-	-	-	-	-	-

For SI: 1 in = 25.4 mm.

TABLE R505.3.4(4)
CLIP ANGLE BEARING STIFFENERS 70 psf Equivalent Snow Load

JOIST DESIGNATION	MINIMUM THICKNESS (mils) OF 2-INCH x 2-INCH (50.8 MM x 50.8 MM) CLIP ANGLE											
	TOP FLOOR				BOTTOM FLOOR IN 2 STORY MIDDLE FLOOR IN 3 STORY				BOTTOM FLOOR IN 3 STORY			
	JOIST SPACING (inches)				JOIST SPACING (inches)				JOIST SPACING (inches)			
	12	16	19.2	24	12	16	19.2	24	12	16	19.2	24
800S162-33	68	68	68	68	97	97	97	97	-	-	-	-
800S162-43	97	97	97	97	97	97	97	-	-	-	-	-
800S162-54	97	97	97	97	97	-	-	-	-	-	-	-
800S162-68	68	68	68	97	97	97	97	-	-	-	-	-
800S162-97	43	43	43	43	43	54	68	97	97	97	-	-
1000S162-43	97	97	97	97	-	-	-	-	-	-	-	-
1000S162-54	-	97	97	97	-	-	-	-	-	-	-	-
1000S162-68	97	97	-	-	-	-	-	-	-	-	-	-
1000S162-97	68	68	68	68	97	97	-	-	-	-	-	-
1200S162-43	97	97	97	97	-	-	-	-	-	-	-	-
1200S162-54	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-68	-	-	-	-	-	-	-	-	-	-	-	-
1200S162-97	97	97	97	-	-	-	-	-	-	-	-	-

For SI: 1 in = 25.4 mm.

15. Add new figure as follows:

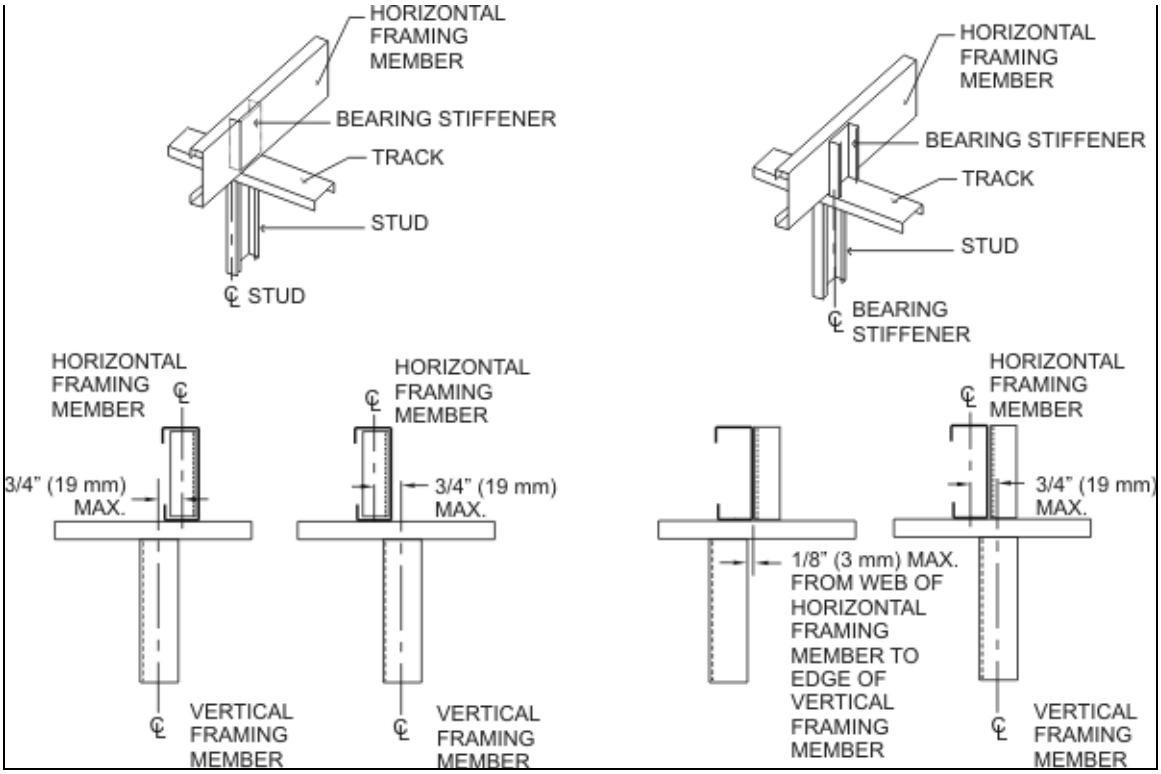


FIGURE R505.1.2
IN-LINE FRAMING

16. Revise as follows:

FIGURE R505.2(1)
C-SHAPED SECTION

(No change to figure)

FIGURE R505.2.5.1~~2~~(3)
FLOOR JOIST WEB HOLES

17. Add new figure as follows:

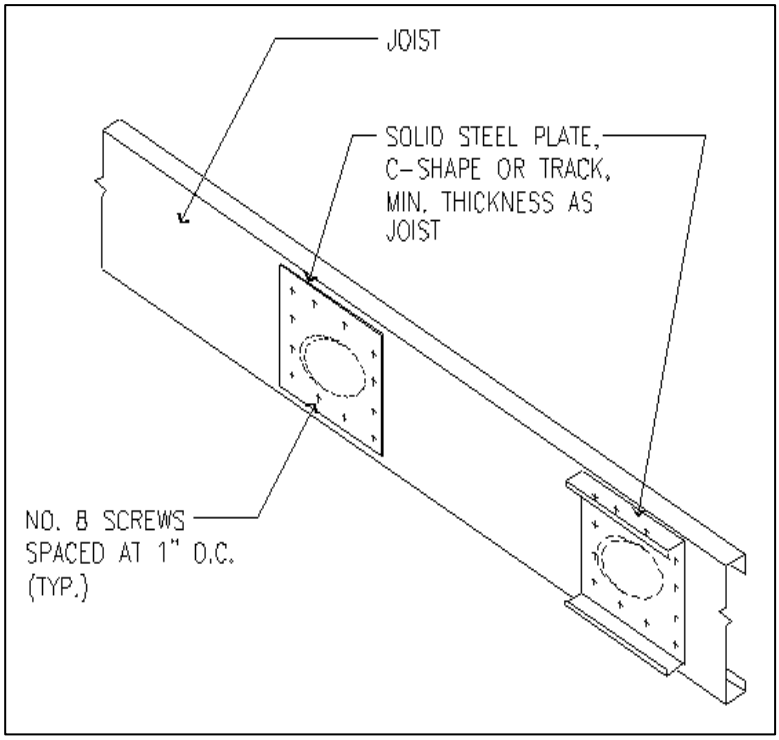


FIGURE R505.2.5.3
WEB HOLE PATCH

18. Delete without substitution:

~~**FIGURE R505.3**~~
~~**STEEL FLOOR CONSTRUCTION**~~

19. Delete existing Figure R505.3.1(1) through (8) and substitute as follows:

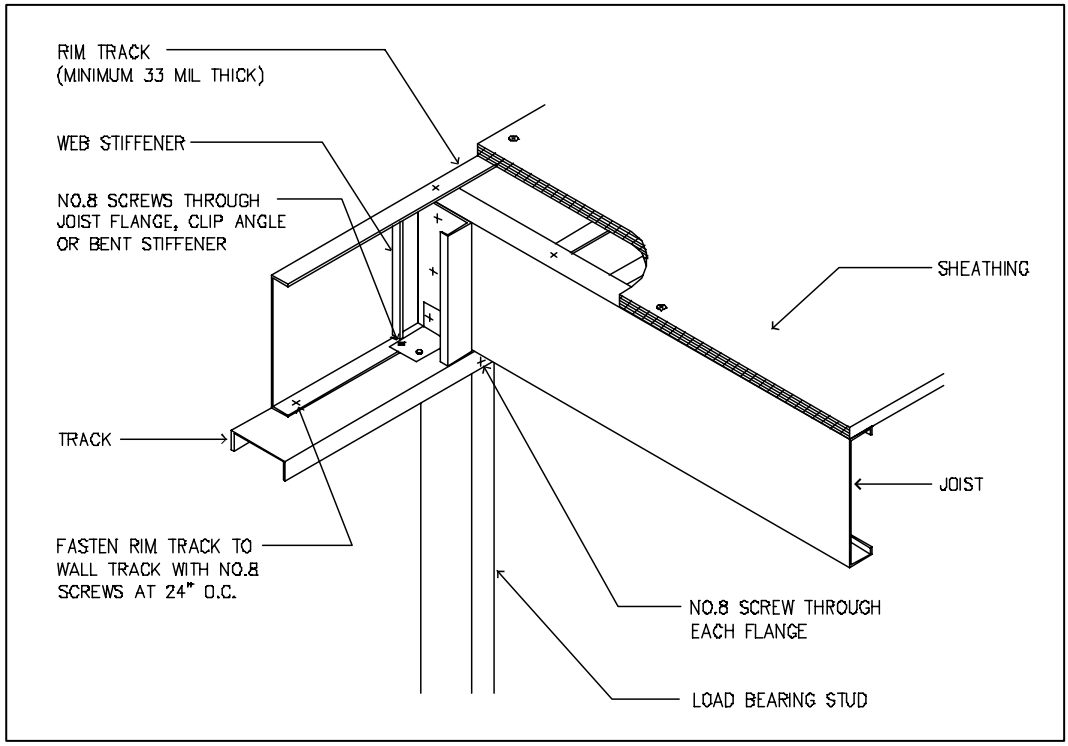


FIGURE R505.3.1(1)
FLOOR TO EXTERIOR LOAD-BEARING WALL STUD CONNECTION

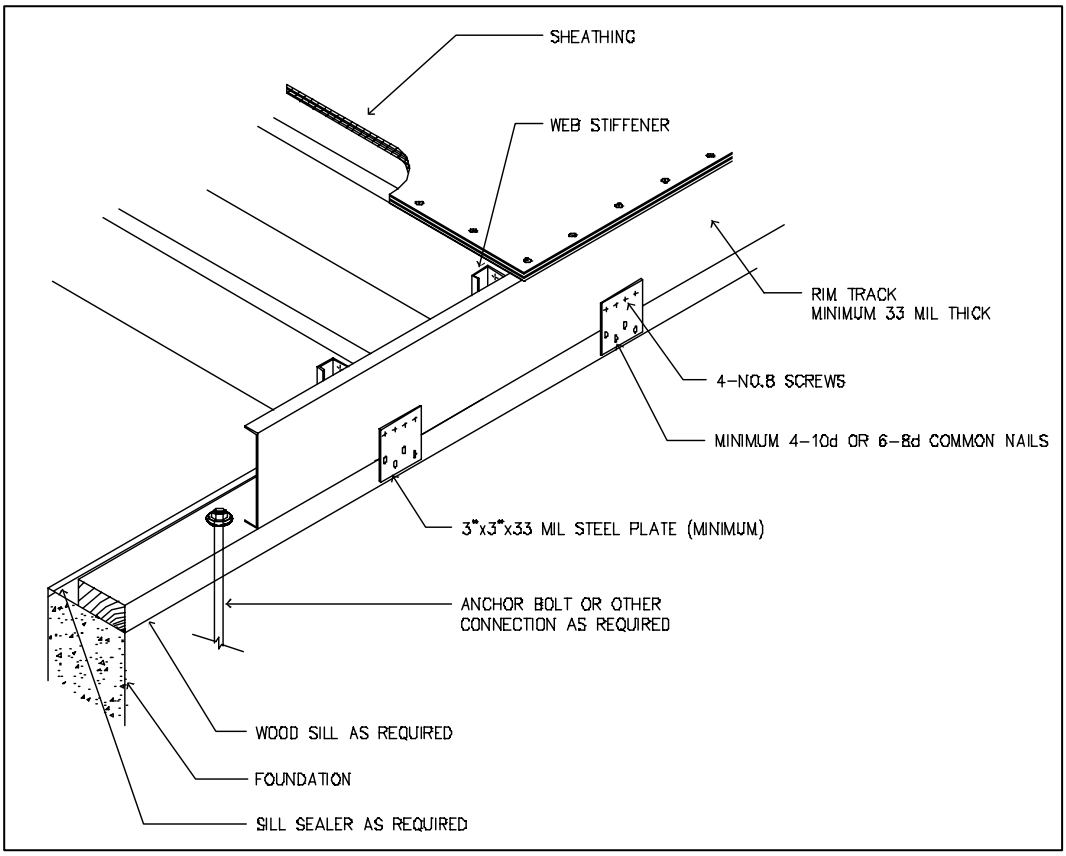


FIGURE R505.3.1(2)
FLOOR TO WOOD SILL CONNECTION

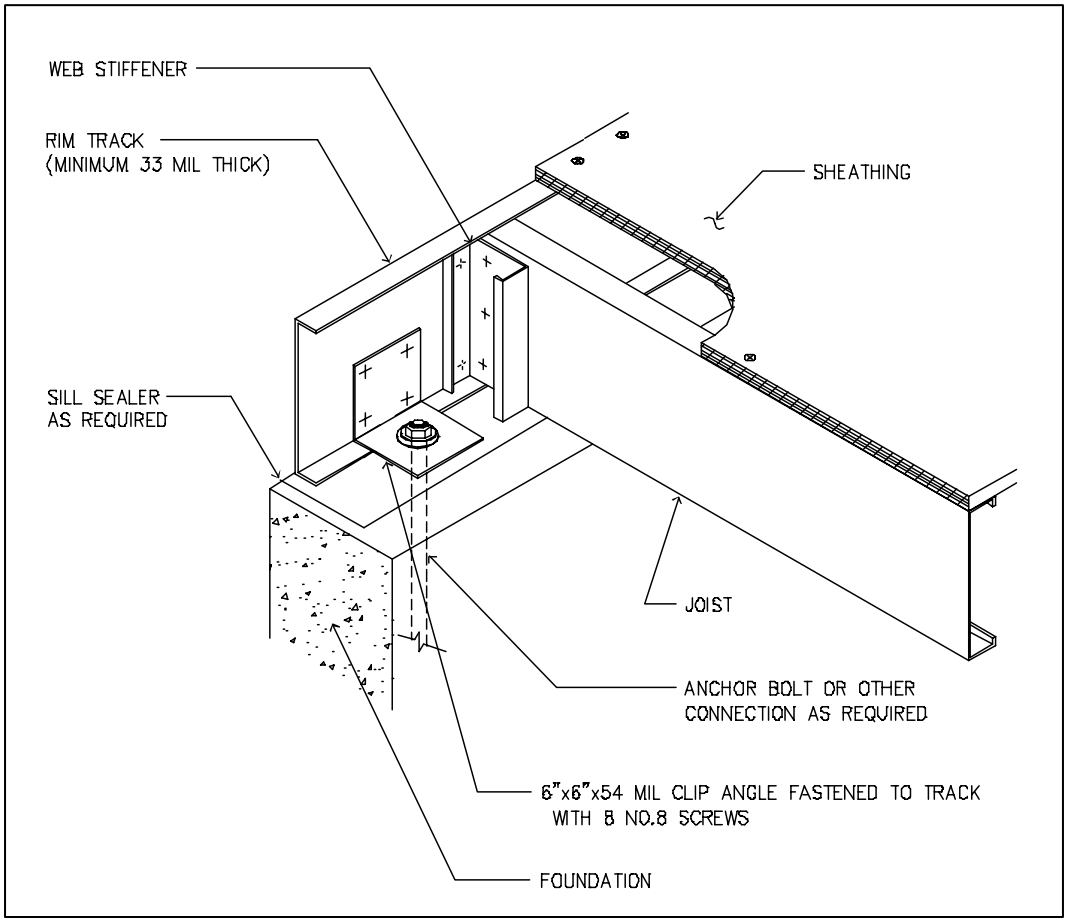


FIGURE R505.3.1(3)
FLOOR TO FOUNDATION CONNECTION

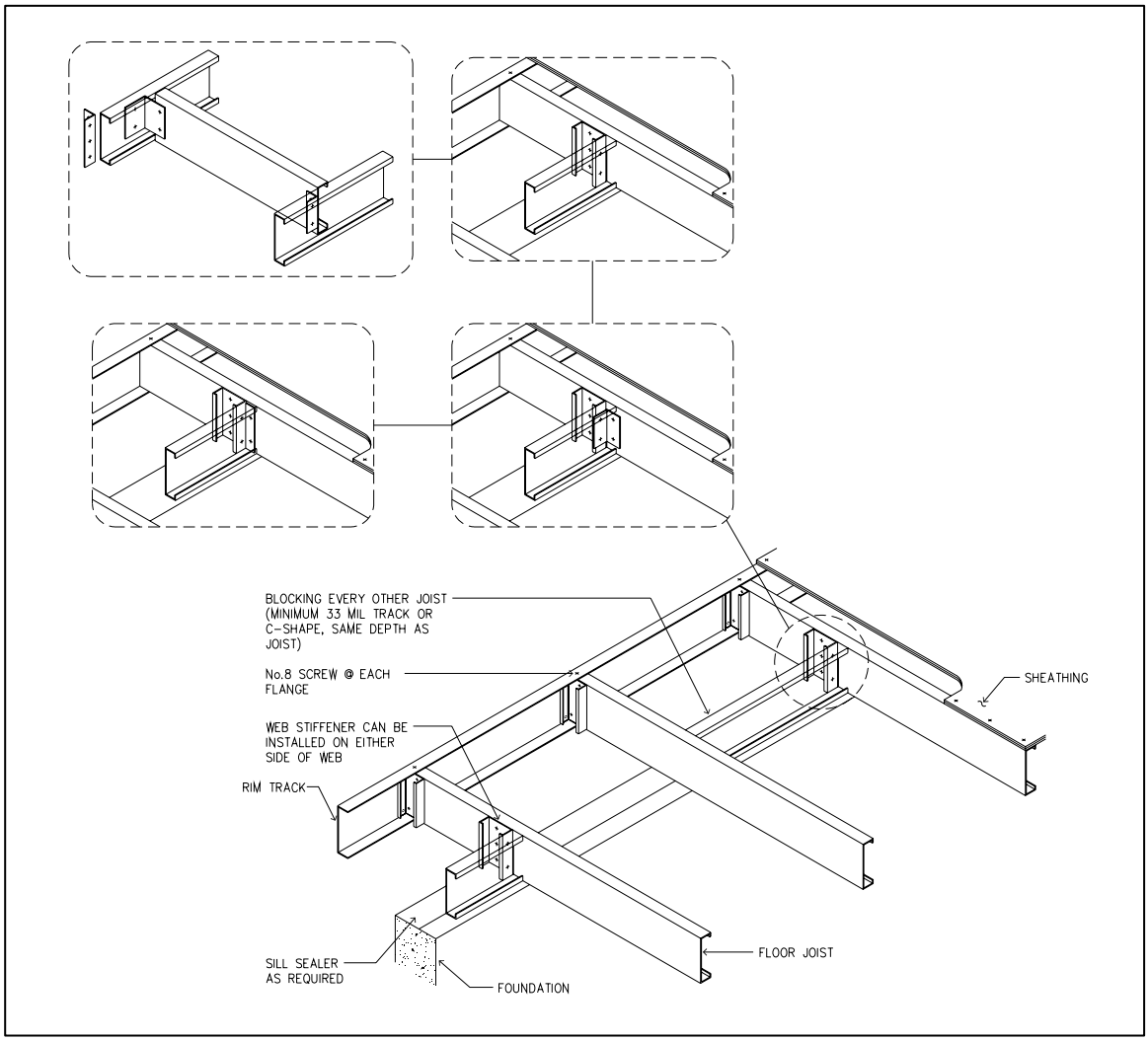


FIGURE R505.3.1(4)
CANTILEVERED FLOOR TO FOUNDATION CONNECTION

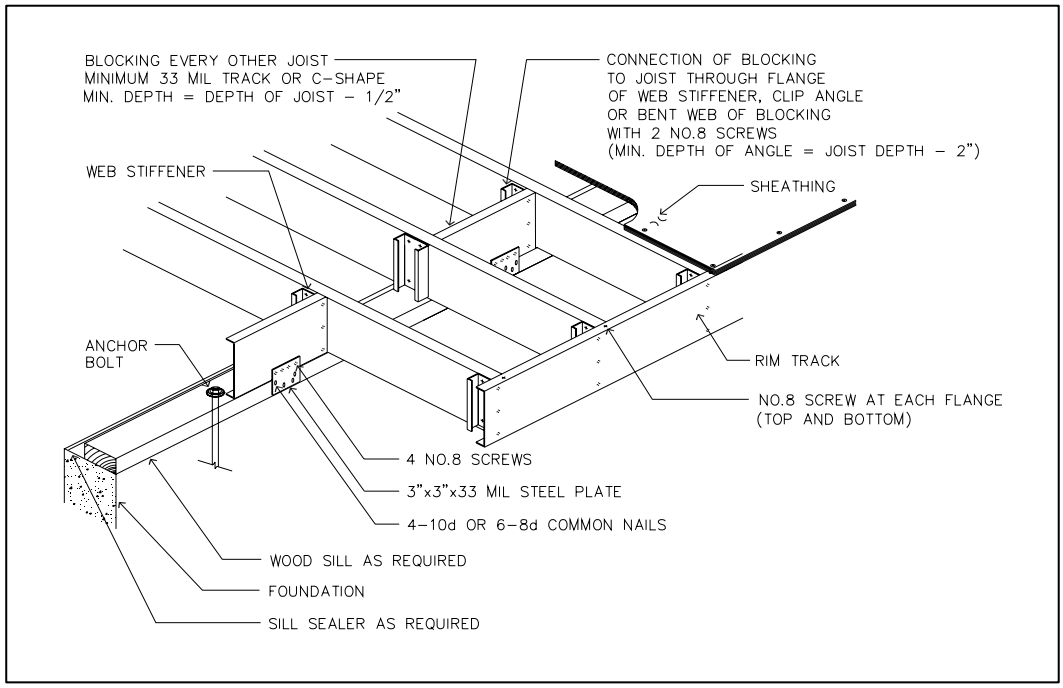


FIGURE R505.3.1(5)
CANTILEVERED FLOOR TO WOOD SILL CONNECTION

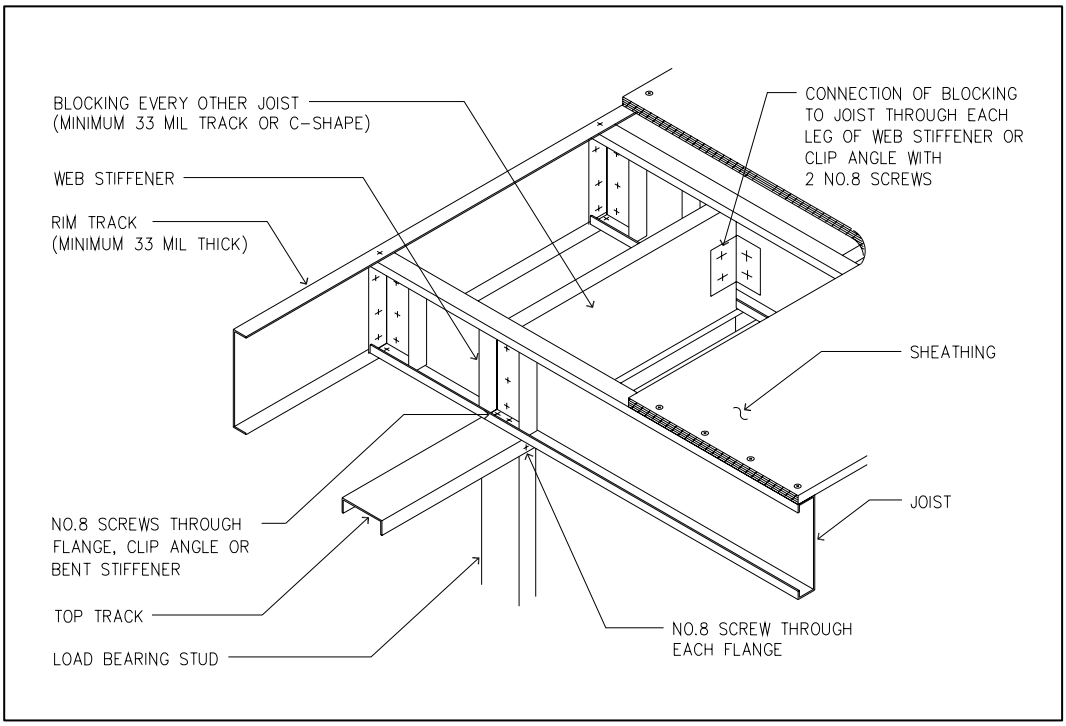


FIGURE R505.3.1(6)
CANTILEVERED FLOOR TO EXTERIOR LOAD-BEARING WALL CONNECTION

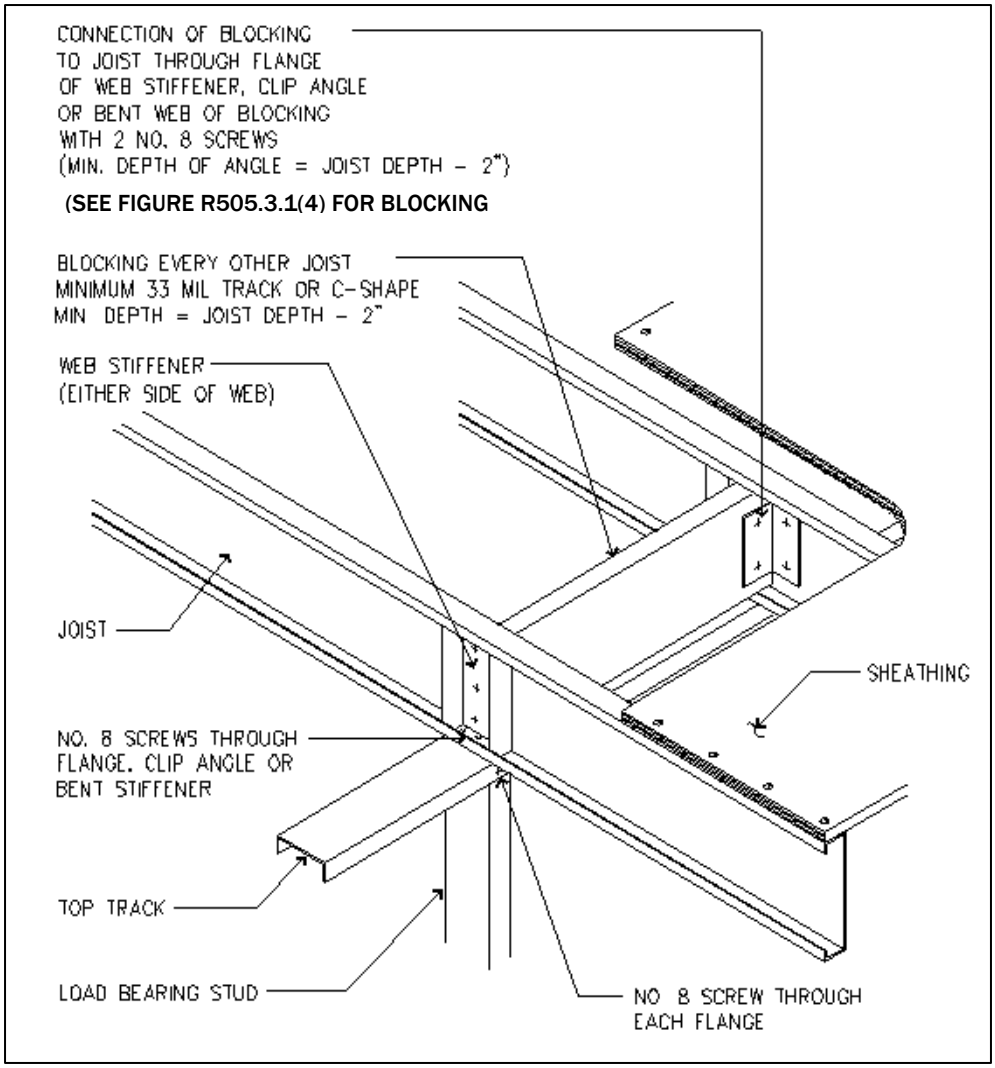


FIGURE R505.3.1(7)
CONTINUOUS SPAN JOIST SUPPORTED ON INTERIOR LOAD-BEARING WALL

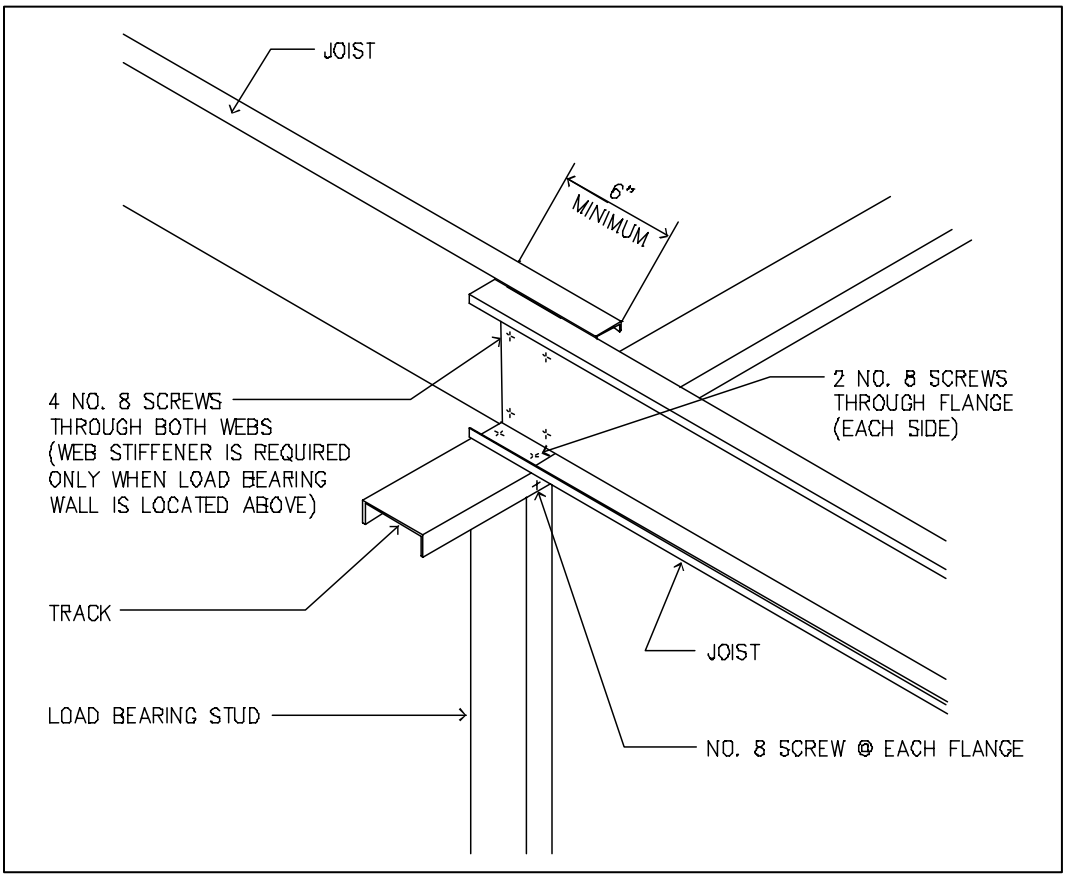


FIGURE R505.3.1(8)
LAPPED JOISTS SUPPORTED ON INTERIOR LOAD-BEARING WALL

20. Add new figures as follows:

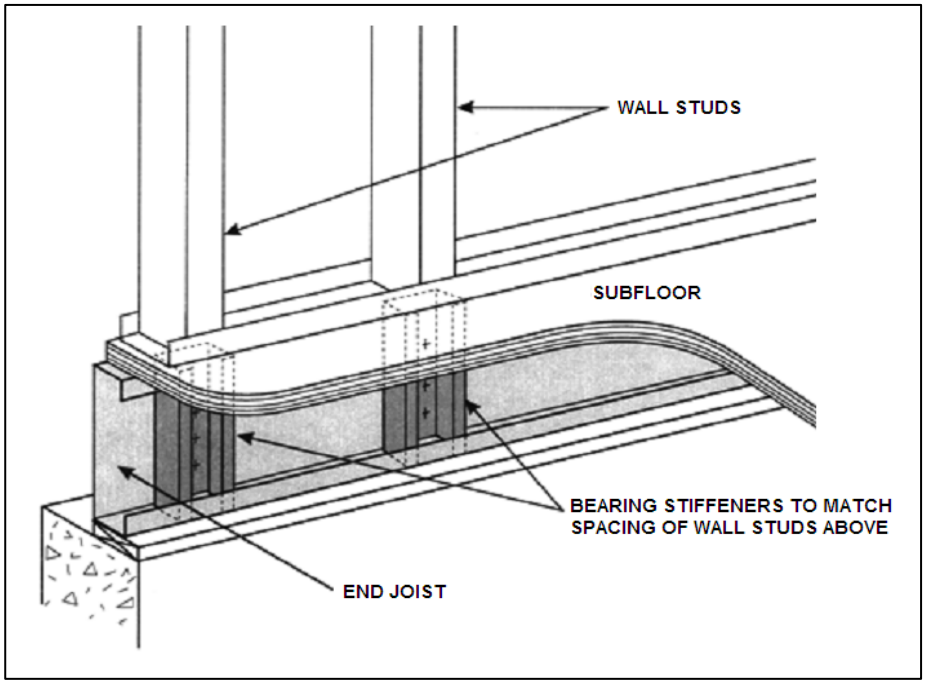


FIGURE R505.3.1(9)
BEARING STIFFENERS FOR END JOISTS

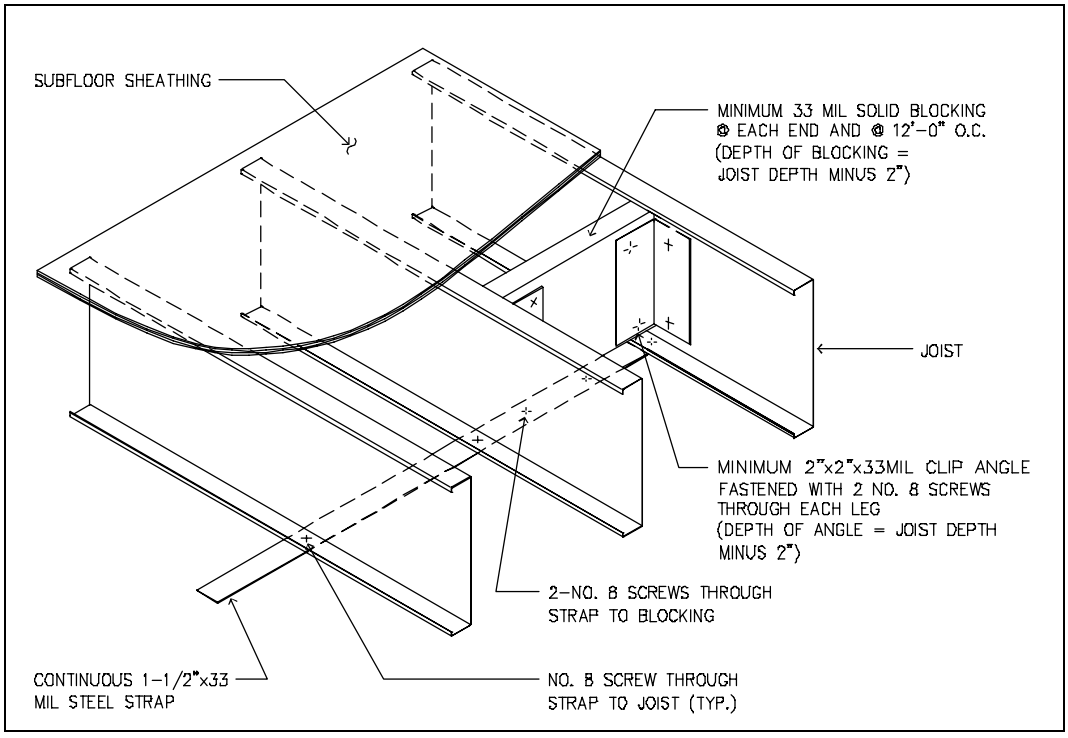


FIGURE R505.3.3.2(1)
JOIST BLOCKING (SOLID)

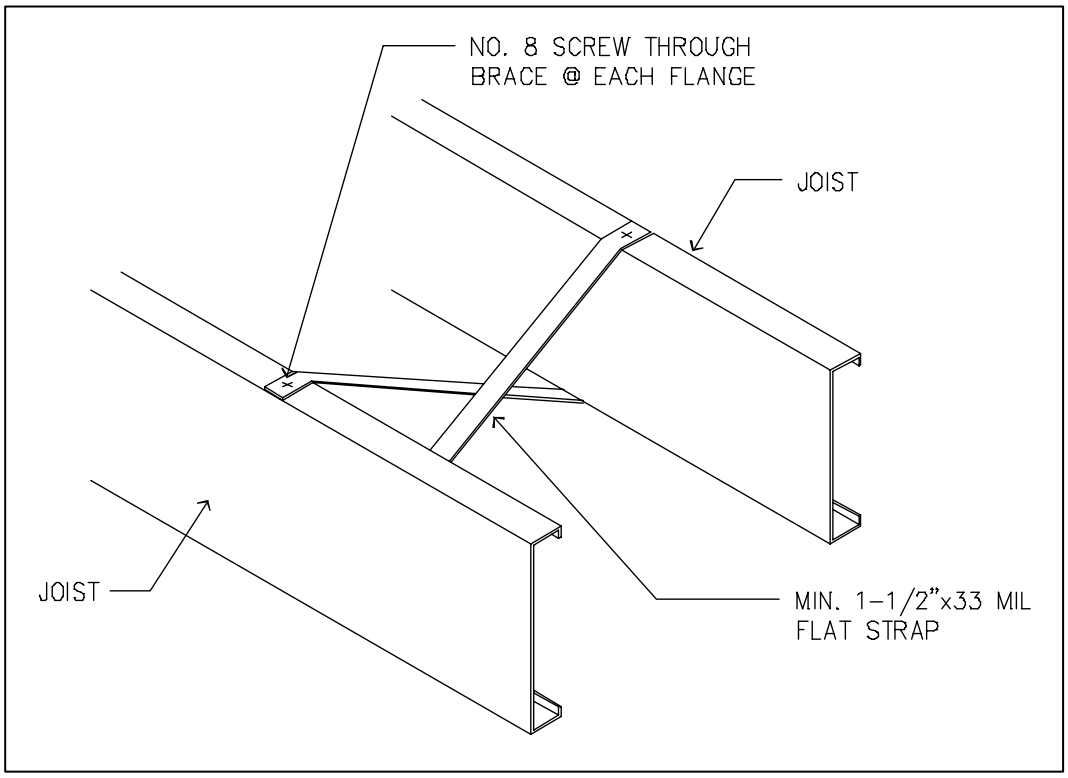


FIGURE R505.3.3.2(2)
JOIST BLOCKING (STRAP)

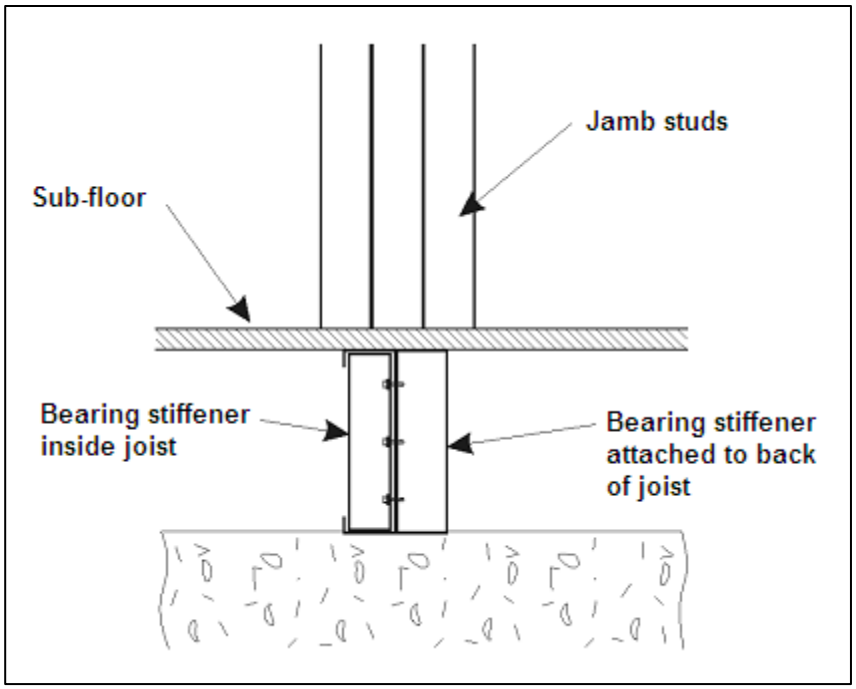


FIGURE R505.3.4(1)
BEARING STIFFENERS UNDER JAMB STUDS

21. Delete existing Figure R505.3.4(2) and replace as follows:

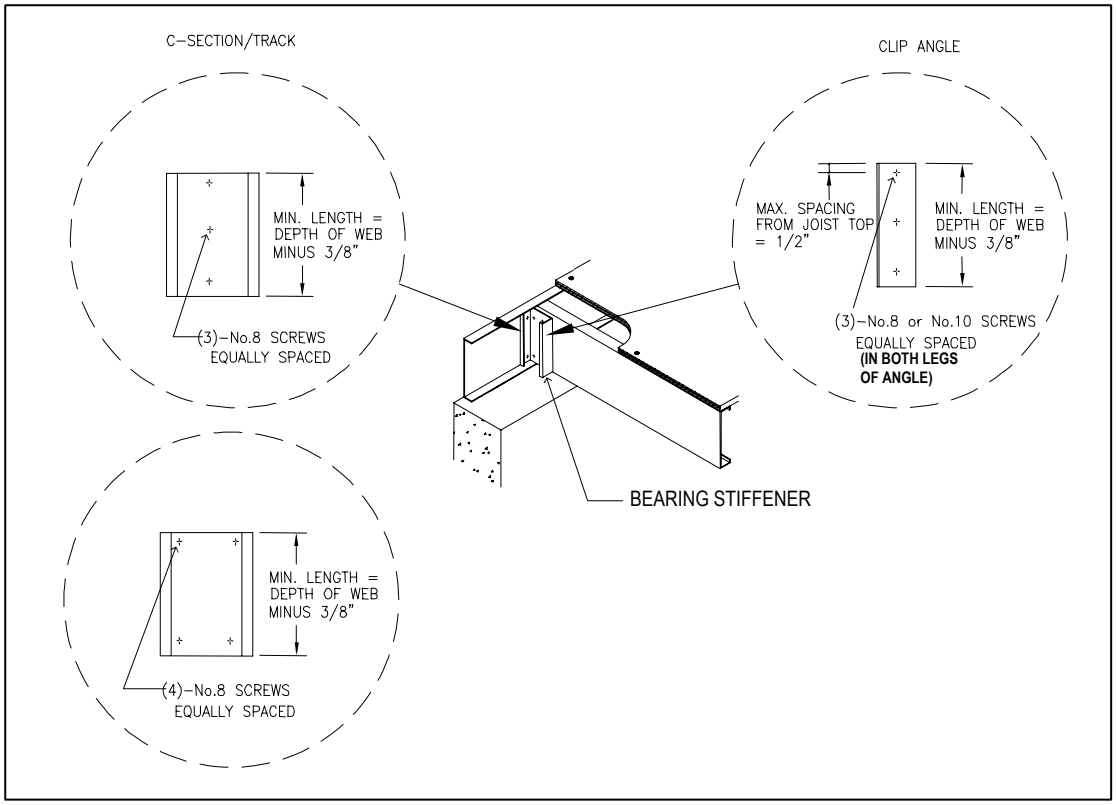


FIGURE R505.3.4(2)
BEARING STIFFENER

22. Delete without substitution:

~~**FIGURE R505.3.6**~~
~~**HOLE PATCH**~~

23. Delete existing Figure R505.3.8, renumber and replace as follows:

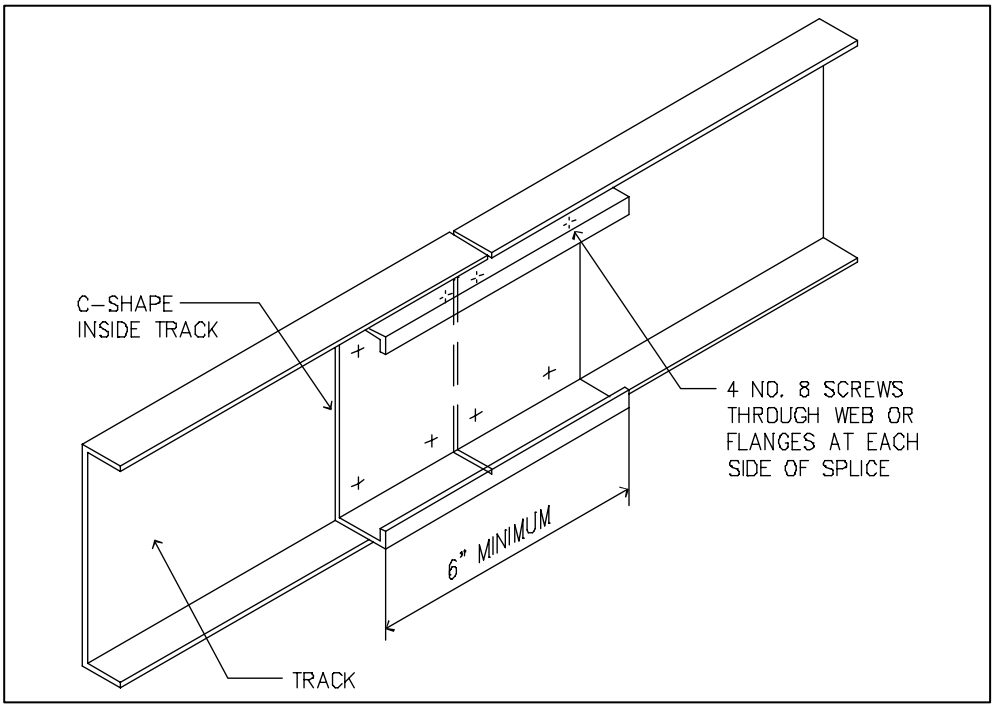


FIGURE R505.3.~~7~~8
TRACK SPLICE

24 Add new figures as follows:

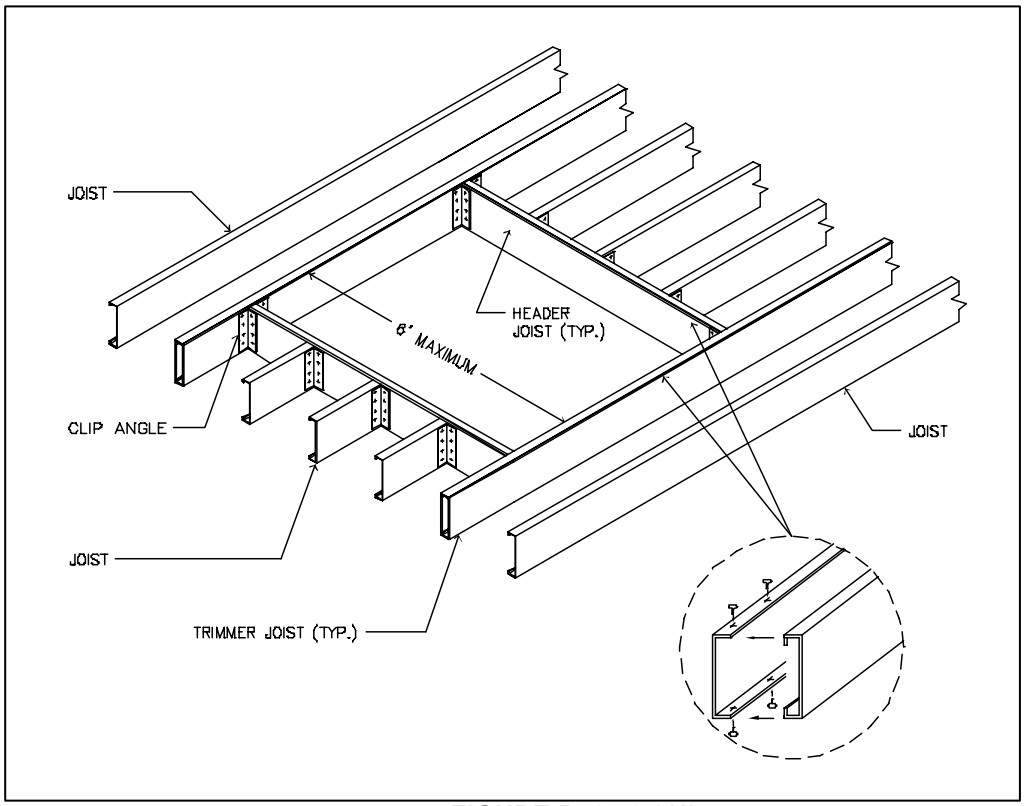


FIGURE R505.3.8(1)
COLD-FORMED STEEL FLOOR CONSTRUCTION: 6-FOOT FLOOR OPENING

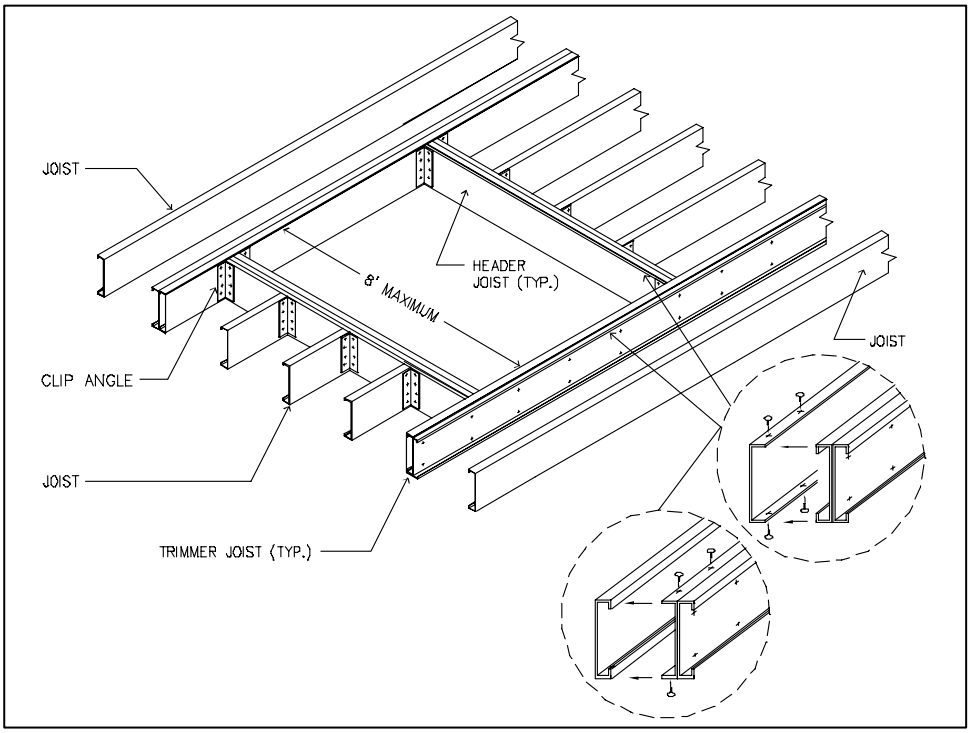


FIGURE R505.3.8(2)
COLD-FORMED STEEL FLOOR CONSTRUCTION; 8-FOOT FLOOR OPENING

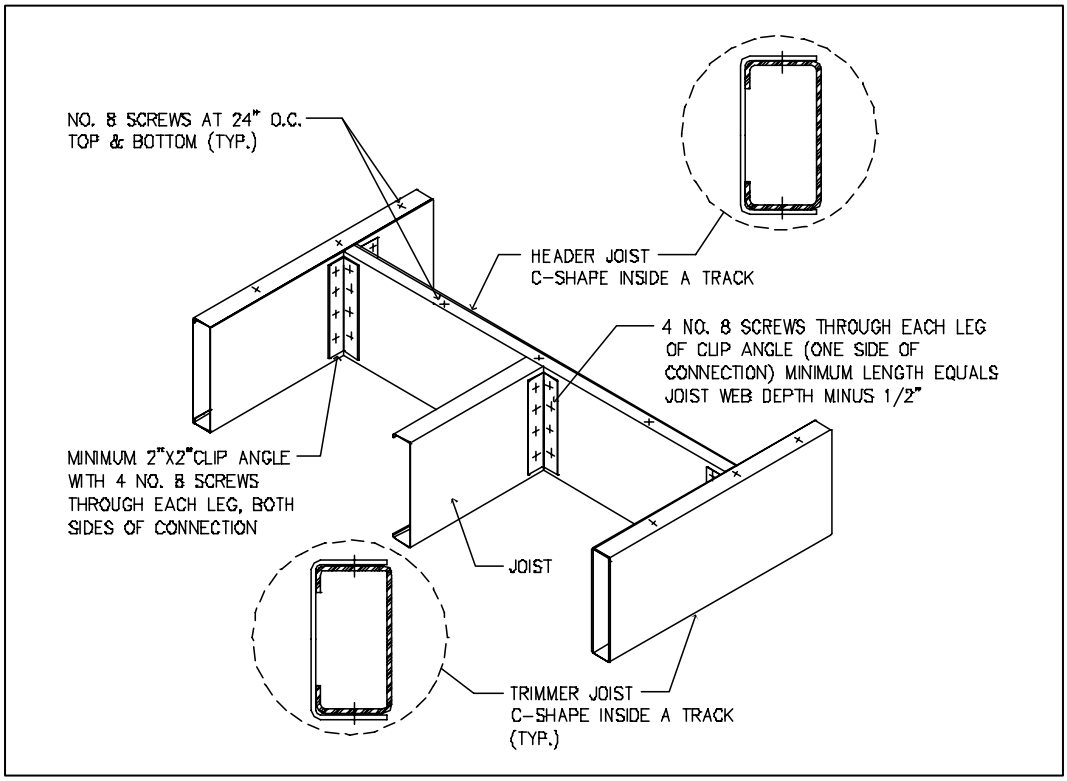
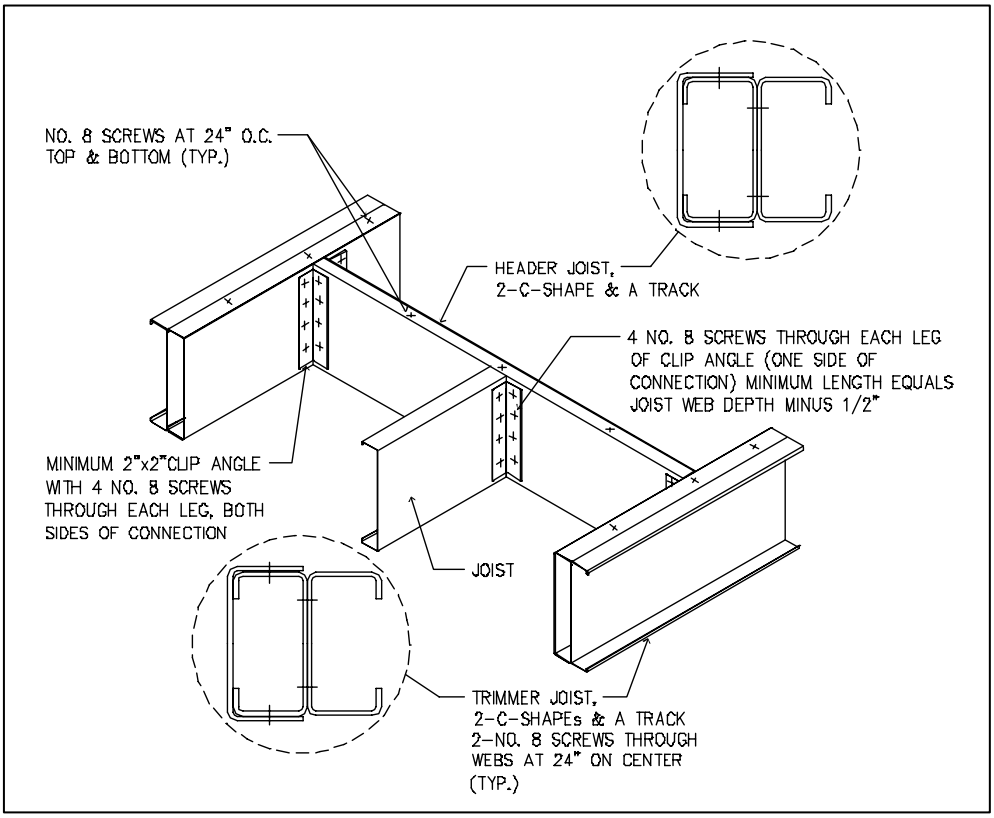


FIGURE R505.3.8(3)
COLD-FORMED STEEL FLOOR CONSTRUCTION: FLOOR HEADER TO TRIMMER CONNECTION
6 FOOT OPENINGS

FIGURE R505.3.8(4)
COLD-FORMED STEEL FLOOR CONSTRUCION: FLOOR HEADER TO TRIMMER CONNECTION – 8-FOOT OPENING



25. Revise as follows:

M1308.1 (Supp) Drilling and notching. Wood-framed structural members shall be drilled, notched or altered in accordance with the provisions of Sections R502.8, R602.6, R602.6.1 and R802.7. Holes in load bearing members of cold-formed steel light frame construction~~, steel-framed, load-bearing members~~ shall be permitted only in accordance with Sections ~~R505.2~~ R505.2.5, ~~R603.2~~ R603.2.5 and ~~R804.2~~ R804.2.5. In accordance with the provisions of Sections R505.3.5, R603.3.4 and R804.3.5, cutting and notching of flanges and lips of load-bearing members of cold-formed~~,~~ steel light frame construction~~-framed, load-bearing members~~ shall not be permitted. Structural insulated panels shall be drilled and notched or altered in accordance with the provisions of Section R614.

M2101.6 (Supp) Drilling and notching. Wood-framed structural members shall be drilled, notched or altered in accordance with the provisions of Sections R502.8, R602.6, R602.6.1 and R802.7. Holes in load bearing members of cold-formed steel light frame construction~~, steel-framed, load-bearing members~~ shall be permitted only in accordance with Sections ~~R505.2~~ R505.2.5, ~~R603.2~~ R603.2.5 and ~~R804.2~~ R804.2.5. In accordance with the provisions of Sections R505.3.5, R603.3.4 and R804.3.5, cutting and notching of flanges and lips of load-bearing members of cold-formed~~,~~ steel light frame construction~~-framed, load-bearing members~~ shall not be permitted. Structural insulated panels shall be drilled and notched or altered in accordance with the provisions of Section R614.

P2603.2 (Supp) Drilling and notching. Wood-framed structural members shall not be drilled, notched or altered in any manner except as provided in Sections R502.8, R602.5, R602.6, R802.7 and R802.7.1. Holes in load bearing members of cold-formed steel light-framed~~ load-bearing members~~ construction shall be permitted only in accordance with Sections ~~R505.2~~ R505.2.5, ~~R603.2~~ R603.2.5 and ~~R804.2~~ R804.2.5. In accordance with the provisions in Sections R505.3.5, R603.3.4 and R804.3.5, cutting and notching of flanges and lips of load bearing members of cold-formed~~,~~ steel light frame construction ~~framed, load-bearing members~~ shall not be permitted. Structural insulated panels shall be drilled and notched or altered in accordance with the provisions of Section R614

26. Add standards to Chapter 43 as follows:

AISI

S100-07 North American Specification for the Design of Cold-Formed Steel Structural Members

ASTM

C 1513-04 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections

Reason: This code change updates the prescriptive requirements of IRC Section R505 to reflect the 2007 edition of AISI S230, *Standard for Cold-Formed Steel Framing -- Prescriptive Method for One- and Two-Family Dwellings*. The following changes have been made:

Items 1 through 24

Section R505.1.1: The 2007 edition of AISI S230 (*Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings*) increases the allowable number of stories from two to three stories. This modification is intended to coordinate with the new scope of AISI S230-07.

Section R505.1.2: The 2007 edition of AISI S230 references the 2007 edition of AISI S200 (*North American Standard for Cold-Formed Steel Framing—General Provisions*) which has revised the in-line framing tolerance to account for the special case of the bearing stiffener located on the back-side of the joist. This was based on research at the University of Waterloo (Reference: Fox, S.R. (2003), "The Strength of Stiffened CFS Floor Joist Assemblies with Offset Loading," American Iron and Steel Institute, Washington, D.C.)

Section R505.1.3: In 2007, the scope of AISI S100, *North American Specification for the Design of Cold-Formed Steel Structural Members*, Section D4 on Wall Studs and Wall Stud Assemblies was broadened to cover Cold-Formed Steel Light-Frame Construction. This was done in order to properly recognize the growing use of cold-formed steel framing in a broader range of residential and light commercial framing applications and to provide the appropriate charging language for the various ANSI approved standards that have been developed by the AISI Committee on Framing Standards. This proposal corrects the charging language and changes the reference from the too specific AISI Truss document (2004) to the more general, and correct, AISI S100, Section D4, which picks up the reference to the whole library of AISI cold-formed steel light frame construction.

Section R505.2: Table R505.2(2) has been corrected to reflect industry standardized thicknesses for structural members. Additionally, a line has been added for 97 mils, since it is used extensively throughout the IRC. The column on Reference Gage Number has been deleted, since gage is no longer used by industry in referencing structural members. Finally, the topic of holes has been relocated to a new Section R505.2.5 on web holes, web hole reinforcement, and web hole patching. Accordingly, the associated Figure R505.2(3) has been renumbered to Figure R505.2.5.1, with no other changes to the figure.

Section R505.2.1: This section has been modified to coordinate with the 2007 edition of AISI S230, which now recognizes ASTM A 1003 as the primary standard for cold-formed steel light frame construction (via a reference to AISI S200). References to the ASTM A 1003 grades have been corrected to specify Structural Type H. Further, references to Grades 37 and 40 have been deleted, since these grades are not used in the IRC. The references to ASTM A 653 and ASTM A792 have been retained, since AISI S230 still considers them deemed-to-comply with ASTM A 1003. However, reference to ASTM A875 has been deleted, since it is no longer used in the construction marketplace.

Section R505.2.2: This section has been modified to reflect the change in terminology in Table R505.2(2) from "uncoated steel thickness" to "base steel thickness."

Section R505.2.3: This section has been modified to coordinate with the 2007 edition of AISI S230, which now recognizes ASTM A1003 as the primary standard for cold-formed steel light frame construction (via a reference to AISI S200). The reference to ASTM A875 has been deleted, since it is no longer used in the construction marketplace.

Section R505.2.4: This section has been modified to coordinate with the 2007 edition of AISI S230, which now recognizes ASTM C 1513 (via a reference to AISI S200) in lieu of SAE J78. ASTM C1513 is the more appropriate consensus standard, which continues to charge SAE J78. The reference to ASTM B 633 has been deleted in favor of the substituted language from AISI S230.

Section R505.2.5.1: Section R505.2.5.1 has been created using existing IRC Section 505.2 with minor modifications in order to improve the clarity and usability of the code by locating all requirements concerning web holes and web hole adjustments in one central location. In addition, Figure R505.2(3) has been renumbered as Figure R505.2.5.1, with no other changes to the figure, as part of the coordination effort.

Section R505.2.5.2: New to the 2007 edition of AISI S230, this language permits the reinforcing of web holes, thus allowing the utility to remain, as long as the finished web hole meets the requirements of this subsection and that of Section R505.2.5.1. The provisions are based on engineering judgment and have been confirmed by preliminary testing.

Section R505.2.5.3: This language has been relocated from Section R505.3.6 in order to improve the clarity and usability of the code. Modifications have been made to the charging language to reflect the fact that the user now has the choice to reinforce non-conforming holes, patch non-conforming holes, or design non-conforming holes with accepted engineering practice per Section R505.2.5.1. Additionally, Figure R505.2.5.3 has been added as an update to the old Figure R505.3.6, in order to coordinate with AISI S230-07.

Section R505.3: The associated figure has been deleted since it is outdated.

Section R505.3.1, Table R505.3.1(1) and Figures R505.3.1(1) through R505.3.1(9): This section, table and its associated figures have been updated to coordinate with AISI S230-07. The figures include new notes and some new graphics to illustrate the intent of the text portion of the steel provisions. Much of the new graphics are related to the location and/or fastening requirements for the installation of blocking and bearing stiffeners. In some cases the figures illustrate more than one installation option, thus making the provisions more flexible.

Section R505.3.2: The charging language for this section has been updated to coordinate with AISI S230-07. Table notes have been added to reflect guidance given in AISI S230-07. Finally, the discussion on blocking has been updated and relocated to Section R505.3.3.

Section R505.3.3: The charging language for this section has been updated to coordinate with AISI S230-07, D5 on joist bracing and blocking. This change improves the clarity of the section by dividing it into four distinct sections on joist top flange bracing, foist bottom flange bracing/blocking, blocking at interior bearing supports and blocking at cantilevers.

Section R505.3.4, Tables R505.3.4(a)-(d), and Figure R505.3.4: This section has been updated to coordinate with AISI S230-07. The 2007 edition offers more options with respect to bearing stiffeners and this section has been expanded accordingly. Four tables were added detailing the design of clip angle bearing stiffeners in order to permit more options for the builder in the field. Additionally, Figures R505.3.4(1) and R505.3.4(2) were added to reflect these new options.

Section R505.3.6(old): This section has been relocated to a new Section R505.2.5 on web holes, web hole reinforcement, and web hole patching. Figure R505.3.6 is outdated and has been substituted with a new Figure R505.2.5.3, which coordinates with AISI S230-07.

Section R505.3.7(old): This section has been modified to coordinate with AISI S230-07, which reflects the increase in story height from two to three stories.

Figure R505.3.8(old): This figure has been updated to coordinate with AISI S230-07.

Section R505.3.9(old): This section has been updated to coordinate with AISI S230-07, which now has established provisions for openings up to 6ft wide and up to 8ft wide.

Item 25
Sections M1308.1, M2101.6 and P2603.2: This code change proposal is a result of the code changes updating the prescriptive requirements of IRC Sections R505, R603 and R804 to reflect the requirements of the 2007 edition of AISI S230, *Standard for Cold-Formed Steel Framing -- Prescriptive Method for One- and Two-Family Dwelling.* In particular, the section numbers have been updated. Additionally, the charging language has been modified editorially to be consistent with the language used in IRC Sections R505, R603 and R804.

Within IRC Sections R505.2.5, R603.2.5 and R804.2.5, revisions now permit the reinforcing of holes when they fall within specified tolerances – a provision which was not allowed in the IRC before. This allows for greater options for contractors and builders.

Item 26
Chapter 43: The modifications to add reference standards in Chapter 43 are coordinated with changes made to Section R505.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: Review of proposed new standards AISI S100-07 and ASTM C1513-04 indicated that, in the opinion of ICC Staff, the standard did comply with ICC standards criteria.

Committee Action: **Approved as Submitted**

Committee Reason: This change updates the prescriptive provision for cold-formed steel floor framing to the current standard.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Bonnie Manley, American Iron and Steel Institute, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R505.1.1 Applicability limits. The provisions of this section shall control the construction of cold-formed steel floor framing for buildings not greater than 60 feet (18,288 mm) in length perpendicular to the joist span, not greater than 40 feet (12 192 mm) in width parallel to the joist span, and less than or equal to three stories ~~in height~~ above grade plane . Cold-formed Steel floor framing constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 110 miles per hour (49 m/s), Exposure ~~A,~~ B~~,~~ or C, and a maximum ground snow load of 70 psf (3.35 kPa).

R505.2 Structural framing. Load-bearing cold-formed steel floor framing members shall comply with Figure R505.2(1) and with the dimensional and minimum thickness requirements specified in Tables R505.2(1) and R505.2(2). Tracks shall comply with Figure R505.2(2) and shall have a minimum flange width of 11/4 inches (32 mm). The maximum inside bend radius for members shall be the greater of 3/32 inch (2.4 mm) minus half the base steel thickness or ~~twice~~ 1.5 times the base steel thickness.

TABLE R505.3.1(1)
FLOOR TO FOUNDATION OR BEARING WALL CONNECTION REQUIREMENTS[a,b]

FRAMING CONDITION	BASIC WIND SPEED (mph) AND EXPOSURE	
	85 MPH EXPOSURE C OR LESS THAN 110MPH EXPOSURE ~~A/~~B	LESS THAN 110 MPH EXPOSURE C

(No change to remainder of table or footnotes)

(Portions of proposal not shown remain unchanged)

Commenter's Reason: In Section R505.1.1, the change from “in height” to “above grade plane” is to maintain consistency with terminology already used throughout the IRC. Additionally, the reference to wind Exposure A has been eliminated, since it is no longer defined in ASCE 7-05.

In Section R505.2, the addition of “cold-formed steel” is editorial and the other modification corrects the maximum inside bend radius to reflect the latest requirements found in AISI S201-07, *North American Standard for Cold-Formed Steel Framing – Product Data*, which is referenced in the adopted AISI S230-07.

In Table R505.3.1(1), the reference to wind Exposure A has been eliminated, since it is no longer defined in ASCE 7-05.

Final Action: AS AM AMPC____ D

RB130-07/08
R506.2.3

Proposed Change as Submitted:

Proponent: Stephen V. Skalko, PE, Portland Cement Association

Revise as follows:

R506.2.3 Vapor retarder. A 6 mil (0.006 inch; 152 µm) polyethylene or approved vapor retarder 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 no base course exists.

Exception: The vapor retarder may be omitted:

1. From detached garages, utility buildings and other unheated accessory structures.
2. From driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date.
3. Where approved by the building official, based on local site conditions.

Reason: The most recent editions of the BOCA National Building Code, Standard Building Code, the CABO One and Two Family Dwelling Code required and the present International Building Code requires vapor retarders under attached garage floor slabs-on-ground. One of the primary reasons is that these attached garages have a high probability of being enclosed at a later date and converted to additional living space like a bedroom or den. These living spaces are typically conditioned which increases the temperature difference between the interior space and the ground below the floor slab which can contribute to moisture migration upward into the living space through the slab. Unfortunately a code change in the 2002 cycle (RB102-02) deleted the word detached associated with garages in Exception No. 1 to R506.3.2 of the IRC based on reasoning that stated *"Attached garages are no more likely to be heated than detached garages".* There was no technical study or data referenced in the supporting statement to validate this line of reasoning. In addition, it does not appear that much thought was given to conditions where the garage may be located in a basement space beneath the dwelling where the likelihood of moisture collecting in the enclosed garage space is more prevalent whether the space is conditioned or not.

Installing a vapor retarder under a garage floor slab to minimize moisture transmission into the enclosed space after it has been converted to living space or under a basement garage floor after the floor slab is poured can be very costly. These costs are very likely to be more than the initial cost to place a vapor retarder under the slab prior to placement of the concrete. To rectify this dilemma and make the IRC consistent with the requirements for vapor retarders under slabs-on-ground in Section 1910 of the IBC, this proposal returns the language in Exception No. 1 to Section 506.3.2 back to the original language in the 2000 edition of the IRC.

Cost Impact: The code change proposal will increase the cost of construction.

Committee Action: **Approved as Submitted**

Committee Reason: Attached garages, especially those located in a basement should have a vapor retarder beneath the floor slab. As stated in the proponent's reason.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Stephen V. Skalko, P.E., Portland Cement Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R506.2.3 Vapor retarder. A 6 mil (0.006 inch; 152 µm) polyethylene or approved vapor retarder 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 no base course exists.

Exception: The vapor retarder may be omitted:

1. From detached garages, utility buildings and other unheated accessory structures.
2. For unheated storage rooms having an area of less than 70 square feet (5.5m^2) and carports.
3. From 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.

Commenter's Reason: Small unheated storage rooms and carports attached to Group R-3 occupancies are exempt from vapor retarders under concrete slabs in Section 1910.1 of the International Building Code. This modification will make the provisions in the IRC consistent with the IBC.

Public Comment 2:

Rick Davidson, City of Maple Grove, MN, representing the Association of Minnesota Building Officials, requests Disapproval.

Commenter's Reason: This proposal would require that a contractor or homeowner go to the time, expense, and related problems caused by the installation of a vapor retarder in an attached garage because, according to the proponent, there is "a high probability at a later date" that the space may be converted to living space.

First, the code should not require all permit holders to comply with an unnecessary requirement because a few homeowners "might" convert their 800 square foot triple stall garage into a bedroom in the future. There was no justification provided to indicate that there is a "high probability" of such an occurrence. In fact, garage conversions seem to be prevalent with older homes with small attached garages and not the homes constructed today. This proposal won't help those homes.

Second, this will require an additional inspection for the building department to validate the installation of the vapor retarder resulting in additional enforcement costs. Without the inspection, there will be no way to validate if the vapor retarder is in place should one of the garages actually be converted.

Third, there are other options to having a vapor retarder under the slab to control moisture. For example, most crawl spaces have dirt floors with a vapor retarder over the dirt. Could not this approach be taken for a garage?

And fourth, whether it costs a little or a lot, if it isn't necessary then it shouldn't be required. This establishes a dangerous precedent.

Public Comment 3:

Jim McClintic, Sandy City, Utah, representing the Utah Chapter of ICC, requests Disapproval.

Commenter's Reason: The proponent's justification is flawed based on his own reasoning to validate this change. Garages are what they are until when or if they are ever changed, and to base this new requirement on an assumption shouldn't be in the code. A front porch could be enclosed and the vapor retarder wasn't required. If there is a problem with moisture in garages, let's address that and not base code on what something might be converted to.

Final Action: AS AM AMPC____ D

RB131-07/08

R602.3, Table R603.3(3), R602.10.2, Table R602.3(1)

Proposed Change as Submitted:

Proponent: Edward L. Keith, APA – The Engineered Wood Association

1. Revise as follows:

R602.3 Design and Construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3.(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Table R602.3(1) through R602.3(4). Exterior walls covered with foam plastic sheathing shall be braced in accordance with Section R602.10. Structural sheathing shall be fastened directly to structural framing members. Wall sheathing shall be capable of resisting wind pressures listed in Table R301.2(2). Maximum wind speeds permitted for exterior walls covered with wood structural panel sheathing are listed in Table R602.3(3).

2. Delete and substitute as follows:

~~**TABLE R602.3(3) (Supp)**~~
~~**WOOD STRUCTURAL PANEL WALL SHEATHING**~~

~~**Panel Span Rating**~~	~~**Panel Nominal Thickness (inch)**~~	~~**Maximum Stud Spacing (inches)**~~	
		~~**Siding nailed to:**~~[a]	
		~~**Stud**~~	~~**Sheathing**~~
~~16/0, 20/0, or wall – 16 o.c.~~	~~3/8~~	~~16~~	~~16~~[b]
~~24/0, 24/16, 32/16 or wall – 24 o.c.~~	~~3/8, 7/10, 15/32, 1/2~~	~~24~~	~~24~~[c]

~~For SI: 1 inch = 25.4 mm.~~
~~a. Blocking of horizontal joints shall not be required.~~
~~b. Plywood sheathing 3/8-inch thick or less shall be applied with long dimension across studs.~~
~~c. Three-ply plywood panels shall be applied with long dimension across studs.~~

TABLE R602.3(3)
MAXIMUM WIND SPEED (mph – 3 SECOND GUST) PERMITTED FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[1,2,3]

Minimum Nail		Minimum Wood Structural Panel Span Rating	Minimum Nominal Panel Thickness (inches)	Maximum Wall Stud Spacing (inches)	Panel Nail Spacing		Maximum Wind Speed (mph)		
							Wind Exposure Category		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	B	C	D
6d Common (0.113" x 2.0")	1.5	24/0	3/8	16	6	12	110	90	85
8d Common (0.131" x 2.5")	1.75	24/16	7/16	16	6	12	130	110	105
				24	6	12	110	90	85

1. Panel strength axis parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.
2. Table is based on wind pressures acting toward and away from building surfaces per R301.2. Lateral bracing requirements shall be in accordance with R602.10.
3. Wood Structural Panels with span ratings of Wall-16 or Wall-24 shall be permitted as an alternate to panels with a 24/0 span rating. Plywood Siding rated 16 oc or 24 oc shall be permitted as an alternate to panels with a 24/16 span rating. Wall-16 and Plywood Siding 16 oc shall be used with studs spaced a maximum of 16 inches on center.

3. Revise as follows:

R602.10.2 (Supp) Braced wall panel construction methods. The construction of braced wall panels shall be in accordance with one of the following methods:

1. Nominal 1-inch-by-4-inch (19.1 mm by 88.9 mm) continuous diagonal braces let in to the top and bottom plates and the intervening studs or approved metal strap devices installed in accordance with the manufacturer's specifications. The let-in bracing shall be placed at an angle not more than 60 degrees (1.06 rad) or less than 45 degrees (0.79 rad) from the horizontal.
2. Wood boards of 5/8-inch (15.9 mm) net minimum thickness applied diagonally on studs spaced a maximum of 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).
3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing. Wood Structural panels shall be installed in accordance with Table R602.3~~(3)~~(1) ~~and Table R602.3(1)~~ for wind speeds less than 85 mph. For winds in excess of 85 mph, wood structural panels shall be installed in accordance with Table R602.3(3).
4. One-half-inch (12.7 mm) or 25/32-inch (19.8 mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).
5. Gypsum board with minimum ½-inch (12.7 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at panel edges including top and bottom plates at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.
6. Particleboard wall sheathing panels installed in accordance with Table R602.3(4) and Table R602.3(1).
7. Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.
8. Hardboard panel siding when installed in accordance with Table R703.4.

Exception: Alternate braced wall panels constructed in accordance with Sections R602.10.3.2.1 or R602.10.3.2.2 shall be permitted to replace any braced wall panel in any of the above methods of braced wall panels.

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b, c,e]	SPACING OF FASTENERS	
		Edges (Inches)[i]	Intermediate supports[c,e] (inches)
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing			
3/8" – 1/2"	6d common (2" x 0.113" nail (subfloor, wall)[j] 8d common (2 1/2" x 0.131") nail (roof)[j]	6	12[g]

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

a. through i. (No change)

j. For regions having basic wind speed of 85 mph or greater, the nail size and attachment schedule of Table R602.3(3) shall be used for attaching wood structural panel wall sheathing.

(Portions of table and footnotes not shown remain unchanged)

Reason: The code change updates the existing wood structural panel wall sheathing table to include requirements for winds regions having a basic wind speed of 85 mph or greater.

The proposed table is an abbreviated version of a similar table that was adopted into the IBC last cycle and is available in the IBC 2007 Supplement in Section 2304.6.1.

The current Table R602.2(3) in the IRC that gives recommended minimum panel thicknesses for wall panel sheathing. To be more precise, it is OK most of the time but in higher wind regions (still within the range of the IRC) the panel thicknesses and orientations recommended in the table and footnotes may not provide the minimum protection to the home and inhabitants that is currently required in Section R301.2.

Recent analysis conducted by the APA staff indicates that in the extreme wind regions covered by the IRC (less than 110 mph) and with more severe exposures (C and D) the minimum thicknesses recommendations given in Table R603.2(3) – Wood Structural Panel Wall Sheathing – are insufficient in thickness and attachment. The proposed table provides the requirements to ensure that this important part of the structural system is correct. The analysis considered panel bending, stiffness, nail withdrawal and nail head pull through as well as the wind pressure requirements of Section R301.2.

Note that the impact to most will be minimal because the most commonly used wood structural panel sheathing thickness in the US is 7/16". As can be seen in the proposed table this sheathing thickness is satisfactory for winds up to 110 mph in all but Exposure D conditions. Most builders will only see the requirement for 8d nails as a change, and this is already the nail required for roof sheathing applications.

The change also proposes a corresponding editorial changes to references in R602.10.3 and adds a footnote to the appropriate cell in the fastening table, Table R602.3(1) – continued, that directs the user to the new table for panel thickness, fastener selection and spacing in winds regions having a basic wind speed of 85 mph or greater.

Cost Impact: The code change proposal will increase the cost of construction in high wind areas. No additional sheathing will be required but in areas of high wind sheathing up to 7/16" may be required as well as 8d nails. Please note that 7/16" sheathing is the most popular thickness of wall sheathing used in the US and in many areas the shift to 8d nails is all that will be seen as a change in practice. As such, the impact on cost will be minimal in most areas.

Committee Action: Approved as Modified

Modify proposal as follows:

R602.3 Design and Construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3.(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Table R602.3(1) through R602.3(4). Exterior walls covered with foam plastic sheathing shall be braced in accordance with Section R602.10. Structural sheathing shall be fastened directly to structural framing members. Exterior wall coverings ~~sheathing~~ shall be capable of resisting wind pressures listed in Table R301.2(2). When wood structural panels are used as the exterior wall covering meeting Table R301.2(2), the maximum wind speeds permitted ~~for exterior walls covered with wood structural panel sheathing~~ are listed in Table R602.3(3).

(Portions of proposal not shown remain unchanged.)

Committee Reason: This change provides a much needed requirement for the correct size of wood structural panels in higher wind and exposures in the wind regions covered by the IRC. The modification clarifies that this applies to exterior wall coverings.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Jay Crandell, P.E., ARES Consulting, representing Foam Sheathing Coalition, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.3 Design and Construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3.(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Table R602.3(1) through R602.3(4). Exterior walls covered with foam plastic sheathing shall be braced in accordance with Section R602.10. Structural sheathing shall be fastened directly to structural framing members. Exterior wall coverings shall be capable of resisting wind pressures listed in Table R301.2(2). When wood structural panels are used as the exterior wall covering meeting Table R301.2(2), the maximum wind speeds permitted are listed in Table R602.3(3). Maximum wind speeds for exterior walls covered with foam sheathing shall comply with Table R602.3(4). Where foam sheathing is applied over wood structural panels or other solid substrate capable of separately resisting the required wind pressure, Table R602.3(4) shall not apply. Foam sheathing shall be protected with an exterior covering installed in accordance with Section R703.

Add new table as follows:

TABLE R602.3(4)
MAXIMUM WIND SPEED (mph – 3 SECOND GUST) PERMITTED FOR FOAM SHEATHING USED TO RESIST WIND PRESSURE ON EXTERIOR WALLS[1,2]

Foam Sheathing Material[3]	Foam Sheathing Nominal Thickness (in)[3]	Maximum Wind Speed (mph) – Exposure B[4,5]			
		Walls with Interior Finish[6]		Walls without Interior Finish	
		16"oc framing	24"oc framing	16"oc framing	24"oc framing
EPS	¾" (unfaced)	115	NP	95	NP
	1" (unfaced)	130	105	130	85
	≥1-1/2" (unfaced)	130	130	130	125
Polyiso-cyanurate	½" (faced)	130	90	110	NP
	¾" (faced)	130	120	130	100
	1" (faced)	130	130	130	120
	≥1-1/2" (faced)	130	130	130	130
XPS	½" (faced)	130	90	115	NP
	¾" (unfaced)	120	NP	100	NP
	1" (unfaced)	130	110	130	90
	≥1-1/2" (unfaced)	130	130	130	130

For SI: 1 inch = 25.4 mm, 1 mile per hour = 1.609 km/h
NP = not permitted

1. Foam sheathing panels shall be permitted to be oriented parallel or perpendicular to framing members.
2. Foam sheathing panels shall be attached to framing in accordance with manufacturer recommendations and covered with exterior cladding installed in accordance with Section R703.
3. Foam sheathing shall meet or exceed the following material standards: Expanded Polystyrene (EPS) – ASTM C578 (Type II, min.), Polyisocyanurate – ASTM C1289 (Type 1, min.), and extruded polystyrene (XPS) – ASTM C578 (Type X, min.). Polyisocyanurate sheathing shall be faced on both sides. XPS sheathing less than ¾" thick shall have an approved facer on both sides. Table requirements for EPS of all thicknesses and XPS products ¾" thick and greater are based on unfaced foam sheathing. For faced or unfaced foam sheathing products of any type or thickness, approved manufacturer data shall be permitted in lieu of the table values.
4. For wind Exposure C, multiply tabulated wind speed by 0.85.
5. Table values have been limited to 130 mph maximum wind speed. For greater wind speed conditions, use of approved manufacturer data shall be permitted.
6. Interior finish shall comply with Section R702.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: RB131 as published in the ROH appropriately requires all wall coverings to be designed to resist wind pressure. However, the RB131 proposal omits prescriptive solutions for all sheathing types except wood structural panels. Therefore, this public comment includes appropriate prescriptive requirements for foam sheathing. Because negative suction pressures are resisted by the siding and foam sheathing assembly (see approved RB186 published in the ROH and a separate public comment on RB195 requesting FAH approval), proposed Table R602.3(4) addresses positive pressure resistance of the foam sheathing. The wind pressure resistance of foam sheathing is based on certified full-scale (4'x8' panel) testing conducted at the NAHB Research Center, Inc and applies a safety factor of 2.0. The design wind speed data (without rounding or capping values) is shown in the table below for informational purposes. This proposal is needed to avoid exclusion of foam sheathing products due to the incompleteness of RB131 and to ensure that adequate wind pressure performance of foam sheathing is achieved.

TABLE (Actual design values based on test data – not rounded or capped as in the proposal)
MAXIMUM WIND SPEED (mph – 3 SECOND GUST) PERMITTED FOR FOAM SHEATHING USED TO RESIST WIND PRESSURE ON EXTERIOR WALLS[1,2]

Foam Sheathing Material[3]	Foam Sheathing Nominal Thickness (in)	Maximum Wind Speed (mph) – Exposure B[4]			
		Walls with Interior Finish[5]		Walls without Interior Finish	
		16"oc framing	24"oc framing	16"oc framing	24"oc framing
EPS	¾"	116	77	97	65
	1"	155	103	130	86
	≥1-1/2"	225	150	188	126
ISO	½"	133	89	112	74
	¾"	181	121	152	101
	1"	214	142	179	119
	≥1-1/2"	237	158	198	132
XPS	½"	138	92	115	77
	¾"	122	81	102	68
	1"	162	108	136	90
	≥1-1/2"	229	153	192	128

Public Comment 2:

Gary J. Ehrlich, P.E., National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.3 Design and Construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3.(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Table R602.3(1) through R602.3(4). ~~Exterior walls covered with foam plastic sheathing shall be braced in accordance~~

~~with Section R602.10.~~ Structural wall sheathing shall be fastened directly to structural framing members. Exterior wall coverings shall be capable of resisting the appropriate wind pressures listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3). ~~When wood structural panels are used as the exterior wall covering meeting Table R301.2(2), the maximum wind speeds permitted are listed in~~ Wood structural panel sheathing used for exterior walls shall conform to the requirements of Table R602.3(3).

Modify proposal as follows:

TABLE R602.3(3)
~~MAXIMUM WIND SPEED (mph – 3 SECOND GUST) PERMITTED~~ REQUIREMENTS
FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[1,2,3]

Minimum Nail		Minimum Wood Structural Panel Span Rating	Minimum Nominal Panel Thickness (inches)	Maximum Wall Stud Spacing (inches)	Panel Nail Spacing		Maximum Basic Wind Speed (mph)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind Exposure Category		
							B	C	D
6d Common (0.113" x 2.0")	1.5	24/0	3/8	16	6	12	110	90	85
8d Common (0.131" x 2.5")	1.75	24/16	7/16	16	6	12	130	110	105
				24	6	12	110	90	85

(Footnotes remain unchanged)

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b, c,e]	SPACING OF FASTENERS	
		Edges (Inches)[i]	Intermediate supports[c,e,j] (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing, and particleboard wall sheathing to framing			
3/8" – 1/2"	6d common (2" x 0.113" nail (subfloor,[f] wall)[j] 8d common (2 1/2" x 0.131") nail (roof)[f]	6	12[g]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1ksi = 6.895 MPa.
a. through i. (No change)
~~j. For regions having basic wind speed of 85 mph or greater, the nail size and attachment schedule of Table R602.3(3) shall be used for attaching wood structural panel wall sheathing.~~

(Portions of table and footnotes not shown remain unchanged)

R602.10.2 Braced wall panel construction methods. The construction of braced wall panels shall be in accordance with one of the following methods:

1. Nominal 1-inch-by-4-inch (19.1 mm by 88.9 mm) continuous diagonal braces let in to the top and bottom plates and the intervening studs or approved metal strap devices installed in accordance with the manufacturer's specifications. The let-in bracing shall be placed at an angle not more than 60 degrees (1.06 rad) or less than 45 degrees (0.79 rad) from the horizontal.
2. Wood boards of 5/8-inch (15.9 mm) net minimum thickness applied diagonally on studs spaced a maximum of 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).
3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing. Wood Structural panels shall be installed in accordance with Table R602.3(1) for interior wall sheathing and Table R602.3(3) for exterior wall sheathing ~~for wind speeds less than 85 mph. For winds in excess of 85 mph, wood structural panels shall be installed in accordance with Table R602.3(3)~~.
4. One-half-inch (12.7 mm) or 25/32-inch (19.8 mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).
5. Gypsum board with minimum ½-inch (12.7 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at panel edges including top and bottom plates at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.
6. Particleboard wall sheathing panels installed in accordance with Table R602.3(4) and Table R602.3(1).
7. Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.
8. Hardboard panel siding when installed in accordance with Table R703.4.

Exception: Alternate braced wall panels constructed in accordance with Sections R602.10.3.2.1 or R602.10.3.2.2 shall be permitted to replace any braced wall panel in any of the above methods of braced wall panels.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This proposed change addresses four concerns NAHB had with the original proposal. First, the approved revisions to the charging language for R602.10 apply to all exterior walls regardless of the exterior wall covering type. Thus, the reference in R602.3 specific to foam sheathing is redundant and can be deleted. Second, editorial changes are made to reference Table R301.2(3) along with Table R301.2(2). Third, the reference to Table R602.3(3) and the table title are editorially revised. The table contains more requirements than just the maximum basic wind speed. Finally, the minimum basic wind speed for the US and territories is 85mph. Thus, the wind speed trigger in proposed footnote "j" is meaningless. Additionally, with the approved modification in Palm Springs, the footnote is redundant anyway—exterior WSP is sent straight to R602.3(3) by the charging language; only interior WSP drops through to R602.3(1). NAHB asks for your support in approving this proposal as modified by this public comment.

Final Action: AS AM AMPC____ D

RB134-07/08
Table R602.3(1), Table R702.3.5

Proposed Change as Submitted:

Proponent: Edward L. Keith, PE, APA – The Engineered Wood Association

Revise table as follows:

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b, c, e]	SPACING[c] OF FASTENERS	
		Edges (inches)[i]	Intermediate Support[c,e] (inches)
Other Wall Sheathing[h]			
½" gypsum sheathing[d]	1 1/2" galvanized roofing nail; staple galvanized 1 1/2" long; 1 1/4 screws, Type W or S	4[i]	8[i]
5/8" gypsum sheathing[d]	1 3/4" galvanized roofing nail; staple galvanized 1 5/8" long; 1 5/8" screws, Type W or S	4[i]	8[i]

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

a. through i. (No change)

j. When gypsum wall sheathing is used as bracing, fasteners shall be installed at 7" along all panel edges and at 7" over intermediate supports as specified in Section R602.10.2, item 5.

(Portions of table and footnotes not shown remain unchanged)

TABLE R702.3.5
MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD

THICKNESS OF GYPSUM BOARD (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBER (inches o.c.)	MAXIMUM SPACING OF FASTENERS (INCHES)		SIZE OF NAILS FOR APPLICATION TO WOOD FRAMING
				Nails[a,f]	Screws[b,g]	

For SI: 1 inch = 25.4 mm.

a. through e. (No change)

f. When gypsum wall board is used as bracing, nails shall be installed at 7" along all panel edges and at 7" over intermediate supports as specified in Section R602.10.2, item 5.

g. When gypsum wall board is used as bracing, screws shall not be permitted for fastening.

(Portions of table and footnotes not shown remain unchanged)

Reason: The purpose of this proposal is to clarify the code. It adds no new requirements. It adds clarification to areas of potential conflict with respect to proper attachment of gypsum wall board products when used as wall bracing.

1. Section R602.10.2, item 5, (2007 Supplement) identifies gypsum sheathing as a candidate for wall bracing providing it uses fasteners in accordance with Table R602.3(1) and attached with a nailing pattern of 7" on panel edges and 7" over intermediate framing. Table R602.3(1), entitled Fastener Schedule for *Structural* Members (emphasis ours), does have fastener recommendations for gypsum sheathing but it also has a recommended nail spacing that is different from the bracing nail spacing. This could cause a potential conflict because one of the true structural applications for gypsum sheathing is when it is used as bracing. This proposal adds a footnote to the fastener spacing columns that clarifies that when used for bracing the 7" and 7" nail spacing is appropriate. This nail spacing has been verified as the relevant nail spacing for gypsum sheathing when used as bracing by the Gypsum Association.

2. Section R602.10.2, item 5, (2007 Supplement) identifies gypsum board as a potential candidate for wall bracing providing it uses fasteners in accordance with Table R702.3.5 and attached with a nailing pattern of 7" on panel edges and 7" over intermediate framing. Table R702.3.5, entitled Minimum Thickness and Application of Gypsum Board, does have fastener recommendations for gypsum sheathing but it also has recommended nail spacing. In addition, it permits the use of screws for attachment of gypsum board. . This could cause a potential conflict with the recommendations in Section R602.10.2, Item 5. This proposal adds a footnote to the fastener spacing column for nails that clarifies that when used for bracing the 7" and 7" nail spacing is appropriate. A companion footnote is placed in the "SCREWS" column. This footnote states that screws shall not be used to attach gypsum board when it is being used as wall bracing. This nail spacing has been verified as the relevant nail spacing for gypsum sheathing when used as bracing by the Gypsum Association.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: The proposal excludes screws when gypsum board is used as bracing. The proponent should work with industry and bring this back.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Edward L. Keith, APA – The Engineered Wood Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R702.3.5
MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD

THICKNESS OF GYPSUM BOARD (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBER (inches o.c.)	MAXIMUM SPACING OF FASTENERS (INCHES)		SIZE OF NAILS FOR APPLICATION TO WOOD FRAMING
				Nails[a,f]	Screws[b,~~g~~]	

For SI: 1 inch = 25.4 mm.

a. through e. (No change)

f. When gypsum wall board is used as bracing, ~~nails~~ fasteners shall be installed at 7" along all panel edges and at 7" over intermediate supports as specified in Section R602.10.2, item 5.

~~g. When gypsum wall board is used as bracing, screws shall not be permitted for fastening.~~

(Portions of table and footnotes not shown remain unchanged)

(Portions of proposal not shown remain unchanged)

Commenter's Reason: RB-133 was recommended for approval as modified at the midyear meeting. RB-133 changes the nail spacing for **gypsum sheathing** to 7" on center at both perimeter and intermediate supports. This was done to minimize any potential conflicts between the nailing requirements of R602.10.2 for wall bracing and the conventional nailing requirements for gypsum sheathing in R602.3(1). This change accomplished one-half of what was originally proposed in RB-134.

The bracing requirements of R602.10.2 recognize two types of gypsum wall bracing. Section R602.10.2, item 5, references Table R602.3(1) for nails appropriate for **gypsum sheathing**. The change proposal in RB-133 makes the information in the referenced table clear and consistent with the bracing nail spacing requirements and we applaud the proponent and committee's actions on this proposal.

However, R602.10.3, item 5 also recognized **gypsum board** and sends the reader to Table R702.3.5 for the nail size. In a manner similar to the gypsum sheathing issue (which will be resolved by RB-133), Table R702.3.5 also gives spacings for the various fastener types. As an example it gives 4 different nail spacings for wall applications alone, and none of which are appropriate for bracing. Again, this is the same problem that prompted the action in RB-133.

All this proposal does is add a footnote to Table R702.3.5 that specifies the appropriate fastener spacing already required in R602.10.3 when gypsum products are used to satisfy the bracing portions of the code. Section R602.10.3, item 5, is provided below exactly as it reads in the 2006 IRC. (The emphasis is ours.)

> "5. Gypsum board with minimum 1/2-inch (13 mm) thickness placed on studs a maximum of 24 inches (178 mm) on center and fastened at 7 inches (178 mm) on center with the size nails specified in **Table R602.3(1) for sheathing** and **Table R702.3.5 for interior gypsum board**."

This spacing (7 inches on center) has been agreed upon by the Gypsum Association as the appropriate nail or screw spacing for both their sheathing and interior gypsum board products.

The original proposal added Footnote g that "reminds" the user that when gypsum board is used for bracing only **nails** are permitted in the bracing section of the code – R602.10.3 (see the above quote). We have been informed that the Gypsum Association that the 7" spacing has been agreed upon as the appropriate spacing for either nails or screws of the appropriate size. We ardently support such a move by the Gypsum Association and in anticipation of the results we have deleted the originally proposed Footnote g.

The purpose of this change is just to clarify the existing code language and minimize any potential misinterpretation of the code provisions.

Final Action: AS AM AMPC____ D

RB135-07/08
Table R602.3(1), Table R802.5.1(9)

Proposed Change as Submitted:

Proponent: Dennis Pitts, American Forest & Paper Association

Revise tables as follows:

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b, c,e]	SPACING OF FASTENERS	
		Edges (Inches)[i]	Intermediate supports[c,e] (inches)
~~Ceiling joist, laps over partitions, face nail~~	~~3 – 10d~~	----	
~~Ceiling joists to parallel rafters, face nail~~	~~3 – 10d~~	----	

(Portions of table and footnotes not shown remain unchanged)

Table R802.5.1(9)
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS [a, b, c, d, e, f, g, h]

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)											
		30 psf [g]				50 psf				70 psf			
		Roof span (feet)											
		12	20	28	36	12	20	28	36	12	20	28	36
		Required number of 16 d common nails [a, b] per heel joint splices [c, d, e, f]											

a. through f. (No change)
g. Applies to roof live load of 20 psf or less.
(Reletter subsequent footnote)

(Portions of table and footnotes not shown remain unchanged)

Reason: RB168-03/04, which was approved as modified, made substantial changes to the wording of R802.3.1 in an attempt to make the subjects of rafter-to-joist connections, rafter ties, and collar ties clearer. One of the requirements of that change was that rafter/ceiling joist heel connections and connections of ceiling joists where they lap over partitions should be in accordance with Table R802.5.1.9. In doing so, reference to the generic fastener table, Table R602.3(1), was deleted. However, even though the reference to Table R602.3(1) was deleted and new connection requirements were added to Table R802.5.1.9, the connection requirements in Table R602.3(1) were inadvertently left in the table. Their presence there causes confusion over the proper fastener schedule. This proposal corrects that problem.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Approved as Submitted**

Committee Reason: This change resolves a conflict between the fastening schedule table and the rafter/ceiling joist heel joint connection.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary J. Ehrlich, P.E., National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b,c,e]	Edges (Inches)[i]	Intermediate supports[c,e] (inches)
Ceiling joist not attached to parallel rafter, laps over partitions, face nail	3 – 10d	----	

(Portions of table and footnotes not shown remain unchanged)

Table R802.5.1(9)
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS [a, b, c, d, e, f, g, h]

RAFTERSLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20 psf [g]				30 psf [g]				50 psf				70 psf			
		Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
		Required number of 16d common nails [a, b] per heel joint splices [c, d, e, f]															
3:12	12	4	6	8	10	(remainder of table unchanged)											
	16	5	8	10	13												
	24	7	11	15	19												
4:12	12	3	5	6	8												
	16	4	6	8	10												
	24	5	8	12	15												
5:12	12	3	4	5	6												
	16	3	5	6	8												
	24	4	7	9	12												
7:12	12	3	4	4	5												
	16	3	4	5	6												
	24	3	5	7	9												
9:12	12	3	3	4	4												
	16	3	4	4	5												
	24	3	4	6	7												
12:12	12	3	3	3	3												
	16	3	3	4	4												
	24	3	4	4	5												

(Portions of table and footnotes not shown remain unchanged)

Commenter's Reason: This public comment proposes two revisions to AF&PA's proposal. The first revision retains the rows in Table R602.3(1) for face nailing of ceiling joists. There is no requirement for ceiling joists to be parallel to and/or attached to a roof rafter. The splice nailing in Table R802.5.1(9) is intended for ceiling joists that are attached to sloped rafters and which must transfer the thrust load from the end of the rafters. If the ceiling joist is not attached to a sloped rafter and is not transferring thrust loads, the additional nailing requirement imposed by Table R802.5.1(9) is not necessary and should not be mandated.

The second revision expands Table R802.5.1(9). The corresponding table in the WFCM contains a column for 20psf roof live load, which was omitted from the proposed table here. Many portions of the country have ground snow loads of 20psf or less. Those roofs should be able to be designed using the 20psf values. They should not be forced conservatively to use the requirements for a higher ground snow load. This change introduces the missing column.

NAHB asks for your support for approving this proposal as modified by this public comment.

Final Action: AS AM AMPC____ D

RB136-07/08
Table R602.3(1)

Proposed Change as Submitted:

Proponent: Daniel Jewitt, Acworth, GA, representing himself

Revise table as follows:

(All additions/deletions are indicated by strike-thru and underline. The remainder of the changes are for reorganization.)

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a,b,c]	SPACING OF FASTENERS
	ROOF	
Blocking between joists or rafters to top plate, toe nail	3-8d (2 ½" x 0.113")	--
Ceiling joists to plate, toe nail	3-8d (2 ½" x 0.113")	--
Ceiling joist, laps over partitions, face nail	3-10d (3" x 0.128")	--
Ceiling joist to parallel rafters, face nail	3-10d (3" x 0.128")	--
Collar tie to rafter, face nail, or 1-1/4" x 20 gage ridge strap	3-10d (3" x 0.128")	--
Rafter to plate, toe nail	2-16d (3 ½ "x 0.135")	--
Roof rafters to ridge, valley or hip rafters: toe nail face nail	 4-16d (3 ½" x 0.135") 3-16d (3 ½" x 0.135")	 -- --
~~Rafter ties to rafters, face nail~~	~~3-8d (21/2" × 0.113")~~	~~—~~
	WALL	
Built-up corner studs	10-d (3" x 0.128")	24" o.c.
Built-up header, two pieces with 1/2" spacer	16d (3 ½" x 0.135")	16" o.c along each edge
Continued header, two pieces	16d (3 ½" x 0.135")	16" o.c along each edge
Continuous header to stud, toe nail	4-8d (2 ½" x 0.113")	--
Double studs, face nail	10d (3" x 0.128")	24" o.c.
Double top plates, face nail	10d (3" x 0.128")	24" o.c
Double top plates, minimum 48-inch offset of end joints, face nail in lapped area	8-16d (3 ½" x 0.135")	--
Sole plate to joist or blocking, face nail	16d (3 ½" x 0.135")	16" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d (3 ½" x 0.135")	16" o.c.
Stud to sole plate, toe nail	3-8d (2 ½" x 0.113") or 2-16d (3 ½" x 0.135")	--
Top or sole plate to stud, end nail	2-16d (3 ½" x 0.135")	--
Top plates, laps at corners and intersections, face nail	2-10d (3" x 0.128")	--
1" brace to each stud and plate, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	-- --
1" x 6" sheathing to each bearing, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	-- --
1" x 8" sheathing to each bearing, face nail	2-8d (2 ½" x 0.113") 3 staples 1-3/4"	-- --
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d (2 ½" x 0.113") 4 staples 1-3/4"	-- --
	FLOOR	
Built-up girders and beams, 2-inch lumber layers	10-d (3" x 0.128"	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
Joist to sill or girder, toe nail	3-8d (2 ½" x 0.113")	--
1" x 6" subfloor or less to each joist, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	—
2" subfloor to joist or girder, blind and face nail	2-16d (2 ½" x 0.135")	--
Rim joist to top plate, toe nail (Roof applications also)	8d (2 ½" x 0.113")	6" o.c.
2" planks (Plank & Beam – Floor & Roof)	2-16d (2 ½ "x 0.135")	At each bearing

(Portions of table and footnotes not shown remain unchanged)

Reason: This table has been reformatted to allow ease of use. The items have been organized in the appropriate categories of "Roof", "Wall", and "Floor" which should make using the table less of a treasure hunt. The present condition of the table is not orderly and tends to contribute to confusion or difficulty of use.

Also, the item **"Rafter ties to rafters face nail"** has been removed to conform to the change to R802.3.1 in the 2006 edition which now requires rafter ties to be nailed in accordance to Table R802.5.1(9).

No other change requiring "technical information or substantiation" has been made.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Approved as Submitted**

Committee Reason: This change improves the table and makes the fastener schedule easier to use.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Ehrlich, P.E., National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENERa,b,c	SPACING OF FASTENERS
ROOF		
Blocking between joists or rafters to top plate, toe nail	3-8d (2 ½" x 0.113")	--
Ceiling joists to plate or girder/beam, toe nail	3-8d (2 ½" x 0.113")	--
Ceiling joist, laps over partitions, face nail	3-10d (3" x 0.128")	--
Ceiling joist to parallel rafters, face nail	3-10d (3" x 0.128")	--
Collar tie to rafter, face nail, or 1-1/4" x 20 gage ridge strap	3-10d (3" x 0.128")	--
Rafter to plate or girder/beam, toe nail	2-16d (3 ½ "x 0.135")	--
Roof rafters to ridge, valley or hip rafters: toe nail face nail	 4-16d (3 ½" x 0.135") 3-16d (3 ½" x 0.135")	 -- --
WALL		
Built-up corner studs	10-d (3" x 0.128")	24" o.c.
Built-up header, two pieces with 1/2" spacer	16d (3 ½" x 0.135")	16" o.c along each edge
Continued header, two pieces	16d (3 ½" x 0.135")	16" o.c along each edge
Continuous header to stud, toe nail	4-8d (2 ½" x 0.113")	--
Double studs, face nail	10d (3" x 0.128")	24" o.c.
Double top plates, face nail	10d (3" x 0.128")	24" o.c
Double top plates, minimum 24 ~~48~~ inch offset of end joints, face nail in lapped area	8-16d (3 ½" x 0.135")	--
Sole plate to joist or blocking, face nail	16d (3 ½" x 0.135")	16" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d (3 ½" x 0.135")	16" o.c.
Stud to sole plate, toe nail	3-8d (2 ½" x 0.113") or 2-16d (3 ½" x 0.135")	--
Top or sole plate to stud, end nail	2-16d (3 ½" x 0.135")	--
Top plates, laps at corners and intersections, face nail	2-10d (3" x 0.128")	--
1" brace to each stud and plate, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	-- --
1" x 6" sheathing to each bearing, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	-- --
1" x 8" sheathing to each bearing, face nail	2-8d (2 ½" x 0.113") 3 staples 1-3/4"	-- --
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d (2 ½" x 0.113") 4 staples 1-3/4"	-- --
FLOOR		
~~Built-up girders and beams, 2-inch lumber layers~~	~~10d (3" x 0.128")~~	~~Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.~~
Joist to sill or girder, toe nail	3-8d (2 ½" x 0.113")	--
1" x 6" subfloor or less to each joist, face nail	2-8d (2 ½" x 0.113") 2 staples 1-3/4"	-- --
2" subfloor to joist or girder, blind and face nail	2-16d (2 ½" x 0.135")	--
Rim joist to top plate, toe nail (Roof applications also)	8d (2 ½" x 0.113")	6" o.c.
2" planks (Plank & Beam – Floor & Roof)	2-16d (2 ½ "x 0.135")	At each bearing
BEAMS AND GIRDERS		
Built-up girders and beams, 2-inch lumber layers	10d (3" x 0.128")	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
Ledger strip supporting joists or rafters	3-16d (2 ½" x 0.135")	At each joist or rafter

Commenter's Reason: We support the proponent's reorganization of the fastener schedule. However, in reviewing the proposal we found several minor editorial changes are required. We opted to save these for a public comment rather than further prolong an already late-running day of the IRC-B/E hearings. These changes clarify where items in the existing schedule apply to both roof and floor applications. One fix in the double top plates fixes an inadvertent technical change in the offset distance. A separate section for built-up beams and girders, and ledger strips supporting joists (see R502.6.2), is added, as beams and girders can be used in floor, ceiling, and roof applications. NAHB asks for your support in approving this proposal as modified by this public comment.

Final Action: AS AM AMPC____ D

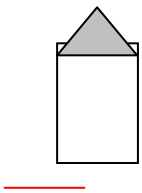
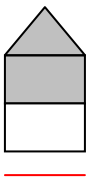
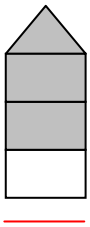
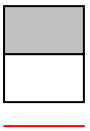
RB139-07/08
Table R602.3(5)

Proposed Change as Submitted:

Proponent: Charles S. Bajnai, Chesterfield County, VA, representing Virginia Building and Code Officials Association (VBCOA)

Revise table as follows:

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS[a]

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height [a] (feet)	Maximum spacing when supporting roof and ceiling assemblies or a loft assembly [c], only (inches)	Maximum spacing when supporting one floor, roof and ceiling assemblies or a loft assembly [c], (inches)	Maximum spacing when supporting two floors, roof and ceiling assemblies or a loft assembly [c], (inches)	Maximum spacing when supporting one floor only (inches)	Laterally unsupported stud height [a] (feet)	Maximum spacing (inches)
							
2× 3[b]	—	—	—	—	—	10	16
2 × 4	10	24	16	—	24	14	24
3 × 4	10	24	24	16	24	14	24
2 × 5	10	24	24	—	24	16	24
2 × 6	10	24	24	16	24	20	24

For SI: 1 inch = 25.4 mm.

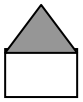
a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.
b. Shall not be used in exterior walls.
c. LOFT. A finished or unfinished area, not considered a story, with an occupiable space complying with all of the following requirements:
   a. The occupiable floor area is at least 70 sq ft, measured between areas that are at least 5 feet tall,
   b. The occupiable area has headroom of at least 7' clearance for at least 50% of the occupiable floor area,
   c. The occupiable floor area does not exceed 70% of the total width of the structure,

d. The occupiable area is designed to carry a minimum of 30 psf live load,
e. The space has no exterior walls, and is enclosed by the knee walls (if applicable) on the sides, and the roof assembly (above) and the floor-ceiling assembly (below),

A loft assembly shall include loads from the roof rafters and ceiling joist assemblies or trusses extended to the perimeter of the structure.

Reason: This change is intended to clarify the intention Table R603(5).

I have tried teaching this chapter of the IRC and have not been able to answer questions regarding the intentions or limitations of this table. Accepted construction practice says that there is not a problem, but the table is too exclusive to be practical. This change it intended to provide prescriptive clarification of the Stud Table.



Column 3: "**Maximum spacing when supporting roof and ceiling assemblies or a loft assembly only"**

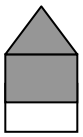
In general the Stud Table R602.3(5) is tacit about how it handles attics, walk-up attics, room trusses, or the infamous attic-finished-off-to-create-another-floor situation, sometimes called a "half story" or "finished attics" (an oxy-moron) or even "residential mezzanines".

The Table offers more questions than answers:

1. Should it be assumed that the Stud Table has taken into account attics, or "finished attics"?
2. Should it be assumed that the Stud Table has taken into account truss roof systems?

Solution:

1. "Roof and ceiling *assemblies*" and "loft *assembly*" provide a more inclusive language as to what the stud table is intended to carry. It would include truss roof systems that are otherwise not clearly allowed.
2. By introducing the new term "loft assembly" into the category heading and defining "loft" in the footnote, we can solve several situations simultaneously. A "loft assembly" along with the footnote definition of "loft" describes the habitable (or potentially habitable) space above the top floor ceiling – without all of the implications of creating another story. It has the physical properties and design load allowances of "habitable" space, but makes the issue of being finished off now or in the future a moot point.
3. Regardless if the studs are supporting a "roof and ceiling assembly" or a "loft assembly" the typical 2x4 studs at 16" o.c. would agree with common accepted practice.
4. The little icon of the one story house is added to help describe the situation.



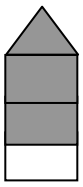
Column 4: "**Maximum spacing when supporting one floor, roof and ceiling assemblies or a loft assembly"**

Under the current IRC, if the two-story house has a "finished attic" it should be treated as a three-story house. That puts the homeowner in a precarious position when he wants to finish off the attic of his two-story house. The plan reviewer would have to treat the finished space as another floor, and the Stud Table would require the homeowner to replace all of the 2x4 first floor studs with 2x6 studs (i.e. going from Column 4 in the Table (supporting one floor plus roof/ceiling) to Column 5 (supporting two floors plus roof/ceiling in the table)).

Similarly, if the two-story house has a roof system constructed with "room trusses" (see attached picture), the truss system then would have to be considered another floor or story with the same issues.

Solution:

1. "Roof and ceiling assemblies" and "loft assembly" provide a more inclusive language of what the stud table was intended to carry. It would include truss roof systems that are otherwise not clearly allowed.
2. Again, by introducing the new term "loft assembly" into the category heading and defining "loft" in the footnote, we can solve several situations simultaneously. By the footnote definition, "loft" would not be considered another story, and therefore would not put extra design requirements on the structure. The first floor studs supporting the second floor and a "loft assembly" could be the typical 2x4 studs at 16" o.c., and would agree with common accepted practice; there is empirical precedence from thousands of homes with two floors, "roof and ceiling assemblies" or "loft assemblies" that prove that these structures do not fail.



Column 5: **"Maximum spacing when supporting two floors, roof and ceiling assemblies or a loft assembly",**

We also have hundreds of houses with a walkout basement, two stories and "finished attic". This creates several other issues: If the basement is a "story above grade", the house is really have a four-story structure. The Table R602.3(5) does not prescribe stud sizes and spacing for four story houses. It is outside the IRC code, and has to be engineered per the IBC.

Solution:

Again the new term "loft" is beneficial. If implemented:

1. The basement would not have to be a story below grade, and hence facilitate walk-out basements easier, AND
2. Table R602.3(5), Column 4 would prescribe 2x4 studs @ 16" o.c. for the first floor walls, consistent with the way contractors are building today, AND
3. Table R602.3(5), Column 5 would prescribe 2x6 studs @16" o.c. for the basement floor walls, consistent with the way contractors are building today.

IMPORTANT NOTE1:

We have run the calculations for wall studs carrying one floor, one exterior wall, and a two-point bearing room truss, and found that 2x4 studs @16" o.c. works for spans up to 32 feet with conventional shingles.
Because the calculations show the 32 feet width (with 5 foot knee walls each side) is about the limit for the studs of a two-story house with trusses, we have the limit of "70% of the total width of the structure" requirement. (i.e. the occupiable space utilizes about 22/32 or 70% of the total width of the structure.).
~~Wall studs supporting one floor, one exterior wall, and a two-point bearing room truss with longer spans should go the Table column for studs supporting two floors and a loft and use 2x6 @16" o.c..~~

IMPORTANT NOTE 2:

If the proposed definition of "loft" is accepted by separate submittal, footnote c is not required, and footnote c can be renumbered.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: Based on the committee's previous action on RB17-07/08, there is no definition of loft.

Assembly Action: **None**

Individual Consideration Agenda

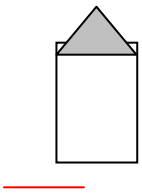
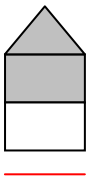
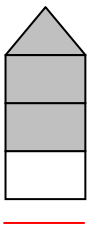
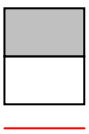
This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Chuck Bajnai, Chesterfield County, VA, representing Virginia Building and Code Officials Association (VBCOA), requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS[a]

	BEARING WALLS				NONBEARING WALLS		
STUD SIZE (inches)	Laterally unsupported stud height [a] (feet)	Maximum spacing when supporting ~~roof and ceiling assemblies or a loft assembly [e],~~ A roof-ceiling assembly or a habitable attic[c] Assembly, only (inches)	Maximum spacing when supporting one floor, ~~roof and ceiling assemblies or a loft assembly [e],~~ Plus a roof-ceiling assembly or a habitable attic[c] Assembly, (inches)	Maximum spacing when supporting two floors, ~~roof and ceiling assemblies or a loft assembly [e],~~ Plus a roof-ceiling assembly or a habitable attic[c] Assembly, (inches)	Maximum spacing when supporting one floor only (inches)	Laterally unsupported stud height [a] (feet)	Maximum spacing (inches)
							
2× 3[b]	—	—	—	—	—	10	16
2 × 4	10	24 [d]	16 [d]	—	24	14	24
3 × 4	10	24	24	16	24	14	24
2 × 5	10	24	24	—	24	16	24
2 × 6	10	24	24	16	24	20	24

For SI: 1 inch = 25.4 mm.

a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.
b. Shall not be used in exterior walls.
~~c. LOFT. A finished or unfinished area, not considered a story, with an occupiable space complying with all of the following requirements:~~

~~a. The occupiable floor area is at least 70 sq ft, measured between areas that are at least 5 feet tall,~~
~~b. The occupiable area has headroom of at least 7' clearance for at least 50% of the occupiable floor area,~~
~~c. The occupiable floor area does not exceed 70% of the total width of the structure,~~
~~d. The occupiable area is designed to carry a minimum of 30 psf live load,~~
~~e. The space has no exterior walls, and is enclosed by the knee walls (if applicable) on the sides, and the roof assembly (above) and the floor ceiling assembly (below),~~

~~A loft assembly shall include loads from the roof rafters and ceiling joist assemblies or trusses extended to the perimeter of the structure.~~

c. **ATTIC, HABITABLE**. A finished or unfinished area, not considered a story, complying with all of the following requirements:

1. The occupiable floor area is at least 70 sq ft in accordance with Section R304.
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.

d. A habitable attic assembly supported by 2x4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall to be increased to 2x6 or the studs shall be designed in accordance with accepted engineering practice.

Commenter's Reason: To reiterate part of the reason statement from RB139, I have tried teaching this chapter of the IRC and have not been able to answer questions regarding the intentions or limitations of this table. Accepted construction practice says that there is not a problem, but the table is too vague to be practical. This change it intended to provide prescriptive clarification of the intent of the Stud Size Table.

1. The existing words "roof and ceiling" do not acknowledge if it was intended to accommodate the live load for a (potentially) habitable room in the truss or rafter space. This change tries to say that the stud walls can carry the anticipated live load from a room in the truss or rafter space up to 32 feet wide span.
2. In the absence of a better term to describe a "finished attic" (an oxymoron by definition), the term "habitable attic" tries to create a differentiation between (potentially) finished space and unfinished space.
3. The icons were added for clarity.
4. I have taken two of the requirements out of the old definition in RB139 because it previously implied that these other requirements were prerequisites for the definition to apply, and if one of them was not done, then the space would not be considered "habitable attic". The definition is intended to only locate the space and provide its physical size limitations. If the space does not meet the three physical requirements, then it will remain and *attic*.
5. The 70% limit in original RB139 is changed in this public comment to a 32' span limit which defines how much roof and habitable attic load the wall can support. This limit was corroborated by AF&PA.

Final Action: AS AM AMPC____ D

RB141-07/08
R602.8, M1501.2 (New)

Proposed Change as Submitted:

Proponent: Julius Ballanco, PE, JB Engineering and Code Consulting, representing In-O-Vate Technologies

1. Revise as follows:

R602.8 (Supp) Fireblocking required. Fireblocking shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space. Fireblocking shall be provided in wood-frame construction in the following locations.

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs; as follows:
   1.1. Vertically at the ceiling and floor levels.
   1.2. Horizontally at intervals not exceeding 10 feet(3048 mm).
2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R311.2.2.
4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E 136 requirements.
5. For the fireblocking of chimneys and fireplaces, see SectionR1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.
7. At openings around dryer exhaust duct at the dryer location in accordance with Section M1501.2.

2. Add new text as follows:

M1501.2 Dryer exhaust duct penetrations. Where a clothes dryer exhaust duct is located within a framed wall, the penetration of the wall membrane at the location of the dryer shall have the annular space sealed with noncombustible material, approved fire caulking, or a noncombustible dryer exhaust duct wall receptacle. Clothes dryer exhaust duct penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R317.3.

Reason: I submitted a similar change last cycle, however, there was confusion as to what penetration needed to be protected as specified. I have clarified the code text to emphasis that the penetration is located at the dryer, or typically behind the dryer. This is where the higher incident of fire occurs.

The difference between a dyer exhaust duct penetration and other penetration is that it is in close proximity to a fuel fired appliance or electric heating appliance. Dryers are more prone to fire than other appliances. To protect the structure, it is important to have a higher level of protection.

A similar change was adopted in the International Mechanical Code. This change will result in consistency between the two codes.

The CPSC identified 15,600 fires associated with dryers in a single year. Studies have shown that metal ducts protect the structure from the spread of fire. Additionally, noncombustible material or fire caulk around the annular space prevents the fire from spreading into the wall or ceiling cavity. The same can be accomplished with manufactured noncombustible receptacles. The noncombustible receptacles also allow for the proper storage and recoil of the transition flexible duct to a metal duct.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Disapproved**

Committee Reason: This is not needed unless there is an issue with the dryer or a blockage in the dryer duct. This would be a maintenance issue for the home owner. Also, the committee believes it is adequately addressed in Section R602.8, Item 4.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Julius Ballanco, P.E., CPD, JB Engineering and Code Consulting, P.C., representing In-O-Vate Technologies, requests Approval as Submitted.

Commenter's Reason: The Committee was of the opinion that Item 4 addresses this issue. However, Item 4 does not include dryer exhaust ducts. In addition, a dryer exhaust duct is located near a fuel burning appliance or an electrical appliance that has a history of starting on fire. As such, it is important for the opening to be properly protected with a metal collar, fire caulking, or a noncombustible box.

This is currently required in the IMC. This change would make the IRC consistent with the IMC requirements.

Final Action: AS AM AMPC____ D

RB143-07/08
R602.10

Proposed Change as Submitted:

Proponent: Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Committee on Wall Bracing

1. Revise as follows:

R602.10.1 (Supp) Braced wall lines. Braced wall lines, both interior and exterior, shall be provided in accordance with this section. ~~with braced wall panels in the percentage and location specified in this section.~~

R602.10.1.1 (Supp) Braced wall panels. Braced wall panels shall be constructed in accordance with ~~one of the bracing methods~~ the intermittent bracing methods specified in Section R602.10.2 ~~the alternate braced wall method of Section R602.10.3.2~~, or the continuous structural panel sheathing method ~~of~~ specified in Section R602.10.4. Mixing of ~~B~~bracing method shall be permitted ~~to vary~~ as follows:

1. ~~Variation in~~ Mixing bracing methods from story to story is permitted.

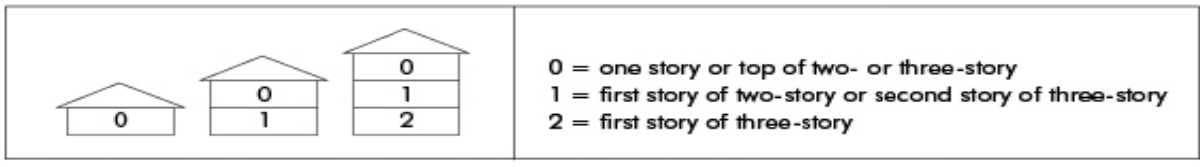
2. ~~Variation in~~ Mixing bracing methods from braced wall line to braced wall line within a story is permitted, except that continuous structural panel sheathing shall conform to the additional requirements of Section R602.10.4.
3. Mixing bracing methods within a braced wall line is only permitted ~~i~~in Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C, ~~variation in bracing method within a braced wall line is permitted.~~ The required sheathing percentage for the braced wall line with mixed sheathing types shall have the higher bracing percentage, in accordance with Table R602.10.1.2(1), of all types of bracing used. ~~Wall lines using continuous wood structural panel sheathing shall conform to the additional requirements of Section R602.10.4.~~

R602.10.1.2~~1~~ Percentage of bracing. The percentage of bracing along each braced wall line shall be in accordance with Table R602.10.1.2(1) and shall be the greater of that required by the Seismic Design Category or the design wind speed. Adjustments to the percent of braced wall specified in Table R602.10.1.2(1) shall be as specified in Table R602.10.1.2(2)

TABLE R602.10.1.2(1)[a,b,c] (Supp)
WALL BRACING SEISMIC DESIGN CATEGORY (SDC) OR WIND SPEED STORIES ABOVE BRACED WALL LINE[d] METHOD OF BRACING PERMITTED PER TABLE R602.10.2 PERCENTAGE OF FULL-HEIGHT BRACING PER WALL LINE MAXIMUM SPACING BETWEEN BRACED WALL LINES (FT)

SEISMIC DESIGN CATEGORY (SDC) OR WIND SPEED	STORIES ABOVE BRACED WALL LINE[d]	METHOD OF BRACING PERMITTED PER TABLE R602.10.2	PERCENTAGE OF FULL-HEIGHT BRACING PER WALL LINE		MAXIMUM SPACING BETWEEN BRACED WALL LINES (FT)
			For Method WSP Bracing	For other methods permitted[e]	
SDC A and B (S_s 0.35g and S_{ds} 0.33g), and . <= 100 mph	0	Methods ~~1~~ ~~8~~ LIB, DWB, WSP, SFB, GB, PBS, PCP, HPS	16%	16%	35 (See Section R602.10.1.4 for exceptions)
	1	Methods ~~1~~ ~~8~~ LIB, DWB, WSP, SFB, GB, PBS, PCP, HPS	16%	25%	
	2	Methods ~~2~~ ~~8~~ DWB, WSP, SFB, GB, PBS, PCP, HPS	25%	35%	
SDC C (S_s 0.6g and S_{ds} 0.53g), and . <= 110 mph	0	Methods LIB, DWB, WSP, SFB, GB, PBS, PCP, HPS~~1 8~~	16%	25%	
	1	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	30%	45%	
	2	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	45%	60%	
SDC D_0 & D_1 (S_s 1.25g and S_{ds} 0.83g), and . <= 110 mph	0	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	20%	30%	25 (See Section R602.10.1.4.1 for exceptions)
	1	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	45%	60%	
	2	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	60%	85%	
SDC D_2, and . <= 110 mph	0	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	25%	40%	
	1	Methods DWB, WSP, SFB, GB, PBS, PCP, HPS~~2 8~~	55%	75%	
	Cripple wall	Method ~~3~~WSP	75%	Not Permitted	

a. Wall bracing percentages are based on a soil site class "D." Interpolation of bracing percentage 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 1613.5 of the *International Building Code*.
b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.8.
c. Methods of bracing shall be as described in Section R602.10.2. ~~The alternate braced wall panels described in Section R602.10.3.2 shall also be permitted~~.
d. Stories above braced wall line. 0 = one story or top of two or three story. 1 = first story of two story or second story of three story. 2 = first story of three story.



e. Method ~~1~~ LIB ~~bracing~~ is exempt from the percentage bracing requirement.

TABLE R602.10.1.2(2) (Supp)
ADJUSTMENT FACTORS TO THE PERCENTAGE OF REQUIRED WALL BRACING [a]

ADJUSTMENT BASED ON:			MULTIPLY PERCENTAGE OF BRACING PER WALL LINE BY:	APPLIES TO:
Story height[b] (Section 301.3)		≤10 ft	1.0	All bracing methods - R602.10.2
		>10 ≤ 12 ft	1.2	
Braced wall line spacing in SDC A-C[b,d]		≤35 ft	1.0	
		> 35 ≤ 50 ft	1.43	
Wall dead load[e]		> 8 ≤ 15	1.0	
		<8 psf	0.85	
Roof/ceiling dead load for wall supporting [b,c]:	roof only or roof plus one story	<15 psf	1.0	
	roof only	> 15 psf ≤ 25 psf	1.1	
	roof plus one story	> 15 psf ≤ 25 psf	1.2	
Walls with stone or masonry veneer in SDC C-D_2		See Section R703.7, Exception 1-4		
Cripple walls		See Section R602.10.8		

a. The total percentage of bracing required for a given wall line is the product of all applicable adjustment factors.
b. Linear interpolation shall be permitted.
c. Bracing required for a site's wind speed shall not be adjusted for dead load.
d. Braced wall line spacing in excess of 35-ft shall be in accordance with R602.10.1.5.
e. The adjusted percentage of bracing shall not be less than that required for the site's wind speed.

R602.10.1.~~2~~3 (Supp) Angled corners. At corners, braced wall lines shall be permitted to angle out of plane up to 45 degrees with a maximum diagonal length of 8 feet (2438 mm). When determining the percentage of bracing, the length of each braced wall line shall be determined as shown in Figure R602.10.1.3. The placement of bracing for the braced wall lines shall begin at the point where the braced wall line, which contains the angled wall adjoins the adjacent braced wall line (Point A as shown in Figure R602.10.1.3). Where an angled corner is constructed at an angle equal to 45 degrees and the diagonal length is no more than 8 feet (2438 mm) in length, the angled wall may be considered as part of either of the adjoining braced wall lines, but not both. Where the diagonal length is greater than 8 feet (2438 mm), it shall be considered its own braced wall line and be braced in accordance with Section R602.10.1 and methods in Section R602.10.2.

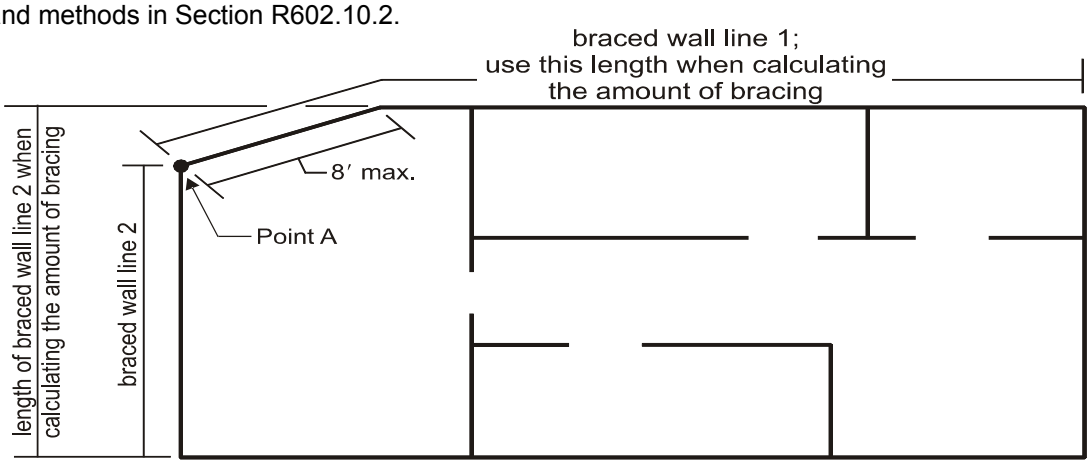


FIGURE R602.10.1.~~3~~2 (Supp)
ANGLED CORNERS

R602.10.1.~~4~~3 (Supp) Braced wall panel location. Braced wall panels shall be located in accordance with Table R602.10.1.2(1) and Figure R602.10.1.~~4~~3(1). Braced wall panels shall be located at least every 25 feet on center and shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line in accordance with Figure R602.10.1.~~4~~3(2). Braced wall panels may be offset out-of-plane up to 4 feet (1219 mm) provided that the total out-to-out offset in any-braced wall line is not more than 8 feet (2438 mm) in accordance with Figure R602.10.1.3(3).

R602.10.1.~~4~~3.1 (Supp) Braced wall panel location in Seismic Design Categories D_0, D_1 and D_2. Exterior braced wall lines shall have a braced wall panel located at each end of the braced wall line.

Exception: For braced wall panel construction Method WSP~~3~~ of Section R602.10.2, the braced wall panel shall be permitted to begin no more than 8 feet (2438 mm) from each end of the braced wall line provided one of the following is satisfied in accordance with Figure R602.10.1.~~4~~3.1:

1. A minimum 24-inch-wide (610 mm) panel is applied to each side of the building corner and the two 24-inch-wide (610 mm) panels at the corner shall be attached to framing in accordance with Figure R602.10.4.3(1), or
2. The end of each braced wall panel closest to the corner shall have a tie-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. The tie-down device shall be capable of providing an uplift allowable design value of at least 1,800 pounds (8 kN). The tie-down device shall be installed in accordance with the manufacturer's recommendations.

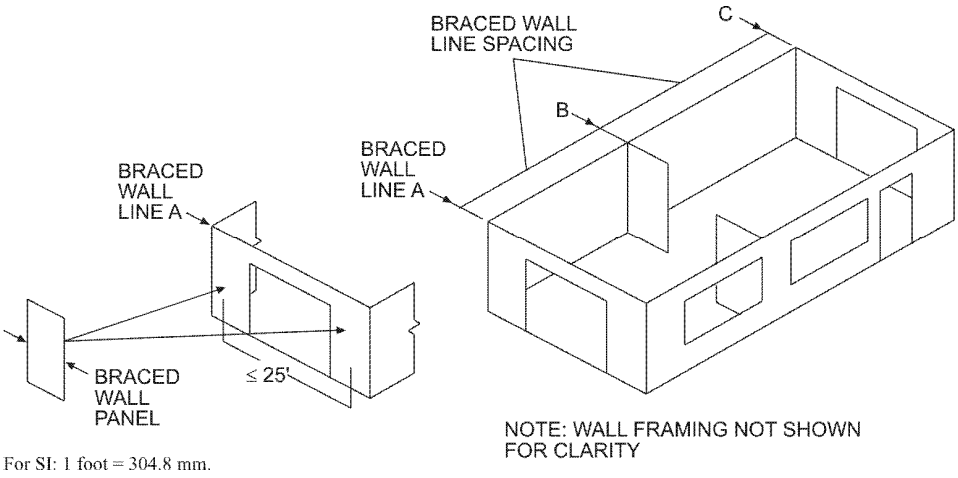


FIGURE R602.10.1.~~3~~4(1) (Supp)
BRACED WALL PANELS AND BRACED WALL LINES

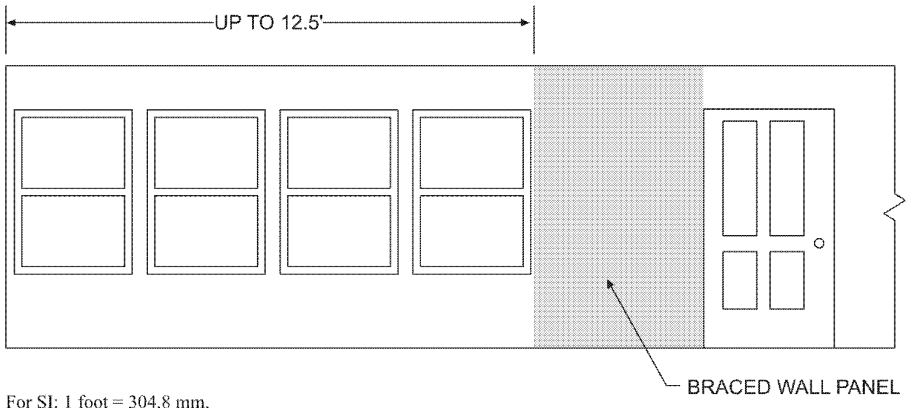


FIGURE R602.10.1.~~3~~4(2) (Supp)
PERMITTED BRACED WALL PANEL DISTANCES FROM ENDS OF A BRACED WALL LINE (SDC A, B and C)

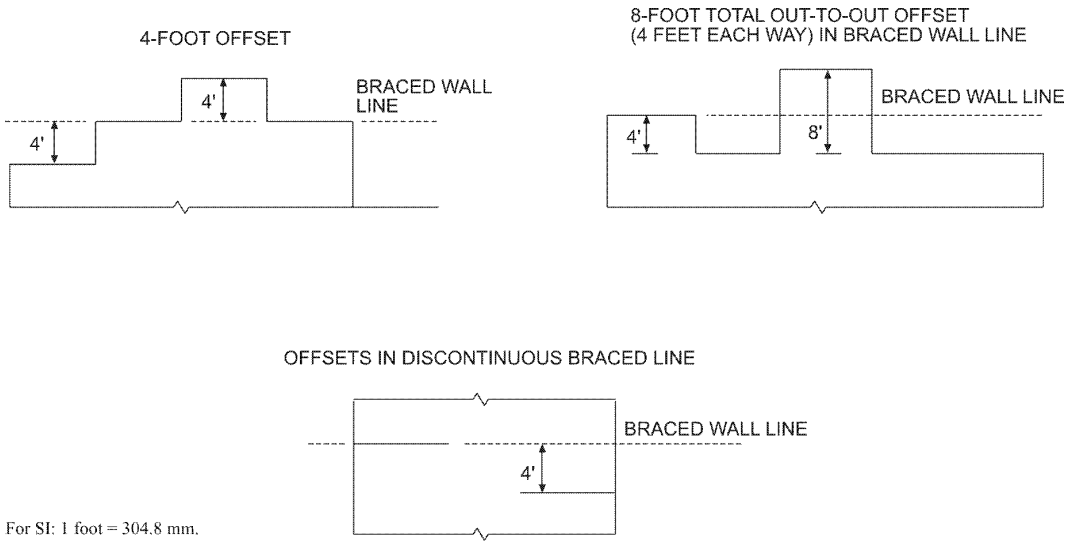


FIGURE R602.10.1.~~43~~(3) (Supp)
OFFSETS PERMITTED FOR BRACED WALL LINES

2. Delete and substitute as follows:

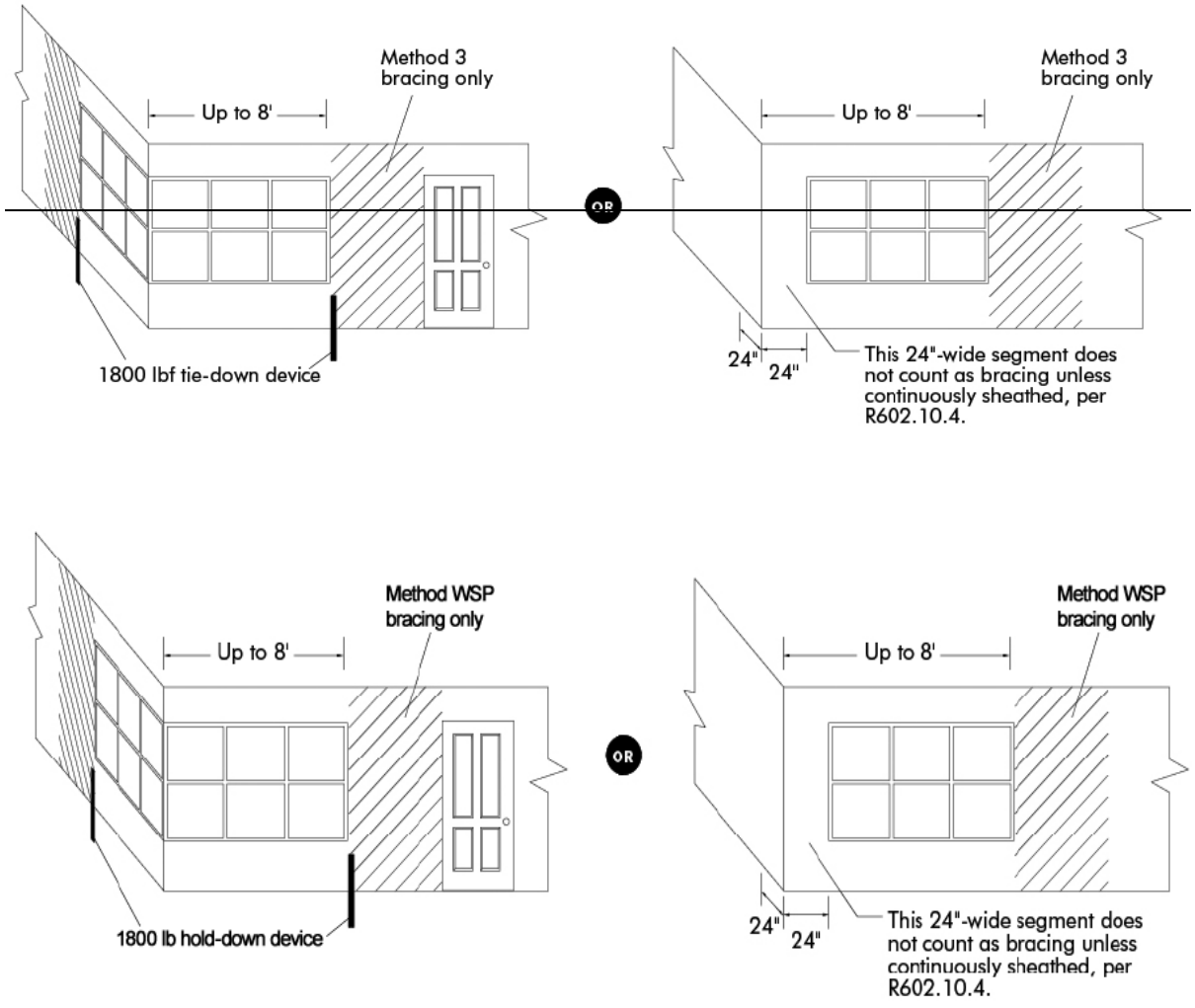


FIGURE R602.10.1.~~34~~.1 (Supp)
BRACED WALL PANELS AT BRACED WALL-LINE ENDS IN SEISMIC DESIGN CATEGORIES D_0, D_1 AND D_2

3. Revise as follows:

R602.10.1.54 (Supp) Braced wall line spacing. Spacing of braced wall lines shall not exceed 35 feet (10 668 mm) on center in both the longitudinal and transverse direction in each story.

Exception: Spacing of braced wall lines not exceeding 50 feet (15 240 mm) shall be permitted where:

1. The wall bracing provided equals or exceeds the percentage of bracing required by Table R602.10.1.2(1) multiplied by a factor equal to the braced wall line spacing divided by 35 feet (10 668 mm), and
2. The length-to-width ratio for the floor/roof diaphragm as measured between braced wall lines does not exceed 3:1.

R602.10.1.54.1 (Supp) Braced wall line spacing for Seismic Design Categories D_0, D_1 and D_2. Spacing between braced wall lines in each story shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

Exception: In one-and two-story buildings, spacing between two adjacent braced wall lines shall not exceed 35 feet (10 668 mm) on center in order to accommodate one single room not exceeding 900 square feet (84 m^2) in each dwelling unit. Spacing between all other braced wall lines shall not exceed 25 feet (7 620 mm). A spacing of 35 feet (10 668 mm) or less shall be permitted between braced wall lines where the length of wall bracing required by Table R602.10.1.2(1) is multiplied by the appropriate adjustment factor from Table R602.10.1.54.1, the length-to-width ratio for the floor/roof diaphragm does not exceed 3:1, and the top plate lap splice face nailing shall be twelve 16d nails on each side of the splice.

TABLE R602.10.1.54.1 (Supp)
ADJUSTMENTS OF BRACING PERCENTAGE FOR BRACED WALL LINES GREATER THAN 25 FEET [a,b]

BRACED WALL LINE SPACING (feet)	MULTIPLY BRACING PERCENTAGE IN TABLE R602.10.1(1) BY:
25	1.0
30	1.2
35	1.4

For SI: 1 foot = 304.8 mm

Notes:

a. Linear interpolation is permissible.
b. For an interior braced wall, the adjustment for the larger spacing between braced wall lines shall be used.

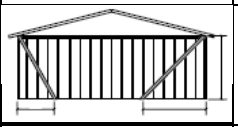
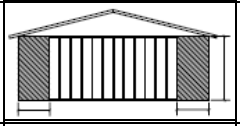
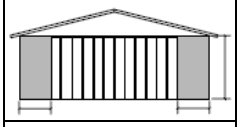
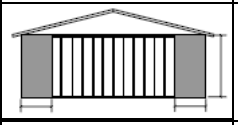
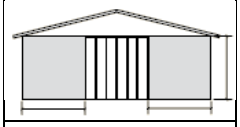
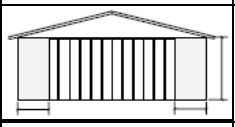
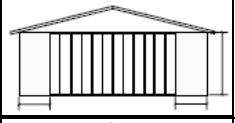
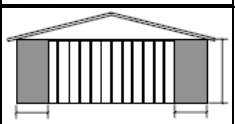
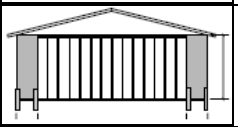
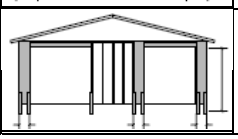
R602.10.2 (Supp) Intermittent braced wall panel construction methods. The construction of intermittent braced wall panels shall be in accordance with one of the ~~following~~ methods listed in Table R602.10.2.~~:~~

~~1. Nominal 1-inch-by-4-inch (19.1 mm by 88.9 mm) continuous diagonal braces let in to the top and bottom plates and the intervening studs or approved metal strap devices installed in accordance with the manufacturer's specifications. The let-in bracing shall be placed at an angle not more than 60 degrees (1.06 rad) or less than 45 degrees (0.79 rad) from the horizontal.~~
~~2. Wood boards of 5/8-inch (15.9 mm) net minimum thickness applied diagonally on studs spaced a maximum of 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).~~
~~3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing. Wood Structural panels shall be installed in accordance with Table R602.3(3) and Table R602.3(1).~~
~~4. One-half-inch (12.7 mm) or 25/32-inch (19.8 mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).~~
~~5. Gypsum board with minimum ½-inch (12.7 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at panel edges including top and bottom plates at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.~~
~~6. Particleboard wall sheathing panels installed in accordance with Table R602.3(4) and Table R602.3(1).~~
~~7. Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.~~
~~8. Hardboard panel siding when installed in accordance with Table R703.4.~~

~~**Exception:** Alternate braced wall panels constructed in accordance with Sections R602.10.3.2.1 or R602.10.3.2.2 shall be permitted to replace any braced wall panel in any of the above methods of braced wall panels.~~

4. Add new table as follows:

TABLE R602.10.2
INTERMITTENT BRACING METHODS

METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
LIB	Let-in-bracing	1x4 wood or approved metal straps at 45° to 60° angles		wood: 2-8d nails per stud metal: per manufacturer
DWB	Diagonal wood boards at 24" spacing	$^5/_8$"		2-8d (2½" x 0.113") nails or 2 staples, 1¾" per stud
WSP	Wood structural panel	$^3/_8$"		6d common (2"x0.113") nails at 6" spacing (panel edges) and at 12" spacing (intermediate supports) or 16 ga. x 1-$^3/_4$ staples: at 3" spacing (panel edges) and 6" spacing (intermediate supports)
SFB	Structural fiberboard sheathing	$^1/_2$" or $^{25}/_{32}$" for 16" stud spacing only		1½" galvanized roofing nails or 8d common (2½"x0.131) nails at 3" spacing (panel edges) at 6" spacing (intermediate supports)
GB	Gypsum board	$^1/_2$"		Nails at 7" spacing at panel edges including top and bottom plates; for exterior sheathing nail size, see Table R602.3(1); for interior gypsum board nail size, see Table R702.3.5
PBS	Particleboard sheathing	$^3/_8$" or $^1/_2$" for 16" stud spacing only		1½" galvanized roofing nails or 8d common (2½"x0.131) nails at 3" spacing (panel edges) at 6" spacing (intermediate supports)
PCP	Portland cement plaster	See Section R703.6		$1^1/_2$", 11 gage, $^7/_{16}$" head nails at 16" spacing or $^7/_{16}$", 16 gage staples at 6" spacing
HPS	Hardboard panel siding	$^7/_{16}$"		0.092" dia., 0.225" head nails with length to accommodate 1½" penetration into studs at 4" spacing (panel edges), at 8" spacing (intermediate supports)
ABW	Alternate braced wall	See Section R602.10.3.2		See Section R602.10.3.2
PFH	Intermittent portal frame	See Section R602.10.3.3		See Section R602.10.3.3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

5. Revise as follows:

R602.10.2.1 (Supp) Intermittent ~~B~~braced wall panel interior finish material. Intermittent ~~B~~braced wall panels shall have gypsum wall board installed on the side of the wall opposite the bracing material. Gypsum wall board shall be not less than ½ inch (12.7 mm) in thickness and be fastened in accordance with Table R702.3.5 for interior gypsum wall board.

Exceptions:

1. Wall panels that are braced in accordance with Methods ~~5~~GB, ABW and PFH.
2. ~~Wall panels that are braced in accordance with Section R602.10.3.2 .~~2. When an approved interior finish material with an in-plane shear resistance equivalent to gypsum board is installed.
3. For Methods ~~2~~DWB, ~~3~~WSP, ~~4~~SFB, ~~6~~PBS, ~~7~~PCP, and ~~8~~HPS, gypsum wall board is permitted to be omitted provided the percentage of bracing in Table R602.10.1.2(1) is multiplied by a factor of 1.5.

R602.10.3 (Supp) Minimum length of braced panels. For Methods ~~2~~DWB, ~~3~~WSP, ~~4~~SFB, ~~6~~PBS, ~~7~~PCP and ~~8~~HPS~~above~~, each braced wall panel shall be at least 48 inches (1219 mm) in length, covering a minimum of three stud spaces where studs are spaced 16 inches (406 mm) on center and covering a minimum of two stud spaces where studs are spaced 24 inches (610 mm) on center. For Method ~~5~~GB ~~above~~, each braced wall panel and shall be at least 96 inches (2438 mm) in length where applied to one face of a braced wall panel and at least 48 inches (1219 mm) where applied to both faces. For Methods ~~2~~DWB, ~~3~~WSP, 4SFB, ~~6~~PBS, ~~7~~PCP and ~~8~~HPS, for purposes of computing the percentage of panel bracing required in Table R602.10.1.2(1), the effective length of the braced wall panel shall be equal to the actual length of the panel. When Method ~~5~~GB panels are applied to only one face of a braced wall panel, bracing percentages required in Table R602.10.1.2(1) for Method ~~5~~ GB shall be doubled.

Exceptions:

1. Lengths of braced wall panels for continuous wood structural panel sheathing shall be in accordance with Section R602.10.4.
2. Lengths of ~~alternate braced wall~~ Method ABW panels shall be in accordance with Section R602.10.3.2.1~~or Section R602.10.3.2.2~~.
3. Length of Method PFH shall be in accordance with Section R602.10.3.3.

~~3~~ 4. For Methods ~~2~~DWB, ~~3~~WSP, 4SFB, ~~6~~PBS, ~~7~~PCP and ~~8~~HPS in Seismic Design Categories A, B, and Panels between 36 inches and 48 inches in length shall be permitted to count towards the required percentage of bracing in Table R602.10.1.2(1), and the effective contribution shall comply with Table R602.10.3.

TABLE R602.10.3 (Supp)
EFFECTIVE LENGTHS FOR BRACE WALL PANELS LESS THAN 48 INCHES IN ACTUAL LENGTH (BRACE METHODS ~~2~~DWB, ~~3~~WSP, 4SFB, ~~6~~PBS, ~~7~~PCP, AND ~~8~~HPS[a]

Actual Length of Braced Wall Panel (inches)	Effective Length of Braced Wall Panel (inches)		
	8-foot Wall Height	9-foot Wall Height	10-foot Wall Height
48	48	48	48
42	36	36	N/A
36	27	N/A	N/A

For SI: 1 inch = 25.4mm

Interpolation shall be permitted.

R602.10.3.1 (Supp) Adjustment of length of braced panels. When story height (H), measured in ft, exceeds 10 feet (3048 mm), in accordance with Section R301.3, the minimum length of braced wall panels specified in Section R602.10.3 shall be increased by a factor H/10. See Table R602.10.3.1. Interpolation is permitted.

TABLE R602.10.3.1 (Supp)
MINIMUM LENGTH REQUIREMENTS FOR BRACED WALL PANELS

SEISMIC DESIGN CATEGORY AND WIND SPEED	BRACING METHOD	HEIGHT OF BRACED WALL PANEL				
		8 ft.	9 ft.	10 ft.	11 ft.	12 ft.
SDC A, B, C, D_o, D_1 and D_2 Wind speed < 110 mph	~~2~~LIB, ~~3~~WSP, 4SFB,~~6~~PBS, ~~7~~PCP, ~~8~~HPS and Method ~~5~~GB when double sided	4'-0"	4'-0"	4'-0"	4'-5"	4'-10"
	Method ~~5~~GB, single sided	8'-0"	8'-0"	8'-0"	8'-10"	9'-8"

For SI: I inch = 25.4mm, 1 foot = 305 mm

6. Delete without substitution:

~~**R602.10.3.2 (Supp) Alternative bracing panels**. As an alternate to the bracing methods in Section R602.10.2, wall bracing panels in accordance with Sections R602.10.3.2.1 and R602.10.3.2.2 shall be permitted.~~

7. Revise as follows:

R602.10.3.2~~.1~~ Method ABW: Alternate braced wall panels. ~~Alternate~~Method ABW braced wall panels constructed in accordance with one of the following provisions shall be permitted to replace each 4 feet (1219 mm) of braced wall panel as required by Section R602.10.3. The maximum height and minimum length and tie-down force of each panel shall be in accordance with Table R602.10.3.2.1:

1. In one-story buildings, each panel shall be sheathed on one face with 3/8-inch-minimum-thickness (9.5 mm) wood structural panel sheathing nailed with 8d common or galvanized box nails spaced in accordance with Table R602.3(1) and blocked at all wood structural panel sheathing edges. Two anchor bolts installed in accordance with Figure R403.1(1) shall be provided in each panel. Anchor bolts shall be placed 6 to 12 inches from each end of the plate. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an uplift capacity in accordance with Table R602.10.3.2.1. The tie-down device shall be installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation, which is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom. When the continuous foundation is required to have a depth greater than 12 inches (305 mm), a minimum 12-inch-by-12-inch (305 mm by 305 mm) continuous footing or turned down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned down slab edge shall be reinforced with not less than one No.4 bar top and bottom. This reinforcement shall be lapped 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.
2. In the first story of two-story buildings, each braced wall panel shall be in accordance with Item 1 above, except that the wood structural panel sheathing edge nailing spacing shall not exceed four inches on center.

TABLE R602.10.3.2~~.1~~
MINIMUM LENGTH REQUIREMENTS AND TIE-DOWN FORCES
FOR ~~ALTERNATE~~ METHOD ABW BRACED WALL PANELS

SEISMIC DESIGN CATEGORY AND WIND SPEED		HEIGHT OF BRACED WALL PANEL				
		8 ft.	9 ft.	10 ft.	11 ft.	12 ft.
SDC A, B and C Wind speed < 110 mph	Minimum Sheathed Length	2'-4"	2'-8"	2'-10"	3'-2"	3'-6"
	R602.10.3.2.1, Item 1 Tie-down Force (lbs)	1800	1800	1800	2000	2200
	R602.10.3.2.1, Item 2 Tie-down Force (lbs)	3000	3000	3000	3300	3600
SDC D_o, D_1 and D_2 Wind speed < 110 mph	Minimum Sheathed Length	2'-8"	2'-8"	2'-10"	NP[a]	NP[a]
	R602.10.3.2.1, Item 1 Tie-down Force (lbs)	1800	1800	1800	NP[a]	NP[a]
	R602.10.3.2.1, Item 2 Tie-down Force (lbs)	3000	3000	3000	NP[a]	NP[a]

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound = 4.44822 N
a. NP = Not Permitted. Maximum height of 10 feet (3,048 mm).

R602.10.3.3~~2.2~~ (Supp) Method PFH: Portal frame with hold-downs ~~Alternate bracing wall panel adjacent to a door or window opening~~. ~~Alternate~~Method PFH braced wall panels constructed in accordance with one of the following provisions are also permitted to replace each 4 feet (1219 mm) of braced wall panel as required by Section R602.10.3 for use adjacent to a window or door opening with a full-length header:

1. In one-story buildings, each panel shall have a length of not less than 16 inches (406 mm) and a height of not more than 10 feet (3048 mm). Each panel shall be sheathed on one face with a single layer of 3/8-inch-minimum-thickness (9.5 mm) wood structural panel sheathing nailed with 8d common or galvanized box nails in accordance with Figure R602.10.3.3~~2.2~~. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed in accordance with Figure R602.10.3.3~~2.2~~. A built-up header consisting of at least two 2 X 12s and fastened in accordance with Table R602.3(1) shall be permitted to be used. A spacer, if used, shall be placed on the side of the built-up beam opposite the wood structural panel sheathing. The header shall extend between the inside faces of the first full-length outer studs of each panel. The clear span of the header between the inner studs of each panel shall be not less than 6 feet (1829 mm) and not more than 18 feet (5486 mm) in length. A strap with an uplift capacity of not less than 1000 pounds (4448 N) shall fasten the header to the side of the inner studs opposite the sheathing. One anchor bolt not less than 5/8-inch-diameter (16 mm) and installed in accordance with Section R403.1.6 shall be provided in the center of each sill plate. The studs at each end of the panel shall have a tie-down device fastened to the foundation with an uplift capacity of not less than 4,200 pounds (18 683 N). The tie-down devices shall be an embedded-strap type, installed in accordance with the manufacturer's recommendations.

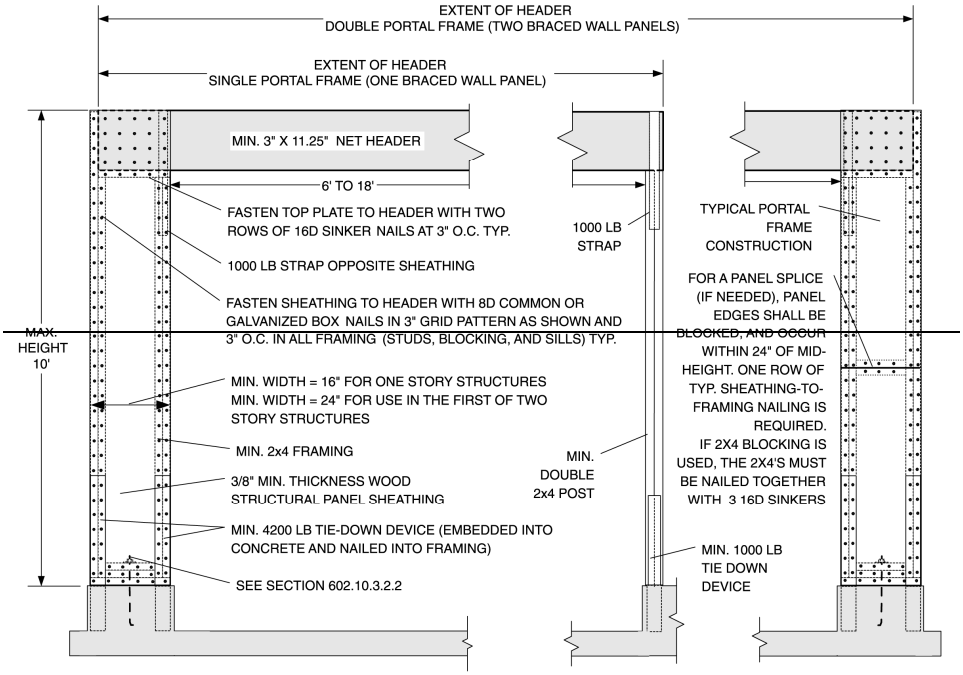
Where a panel is located on one side of the opening, the header shall extend between the inside face of the first full-length stud of the panel and the bearing studs at the other end of the opening. A strap with an uplift capacity of not less than 1,000 pounds (4448 N) shall fasten the header to the bearing studs. The bearing studs shall also have a tie-down device fastened to the foundation with an uplift capacity of not less than 1,000 pounds (4448 N).

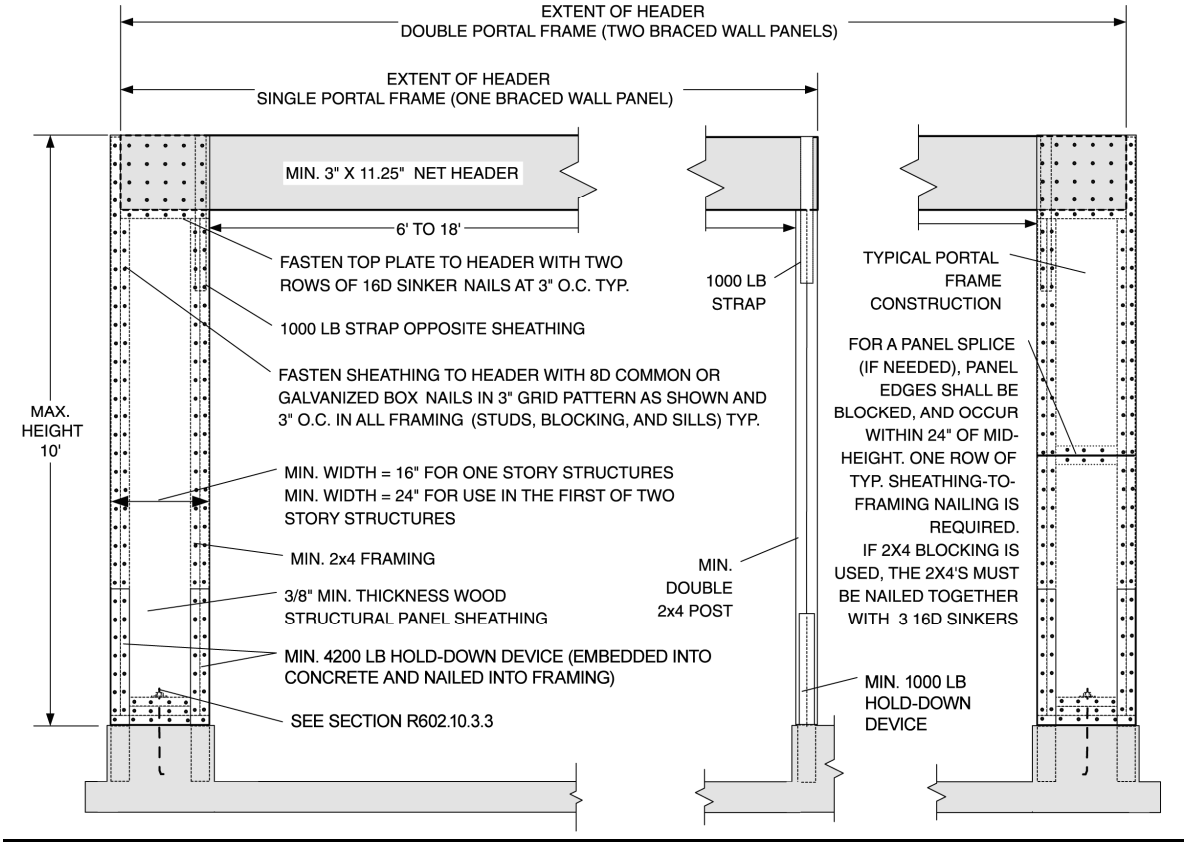
The panels shall be supported directly on a foundation, which is continuous across the entire length of the braced wall line. The foundation shall be reinforced with not less than one No. 4 bar top and bottom.

Where the continuous foundation is required to have a depth greater than 12 inches (305 mm), a minimum 12-inch-by-12-inch (305 mm by 305 mm) continuous footing or turned down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped not less than 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.

2. In the first story of two-story buildings, each wall panel shall be braced in accordance with item 1 above, except that each panel shall have a length of not less than 24 inches (610 mm).

8. Delete and substitute as follows:





For SI: 1 inch = 25.4 mm, 1 foot = 305 mm

FIGURE R602.10.3.3~~2.2~~ (Supp)
~~ALTERNATE BRACED WALL PANEL ADJACENT TO A DOOR OR WINDOW OPENING~~
METHOD PFH: PORTAL FRAME WITH HOLD-DOWNS

9. Revise as follows:

R602.10.4 (Supp) Continuously-sheathed braced wall line using Method ~~3~~WSP (wood structural panel). Continuously sheathed braced wall lines using wood structural panels shall comply with this section. Different bracing methods shall not be permitted within a continuously sheathed braced wall line. Other bracing methods prescribed by this code shall be permitted on other braced wall lines on the same story level or on different story levels of the building.

Exception: All exterior braced wall lines shall be continuously sheathed where required by Section R602.10.4.7.

R602.10.4.4 (Supp) Braced wall percentage. In addition to bracing percentage adjustments specified elsewhere in this code, the braced wall percentages for Method ~~3~~ WSP from Table 602.10.1.2(1) shall be permitted to be multiplied by a factor in accordance with Table R602.10.4.4.

TABLE R602.10.4.4 (Supp)
ADJUSTMENT FACTORS TO THE PERCENTAGE OF REQUIRED BRACING PER WALL LINE –CONTINUOUSLY SHEATHED

ADJUSTMENT BASED ON MAXIMUM WALL CLEAR OPENING HEIGHT:		MULTIPLY PERCENTAGE OF BRACING PER WALL LINE BY:
Continuous wood structural panel sheathing when maximum opening height in wall line does not exceed [a] (Section 301.2.2.2.1)	85% of wall height	0.9
	67% of wall height	0.8

a. Percentage of bracing for continuous wood structural panel sheathing shall be based on Method ~~3~~ WSP requirements.

R602.10.7 (Supp) Panel joints. All vertical joints of panel sheathing shall occur over, and be fastened to common studs. Horizontal joints in braced wall panels shall occur over, and be fastened to common blocking of a minimum 1-1/2 inch (38 mm) thickness.

Exceptions:

1. Blocking at horizontal joints shall not be required in wall segments that are not counted as braced wall panels.
2. Where the bracing percentage provided is at least twice the minimum percentage required by Table R602.10.1.2(1) blocking at horizontal joints shall not be required in braced wall panels constructed using Methods ~~3, 4, 5, 6, or 8~~WSP, SFB, GB, PBS or PCP.

Reason: The ICC Ad-Hoc Committee on Wall Bracing is proposing fourteen technical and non-technical code changes as we work through the process of making Section R602.10 of the 2009 IRC technically correct and easier to understand. The individual code changes are designed to stand alone if necessary, but the total body of work is respectively submitted as a comprehensive continuation of cycle 1 changes for the 2009 IRC. To see how the individual changes are intended to meld together, please visit the ICC web site, and review the composite document on the Ad hoc Committee on Wall Bracing page: http://www.iccsafe.org/cs/cc/ahc-wb/index.html.

This is a non-technical formatting change to provide:

- Further differentiation between intermittent panel methods and the continuous sheathing method,
- To remove method numbers and replace them in a tabular format with distinct names, abbreviations and descriptions.

Members of the ICC Ad-Hoc Committee on Wall Bracing have reported that there is significant confusion among builders and designers regarding identification and options of bracing methods. To address the confusion, we have categorized the methods into two distinct classifications: "intermittent" and "continuous" methods. To help understand "intermittent methods", we have:

- Put the original 8 methods listed in the 2006 IRC, into tabular format with new abbreviations, description and connection criteria,
- Added the two "alternate" methods into new table as actual methods, the *Alternate Brace Wall Panels,* now referred to as Method ABW, and the *Alternate Bracing Wall Panel Adjacent to a Door or Opening* method, now referred to Method, PFH

Another area of confusion has been the bracing methods being identified as numbers. Most users of the IRC cannot easily identify Method 3 with wood structural panels. However, it is easier to identify WSP with wood structural panels. It is also easier to retire and/or add new methods without having to alter a numbering scheme.

The new tabular format is intended to make it easier for everyone to understand the options available.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Approved as Modified**

Modify proposal as follows:

TABLE R602.10.1.2(1)[a,b,c] (Supp)
WALL BRACING
~~**SEISMIC DESIGN CATEGORY (SDC) OR WIND SPEED STORIES ABOVE BRACED WALL LINE[d] METHOD OF BRACING PERMITTED PER TABLE R602.10.2 PERCENTAGE OF FULL-HEIGHT BRACING PER WALL LINE MAXIMUM SPACING BETWEEN BRACED WALL LINES (FT)**~~
(No change to proposed table)

TABLE R602.10.1.2(2) (Supp)
ADJUSTMENT FACTORS TO THE PERCENTAGE OF REQUIRED WALL BRACING [a]
(No change to proposed table)

a. The total percentage of bracing required for a given wall line is the product of all applicable adjustment factors.
b. Linear interpolation shall be permitted.
c. Bracing required for a site's wind speed shall not be adjusted for dead load.
d. Braced wall line spacing in excess of 35-ft shall be in accordance with Section R602.10.1.5.
e. The adjusted percentage of bracing shall not be less than that required for the site's wind speed.

R602.10.1.4.1 (Supp) Braced wall panel location in Seismic Design Categories D_0, D_1 and D_2. Exterior braced wall lines shall have a braced wall panel located at each end of the braced wall line.

Exception: For braced wall panel construction Method WSP of Section R602.10.2, the braced wall panel shall be permitted to begin no more than 8 feet (2438 mm) from each end of the braced wall line provided one of the following is satisfied in accordance with Figure R602.10.1.4.1:

1. A minimum 24-inch-wide (610 mm) panel is applied to each side of the building corner and the two 24-inch-wide (610 mm) panels at the corner shall be attached to framing in accordance with Figure R602.10.4.~~3~~(1), or
2. The end of each braced wall panel closest to the corner shall have a tie-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. The tie-down device shall be capable of providing an uplift allowable design value of at least 1,800 pounds (8 kN). The tie-down device shall be installed in accordance with the manufacturer's recommendations.

FIGURE R602.10.1. 4.1 (Supp)
BRACED WALL PANELS AT ~~BRACED WALL LINE~~ ENDS OF BRACED WALL LINES IN SEISMIC DESIGN CATEGORIES D_0, D_1 AND D_2
(No change to proposed figure)

TABLE R602.10.3.1 (Supp)
MINIMUM LENGTH REQUIREMENTS FOR BRACED WALL PANELS

SEISMIC DESIGN CATEGORY AND WIND SPEED	BRACING METHOD	HEIGHT OF BRACED WALL PANEL				
		8 ft.	9 ft.	10 ft.	11 ft.	12 ft.
SDC A, B, C, D_o, D_1 and D_2 Wind speed < 110 mph	~~LIB~~ DWB, WSP, ~~4~~SFB, PBS, PCP, HPS and Method GB when double sided	4'-0"	4'-0"	4'-0"	4'-5"	4'-10"
	Method GB, single sided	8'-0"	8'-0"	8'-0"	8'-10"	9'-8"

(No change to portions of proposal not shown)

Committee Reason: This change clarifies the different bracing methods and simplifies the code. The modification corrects errors in the original submittal.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

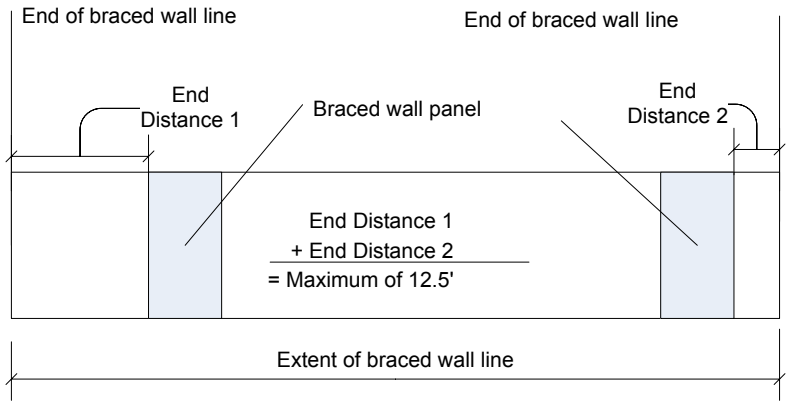
Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Wall Bracing Committee, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.10.1.2 Percentage of bracing. The percentage of bracing along each braced wall line shall be in accordance with Table R602.10.1.2(1) and shall be the greater of that required by the Seismic Design Category, ~~or~~ the design wind speed or braced wall panel location requirements of Section R602.10.1.4. Adjustments to the percent of braced wall specified in Table R602.10.1.2(1) shall be as specified in Table R602.10.1.2(2)

R602.10.1.4 Braced wall panel location. Braced wall panels shall be located in accordance with Table R602.10.1.2(1) and Figure R602.10.1.4(1). Braced wall panels shall be located ~~at least every~~ not more than 25 feet on center and shall be permitted to begin no more than 12.5 feet (3810 mm) from ~~each~~ the end of a braced wall line in accordance with Figure R602.10.1.4(2). The total combined distance from each end of a braced wall line to the outermost braced wall panel or panels in the line shall not exceed 12.5 ft. Braced wall panels may be offset out-of-plane up to 4 feet (1219 mm) provided that the total out-to-out offset in any-braced wall line is not more than 8 feet (2438 mm) in accordance with Figure R602.10.1.3(3).

Delete Figure R602.10.1.4(2) and replace with the following:



Braced wall panel shall be permitted to be located away from the end of a braced wall line, provided the total end distance from each end to the nearest braced wall panel does not exceed 12.5'. If braced wall panel is located at the end of the braced wall line, then end distance is 0'.

FIGURE R602.10.1.4(2)
~~PERMITTED~~ BRACED WALL PANEL END DISTANCE REQUIREMENTS ~~FROM ENDS OF A BRACED WALL LINE~~ (SDC A, B and C)

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This modification is a result of actions agreed upon within the ICC Ad Hoc Committee on Wall Bracing. Braced wall panels are intended to be installed at each end of braced wall lines, or allowed to be inset a limited distance from the end. This modification reinstates the historic minimum bracing locations to require a braced wall panel at each end of a braced wall line, while still allowing flexibility to inset a panel a distance of up to 12.5' from one end. This modification prevents a user from installing one 4' braced wall panel in the center of 25'

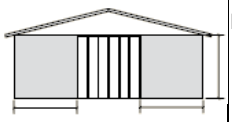
panel because that one panel cannot represent both ends, and such a case results in half the bracing that has historically been required for such a braced wall line. In revising the bracing amounts in RB148, the intention was that the new amounts should not result in less bracing than the historical requirement for bracing at each end of a braced wall line. This modification coordinates the historic bracing location requirements with the new calculated bracing amounts in RB148.

Public Comment 2:

Michael A. Gardner, Gypsum Association, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

TABLE R602.10.2
INTERMITTENT BRACING METHODS

METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
GB	Gypsum board	$^1/_2$"		Nails or screws at 7" spacing at panel edges including top and bottom plates; for exterior sheathing nail size, see Table R602.3(1); for interior gypsum board nail size, see Table R702.3.5

(For SI:: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

(Portions of table not shown remain unchanged)

(Portions of proposal not shown remain unchanged)

Commenter's Reason: Current code language for a wall braced using gypsum board allows only the use of nails for fastening the gypsum. Available literature (Kanvinde & Deirlein; CUREE W-15) clearly supports the concept that a standard drywall screw performs as well as or better than a standard drywall nail in braced or shear wall application. The literature suggests that a broader spacing for screws (when compared to nails) may be appropriate; however, without additional documentation to support a specific spacing difference, it is proposed that a one-for-one swap of screws for nails be permitted by the code. Fasteners used in the comparative test programs referenced herein replicate those required by the IRC for a standard application.

Public Comment 3:

Edward L. Keith, APA – The Engineered Wood Association, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

TABLE R602.3(3)
WOOD STRUCTURAL PANEL WALL SHEATHING
(No change to table contents)

a. Blocking of all horizontal joints shall be required except as permitted in Section R602.10.7.
b. and c. (No change)

Commenter's Reason: Proposal RB-143 requires all panel-type bracing methods to have blocked horizontal joints that do not otherwise fall on and are attached to common framing members [Section R602.10.7 (supp)]. This proposal has a number of exceptions listed when blocking is not required. The provision of this section, if adopted, will conflict with Footnote a of Table R602.3(3) which currently permits unblocked horizontal joints for wood structural panel bracing. The provisions of the proposed RB-143 are correct.

RB-131 provides a new version of Table R602.3(3) that does not have this contradictory provision. If RB-143 passes and RB-131 does not, then this public comment is necessary to make the IRC consistent where blocking is concerned. If either both pass or neither pass, then this PC will be withdrawn.

Final Action: AS AM AMPC____ D

RB147-07/08

R202, R602.10.1, R602.10.1.3, R602.10.1.4, Figure R602.10.1.4 (New)

Proposed Change as Submitted:

Proponent: Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Committee on Wall Bracing

1. Revise as follows:

SECTION R202
GENERAL DEFINITIONS

ASPECT RATIO. The ratio of longest to shortest perpendicular dimensions, or for wall sections, the ratio of height to length. ~~width (h/w) of a shear wall. The shear wall height is the maximum clear height from top of foundation or diaphragm to bottom of diaphragm framing above and the shear wall width is the sheathed dimension in the direction of applied force on the shear wall~~.

BRACED WALL LINE. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing ~~series of braced wall panels in a single story constructed in accordance with Section R602.10 for wood framing or Section R603.7 or R301.1.1 for cold-formed steel framing to resist racking from seismic and wind forces~~.

BRACED WALL PANEL. A full-height section of ~~a braced wall line~~ wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material, and anchors. The panel's length meets the requirements of its particular bracing method, and contributes toward the total amount of bracing required along its braced wall line in accordance with Section R602.10.1. ~~in accordance with Section R602.10 for wood framing or Section R603.7 or R301.1.1 for cold-formed steel framing, which extend the full height of the wall.~~

R602.10.1 (Supp) Braced wall lines. Braced wall lines, both interior and exterior, shall be provided with braced wall panels in the percentage and location specified in this section. The length of a braced wall line shall be measured as the distance between the ends of the wall line. The end of a braced wall line shall be considered to be either

The intersection with perpendicular exterior walls or projection thereof.
The intersection with perpendicular braced wall lines.
The end of the braced wall line shall be chosen such that the maximum length results.

Braced wall panels shall be in accordance with one of the bracing methods specified in Section R602.10.2, the alternate braced wall method of Section R602.10.3.2, or the continuous structural panel sheathing method of Section R602.10.4. Bracing method shall be permitted to vary as follows:

1. Variation in bracing method from story to story is permitted.
2. Variation in bracing method from braced wall line to braced wall line within a story is permitted, except that continuous structural panel sheathing shall conform to the additional requirements of Section R602.10.4.
3. In Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C, variation in bracing method within a braced wall line is permitted. The required sheathing percentage for the braced wall line with mixed sheathing types shall have the higher bracing percentage, in accordance with Table R602.10.1(1), of all types of bracing used. Wall lines using continuous wood structural panel sheathing shall conform to the additional requirements of Section R602.10.4.

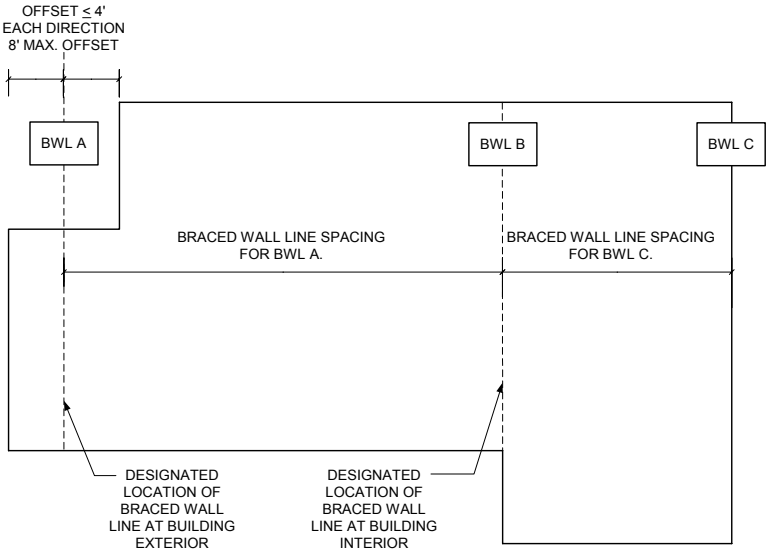
R602.10.1.3 (Supp) Braced wall panel location. Braced wall panels shall be located in accordance with Table R602.10.1(1) and Figure R602.10.1.3(1). Braced wall panels shall be located at least every 25 feet on center and shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line in accordance with Section R602.10.1 and Figure R602.10.1.3(2). Braced wall panels may be offset out-of-plane up to 4 feet (1219 mm) from the designated braced wall line provided that the total out-to-out offset of braced wall panels in ~~any~~ a braced wall line is not more than 8 feet (2438 mm) in accordance with Figure R602.10.1.3(3). All braced wall panels within a braced wall line shall be permitted to be offset from the designated braced wall line.

R602.10.1.4 (Supp) Braced wall line spacing. Spacing of braced wall lines shall not exceed 35 feet (10 668 mm) on center in both the longitudinal and transverse direction in each story. Braced wall line spacing shall be measured as the maximum distance to any adjacent parallel braced wall line. See Figure R602.10.1.4.

Exception: Spacing of braced wall lines not exceeding 50 feet (15 240 mm) shall be permitted where:

1. The wall bracing provided equals or exceeds the percentage of bracing required by Table R602.10.1(1) multiplied by a factor equal to the braced wall line spacing divided by 35 feet (10 668 mm), and
2. The length-to-width ratio for the floor/roof diaphragm as measured between braced wall lines does not exceed 3:1.

2. Add new figure as follows:



NOTE: BRACED WALL SPACING FOR BWL B IS THE GREATER OF THE DISTANCE FROM BWL A TO BWL B OR FROM BWL B TO BWL C.

FIGURE R602.10.1.4
BRACED WALL LINE SPACING

Reason: The ICC Ad-Hoc Committee on Wall Bracing is proposing fourteen technical and non-technical code changes as we work through the process of making Section R602.10 of the 2009 IRC technically correct and easier to understand. The individual code changes are designed to stand alone if necessary, but the total body of work is respectively submitted as a comprehensive continuation of cycle 1 changes for the 2009 IRC. To see how the individual changes are intended to meld together, please visit the ICC web site, and review the composite document on the Ad hoc Committee on Wall Bracing page: http://www.iccsafe.org/cs/cc/ahc-wb/index.html.

This change represents the Committee's best interpretation regarding length, location and spacing of braced wall lines, and to clarify some definitions that deal with braced wall panels and braced wall lines.

One of the items that the ICC Ad Hoc Committee on Wall Bracing identified as being in need of clarification is the length and spacing of braced wall panels. The existing definitions of braced wall lines and panels are circular, so that each refers to the other in its definition. The existing definition of aspect ratio refers to shear walls, but except for masonry walls, the IRC does not use shear walls, it uses braced wall panels. Braced wall length and spacing are not currently specifically defined. Without these new definitions, it is difficult to consistently determine the length and spacing of braced wall lines. If the length and spacing of braced wall lines can not be determined, the amount of bracing required can not be determined.

At their meeting on July 13, 2007, the ICC Ad Hoc Committee on Wall Bracing developed these definitions of aspect ratio, braced wall lines, braced wall panels, length of braced wall lines and spacing of braced wall lines. We believe these definitions result in the most accurate application of the braced wall amounts in the IRC.

Cost Impact: The code change proposal will not increase the cost of construction.

Committee Action: **Approved as Submitted**

Committee Reason: Changes the definition to more succinctly describe the elements defined and better describes how to determine what constitutes a braced wall line.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Wall Bracing Committee, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.10.1.3 (Supp) Braced wall panel location. Braced wall panels shall be located in accordance with ~~Table R602.10.1(1) and~~ Figure R602.10.1.3(1). Braced wall panels shall be located at least every 25 feet on center and shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line in accordance with Section R602.10.1 and Figure R602.10.1.3(2). Braced wall panels may be offset out-of-plane up to 4 feet (1219 mm) from the designated braced wall line provided that the total out-to-out offset of braced wall panels in a braced wall line is not more than 8 feet (2438 mm) in accordance with Figures R602.10.1.3(3) and R602.10.1.3(4). All braced wall panels within a braced wall line shall be permitted to be offset from the designated braced wall line.

Delete without substitution:

~~**R602.10.1.4 (Supp) Braced wall line spacing.** Spacing of braced wall lines shall not exceed 35 feet (10 668 mm) on center in both the longitudinal and transverse direction in each story. Braced wall line spacing shall be measured as the maximum distance to any adjacent parallel braced wall line. See Figure R602.10.1.4.~~

~~**Exception:** Spacing of braced wall lines not exceeding 50 feet (15 240 mm) shall be permitted where:~~

~~1. The wall bracing provided equals or exceeds the percentage of bracing required by Table R602.10.1(1) multiplied by a factor equal to the braced wall line spacing divided by 35 feet (10 668 mm), and~~
~~2. The length-to-width ratio for the floor/roof diaphragm as measured between braced wall lines does not exceed 3:1.~~

Change figure number to read as shown:

FIGURE ~~R602.10.1.4~~ R602.10.1.3(4)
BRACED WALL LINE SPACING

(No change to figure)

Commenter's Reason: RB147 was approved *As Submitted* and this modification was not allowed by the Committee. It is being offered again by Public Comment.

One of the significant reasons for RB147 is to allow the concept that none of the braced wall panels have to reside on a braced wall line. This figure shows that no braced wall panels would actually be on BWL A, as they would all be offset - and this is perfectly acceptable based on the limits of offsetting.

This figure would be eliminated if RB148 is approved.

Final Action: AS AM AMPC____ D

RB148-07/08

R602.10.1, R602.10.1.1, R602.10.1.2, Table R602.10.1(1), Table R602.10.1(2) (New), Table R602.10.1(2), Table R602.10.1(3), R602.10.1.4, R602.10.1.4.1,, Table R602.10.1.4.1, R602.10.2.1, R602.10.3, Table R602.3(1), R602.10.2, R602.10.4.1, R602.10.4.4, Table R602.10.4.4, R602.10.4.5, R602.10.4.6, R602.10.7, R602.10.8

Proposed Change as Submitted:

Proponent: Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad Hoc Committee on Wall Bracing

1. Revise Sections R602.10.1, R602.10.1.1, and R602.10.1.2 as follows and add a new table R602.10.1(1):

R602.10.1 (Supp) Braced wall lines. Braced wall lines~~, both interior and exterior,~~ shall be provided in accordance with this section. ~~with braced wall panels in the percentage and location specified in this section.~~

Braced wall panels shall be in accordance with one of the bracing methods specified in Section R602.10.2, the alternate braced wall method of Section R602.10.3.2, or the continuous structural panel sheathing method of Section R602.10.4. Bracing method shall be permitted to vary as follows:

1. Variation in bracing method from story to story is permitted.
2. Variation in bracing method from braced wall line to braced wall line within a story is permitted, except that continuous structural panel sheathing shall conform to the additional requirements of Section R602.10.4.
3. In Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C, variation in bracing method within a braced wall line is permitted. The ~~required sheathing percentage~~ length of required bracing for the braced wall line with mixed sheathing types shall have the higher bracing ~~percentage~~ length requirement, in accordance with Tables R602.10.1(1) and R602.10.1(2), of all types of bracing used. Wall lines using continuous wood structural panel sheathing shall conform to the additional requirements of Section R602.10.4.

R602.10.1.1 (Supp) ~~Percentage~~ Length of bracing. The ~~percentage~~ length of bracing along each braced wall line shall be in accordance with Tables R602.10.1(1) and R602.10.1(2)and shall be the greater of that required by the design wind speed ~~Seismic Design Category~~ or the ~~design wind speed~~ Seismic Design Category. Adjustments to the ~~percent~~ length of braced wall specified in Tables R602.10.1(1) and R602.10.1(2) shall be as specified in Table R602.10.1(~~2~~ 3)

R602.10.1.2 (Supp) Angled corners. At corners, braced wall lines shall be permitted to angle out of plane up to 45 degrees with a maximum diagonal length of 8 feet (2438 mm). When determining the ~~percentage~~ length of bracing required, the length of each braced wall line shall be determined as shown in Figure R602.10.1.2. The placement of bracing for the braced wall lines shall begin at the point where the braced wall line, which contains the angled wall adjoins the adjacent braced wall line (Point A as shown in Figure R602.10.1.2). Where an angled corner is constructed at an angle equal to 45 degrees and the diagonal length is no more than 8 feet (2438 mm) in length, the angled wall may be considered as part of either of the adjoining braced wall lines, but not both. Where the diagonal length is greater than 8 feet (2438 mm), it shall be considered its own braced wall line and be braced in accordance with Section R602.10.1 and methods in Section R602.10.2.

2. Delete and substitute as follows:

~~TABLE R602.10.1(1)[a,b,c] (Supp)~~
~~WALL BRACING~~

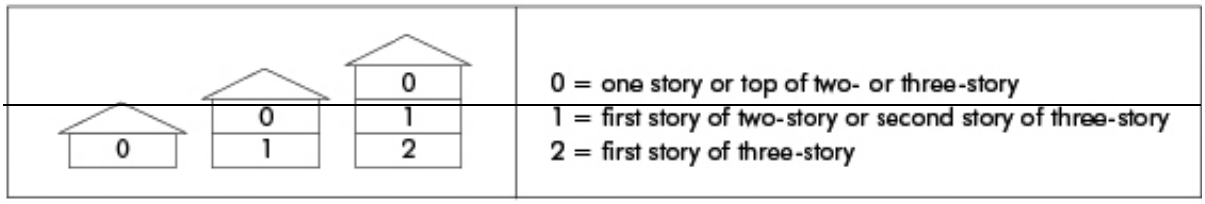
~~SEISMIC DESIGN CATEGORY (SDC) OR WIND SPEED~~	~~STORIES ABOVE BRACED WALL LINE[d]~~	~~METHOD OF BRACING PERMITTED~~	~~PERCENTAGE OF FULL HEIGHT BRACING PER WALL LINE~~		~~MAXIMUM SPACING BETWEEN BRACED WALL LINES (FT)~~
			~~For Method 3 Bracing~~	~~For other methods permitted[e]~~	
~~SDC A and B (S_s = 0.35g and S_{ds} = 0.33g), < 100 mph~~	~~0~~	~~Methods 1-8~~	~~16%~~	~~16%~~	~~35 (See Section R602.10.1.4 for exceptions)~~
	~~1~~	~~Methods 1-8~~	~~16%~~	~~25%~~	
	~~2~~	~~Methods 2-8~~	~~25%~~	~~35%~~	
~~SDC C (S_s = 0.6g and S_{ds} = 0.53g), < 110 mph~~	~~0~~	~~Methods 1-8~~	~~16%~~	~~25%~~	
	~~1~~	~~Methods 2-8~~	~~30%~~	~~45%~~	
	~~2~~	~~Methods 2-8~~	~~45%~~	~~60%~~	
~~SDC D_0 & D_1 (S_s = 1.25g and S_{ds} = 0.83g), < 110 mph~~	~~0~~	~~Methods 2-8~~	~~20%~~	~~30%~~	~~25 (See Section R602.10.1.4.1 for exceptions)~~
	~~1~~	~~Methods 2-8~~	~~45%~~	~~60%~~	
	~~2~~	~~Methods 2-8~~	~~60%~~	~~85%~~	
~~SDC D_2, < 110 mph~~	~~0~~	~~Methods 2-8~~	~~25%~~	~~40%~~	
	~~1~~	~~Methods 2-8~~	~~55%~~	~~75%~~	
	~~Cripple wall~~	~~Method 3~~	~~75%~~	~~Not Permitted~~	

~~a. Wall bracing percentages are based on a soil site class "D." Interpolation of bracing percentage 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 1613.5 of the *International Building Code*.~~

~~b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.8.~~

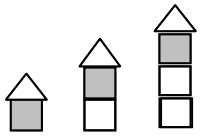
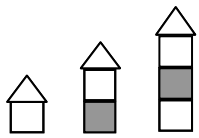
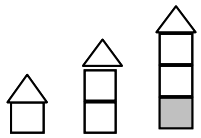
~~c. Methods of bracing shall be as described in Section R602.10.2. The alternate braced wall panels described in Section R602.10.3.2 shall also be permitted~~

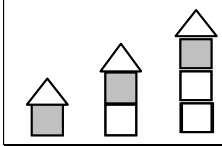
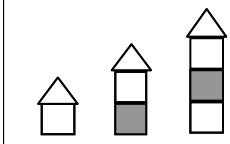
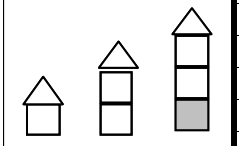
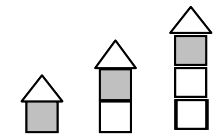
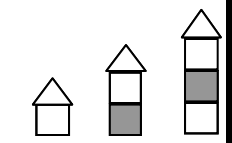
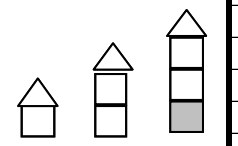
~~d. Stories above braced wall line. 0 = one story or top of two or three story. 1 = first story of two story or second story of three story. 2 = first story of three story.~~



~~e. Method 1 bracing exempt from percentage bracing requirement.~~

TABLE R602.10.1(1)[a,b,c,d]
BRACING REQUIREMENTS BASED ON WIND
(A FUNCTION OF BRACED WALL LINE SPACING)
Minimum Total Length (feet) of Braced Wall Panels Required each Braced Wall Line

Exposure B mrh= 30' Eave to ridge =10 wall height = 10' 2 BWL							
Wind Speed	Location	BWL Spacing	Method 1	Method 5[f] (double sided)	Methods[e,g] 2,3,4,6,7,8	Cont Sheathing (85% opening)	Cont Sheathing (65% opening)
≤ 90 MPH		10	7.7	7.7	4.4	4.0	3.5
		15	11.1	11.1	6.4	5.7	5.1
		20	14.4	14.4	8.2	7.4	6.6
		25	17.6	17.6	10.1	9.1	8.1
		30	20.8	20.8	11.9	10.7	9.5
		35	23.9	23.9	13.7	12.3	10.9
		40	27.1	27.1	15.5	13.9	12.4
		45	30.2	30.2	17.3	15.5	13.8
		50	33.3	33.3	19.0	17.1	15.2
		10	10.5	10.5	6.0	5.7	5.4
		15	15.2	15.2	8.7	8.3	7.8
		20	19.7	19.7	11.3	10.7	10.1
		25	24.1	24.1	13.8	13.1	12.4
		30	28.4	28.4	16.2	15.4	14.6
		35	32.7	32.7	18.7	17.8	16.8
		40	37.0	37.0	21.2	20.1	19.0
		45	41.3	41.3	23.6	22.4	21.2
		50	45.6	45.6	26.0	24.7	23.4
		10	NP	12.1	6.9	6.9	6.9
		15	NP	17.5	10.0	10.0	10.0
		20	NP	22.6	12.9	12.9	12.9
		25	NP	27.6	15.8	15.8	15.8
		30	NP	32.6	18.6	18.6	18.6
		35	NP	37.6	21.5	21.5	21.5
		40	NP	42.5	24.3	24.3	24.3
		45	NP	47.4	27.1	27.1	27.1
		50	NP	52.3	29.9	29.9	29.9

≤ 100 MPH		10	9.5	9.5	5.4	4.9	4.4
		15	13.8	13.8	7.9	7.1	6.3
		20	17.8	17.8	10.2	9.2	8.1
		25	21.8	21.8	12.4	11.2	9.9
		30	25.7	25.7	14.7	13.2	11.7
		35	29.6	29.6	16.9	15.2	13.5
		40	33.4	33.4	19.1	17.2	15.3
		45	37.3	37.3	21.3	19.2	17.0
		50	41.1	41.1	23.5	21.2	18.8
		10	13.0	13.0	7.4	7.1	6.7
		15	18.8	18.8	10.8	10.2	9.7
		20	24.3	24.3	13.9	13.2	12.5
		25	29.7	29.7	17.0	16.1	15.3
		30	35.1	35.1	20.1	19.0	18.0
		35	40.4	40.4	23.1	21.9	20.8
		40	45.7	45.7	26.1	24.8	23.5
		45	51.0	51.0	29.1	27.7	26.2
		50	56.3	56.3	32.1	30.5	28.9
		10	NP	14.9	8.5	8.5	8.5
		15	NP	21.6	12.3	12.3	12.3
		20	NP	27.9	16.0	16.0	16.0
		25	NP	34.1	19.5	19.5	19.5
		30	NP	40.3	23.0	23.0	23.0
		35	NP	46.4	26.5	26.5	26.5
		40	NP	52.5	30.0	30.0	30.0
		45	NP	58.5	33.4	33.4	33.4
		50	NP	64.6	36.9	36.9	36.9
< 110 MPH		10	11.3	11.3	6.5	5.8	5.2
		15	16.4	16.4	9.3	8.4	7.5
		20	21.1	21.1	12.1	10.9	9.7
		25	25.8	25.8	14.8	13.3	11.8
		30	30.5	30.5	17.4	15.7	13.9
		35	35.1	35.1	20.1	18.1	16.1
		40	39.7	39.7	22.7	20.4	18.2
		45	44.3	44.3	25.3	22.8	20.3
		50	48.9	48.9	27.9	25.1	22.3
		10	15.5	15.5	8.8	8.4	8.0
		15	22.4	22.4	12.8	12.1	11.5
		20	28.9	28.9	16.5	15.7	14.9
		25	35.3	35.3	20.2	19.2	18.2
		30	41.7	41.7	23.8	22.6	21.4
		35	48.0	48.0	27.4	26.1	24.7
		40	54.3	54.3	31.0	29.5	27.9
		45	60.6	60.6	34.6	32.9	31.2
		50	66.8	66.8	38.2	36.3	34.4
		10	NP	17.7	10.1	10.1	10.1
		15	NP	25.7	14.7	14.7	14.7
		20	NP	33.2	19.0	19.0	19.0
		25	NP	40.6	23.2	23.2	23.2
		30	NP	47.8	27.3	27.3	27.3
		35	NP	55.1	31.5	31.5	31.5
		40	NP	62.3	35.6	35.6	35.6
		45	NP	69.5	39.7	39.7	39.7
		50	NP	76.7	43.8	43.8	43.8

a. Bracing values are based upon an assumption of 10ft high walls and 10 ft eave to ridge height.
b. Wind exposure B and a 30' mean roof height. For other conditions, multiply required bracing length by one of the following factors:

No. of Stories in Bldg	Mean Roof, ht h	Exposure/Height Factors, λ	
		Exp B	Exp C
1	15	1.0	1.2
2	22.5	1.0	1.3
3	30	1.0	1.4

c. Wall height of 10 feet for all stories. For maximum 9-foot wall heights, multiply table values by 0.95. For maximum 8-foot wall heights, multiply table values by 0.9. For maximum 12-foot wall heights, multiply table values by 1.1.

d. Two braced wall lines sharing load in a given plan direction on a given story level. For a different number of braced wall lines in a given plan direction, multiply required bracing length by one of the following:

No. of BWLs	Adjustment Factor
2	1
3	1.3
4	1.45
5	1.6

e. GWB finish (or equivalent) applied to the inside face of a brace wall panel. When GWB finish (or equivalent) is not applied to inside face of BWP, multiply table values by one of the following factors:

Bracing Method	Multiply Required Bracing Amount by:
Method 1	1.8
Method 2-8	1.4

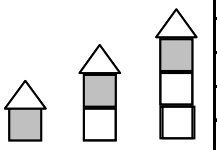
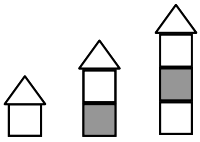
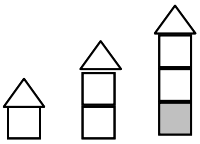
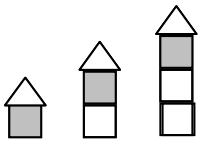
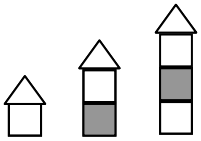
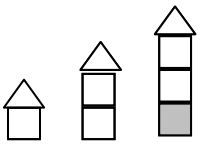
f. Bracing amounts for Method 5 are based on application of GWB on both faces of a BWP. When Method 5 Bracing is used on only side of the wall, the required bracing amounts shall be doubled.

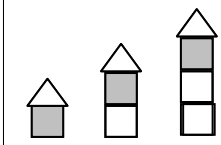
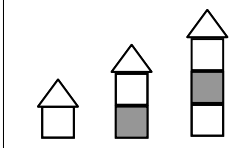
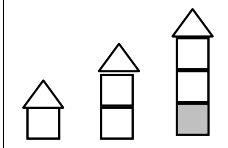
g. Method 1 bracing shall have gypsum wallboard attached to at least one side according to the Section R602.10.2 Method 5 requirements.

3. Add new table as follows:

TABLE R602.10.1(2)[a,b,c]
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEROGY
(A FUNCTION OF BRACED WALL LINE LENGTH)
Minimum Total Length (feet) of Braced Wall Panels Required of Braced Wall Line

Soil Class D Wall Height = 10 ft 10 psf floor dead load 15 psf roof/ceiling dead load 1 BWL BWL Spacing ≤ 25 ft							
Seismic Design Category	Location	BWL Length	Method 1	Methods 2,4,5,6,7,8	Method 3	Cont Sheathing (85% Opening)	Cont. Sheathing (65% Opening)
SDC A and B, and Detached Dwellings in C		**Exempt from Seismic Requirements** Use Table R602.10.1(1) for bracing requirements					

SDC C		10.0	2.5	2.5	1.6	1.4	1.3
		15.0	3.8	3.8	2.4	2.2	1.9
		20.0	5.0	5.0	3.2	2.9	2.6
		25.0	6.3	6.3	4.0	3.6	3.2
		30.0	7.5	7.5	4.8	4.3	3.8
		35.0	8.8	8.8	5.6	5.0	4.5
		40.0	10.0	10.0	6.4	5.8	5.1
		45.0	11.3	11.3	7.2	6.5	5.8
		50.0	12.5	12.5	8.0	7.2	6.4
		10.0	NP	4.5	3.0	2.7	2.4
		15.0	NP	6.8	4.5	4.1	3.6
		20.0	NP	9.0	6.0	5.4	4.8
		25.0	NP	11.3	7.5	6.8	6.0
		30.0	NP	13.5	9.0	8.1	7.2
		35.0	NP	15.8	10.5	9.5	8.4
		40.0	NP	18.0	12.0	10.8	9.6
		45.0	NP	20.3	13.5	12.2	10.8
		50.0	NP	22.5	15.0	13.5	12.0
		10.0	NP	6.0	4.5	4.1	3.6
		15.0	NP	9.0	6.8	6.1	5.4
		20.0	NP	12.0	9.0	8.1	7.2
		25.0	NP	15.0	11.3	10.1	9.0
		30.0	NP	18.0	13.5	12.2	10.8
		35.0	NP	21.0	15.8	14.2	12.6
		40.0	NP	24.0	18.0	16.2	14.4
		45.0	NP	27.0	20.3	18.2	16.2
		50.0	NP	30.0	22.5	20.3	18.0
SDC D0 or D1		10.0	NP	3.0	2.0	1.8	1.6
		15.0	NP	4.5	3.0	2.7	2.4
		20.0	NP	6.0	4.0	3.6	3.2
		25.0	NP	7.5	5.0	4.5	4.0
		30.0	NP	9.0	6.0	5.4	4.8
		35.0	NP	10.5	7.0	6.3	5.6
		40.0	NP	12.0	8.0	7.2	6.4
		45.0	NP	13.5	9.0	8.1	7.2
		50.0	NP	15.0	10.0	9.0	8.0
		10.0	NP	6.0	4.5	4.1	3.6
		15.0	NP	9.0	6.8	6.1	5.4
		20.0	NP	12.0	9.0	8.1	7.2
		25.0	NP	15.0	11.3	10.1	9.0
		30.0	NP	18.0	13.5	12.2	10.8
		35.0	NP	21.0	15.8	14.2	12.6
		40.0	NP	24.0	18.0	16.2	14.4
		45.0	NP	27.0	20.3	18.2	16.2
		50.0	NP	30.0	22.5	20.3	18.0
		10.0	NP	8.5	6.0	5.4	4.8
		15.0	NP	12.8	9.0	8.1	7.2
		20.0	NP	17.0	12.0	10.8	9.6
		25.0	NP	21.3	15.0	13.5	12.0
		30.0	NP	25.5	18.0	16.2	14.4
		35.0	NP	29.8	21.0	18.9	16.8
		40.0	NP	34.0	24.0	21.6	19.2
		45.0	NP	38.3	27.0	24.3	21.6
		50.0	NP	42.5	30.0	27.0	24.0

SDC D_2		10.0	NP	4.0	2.5	2.3	2.0
		15.0	NP	6.0	3.8	3.4	3.0
		20.0	NP	8.0	5.0	4.5	4.0
		25.0	NP	10.0	6.3	5.6	5.0
		30.0	NP	12.0	7.5	6.8	6.0
		35.0	NP	14.0	8.8	7.9	7.0
		40.0	NP	16.0	10.0	9.0	8.0
		45.0	NP	18.0	11.3	10.1	9.0
		50.0	NP	20.0	12.5	11.3	10.0
		10.0	NP	7.5	5.5	5.0	4.4
		15.0	NP	11.3	8.3	7.4	6.6
		20.0	NP	15.0	11.0	9.9	8.8
		25.0	NP	18.8	13.8	12.4	11.0
		30.0	NP	22.5	16.5	14.9	13.2
		35.0	NP	26.3	19.3	17.3	15.4
		40.0	NP	30.0	22.0	19.8	17.6
		45.0	NP	33.8	24.8	22.3	19.8
		50.0	NP	37.5	27.5	24.8	22.0
		10.0	NP	NP	NP	NP	NP
		15.0	NP	NP	NP	NP	NP
		20.0	NP	NP	NP	NP	NP
		25.0	NP	NP	NP	NP	NP
		30.0	NP	NP	NP	NP	NP
		35.0	NP	NP	NP	NP	NP
		40.0	NP	NP	NP	NP	NP
		45.0	NP	NP	NP	NP	NP
		50.0	NP	NP	NP	NP	NP

a. 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 1613.5 of the *International Building Code*.
b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.8.
c. Methods of bracing shall be as described in Section R602.10.2. The alternate braced wall panels described in Section R602.10.3.2 shall also be permitted

4. Revise Table R602.10.1(2) as follows:

TABLE R602.10.1(~~2~~ 3) (Supp)
ADJUSTMENT FACTORS TO THE ~~PERCENTAGE~~ LENGTH OF REQUIRED WALL BRACING [a]

ADJUSTMENT BASED ON:			MULTIPLY ~~PERCENTAGE~~ LENGTH OF BRACING PER WALL LINE BY:	APPLIES TO:
Story height[b] (Section 301.3)		≤ 10 ft	1.0	All bracing methods - R602.10.2
		> 10 ≤ 12 ft	1.2	
Braced wall line spacing in SDC A-C[b,d]		≤ 35 ft	1.0	
		> 35 ≤ 50 ft	1.43	
Wall dead load[e]		> 8≤ 15 psf	1.0	
		≤ 8 psf	0.85	
Roof/ceiling dead load for wall supporting [b,c]:	roof only or roof plus one story	≤ 15 psf	1.0	
	roof only	> 15 psf ≤ 25 psf	1.1	
	roof plus one story	> 15 psf ≤ 25 psf	1.2	
Walls with stone or masonry veneer in SDC C-D_2		See Section R703.7, Exception 1-4		
Cripple walls		See Section R 602.10.8		

a. The total ~~percentage~~ length of bracing required for a given wall line is the product of all applicable adjustment factors.
b. Linear interpolation shall be permitted.
c. Bracing required for a site's wind speed shall not be adjusted for dead load.
d. Braced wall line spacing in excess of 35-ft shall be in accordance with R602.10.1.4.

e. The adjusted ~~percentage~~ length of bracing shall not be less than that required for the site's wind speed.

5. Delete Section R602.10.1.4, revise Section R602.10.1.4.1 and Table R602.10.1.4.1 as follows:

~~**R602.10.1.4 (Supp) Braced wall line spacing**. Spacing of braced wall lines shall not exceed 35 feet (10 668 mm) on center in both the longitudinal and transverse direction in each story.~~

~~**Exception:** Spacing of braced wall lines not exceeding 50 feet (15 240 mm) shall be permitted where:~~

~~1. The wall bracing provided equals or exceeds the percentage of bracing required by Table R602.10.1(1) multiplied by a factor equal to the braced wall line spacing divided by 35 feet (10 668 mm), and~~
~~2. The length-to-width ratio for the floor/roof diaphragm as measured between braced wall lines does not exceed 3:1.~~

R602.10.1.4~~.1~~ (Supp) Braced wall line spacing for Seismic Design Categories D_0, D_1 and D_2. Spacing between braced wall lines in each story shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

Exception: In one-and two-story buildings, spacing between two adjacent braced wall lines shall not exceed 35 feet (10 668 mm) on center in order to accommodate one single room not exceeding 900 square feet (84 m^2) in each dwelling unit. Spacing between all other braced wall lines shall not exceed 25 feet (7 620 mm). A spacing of 35 feet (10 668 mm) or less shall be permitted between braced wall lines where the length of wall bracing required by Table R602.10.1(~~1~~ 2) is multiplied by the appropriate adjustment factor from Table R602.10.1.4~~.1~~, the length-to-width ratio for the floor/roof diaphragm does not exceed 3:1, and the top plate lap splice face nailing shall be twelve 16d nails on each side of the splice.

TABLE R602.10.1.4~~.1~~ (Supp)
ADJUSTMENTS OF BRACING ~~PERCENTAGE~~ LENGTH FOR BRACED WALL LINES GREATER THAN 25 FEET [a,b]

BRACED WALL LINE SPACING (feet)	MULTIPLY BRACING ~~PERCENTAGE~~ LENGTH IN TABLE R602.10.1(~~1~~ 2) BY:
25	1.0
30	1.2
35	1.4

For SI: 1 foot = 304.8 mm.
Notes:
a. Linear interpolation is permissible.
b. For an interior braced wall, the adjustment for the larger spacing between braced wall lines shall be used.

6. Revise Section R602.10.2.1 as follows:

R602.10.2.1 (Supp) Braced wall panel interior finish material. Braced wall panels shall have gypsum wall board installed on the side of the wall opposite the bracing material. Gypsum wall board shall be not less than ½ inch (12.7 mm) in thickness and be fastened in accordance with Table R702.3.5 for interior gypsum wall board.

Exceptions:

1. Wall panels that are braced in accordance with Method 5.
2. Wall panels that are braced in accordance with Section R602.10.3.2 .
3. When an approved interior finish material with an in-plane shear resistance equivalent to gypsum board is installed.
4. For Methods 2, 3, 4, 6, 7, and 8, gypsum wall board is permitted to be omitted provided the ~~percentage~~ length of bracing in Tables R602.10.1(1) and R602.10.1(2) is multiplied by a factor of 1.5.

7. Revise Section R602.10.3 as follows:

R602.10.3 (Supp) Minimum length of braced panels. For Methods 2, 3, 4, 6, 7 and 8 above, each braced wall panel shall be at least 48 inches (1219 mm) in length, covering a minimum of three stud spaces where studs are spaced 16 inches (406 mm) on center and covering a minimum of two stud spaces where studs are spaced 24

inches (610 mm) on center. For Method 5 above, each braced wall panel and shall be at least 96 inches (2438 mm) in length where applied to one face of a braced wall panel and at least 48 inches (1219 mm) where applied to both faces. For Methods 2, 3, 4, 6, 7 and 8, for purposes of computing the ~~percentage~~ length of panel bracing required in Tables R602.10.1(1) and R602.10.1(2), the effective length of the braced wall panel shall be equal to the actual length of the panel. When Method 5 panels are applied to only one face of a braced wall panel, bracing ~~percentages~~ lengths required in Tables R602.10.1(1) and R602.10.1(2) for Method 5 shall be doubled.

Exceptions:

1. Lengths of braced wall panels for continuous wood structural panel sheathing shall be in accordance with Section R602.10.4.
2. Lengths of alternate braced wall panels shall be in accordance with Section R602.10.3.2.1 or Section R602.10.3.2.2.
3. For Methods 2, 3, 4, 6, 7 and 8 in Seismic Design Categories A, B, and C: Panels between 36 inches and 48 inches in length shall be permitted to count towards the required ~~percentage~~ length of bracing in Tables R602.10.1(1) and R602.10.1(2), and the effective contribution shall comply with Table R602.10.3.

8. Revise Table R602.3(1) and Section R602.10.2 as follows:

Table R602.3(1) (Supp)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENERS[a,b,c]	SPACING OF FASTENERS	
1" brace to each stud and plate, face nail	2-8d (2 ½ " x 0.131" ~~0.113)~~ ~~2~~ 3 staples, 1 ¾"	--	
1" x 6" Sheathing to each bearing, face nail	2-8d (2 ½" x 0.131" ~~0.113"~~) ~~2 staples~~ at each stud 3-8d (2 ½" x 0.131") at each plate	--	
1" x 8" Sheathing to each bearing, face nail	2-8d (2 ½" x 0.131" ~~0.113"~~) ~~2 staples~~ at each stud 3-8d (2 ½" x 0.131") at each plate	--	
Wood structural panels, subfloor, roof and wall sheathing to framing, ~~and particleboard wall sheathing to framing~~			
3/8" -1/2"	6d common (2" x 0.113") nail (subfloor, wall 8d common (2 1/2" x 0.131") nail (roof)[f]	6	12[g]
19/32"-1"	8d common nail (2 1/2" x 0.131")	6	12[g]
1 1/8" – 1 1/4"	10d common (3" x 0.148") nail or 8d (2 1/2" x 0.131") deformed nail	6	12
Particleboard wall sheathing to framing			
3/8"	6d common nail (2" x 0.113")	4	6
3/8"-1/2"	8d common nail (2 ½" x 0.131")	4	6
½"-5/8"	10d common nail (3" x 0.148")	4	6

(Portions of table and footnotes not shown remain unchanged)

R602.10.2 (Supp) Braced wall panel construction methods. The construction of braced wall panels shall be in accordance with one of the following methods:

1. Nominal 1-inch-by-4-inch (19.1 mm by 88.9 mm) continuous diagonal braces let in to the top and bottom plates and the intervening studs or approved metal strap devices installed in accordance with the manufacturer's specifications. The let-in bracing shall be placed at an angle not more than 60 degrees (1.06 rad) or less than 45 degrees (0.79 rad) from the horizontal. Let-in brace shall be attached to studs in accordance with Table R602.3(1). Stud spacing shall not exceed 16: o.c.
2. Wood boards ~~of 5/8-inch (15.9 mm) net~~ of nominal 1" minimum thickness (3/4", 19 mm actual) applied diagonally on studs spaced a maximum of 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).
3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing. Wood Structural panels shall be installed in accordance with Table R602.3(3) and Table R602.3(1).
4. One-half-inch (12.7 mm) or 25/32-inch (19.8 mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).
5. Gypsum board with minimum ½-inch (12.7 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at panel edges including top and bottom plates at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board. Gypsum shall be attached to the studs and top and bottom plates for all braced wall panel locations
6. Particleboard wall sheathing panels installed in accordance with Table R602.3(4) and Table R602.3(1).

7. Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.
8. Hardboard panel siding when installed in accordance with Table R703.4.

Exception: Alternate braced wall panels constructed in accordance with Sections R602.10.3.2.1 or R602.10.3.2.2 shall be permitted to replace any braced wall panel in any of the above methods of braced wall panels.

9. Revise Sections R602.10.4.1and R602.10.4.4 as follows:

R602.10.4.1 (Supp) Continuously-sheathed braced wall line requirements. Continuously-sheathed braced wall line shall be in accordance with Figure R602.10.4(1) and shall comply with all of the following requirements:

1. Structural sheathing shall be applied to all exterior sheathable surfaces of a braced wall line including areas above and below openings.
2. Only full-height braced wall panels shall be used for calculating the braced wall ~~percentage~~ length in accordance with Tables R602.10.1(1) and R602.10.1(2).

R602.10.4.4 (Supp) Braced wall ~~percentage~~ length. In addition to bracing ~~percentage~~ length adjustments specified elsewhere in this code, the braced wall ~~percentages~~ lengths for continuously sheathed braced wall lines shall be in accordance with Tables R602.10.1(1) and R602.10.1(2). ~~Method 3 from Table 602.10.1(1) shall be permitted to be multiplied by a factor in accordance with Table R602.10.4.4.~~

~~**TABLE R602.10.4.4 (Supp)**~~
~~**ADJUSTMENT FACTORS TO THE PERCENTAGE OF REQUIRED BRACING PER WALL LINE –CONTINUOUSLY SHEATHED**~~

~~ADJUSTMENT BASED ON MAXIMUM WALL CLEAR OPENING HEIGHT:~~		~~MULTIPLY PERCENTAGE OF BRACING PER WALL LINE BY:~~
~~Continuous wood structural panel sheathing when maximum opening height in wall line does not exceed [a] (Section 301.2.2.2.1)~~	~~85% of wall height~~	~~0.9~~
	~~67% of wall height~~	~~0.8~~

~~a. Percentage of bracing for continuous wood structural panel sheathing shall be based on Method 3 requirements.~~

10. Revise Sections R602.10.4.5 and R602.10.4.6 as follows:

R602.10.4.5 (Supp) 4:1 aspect ratio segments at garage door openings used with continuous structural panel sheathing. A 4:1 aspect ratio shall be permitted for full-height sheathed wall segments on either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf (0.14 kN/m^2) or less. For purposes of calculating the ~~percentage~~ length of panel bracing required by Table R602.10.1(1), the length of the full height sheathing segment shall be equal to its measured length. This option is limited to one wall of the garage.

R602.10.4.6 (Supp) 6:1 aspect ratio segments used with continuous structural panel sheathing. Wall segments having a maximum 6:1 height to width ratio shall be permitted to be built in accordance with Figure R602.10.4.6 The maximum 6:1 height-to-width ratio is based on height being measured from top of header to the bottom of the wall segment bottom-plate. For purposes of calculating the ~~percentage~~ length of panel bracing required by Tables R602.10.1(1) and R602.10.1(2), the width of the full-height sheathing segment shall be equal to its measured width. Corners at the ends of walls using this option shall be constructed in accordance with Figure R602.10.4.3(1). The reduction factors for continuously braced walls from Section R602.10.4.4 shall be applied when calculating applicable ~~percentages~~ lengths of wall bracing. The number of wall segments having a maximum 6:1 height to width ratio in a wall line shall not exceed four. In multi-story buildings, wall segments having a maximum 6:1 height to width ratio are not permitted to be directly stacked vertically. For purposes of resisting wind pressures acting perpendicular to the wall, in accordance with Section R301.2, the minimum requirements of Figure R602.10.4.6 shall be sufficient for wind speeds less than 110 mph in Exposure Category B. For Exposure Categories C and D, the header to jack stud strap requirements and the number of additional jack studs shall be in accordance with Table R602.10.4.6.

11. Revise Sections R602.10.7 and R602.10.8 as follows:

R602.10.7 (Supp) Panel joints. All vertical joints of panel sheathing shall occur over, and be fastened to common studs. Horizontal joints in braced wall panels shall occur over, and be fastened to common blocking of a minimum 1-1/2 inch (38 mm) thickness.

Exceptions:

1. Blocking at horizontal joints shall not be required in wall segments that are not counted as braced wall panels.
2. Where the bracing ~~percentage~~ length provided is at least twice the minimum ~~percentage~~ length required by Tables R602.10.1(1) and R602.10.1(2) blocking at horizontal joints shall not be required in braced wall panels constructed using Methods 3, 4, 5, 6, or 8.

R602.10.8 (Supp) Cripple wall bracing. In Seismic Design Categories other than D_2, cripple walls shall be braced with a ~~percentage~~ length and type of bracing as required for the wall above in accordance with Tables R602.10.1(1) and R602.10.1(2) with the following modifications for cripple wall bracing:

1. The ~~percentage~~ length of bracing as determined from Tables R602.10.1(1) and R602.10.1(2) shall be multiplied by a factor of 1.15, and
2. The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

Reason: The ICC Ad-Hoc Committee on Wall Bracing is proposing fourteen technical and non-technical code changes as we work through the process of making Section R602.10 of the 2009 IRC technically correct and easier to understand. The individual code changes are designed to stand alone if necessary, but the total body of work is respectively submitted as a comprehensive continuation of cycle 1 changes for the 2009 IRC. To see how the individual changes are intended to meld together, please visit the ICC web site, and review the composite document on the Ad hoc Committee on Wall Bracing page: http://www.iccsafe.org/cs/cc/ahc-wb/index.html.

This is a technical change to provide:

- Separate the bracing requirements for wind and seismic loading.
- Revise the bracing tables and convert them from percentages to lengths in feet.

This change corrects a problem that has been in the IRC since it was "merged". The assumption that structures responding to wind loading will perform similar to structures responding to seismic events was overstated. Therefore, this code change introduces new bracing requirements for wind loading (i.e. a new "Wind Table") and reformats the seismic bracing requirements (i.e. the "Seismic Table").

To make the tables less onerous, the ad hoc committee replaced "percentages" with actual "length" of bracing in feet.

1 & 2) This proposal introduces the table **BRACING REQUIREMENTS BASED ON WIND**.

This major change creates a "wind table" for the majority of the country where wind loading is the dominant lateral force. In prior editions of the code, wind bracing was erroneously assumed to be similar to the "percentages" of the "seismic table".

The problem with the existing "seismic table" is that it is based entirely on seismic loading, which is proportional to the length of the building. Wind loading on the other hand, is proportional to the wall line spacing, the height of the walls and the height of the roof relative to the eaves (i.e. the sail area upon which the wind pressure is exerted).

Having a single table (driven by seismic loading) has been a major concern in the higher wind speed regions. An evaluation based on testing and analysis of available engineering data by the Ad Hoc Committee has shown that the sheathing requirements for the 90 – 110 MPH wind speeds are currently insufficient, and thus a separate wind table is necessary. Note: in the hurricane prone regions of the country, the IRC requires the use of alternative design documents.

The "wind table" was developed based on the sail area of the building, with an assumed 10 ft high wall for each story, and a 10 ft height between the eave and the ridge of the building. The loads are based on the reference document for the code, ASCE 7-05. Built into the new Wind Table is an agreed assumption that 55% of the full restraint can be achieved on the top story, 75% of the full restraint can be achieved on a bottom story of a two story or the second story of a three story, and 100% full restraint can be achieved on the bottom story of a three story building. These assumptions of performance are carried through to all of the higher wind speeds.

The difference between Method 3 and its "exception", continuous wood structural panels, is that method 3 is assumed to have 100% openings adjacent to it (i.e. the wood structural panels are non-contiguous). When the continuous wood structural panel method is used, the sheathing above and below openings do contribute to the strength of the braced wall line. A benefit is granted by way of a less required bracing along that line.

Having said that, however, the reason that in the Wind Table, the Method 3 column and the 85% and the 65% columns each have the same amount of required bracing on the first of three story structures follows: The bottom of a three story structure, where the braced wall panels already act as if they are fully restrained, little to no additional strength can be achieved by sheathing above and below the openings. Therefore the amount of bracing is the same for Method 3 and the 85% and 65% adjacent openings.

The values for the second story of 3 and the bottom story of 2 does receive a benefit, but only half as much as the top story, because the base values used in determining the Method 3 sheathing requirements assume that the second story is 75% restrained for overturning by the surrounding structure. The top story is gets the full benefit of using continuous sheathing since it is the least restrained by the surrounding structure and is the most representative of the test conditions upon which the continuously sheathed method is based.

The calibration of the calculations was checked to see if the numbers were reasonably close to what has historically (i.e. 1950-1960) been built in the central United States for 1 story buildings. The check was reasonably close to what was typically used.

The adjustments for conditions other than those assumed for the table are provided in the footnotes. These adjustments include increases if the exposure of the building is classified as Exposure C, decreases or increases if the wall height is different than 10ft, if there are more than 2 wall lines resisting the load, and if gypsum wallboard is not used on the inside of the wall.

3) This change reformats the seismic bracing table. It deletes "percentages" and provides the bracing requirements in "length (feet)" of braced wall line.

The reformat of the seismic table is non-technical except for the addition of let-in bracing. Let-in bracing was given the same value of resistance as gypsum wall board, just as was done when the bracing requirements were developed for the new wind load bracing requirements in Item 1 of this proposal.

4) Deleted the word "percentage" and changes it to "length" for consistency in the code.

5) Changes to Sections R602.10.1.4 and R602.10.1.4.1 are made to eliminate the need for making modifications to the bracing amounts for wind since they are included in the new table and the modifications for wall line spacing greater than 25 ft for seismic was modified to change the word percentage to length.

6) The word "percentage" was changed to "length" and the reference to the bracing tables was corrected to include both tables.

7) Section R602.10.3 was modified to change the word "percentage" to "length" and to correct the reference to the bracing tables to include both tables

8) Changes to Table R602.3(1) and Section R602.10.2 are made to make the construction practice mimic the requirements of the Special Design Provisions for Wind and Seismic of the National Design Specification and experimental testing, upon which the resistances are based. The fastening requirements for let-in bracing, diagonal lumber sheathing, and gypsum wallboard are effected. Gypsum wallboard fastening is not changed, but additional language is added to the method description to highlight the fact that the wall sheathing needs to be attached to the top and bottom plates if the wallboard is to be included as bracing. This modifies the practice of floating the corners in the gypsum wallboard to where now only the ceiling gypsum can be floated in locations where the wall is being used as bracing. The gypsum wallboard needs to be attached to the top and bottom plates as well as the studs in order for the wall panel to resist any lateral forces.

This change allows all of the sheathing types, with the exception of let-in bracing and continuous sheathing methods, to be considered equal when resisting wind since strength is the only concern. Due to the differences in ductility, and general toughness when subjected to cyclic loads, the sheathing materials could not be considered equal for seismic loading at this time. This is an issue being worked on by the Dolan Group.

9) Sections R602.10.4.1 and R602.10.4.4 were revised to add the reference to the new bracing requirements provided for wind loading, change the word "percentage" to "length", and eliminate the adjustment factors since they are included in the new tables.

10) Sections R602.10.4.5 and R602.10.4.6 were revised to add the reference to the new bracing requirements provided for wind loading, and change the word "percentage" to "length".

11) Sections R602.10.4.7 and R602.10.4.8 were revised to add the reference to the new bracing requirements provided for wind loading, and change the word "percentage" to "length".

Cost Impact: The code change proposal will increase the cost of construction.

Committee Action: Disapproved

Committee Reason: The committee appreciates the work that the Ad-hoc Committee has done, but feels more work is needed to make this current for both wind and seismic. The committee would like to see a more holistic approach. Look at the whole building system for seismic and wind. The Ad-hoc Committee should rework this and bring back to the Final Action.

Assembly Action: Approved as Submitted

Individual Consideration Agenda

This item is on the agenda for individual consideration because an assembly action was successful and public comments were submitted.

Public Comment 1:

Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad-Hoc Committee on Wall Bracing, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.10.1.1 (Supp) Length of bracing. The length of bracing along each braced wall line ~~shall be in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2) and~~ shall be the greater of that required by the design wind speed and braced wall line spacing in accordance with Table R602.10.1.2(1) as adjusted by the factors in the footnotes, or the Seismic Design Category and braced wall line length in accordance with Table R602.10.1.2(2) as adjusted by the factors in~~. Adjustments to the length of braced wall as specified in Tables R602.10.1.2(1) and R602.10.1.2(2) shall be as specified in~~ Table R602.10.1.2(3). Only walls that are parallel to the braced wall line may be counted towards the bracing requirement of that line.

R602.10.1.1.1 Braced wall panel uplift load path. Braced wall panels located at exterior walls that support roof rafters or trusses (including stories below top story) shall have the framing members connected in accordance with one of the following:

1. Fastening in accordance with Table R602.3(1) where:
   - 1.1. The basic wind speed does not exceed 90 mph, the wind exposure category is B, the roof pitch is 5:12 or greater, and the roof span is 32 feet or less, or
   - 1.2 The net uplift value at the top of a wall does not exceed 100 plf. The net uplift value shall be determined in accordance with Section R802.11 and shall be permitted to be reduced by 60 plf for each full wall above.
2. Where the net uplift value at the top of a wall exceeds 100 plf, installing approved uplift framing connectors to provide a continuous load path from the top of the wall to the foundation. The net uplift value shall be as determined in Item 1.2 above.
3. Bracing and fasteners designed in accordance with accepted engineering practice to resist combined uplift and shear forces.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This public comment is needed to coordinate with a separate public comment on RB148 modifying required bracing lengths for wind. The lateral load capacity of wall bracing elements is reduced when vertical uplift forces from wind acting on the roof are also transferred through the bracing elements. The bracing lengths addressed in a separate public comment on RB148 are derived based on the assumption that the net roof uplift transferred through braced wall panels is less than 100 plf (per Section R602.10.1.1.1, Item 1), as determined by Section R802.11 provisions for roof uplift connections. When Section R802.11 requires clips or straps at the roof-to-wall connection, vertical straps from the roof-to-stud or plate-to-stud shall be provided, unless the weight of the wall above offsets the uplift load (per Section R602.10.1.1.1, Item 1.2). In addition, when the net uplift at the bottom of the wall exceeds 100 plf (per Section R602.10.1.1.1, Item 2), vertical straps must be provided across the story-to-story (wall assembly-to-wall assembly) connections and uplift connections will be required at the braced wall panels). As an alternative (per Section R602.10.1.1.1, Item 3), some bracing systems such as wood structural panels can be designed to resist combined uplift and shear.

Public Comment 2:

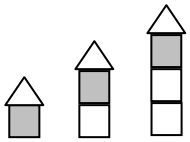
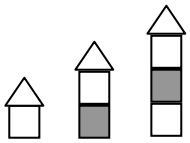
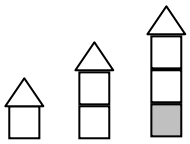
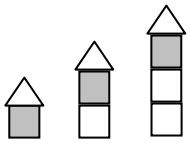
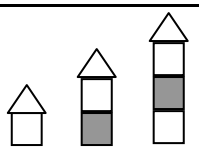
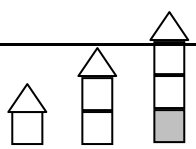
Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad-Hoc Committee on Wall Bracing, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

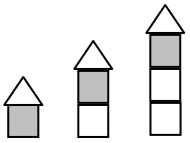
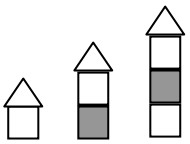
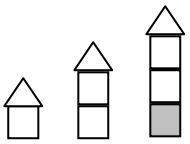
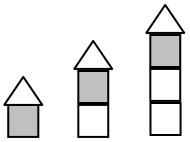
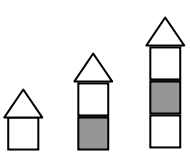
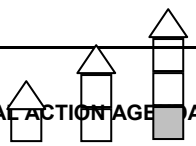
R602.10.1.1 (Supp) Length of bracing. The length of bracing along each braced wall line shall be in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2) and shall be the greater of that required by the design wind speed or the Seismic Design Category. Adjustments to the length of braced wall specified in Tables R602.10.1.2(1) and R602.10.1.2(2) shall be as specified in Table R602.10.1.2(3). Only walls that are parallel to the braced wall line may be counted towards the bracing requirement of that line. In no case shall the minimum total length of bracing in a braced wall line, after all adjustments have been taken, be less than 48 inches total.

Replace proposed Table R602.10.2(1) with the following:

TABLE R602.10.1(1)[a,b,c,d,e]
BRACING REQUIREMENTS BASED ON WIND SPEED
(AS A FUNCTION OF BRACED WALL LINE SPACING)

EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD 1[f,h]	METHOD 5 (DOUBLE SIDED)[g]	METHODS 2, 3, 4, 6, 7, 8[f]	CONT. SHEATHING
≤ 85 MPH		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0
		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.5	5.5
		30	16.5	16.5	9.5	8.0
		40	21.5	21.5	12.5	10.5
		50	26.5	26.5	15.0	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.0	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.0	15.5
		50	NP	39.0	22.5	19.0
		60	NP	46.5	26.5	22.5
≤ 90 MPH		10	3.5	3.5	2.0	2.0
		20	7.0	7.0	4.0	3.5
		30	9.5	9.5	5.5	5.0
		40	12.5	12.5	7.5	6.0
		50	15.5	15.5	9.0	7.5
		60	18.5	18.5	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	13.0	13.0	7.5	6.5
		30	18.5	18.5	10.5	9.0
		40	24.0	24.0	14.0	12.0
		50	29.5	29.5	17.0	14.5
		60	35.0	35.0	20.0	17.0
		10	NP	10.5	6.0	5.0
		20	NP	19.0	11.0	9.5

EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD 1[f,h]	METHOD 5 (DOUBLE SIDED)[g]	METHODS 2, 3, 4, 6, 7, 8[f]	CONT. SHEATHING
		30	NP	27.5	15.5	13.5
		40	NP	35.5	20.5	17.5
		50	NP	44.0	25.0	21.5
		60	NP	52.0	30.0	25.5

EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD 1[f,h]	METHOD 5 (DOUBLE SIDED)[g]	METHODS 2, 3, 4, 6, 7, 8[f]	CONT. SHEATHING
≤ 100 MPH		10	4.5	4.5	2.5	2.5
		20	8.5	8.5	5.0	4.0
		30	12.0	12.0	7.0	6.0
		40	15.5	15.5	9.0	7.5
		50	19.0	19.0	11.0	9.5
		60	22.5	22.5	13.0	11.0
		10	8.5	8.5	5.0	4.5
		20	16.0	16.0	9.0	8.0
		30	23.0	23.0	13.0	11.0
		40	29.5	29.5	17.0	14.5
		50	36.5	36.5	21.0	18.0
		60	43.5	43.5	25.0	21.0
		10	NP	12.5	7.5	6.0
		20	NP	23.5	13.5	11.5
		30	NP	34.0	19.5	16.5
		40	NP	44.0	25.0	21.5
		50	NP	54.0	31.0	26.5
		60	NP	64.0	36.5	31.0
< 110 MPH		10	5.5	5.5	3.0	3.0
		20	10.0	10.0	6.0	5.0
		30	14.5	14.5	8.5	7.0
		40	18.5	18.5	11.0	9.0
		50	23.0	23.0	13.0	11.5
		60	27.5	27.5	15.5	13.5
		10	10.5	10.5	6.0	5.0
		20	19.0	19.0	11.0	9.5
		30	27.5	27.5	16.0	13.5
		40	36.0	36.0	20.5	17.5
		50	44.0	44.0	25.5	21.5
		60	52.5	52.5	30.0	25.5
		10	NP	15.5	9.0	7.5
		20	NP	28.5	16.5	14.0

EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD 1[f,h]	METHOD 5 (DOUBLE SIDED)[g]	METHODS 2, 3, 4, 6, 7, 8[f]	CONT. SHEATHING
		30	NP	41.0	23.5	20.0
		40	NP	53.0	30.5	26.0
		50	NP	65.5	37.5	32.0
		60	NP	77.5	44.5	37.5

a. Tabulated bracing lengths are based on wind exposure category B, a 30 ft mean roof height, a 10 ft eave to ridge height, a 10 ft wall height, and two braced wall lines sharing load in a given plan direction on a given story level. Methods of bracing shall be as described in Sections R602.10.2 and R602.10.4. Interpolation shall be permitted.

b. For other mean roof heights and exposure categories, the required bracing length shall be multiplied by the appropriate factor from the following table:

Number of Stories	Exposure/Height Factors		
	Exposure B	Exposure C	Exposure D
1	1.0	1.2	1.5
2	1.0	1.3	1.6
3	1.0	1.4	1.7

c. For other roof-to-eave ridge heights, the required bracing length shall be multiplied by the appropriate factor from the following table:

Support Condition	Roof Eave-to-Ridge Height			
	5'-0" or less	10 ft	15 ft	20 ft
Roof Only	0.7	1.0	1.3	1.6
Roof+Floor	0.85	1.0	1.15	1.3
Roof + 2 Floors	0.9	1.0	1.1	NP

1. Interpolation shall be permitted.

d. For a maximum 9-foot wall height, the table values shall be permitted to be multiplied by 0.95. For a maximum 8-foot wall height, the table values shall be permitted to be multiplied by 0.90. For a maximum 12-foot wall height, the table values shall be multiplied by 1.1.

e. For three or more braced wall lines in a given plan direction, the required bracing length on each braced wall line shall be multiplied by the appropriate factor from the following table:

Number of Braced Wall Lines	Adjustment Factor
3	1.30
4	1.45
≥5	1.60

f. Bracing lengths are based on the application of gypsum board finish (or equivalent) applied to the inside face of a braced wall panel. When gypsum board finish (or equivalent) is not applied to the inside face of braced wall panels, the tabulated lengths shall be multiplied by the appropriate factor from the following table:

Bracing Method	Adjustment Factor
Method 1	1.8
Methods 2,3,4,6,7,8	1.4

g. Bracing lengths for Method 5 are based on the application of gypsum board on both faces of a braced wall panel. When Method 5 Bracing is provided on only one side of the wall, the required bracing amounts shall be doubled.

h. Method 1 bracing shall have gypsum board attached to at least one side according to the Section R602.10.2 Method 5 requirements.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: One of the principal tasks undertaken by the Ad-Hoc Wall Bracing Committee was the creation of a separate bracing table for wind loads. This task emerged from a sense that the current percentages, based on seismic loading, could generate inadequate wind bracing, especially when combined with the 12'-6" end distance offset permitted by the IRC. The Ad-Hoc Wall Bracing Committee developed a separate table incorporating the current ASCE 7 wind load provisions, their proper application to the "sail area" (i.e, based on braced wall line spacing, not wall length as appropriate to seismic loading only), the use of material capacities from AF&PA standards, and judgments based on a selection of 2D testing of wall assemblies. This public comment revises the proposed wind bracing table for the following reasons:

For Methods 1-8: Based on testimony from the floor, the IRC Building/Energy Committee disapproved the original proposal and directed the Ad-Hoc Committee to undertake a further review of the proposed bracing lengths for wind. The IRC committee agreed with opponents that the

bracing amounts reflected in the original proposal were overly conservative, in excess of historical amounts provided under CABO, and would prove to be a design burden for builders and a plan review and inspection burden for code officials. The IRC committee directed the Ad-Hoc Committee to develop revised bracing amounts that would consider the 3D effects that occur when an individual braced wall is placed within a complete structure (including interior and exterior finishes, floors and ceilings, windows, etc.). This "whole-house behavior" gives the braced wall and its panels a higher resistance to lateral loads than a 2D shear wall tests and related simple engineering analyses would suggest. The revised table in this public comment is the result of the Ad-Hoc Committee arriving at a rational method to incorporate these holistic effects into the wall bracing analysis for RB148. The 3D whole building test data and the discussion and analysis of the data the committee considered in arriving at the revised proposal is available for download at www.foamsheathing.org.

This revised table was benchmarked against Examples 10.1 and 10.2 from the ICC/APA "Guide to the 2006 IRC Wall Wood Bracing Provisions". These examples calculate bracing for a two-story house approximately 25'-0" by 40'-0". The revised table generates bracing lengths consistent with the CABO One- and Two-Family Dwelling Code. These examples represent construction which has performed well in typical 90 mph, Exposure B urban and suburban environments. The revised table will increase the required bracing length for large braced wall spacings, for three-story dwellings and for dwellings in regions of 100mph to 110mph basic wind speeds, Increases for these homes are desired and would be expected based on relative difference in wind load.

For Continuous Wood Structural Panel Sheathing: To provide simplification, it is proposed to replace the two columns reflecting the adjustments for 85% and 65% opening heights for continuous wood structural panel braced walls with one factor for all cases of these walls.

The value of 0.85 is conservative, as it implies that a continuous sheathed wood structural panel braced wall is only 15% stronger and stiffer than an intermittent wood structural panel braced wall (method 3). Testing and analysis provide justification for values considerably higher than 15% for many cases, however because of the complexities restraint conditions and various possible configurations, a conservative and simple value is proposed. The justification can be summarized in the following:

CUREE shake table tests of a two-story wood frame house examined the effects of extra sheathing used above and below the openings. Houses built with segmented shear walls both with and without wood structural panel sheathing above and below window and door openings were compared. The shake table tests of segmented walls built without the added wood structural panel sheathing above and below openings had increased wall displacements by a factor more than two, suggesting that the wood structural panel sheathing above and below openings have an effect near a factor of 2 on the performance of the structure (Fischer et al., 2004).

A review of unrestrained full-scale wood structural panel bracing wall tests (Martin et al., 2007), which includes 53 different tests of intermittent and continuous wall bracing in walls ranging from 12-ft long to 40-ft long and some 3D whole house testing shows that on average the improvement in peak loads for continuous is 1.95 (for walls without gypsum) and 1.87 (for walls with gypsum). This comprehensive comparison shows that walls continuously sheathed with wood structural panels resist approximately two times the load at 0.5% drift and peak capacity. Further details can be seen at: www.apawood.org/pdfs/TSD/review_lg_scale_wall_bracing_tests.pdf.

Large scale 3D testing at APA of a 25-ft x 37.5-ft single story house shows that for equal amounts of bracing the continuously sheathed walls resisted 2.16 to 1.78 times higher loads at racking displacements of 1.5 inches. Further details can be seen at: http://www.apawood.org/pdfs/TSD/T-Reports/T2007-73.pdf.

Comparing wall racking test data with a high degree of end restraint provided by hold down devices shows that a 4-ft intermittent method 3 segment has a peak load of 597 plf, and a 12-ft wall with only two 24-inch segments next to a 62-inch tall window with sheathing above and below the opening has a peak load of 751 plf. This data supports an increase of 1.26 in the strength of continuous over intermittent and the comparison is conservative because the continuous wall had less full height segment restraint. Simpson Strong Tie has reported similar values comparing similar wall segments. Further details can be seen at: http://www.apawood.org/pdfs/TSD/InterVsContTestData.pdf.

The Sugiyama perforated shear wall equations show that for equal amounts of full height segments, the additional area of sheathing above and below openings results in predicted strength increases of at least around 20%. Further details can be seen at: http://www.apawood.org/pdfs/TSD/InterVsContPerfSWequations.pdf.

Additional enhancements: Bracing values for a 60'-0" braced wall line spacing were added to the table. This was a request from building officials who frequently see this spacing on larger houses. A preference was expressed for seeing the wall bracing section expand to cover these houses when sufficient room on exterior walls exist to accommodate wall bracing without requiring the use of interior braced wall lines.

The footnotes were further simplified and clarified. All of the basic assumptions are now gathered in the first footnote, similar to other tables within the IRC. The Ad-Hoc committee also voted to include a needed adjustment factor table for different roof-to-eave heights. All of the remaining adjustment factor tables and their charging language were graphically and editorially cleaned up. No other changes to the content of those tables were made.

With this improved bracing table, most one- and two-story house plans today will meet bracing requirements without a need for major revisions. Bracing amounts will increase only where one would logically expect additional bracing to be required (for example, higher wind regions). With these changes, it is also anticipated that the AHWB committee will be able to develop and implement a simplified "2-page" bracing provision for typical homes in the 90mph Exposure B conditions in the next code development cycle. Life will be truly simpler for builders, code officials, and inspectors. The Ad-Hoc Committee requests your support for this proposal, which accomplishes a badly needed fix to the wall bracing section.

References

APA, 2007. Full Scale 3-D Wall Bracing Tests. APA-The Engineered Wood Association, Tacoma, WA. Available at: http://www.apawood.org/pdfs/TSD/T-Reports/T2007-73.pdf

Fischer, D., Filiatrault, A., Folz, B., Uang, C-M, Seible, F., 2004. Shake Table Tests of a Two-Story Woodframe House. CUREE Publication W-06. CUREE, Richmond, CA.

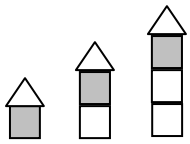
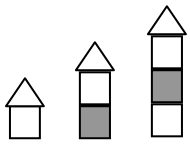
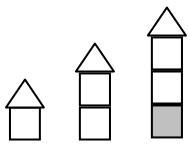
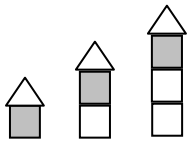
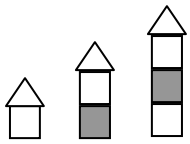
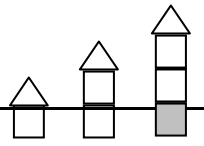
Martin, Z., Skaggs, T., Keith, E., Yeh, B. 2007. A Review of Large Scale Wood Structural Panel Bracing Tests, Report to BSSC Bracing Committee May 2007, APA-The Engineered Wood Association, Tacoma, WA. Available at: www.apawood.org/pdfs/TSD/review_lg_scale_wall_bracing_tests.pdf

Public Comment 3:

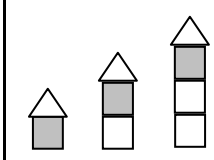
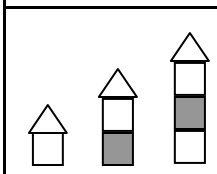
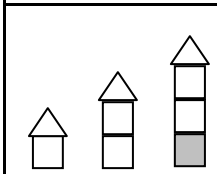
Chuck Bajnai, Chesterfield County, VA, representing the ICC Ad-Hoc Committee on Wall Bracing, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.10.1.2(2) [a,b,c]
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY
(A FUNCTION OF BRACED WALL LINE LENGTH)
~~**Minimum Total Length (feet) of Braced Wall Panels Required of Braced Wall Line**~~

SOIL CLASS D[a] WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD ~~1 BWL~~ ~~BWL~~BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE				
SEISMIC DESIGN CATEGORY (SDC)	STORY LOCATION	~~BWL~~ BRACED WALL LINE LENGTH	METHOD 1	METHODS 2, 4, 5, 6, 7, 8	METHOD 3	CONT. SHEATHING ~~(85% OPENING)~~	~~CONT. SHEATHING (65% OPENING)~~
SDC A and B, and Detached Dwellings in C		Exempt from Seismic Requirements Use Table R602.10.1(1) for bracing requirements					
SOIL CLASS Da WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD 1 BWL BWLBRACED WALL LINE SPACING ≤ 25 FT		MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE					
SEISMIC DESIGN CATEGORY (SDC)	STORY LOCATION	~~BWL~~ BRACED WALL LINE LENGTH	METHOD 1	METHODS 2, 4, 5, 6, 7, 8	METHOD 3	CONT. SHEATHING ~~(85% OPENING)~~	~~CONT. SHEATHING (65% OPENING)~~
SDC C		10	2.5	2.5	1.6	1.4	~~1.3~~
		20	5.0	5.0	3.2	2.7	~~2.6~~
		30	7.5	7.5	4.8	4.1	~~3.8~~
		40	10.0	10.0	6.4	5.4	~~5.1~~
		50	12.5	12.5	8.0	6.8	~~6.4~~
		10	NP	4.5	3.0	2.6	~~2.4~~
		20	NP	9.0	6.0	5.1	~~4.8~~
		30	NP	13.5	9.0	7.7	~~7.2~~
		40	NP	18.0	12.0	10.2	~~9.6~~
		50	NP	22.5	15.0	12.8	~~12.0~~
		10	NP	6.0	4.5	3.8	~~3.6~~
		20	NP	12.0	9.0	7.7	~~7.2~~
		30	NP	18.0	13.5	11.5	~~10.8~~
		40	NP	24.0	18.0	15.3	~~14.4~~
		50	NP	30.0	22.5	19.1	~~18.0~~
SDC D0 or D1		10	NP	3.0	2.0	1.7	~~1.6~~
		20	NP	6.0	4.0	3.4	~~3.2~~
		30	NP	9.0	6.0	5.1	~~4.8~~
		40	NP	12.0	8.0	6.8	~~6.4~~
		50	NP	15.0	10.0	8.5	~~8.0~~
		10	NP	6.0	4.5	3.8	~~3.6~~
		20	NP	12.0	9.0	7.7	~~7.2~~
		30	NP	18.0	13.5	11.5	~~10.8~~
		40	NP	24.0	18.0	15.3	~~14.4~~
		50	NP	30.0	22.5	19.1	~~18.0~~
		10	NP	8.5	6.0	5.1	~~4.8~~
		20	NP	17.0	12.0	10.2	~~9.6~~
		30	NP	25.5	18.0	15.3	~~14.4~~

SOIL CLASS D[a] WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD<br~~1 BWL~~ ~~BWL~~BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE				
SEISMIC DESIGN CATEGORY (SDC)	STORY LOCATION	~~BWL~~ BRACED WALL LINE LENGTH	METHOD 1	METHODS 2, 4, 5, 6, 7, 8	METHOD 3	CONT. SHEATHING ~~(85% OPENING)~~	~~CONT. SHEATHING (65% OPENING)~~
SDC A and B, and Detached Dwellings in C		Exempt from Seismic Requirements Use Table R602.10.1(1) for bracing requirements					
SOIL CLASS Da WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD 1 BWL BWLBRACED WALL LINE SPACING ≤ 25 FT		MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE					
SEISMIC DESIGN CATEGORY (SDC)	STORY LOCATION	~~BWL~~ BRACED WALL LINE LENGTH	METHOD 1	METHODS 2, 4, 5, 6, 7, 8	METHOD 3	CONT. SHEATHING ~~(85% OPENING)~~	~~CONT. SHEATHING (65% OPENING)~~
		40	NP	34.0	24.0	20.4	~~19.2~~
		50	NP	42.5	30.0	25.5	~~24.0~~

SOIL CLASS D[a] WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD<br~~1 BWL~~ ~~BWL~~BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE				
SEISMIC DESIGN CATEGORY (SDC)	STORY LOCATION	~~BWL~~ BRACED WALL LINE LENGTH	METHOD 1	METHODS 2, 4, 5, 6, 7, 8	METHOD 3	CONT. SHEATHING ~~(85% OPENING)~~	~~CONT. SHEATHING (65% OPENING)~~
SDC D2		10	NP	4.0	2.5	2.1	~~2.0~~
		20	NP	8.0	5.0	4.3	~~4.0~~
		30	NP	12.0	7.5	6.4	~~6.0~~
		40	NP	16.0	10.0	8.5	~~8.0~~
		50	NP	20.0	12.5	10.6	~~10.0~~
		10	NP	7.5	5.5	4.7	~~4.4~~
		20	NP	15.0	11.0	9.4	~~8.8~~
		30	NP	22.5	16.5	14.0	~~13.2~~
		40	NP	30.0	22.0	18.7	~~17.6~~
		50	NP	37.5	27.5	23.4	~~22.0~~
		10	NP	NP	NP	NP	~~NP~~
		20	NP	NP	NP	NP	~~NP~~
		30	NP	NP	NP	NP	~~NP~~
		40	NP	NP	NP	NP	~~NP~~
		50	NP	NP	NP	NP	~~NP~~

a. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the Sds values associated with the Seismic Design Categories shall be permitted when a site-specific Sds value is determined in accordance with Section 1613.5 of the International Building Code.
b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.8.
c. Methods of bracing shall be as described in Sections R602.10.2 and R602.10.4. ~~The alternate braced wall panels described in Section R602.10.3.2 shall also be permitted.~~

TABLE R602.10.1(3)
ADJUSTMENT FACTORS TO THE LENGTH OF REQUIRED SEISMIC WALL BRACING [a]

ADJUSTMENT BASED ON:			MULTIPLY LENGTH OF BRACING PER WALL LINE BY:	APPLIES TO:
Story height[b] (Section R301.3)		≤ 10 ft	1.0	All bracing methods - R602.10.2 and R602.10.4
		> 10 ft ≤ 12 ft	1.2	
Braced wall line spacing, townhouses in SDC A - C [b,c~~d~~]		≤ 35 ft	1.0	
		> 35 ≤ 50 ft	1.43	
Wall dead load [~~e~~]		> 8 ≤ 15	1.0	
		≤ 8 psf	0.85	
Roof/ceiling dead load for wall supporting [b,~~c~~e]	roof only or roof plus one story	≤ 15 psf	1.0	
	roof only	> 15 psf ≤ 25 psf	1.1	
	roof plus one story	> 15 psf ≤ 25 psf	1.2	
Walls with stone or masonry veneer in SDC C - D_2		See Section R703.7, Exception 1-4		
Cripple walls		See Section R602.10.8		

a. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
b. Linear interpolation shall be permitted.
~~c. Bracing required for a site's wind speed shall not be adjusted for dead load.~~
~~d~~c. Braced wall line spacing and adjustments to bracing length in SDC D_0 to D_2 ~~excess of 35-ft~~ shall ~~be in accordance~~ comply with Section R602.10.1.4.
~~e. The adjusted length of bracing shall not be less than that required for the site's wind speed.~~

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This change proposes editorial and technical changes to the seismic table in RB148 based on Ad-Hoc Committee discussions. The changes are as follows:

Editorial changes: Revisions to the seismic table in RB148 are made for coordination with approved proposals RB143 and RB144. Primarily, references to the section defining the continuous sheathing methods are provided. The header for the seismic bracing table is editorially cleaned up, similar to editorial changes proposed in a separate public comment on the new wind bracing table. To shorten the length of the table, the originally proposed 5' increments have been deleted. Also, Table R602.10.1(3) is clarified as applying to seismic bracing amounts only. Where factors in the table applied to wind bracing amounts, those adjustments were directly incorporated into the wind bracing table.

Technical changes: To provide simplification, it is proposed to replace the two columns reflecting the adjustments for 85% and 65% opening heights for continuous wood structural panel braced walls with one factor for all cases of these walls.

The value of 0.85 is conservative, as it implies that a continuous sheathed wood structural panel braced wall is only 15% stronger and stiffer than an intermittent wood structural panel braced wall (method 3). Testing and analysis provide justification for values considerably higher than 15% for many cases, however because of the complexities restraint conditions and various possible configurations, a conservative and simple value is proposed. The justification can be summarized in the following:

CUREE shake table tests of a two-story wood frame house examined the effects of extra sheathing used above and below the openings. Houses built with segmented shear walls both with and without wood structural panel sheathing above and below window and door openings were compared. The shake table tests of segmented walls built without the added wood structural panel sheathing above and below openings had increased wall displacements by a factor more than two, suggesting that the wood structural panel sheathing above and below openings have an effect near a factor of 2 on the performance of the structure (Fischer et al., 2004).

A review of unrestrained full-scale wood structural panel bracing wall tests (Martin et al., 2007), which includes 53 different tests of intermittent and continuous wall bracing in walls ranging from 12-ft long to 40-ft long and some 3D whole house testing shows that on average the improvement in peak loads for continuous is 1.95 (for walls without gypsum) and 1.87 (for walls with gypsum). This comprehensive comparison shows that walls continuously sheathed with wood structural panels resist approximately two times the load at 0.5% drift and peak capacity. Further details can be seen at: www.apawood.org/pdfs/TSD/review_lg_scale_wall_bracing_tests.pdf.

Large scale 3D testing at APA of a 25-ft x 37.5-ft single story house shows that for equal amounts of bracing the continuously sheathed walls resisted 2.16 to 1.78 times higher loads at racking displacements of 1.5 inches. Further details can be seen at: http://www.apawood.org/pdfs/TSD/T-Reports/T2007-73.pdf.

Comparing wall racking test data with a high degree of end restraint provided by hold down devices shows that a 4-ft intermittent method 3 segment has a peak load of 597 plf, and a 12-ft wall with only two 24-inch segments next to a 62-inch tall window with sheathing above and below the opening has a peak load of 751 plf. This data supports an increase of 1.26 in the strength of continuous over intermittent and the comparison is conservative because the continuous wall had less full height segment restraint. Simpson Strong Tie has reported similar values comparing similar wall segments. Further details can be seen at: http://www.apawood.org/pdfs/TSD/InterVsContTestData.pdf.

The Sugiyama perforated shear wall equations show that for equal amounts of full height segments, the additional area of sheathing above and below openings results in predicted strength increases of at least around 20%. Further details can be seen at: http://www.apawood.org/pdfs/TSD/InterVsContPerfSWequations.pdf.

References

APA, 2007. Full Scale 3-D Wall Bracing Tests. APA-The Engineered Wood Association, Tacoma, WA. Available at: http://www.apawood.org/pdfs/TSD/T-Reports/T2007-73.pdf

Fischer, D., Filiatrault, A., Folz, B., Uang, C-M, Seible, F., 2004. Shake Table Tests of a Two-Story Woodframe House. CUREE Publication W-06. CUREE, Richmond, CA.

Martin, Z., Skaggs, T., Keith, E., Yeh, B. 2007. A Review of Large Scale Wood Structural Panel Bracing Tests, Report to BSSC Bracing Committee May 2007, APA-The Engineered Wood Association, Tacoma, WA. Available at: www.apawood.org/pdfs/TSD/review_lg_scale_wall_bracing_tests.pdf

Public Comment 4:

Randall Shackelford, P.E., representing Simpson Strong-Tie Co., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.10.1(1)[a, b, c, d]
BRACING REQUIREMENTS BASED ON WIND
(A FUNCTION OF BRACED WALL LINE SPACING)
Minimum Total Length (feet) of Braced Wall Panels Required each Braced Wall Line

Exposure B mrh= 30' Eave to ridge =10 wall height = 10' 2 BWL							
Wind Speed	Location	BWL Spacing	Method 1	Method 5 [f] (double sided)	Methods [e,g,h] 2,3,4,6,7,8	Cont Sheathing (85% opening)	Cont Sheathing (65% opening)

(Portion of table not shown remains unchanged)

a. through g. (No change)

h. Required bracing length for Methods 2, 3, 4, 6, 7, and 8 in braced wall lines located in one-story buildings and in the top story of two or three story buildings shall be permitted to be multiplied by 0.80 when an approved tie-down device with a minimum uplift design value of 800 pounds (3560 N) is fastened to the end studs of each braced wall panel in the braced wall line and to the foundation or framing below.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The bracing amounts in Table R602.10.1(1) have been developed by relying on the structure above the braced wall panel to provide partial overturning restraint. The top most braced wall panels have the least amount of overturning restraint. The best estimate of the amount of restraint provided at the top story is 80%, per the minutes of the 4-29-08 IRC Sheathing Ad Hoc Committee, chaired by Dr. Dan Dolan.

The fully-restrained allowable shear capacity for Methods 2, 3, 4, 6, 7, and 8 is 350 plf.
The 80% restrained shear capacity would be 350 × 0.8 = 280 plf.
For a 10' tall wall, the required full restraint value would be 350×10=3500 pounds.
80% of full restraint would be 3500×0.8=2800 pounds.
Adding an 800 pound tiedown results in 2800+800=3600 pounds of restraint.
This exceeds the amount of restraint required for full restraint, so the full 350 plf shear is achieved.
The increased shear capacity is 350/280=1.25.
So the reduced amount of sheathing required is 1/1.25=0.8
Therefore a 0.8 reduction factor is proposed.
No reduction is proposed for other stories in the building.

Final Action: AS AM AMPC____ D

RB160-07/08

R602.10.4.6, Figure R602.10.4.6, Table R602.10.4.6

Proposed Change as Submitted:

Proponent: Zeno Martin, PE, APA – The Engineered Wood Association

1. Revise as follows:

R602.10.4.6 6:1 aspect ratio segments used with continuous structural panel sheathing. Wall segments having a maximum 6:1 height to width ratio shall be permitted to be built in accordance with Figure R602.10.4.6 and Table R602.10.4.6. The maximum 6:1 height-to-width ratio is based on height being measured from top of the header to the bottom of the wall segment bottom plate. For purposes of calculating the percentage of panel bracing required by Table R602.10.1, the width of the full height sheathing segment shall be equal to its measured width. Corners at ends of walls using this option shall be constructed in accordance with Figure R602.10.4.3(1). The reduction factors for continuously braced walls from Section R602.10.4.4 shall be applied when calculating applicable percentages of wall bracing. The number of wall segments having a maximum 6:1 height to length ratio in a wall line shall not exceed four. In multi-story buildings, wall segments having a maximum 6:1 height to length ratio shall not be permitted to be directly stacked vertically. ~~For purposes of resisting wind pressures acting perpendicular to the wall, in accordance with Section R301.2, the minimum requirements of Figure R602.10.4.6 shall be sufficient for wind speeds less than 110 mph in Exposure Category B. For Exposure Categories C and D, the header to jack stud strap requirements and the number of additional jack studs shall be in accordance with Table R602.10.4.6~~ For purposes of resisting wind pressures acting perpendicular to the wall, the requirements of Figure R602.10.4.6 and Table R602.10.4.6 shall be met. There shall be a maximum of two braced wall segments per header and header length shall not exceed 20'-8". Tension straps shall be installed in accordance with the manufacturer's recommendations.

2. Delete existing Figure R602.10.4.6 and substitute with new Figure R602.10.4.6 as follows:

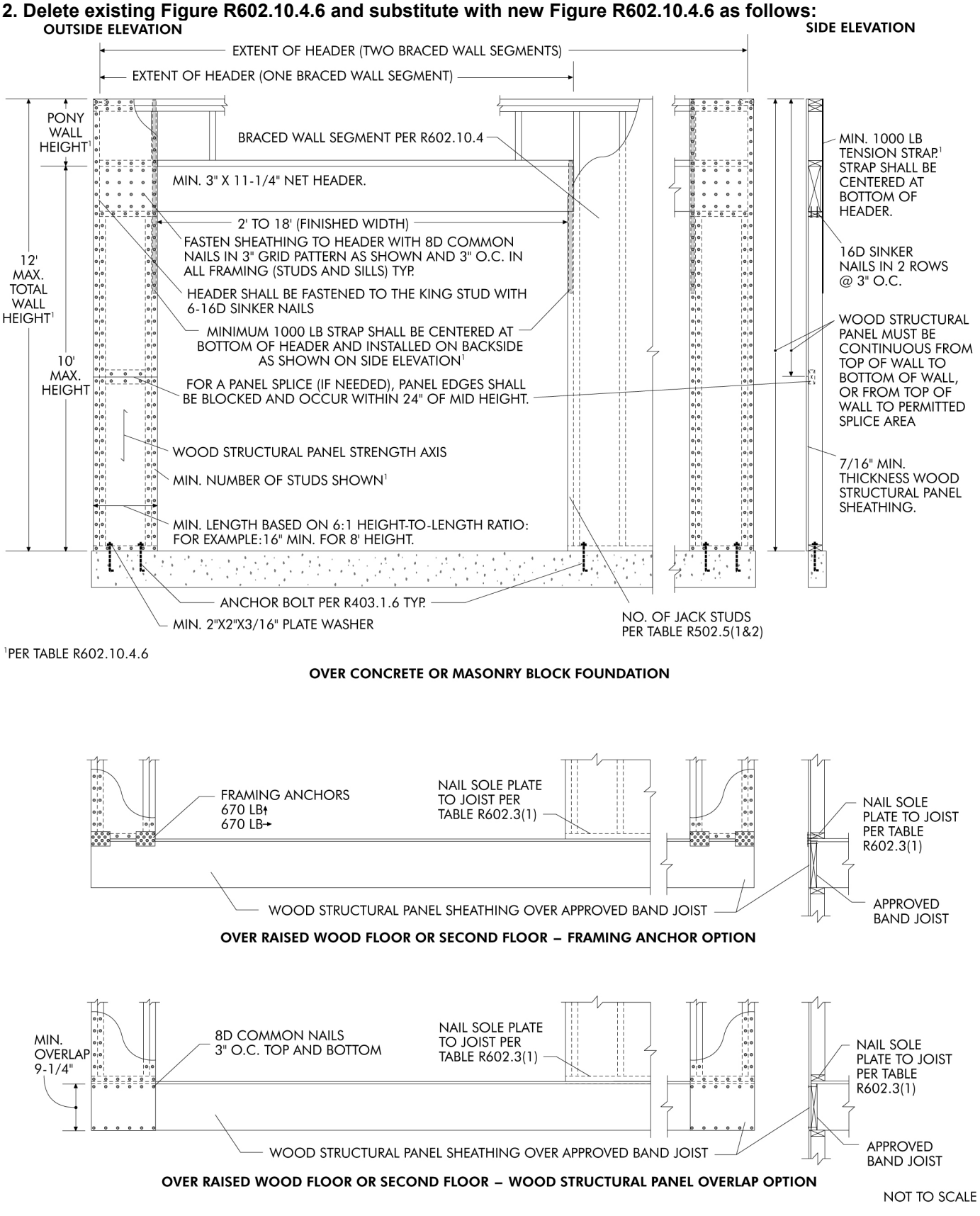


FIGURE R602.10.4.6
WALLS WITH 6:1 ASPECT RATIO USED WITH CONTINUOUS WOOD STRUCTURAL PANEL SHEATHING