RB213-06/07
Table R602.10.5

Proposed Change as Submitted:

Proponent: Scott Beard, SE, City of Tacoma, WA

Revise as follows:

TABLE R602.10.5
LENGTH REQUIREMENTS FOR BRACED WALL PANELS IN A CONTINUOUSLY SHEATHED WALL[a, b, c]

(No change to table entries)

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479kPa.

a. Linear interpolation shall be permitted.
b. Full-height sheathed wall segments to either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf or less shall be permitted to have a 4:1 aspect ratio. <u>This option is limited to one wall of the garage only.</u>
c. Walls on either or both sides of openings in garages attached to fully sheathed dwellings shall be permitted to be built in accordance with Section R602.10.6.2 and Figure R602.10.6.2 except that a single bottom plate shall be permitted and two anchor bolts shall be placed at 1/3 points. In addition, tie-down devices shall not be required and the vertical wall segment shall have a maximum 6:1 height-to-width ratio (with height being measured from top of header to the bottom of the sill plate). This option shall be permitted for the first story of two-story applications in Seismic Design Categories A through C.

Reason: When this provision was created, the writers did not envision using it for a drive-through garage. Even though this particular provision is packaged as a continuously sheathed item, it is really powered by diaphragm in rotation. The 2 ft wide panels next to the garage door are primarily providing stiffness so that the rotational analysis will work.

Placing another large door with narrow panels in any other wall will make this mechanism fail to work. This wasn't intended, we need to plug the hole.

Cost Impact: The code change proposal will increase the cost of construction. (But not much. This is a small impact item.)

Committee Action: **Approved as Modified**

Modify the proposal as follows:

TABLE R602.10.5
LENGTH REQUIREMENTS FOR BRACED WALL PANELS
IN A CONTINUOUSLY SHEATHED WALL[a, b,c]

(No change to table entries)

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479kPa.

a. Linear interpolation shall be permitted.
b. Full-height sheathed wall segments to either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf or less shall be permitted to have a 4:1 aspect ratio. This option is limited to one wall of the garage ~~only~~.
c. Walls on either or both sides of openings in garages attached to fully sheathed dwellings shall be permitted to be built in accordance with Section R602.10.6.2 and Figure R602.10.6.2 except that a single bottom plate shall be permitted and two anchor bolts shall be placed at 1/3 points. In addition, tie-down devices shall not be required and the vertical wall segment shall have a maximum 6:1 height-to-width ratio (with height being measured from top of header to the bottom of the sill plate). This option shall be permitted for the first story of two-story applications in Seismic Design Categories A through C.

Committee Reason: This change clarifies that the exception of Footnote "b" does not apply to all walls of a garage. The modification deletes a redundant word for clarity.

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 Disapproval.

Commenter's Reason: The proponent of this proposal made the claim that a "drive-through" garage constructed with 4:1 aspect ratio panels on the front and rear walls would fail due to rotation of the roof/ceiling diaphragm. The proponent did not submit to the committee any technical justification for this contention, nor did he submit any documentation of failures of "drive-through" garages constructed with 4:1 aspect ratio panels.

In fact, torsional effects do not come into play for a typical one-story "drive through" garage conforming to the current provisions of the continuously-sheathed method. Such a garage meets all the tests of ASCE 7-05 Section 6.4.1.1 for using the simplified method for wind design. Note #5 of Figure 6-10 states clearly that torsional effects need not be considered for a one-story structure less than 30 feet in height. For seismic design, the garage meets all of the criteria under Section 12.14.1.1 for a simplified seismic design, including the tests for flexible diaphragms, non-irregular structures, and location of shear walls relative to the structure's center of gravity. It is clear that torsional rotation of the roof/ceiling diaphragm in a one-story "drive-through" garage is not the concern the proponent claims they are.

Additionally, this provision conflicts with a common practice in flood-prone areas. FEMA's coastal construction guidelines recommend (or require, in V-zones) the construction of breakaway walls for garages. A garage constructed with breakaway walls at the rear is essentially a "drive-through" garage. Limiting braced segments of the rear wall to four feet or wider will compromise the performance of the breakaway wall.

NAHB asks for your support in disapproving this proposal and reversing the committee's action.

Reference

FEMA Homebuilder's Guide to Coastal Construction (FEMA 499)—Technical Fact Sheet #27, Enclosures and Breakout Walls.

Final Action: AS AM AMPC____ D

RB214-06/07

Table R602.10.5, Figure R602.10.5(2)-(New)

Proposed Change as Submitted:

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

Revise table footnotes as follows:

TABLE R602.10.5
LENGTH REQUIREMENTS FOR BRACED WALL PANELS IN A CONTINUOUSLY SHEATHED WALL[a, b, c]

(No change to table entries)

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479kPa.

a. Linear interpolation shall be permitted.

b. Full-height sheathed wall segments to either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf or less shall be permitted to have a 4:1 aspect ratio.

c. Wall~~s~~ segments having a maximum 6:1 height to width ratio ~~on either or both sides of openings in garages attached to fully sheathed dwellings~~ shall be permitted to be built in accordance with ~~Section R602.10.6.2 and~~ Figure ~~R602.10.6.2~~ R602.10.5(2) ~~except that a single bottom plate shall be permitted and two anchor bolts shall be placed at 1/3 points. In addition, tie-down devices shall not be required and the vertical wall segment shall have a~~ The maximum 6:1 height-to-width ratio is based on (~~with~~ height being measured from top of header to the bottom of the ~~sill~~ wall segment bottom-plate). ~~This option shall be permitted for the first story of two-story applications in Seismic Design Categories A through C.~~ 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.

2. Add new figure as follows:

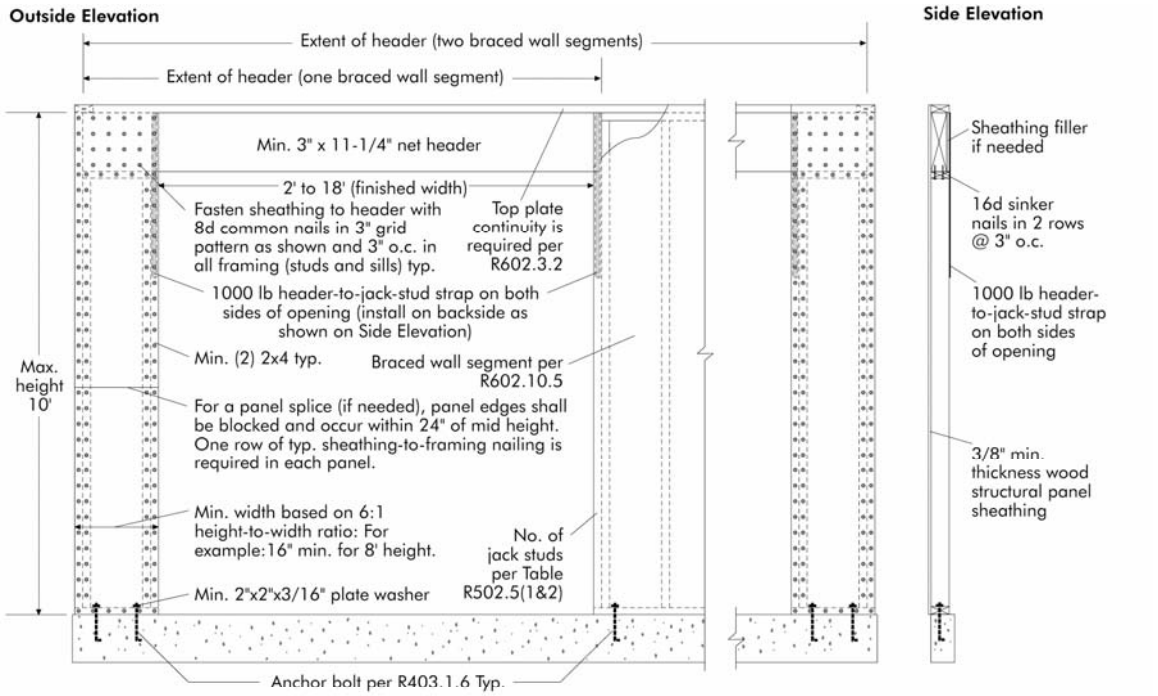


FIGURE R602.10.5(2)
WALLS WITH 6:1 ASPECT RATIO USED WITH CONTINUOUS WOOD STRUCTURAL PANEL SHEATHING

Reason: The purpose of this proposal is to add to the content of the code by permitting a narrow segment bracing option to give more flexibility for builders to meet wall-bracing requirements.

Footnote c currently permits an aspect ratio of 6:1 if a modified version of the portal frame (Section R602.10.6.2) is used in conjunction with wood structural panel continuously sheathed walls. This proposal adds a figure describing the 6:1 aspect ratio wall segment. Previously, the footnote referenced another figure and then enumerated exceptions to that figure, making it difficult to use the provisions.

The proposal also does not limit these provisions to use over a concrete footing at garage openings nor to Seismic Design Categories A-C. Extensive testing has been completed that shows the proposed 6:1 segment performs significantly better compared to existing permitted bracing which can be used in raised floor applications, in all story locations, and in all Seismic Design Categories. More than 50 cyclic tests have been conducted in the last 4 years to support this proposal. Testing has been conduced under a wide range of different boundary conditions, including on raised wood floors with supporting joists parallel and with joists perpendicular to the bracing segment, with solid sawn and engineered joists, with nailed bottom plates, on rigid foundations, with bolted bottom plates, with bottom plate washer nuts finger tight + ¼ turn, with and without any end restraint on the segments, with and without gypsum on the backside of the segments, for braced wall heights of 12-ft, and for braced wall heights of 8-ft. Figures 1, 2 and 3 summarize test results with a low degree of end restraint (no load head, no dead loads, no hold downs, and nuts where used on plate washers were finger tight + ¼ turn).

This proposal is very conservative based on each of the following facts:

1) When equal amounts of bracing are compared, the proposed performs significantly better than currently permitted bracing, as shown in Figure 1. The proposed requires three 16-inch wide segments to equal the same bracing amount as one single 48-inch wide segment or two single 24-inch wide segments.
2) The performance of only 32" of total bracing of the proposed is approximately equal or better compared to 48" of currently existing permitted 4:1, and 2:1 height to width ratio bracing segments (as shown in Figures 2 and 3).
3) Testing shown in Figures 1, 2 and 3 uses conservative boundary conditions. If the structure is assumed to impose any degree of end restraint to the wall segments, testing shows that the 6:1 segment improves considerably more than the existing permitted 4:1.
4) A braced wall line using 4:1 segments is currently permitted a 20% reduction in total bracing amount required (in accordance with 2006 IRC Section R602.10.5). It is not proposed to extend this 20% reduction in total amount of bracing required to a wall line with 6:1 segments.
5) The proposed 6:1 segment may only be used in a wall line continuously sheathed with wood structural panels. Unlike isolated 48-inch wide bracing, such as Method 3, where minimal isolated bracing segments are often all that is present, the continuous wood structural panel braced wall line realistically often has much more structural capacity and redundancy because the wall requires continuous wood structural panel sheathing.
6) The proposed is aspect ratio based, meaning that as the wall becomes taller the segment becomes wider. Few other currently permitted bracing segments, except those in wood structural panel continuously sheathed walls, have a similar requirement.

Almost all of the above facts are cumulative, meaning that as you add them together the proposed becomes a very safe alternative compared to currently permitted bracing segments. This proposed bracing segment option provides much needed flexibility and a very significant, unprecedented amount of testing has been conducted to establish and confirm the safety of this proposal.

Figure 1. Load-displacement backbone curves of proposed 6:1 bracing compared to existing permitted 4:1 and 2:1 bracing segments. All segments shown were tested with no hold downs, no end restraint and plate washers finger tight plus ¼ turn.

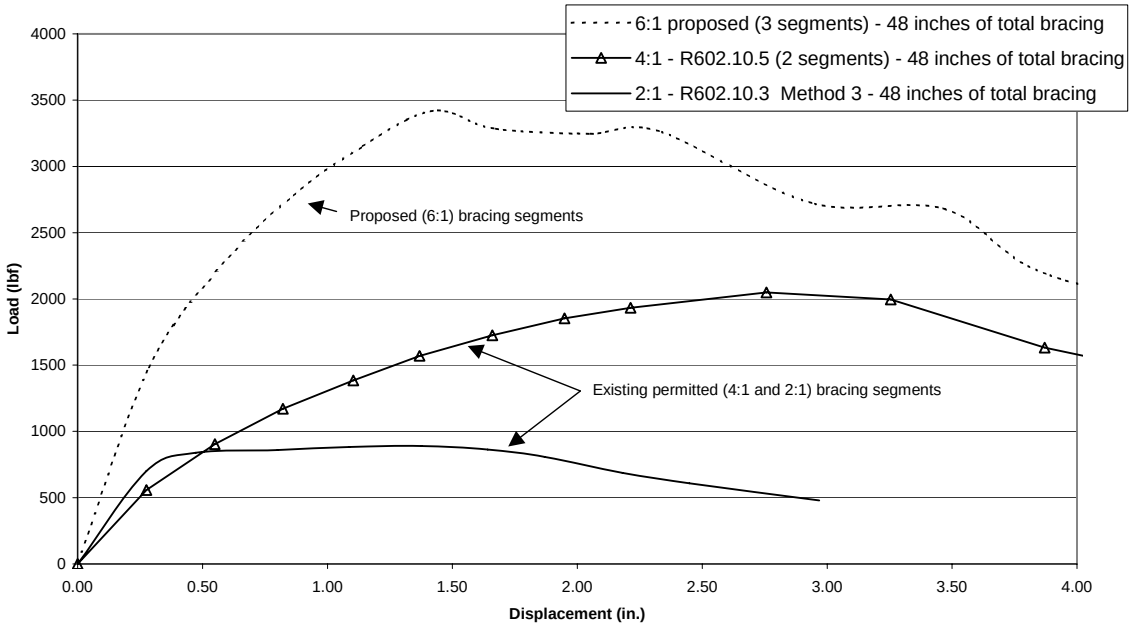


Figure 2. Load-displacement backbone curves of proposed bracing compared to existing permitted 4:1 and 2:1 bracing segments tested on a raised floor support condition. Note that the existing permitted total bracing length is 48-inches compared to only 32-inches of the proposed, a very conservative comparison because the existing permitted bracing in this graph is 50% more bracing length than the proposed. If using the proposed, more bracing would be required elsewhere to provide an equal amount. Comparisons of equal amounts of bracing are shown in Figure 1.

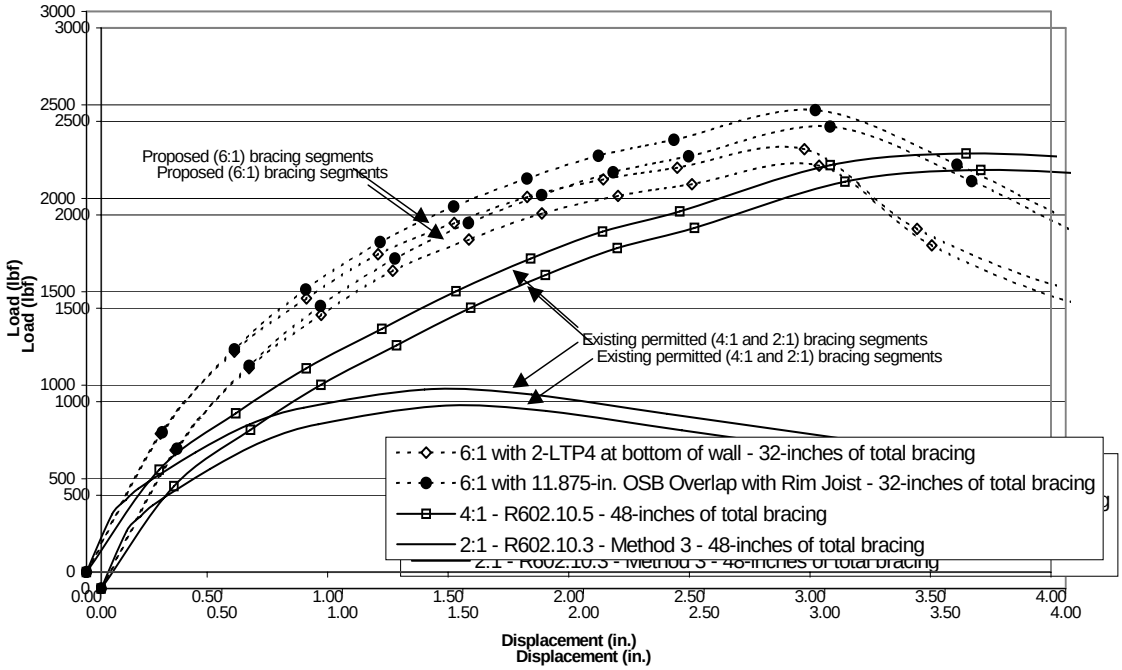
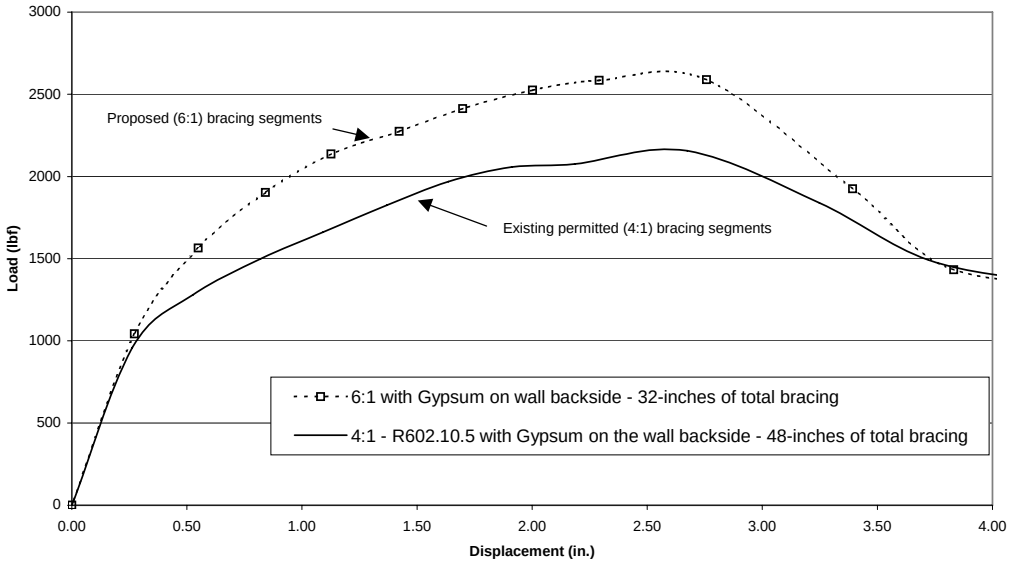


Figure 3. Load-displacement backbone curves of proposed bracing compared to existing permitted 4:1 bracing segments with gypsum on wall backside. Note that the existing permitted total bracing length is 48-inches compared to only 32-inches of the proposed, a very conservative comparison because the existing permitted bracing in this graph is 50% more bracing length than the proposed. If using the proposed, more bracing would be required elsewhere to provide an equal amount. Comparisons of equal amounts of bracing are shown in Figure 1.



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

Committee Action: Disapproved

Committee Reason: The committee prefers RB209-06/07.

Assembly Action: None

Individual Consideration Agenda

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

Public Comment 1:

David S. Gromala, P.E., Weyerhaeuser, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.10.5
LENGTH REQUIREMENTS FOR BRACED WALL PANELS IN A CONTINUOUSLY SHEATHED WALL[a, b, c]

(No change to table entries)

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479kPa.
a. Linear interpolation shall be permitted.
b. Full-height sheathed wall segments to either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf or less shall be permitted to have a 4:1 aspect ratio.
c. Wall segments having a maximum 6:1 height to width ratio shall be permitted to be built in accordance with Figure R602.10.5(2) 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 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 the ends of walls using this option shall be constructed in accordance with Figure R602.10.5. The reduction factors for continuously braced walls from Section R602.10.5 shall be applied when calculating applicable percentages 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.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: We believe that the code change proposal RB214 has significant merit and should be reconsidered for approval. However, to better match the underlying test data and to clarify specific limitations of the proposed method, the following modifications are proposed:

Note C – New sentence #1 - *The linkage between the text requirement for corner detailing and the final graphical depiction of the portal frame (referenced via a footnote in a table that is referenced in the text) is too loose. Building officials are better served by a direct reference to the corner detail requirement – either in the footnote (as stated) or directly on the figure.*

Note C – New sentence #2 - *The linkage between the text requirement permitting reduction factors for certain continuously sheathed walls and the portal frame is unclear. If this is not changed, the intent of the last sentence of RB214 (….the width of the full-height sheathing segment shall be equal to its measured width) is unclear.*

Note C – New sentence #3 - *The portal frame method is proposed for inclusion under the category of a "continuously sheathed wall." Conceptually, a continuously sheathed wall is no longer a continuously sheathed wall if it is simply a series of portal frames. Testing has indicated that the contribution of interior piers (without interior holddowns) is less than the contribution of piers at wall ends. While some testing has been conducted using a full line of piers, it is confusing why this should be considered to be a "continuously sheathed method."*

Note C – New sentence #4 - *The forces imparted on the structure by 6:1 aspect ratio portal frames are substantially higher than those in a traditionally sheathed wall. No test data have been provided, nor detailing specified, to deal with the load path required to transmit these forces if the narrow portals are vertically stacked.*

It is our understanding that the proponent and the ICC Ad Hoc Committee on Wall Bracing have agreed upon the addition of a connection detail to resist out of plane loads. It is also our understanding that the detail will include limitations to specific wind speed and exposure categories.

The new figure in the RB214 proposal includes a requirement for a framing anchor with 640 pounds of lateral design resistance and 640 pounds of uplift design resistance. Conversely, the same figure on the APA website has deleted the uplift resistance component from their recommendation. Based on the mechanics of forces on the pier, it would appear that both components must be resisted. We have requested clarification on this issue by APA.

Public Comment 2:

Zeno Martin, APA – The Engineered Wood Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R602.10.5
LENGTH REQUIREMENTS FOR BRACED WALL PANELS IN A CONTINUOUSLY SHEATHED WALL[a, b, c]

(No change to table entries)

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound per square foot = 0.0479kPa.
a. Linear interpolation shall be permitted.
b. Full-height sheathed wall segments to either side of garage openings that support light frame roofs only, with roof covering dead loads of 3 psf or less shall be permitted to have a 4:1 aspect ratio.
c. Wall segments having a maximum 6:1 height to width ratio shall be permitted to be built in accordance with Figure R602.10.5(2) 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 of panel bracing required by Table R602.10.1, the width of the full-height sheathing segment

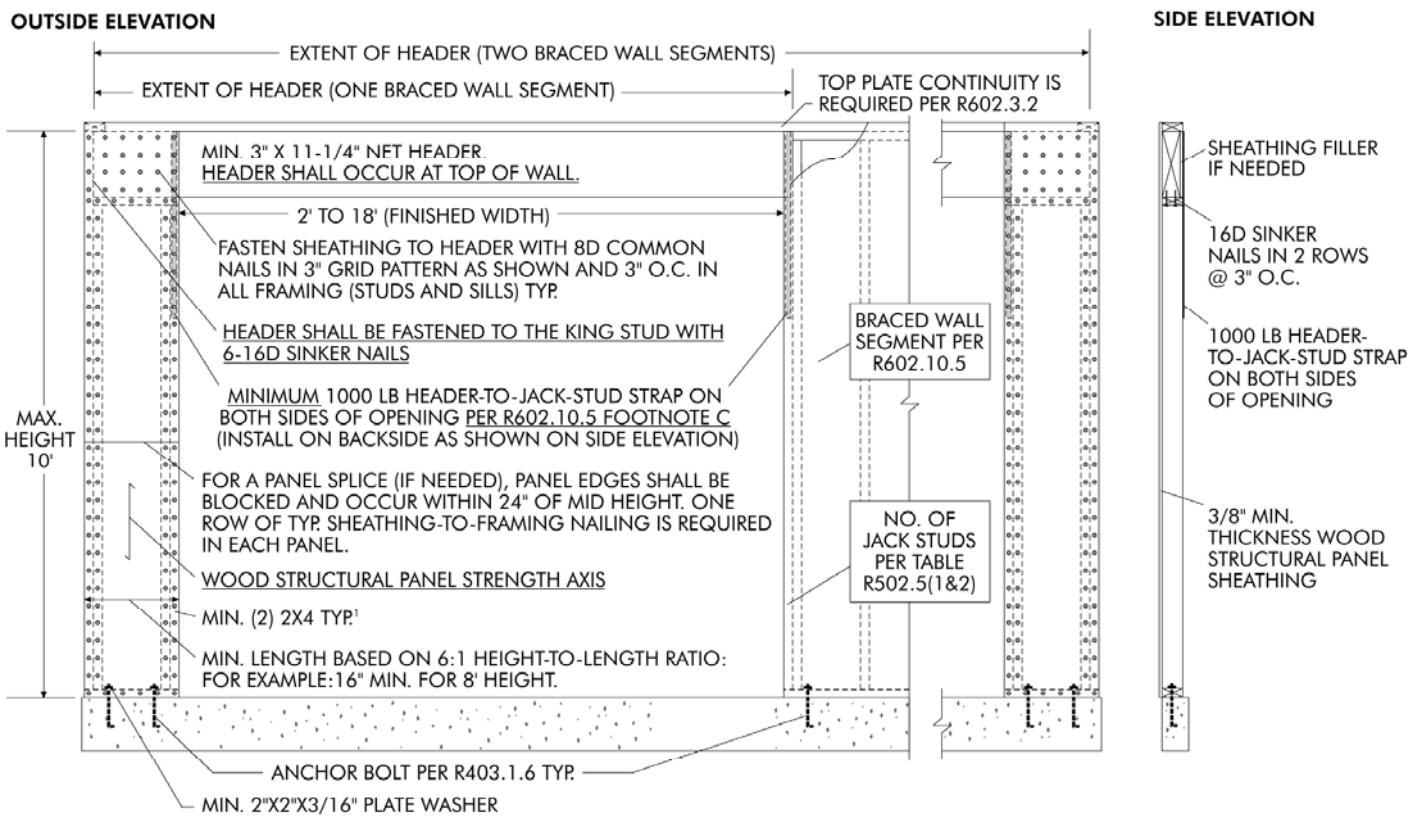
shall be equal to its measured width. For purposes of resisting wind pressures acting perpendicular to the wall, in accordance with Section R301.2, the minimum requirements of Figure R602.10.5(2) shall be sufficient for wind speeds less than 110 mph in Exposure Category B. For Exposure Categories C and D, the header to jack stud strap requirements and the number of additional jack studs shall be in accordance with Table R602.10.5(1).

Add new table as shown:

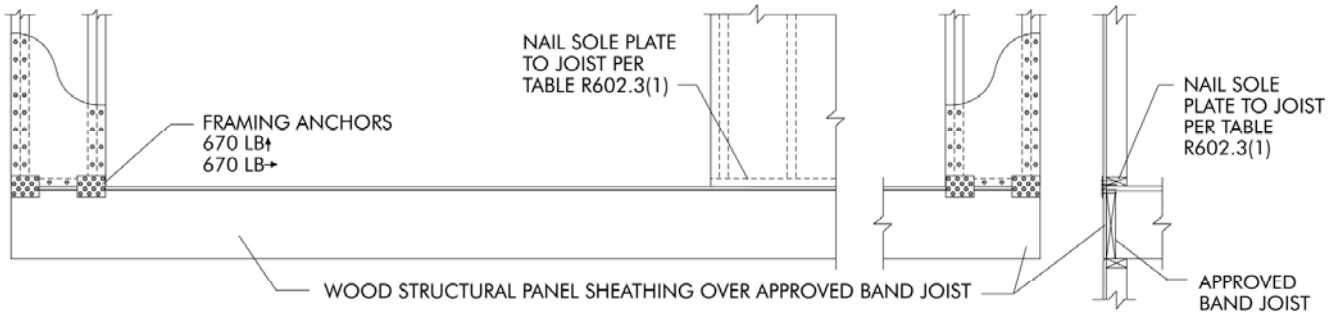
TABLE R602.10.5(1)
HEADER TO JACK STUD STRAP AND THE NUMBER OF ADDITIONAL JACK STUDS REQUIRED FOR RESISTING WIND PRESSURES PERPENDICULAR TO 6:1 ASPECT RATIO WALLS LOCATED IN WIND EXPOSURE CATEGORIES C AND D

Required	Wall Height (ft)	Wind Exposure Category C			Wind Exposure Category D		
		85 mph	90 mph	less than 110 mph	85 mph	90 mph	less than 110 mph
Strap Capacity(lb)[a]	10 and less	1000	1200	2275	1375	1750	3050
Number of additional 2x4 Jack Studs[b]	8	--	--	--	--	--	1
	9	--	--	1	--	1	2
	10	--	1	2	1	2	3

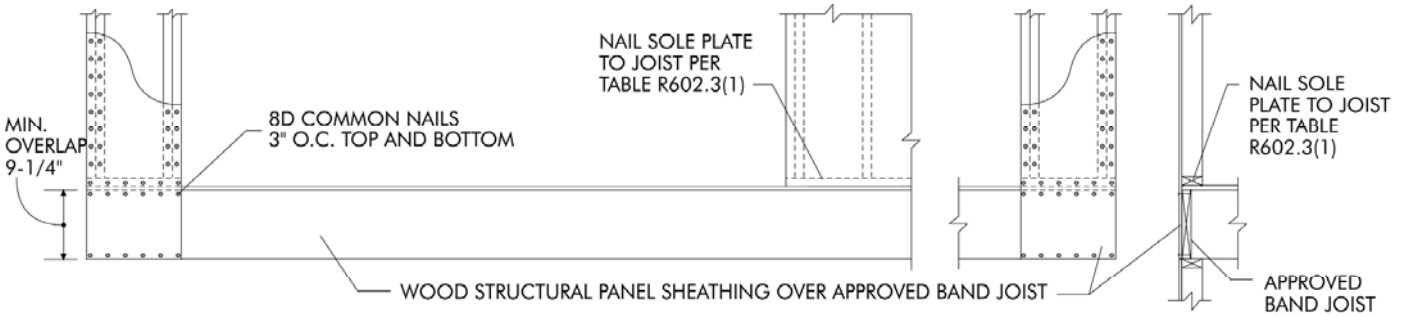
a. If 2x6 framing is used, then the required strap capacity may be multiplied by 0.65, but in no case shall the required strap capacity be less than 1000 lb.
b. If 2x6 framing is used, then no additional framing shall be required.



[1]FOR WIND EXPOSURE CATEGORIES C AND D, ADDITIONAL JACK STUDS MAY BE REQUIRED PER R602.10.5 FOOTNOTE C



OVER RAISED WOOD FLOOR OR SECOND FLOOR – FRAMING ANCHOR OPTION



OVER RAISED WOOD FLOOR OR SECOND FLOOR – WOOD STRUCTURAL PANEL OVERLAP OPTION

NOT TO SCALE

FIGURE R602.10.5(2)
WALLS WITH 6:1 ASPECT RATIO USED WITH CONTINUOUS WOOD STRUCTURAL PANEL SHEATHING

Commenter's Reason: The ICC Ad Hoc Committee on wall bracing deemed it important to ensure that the 6:1 aspect ratio bracing segment framing be capable of resisting design wind pressures acting normal to the wall surface (acting perpendicular to the wall) before support is given to code change RB214-06/07. This modification adds requirements so that the required framing for the lateral bracing segment is capable of resisting design wind pressures acting normal to the wall surface.

Engineering analysis was performed to determine the capacity of the 6:1 aspect ratio bracing segment framing to resist wind pressures normal to the wall surface. The load demand is based on wind pressures in Table R301.2(2) and Table R301.2(3) for worst case conditions, zone 5 wind pressures, and 30-foot mean roof height. Results of the engineering analysis have been reviewed and supported by the ICC Ad Hoc Committee on wall bracing.

Additional testing and analysis has also been conducted that further supports this code change proposal. Details are described below.

Independent Testing Supports Proposal

Opponents of APA's code change proposals, to add narrow wall bracing options into the International Residential Code (IRC), have published test results and details from their own tests conducted on the 6:1 aspect ratio portal frame with no hold downs. Three independent reports have been published, that when combined, total 32 individual wall tests. After examining the published test reports, including test details, *and normalizing the data for equal percents of bracing*, the results support APA's code change proposal (RB214-06/07). Specifically,

- Considering the various test conditions, with and without end restraints, gypsum and missing nails (due to installation); and the fact that these tests were conducted by critical sources (actual opponents), the worst result reported is only slightly (7%) below the expected performance, which is typically insignificant between like specimens.
- The vast majority of testing conducted by opponents showed that the 6:1 aspect ratio portal frame performed equal to or better than the bracing permitted by the 2006 IRC.

Complete details of this evaluation are available [1].

Large Scale Three-Dimensional Full House Testing Supports Proposal

Large scale testing has been conducted on a 25- x 37-foot three-dimensional house, comparing a braced wall line using traditional 4-foot-wide isolated wood structural panel bracing methods. Continuous wood structural panel braced walls were tested with 16-inch portal frames (6:1 aspect ratio) alone and in combination with 24- and 32-inch-wide (4:1 and 3:1 aspect ratio) bracing segments.

Each three-dimensional house test was conducted with equal amounts of bracing, 12 feet of total bracing in the 37–foot-long wall and 8 feet of total bracing in the 25–foot-long wall. The test results support the following conclusions:

1. The test with only 6:1 aspect ratio portal frame bracing segments in the East wall (6b) performed 65-147 percent better than the test with isolated 4-foot wood structural panel bracing.
2. The test with half the wall constructed with 6:1 aspect ratio portal frame bracing segments and the other half with a 3:1 and two 4:1 bracing segments performed 66-149 percent better than the test with isolated 4-foot wood structural panel bracing.
3. For equal amounts of bracing, the 6:1 aspect ratio portal frame bracing segments perform significantly better than the isolated 4-foot wood structural panel bracing. The speculation that using only 6:1 aspect ratio segments may lead to a soft story, or otherwise weaker wall system, is not supported by the test results.
4. When 6:1 aspect ratio portal frame bracing segments are mixed in a wall with other bracing types (shear wall based), the performance is significantly better than that observed from a wall with isolated 4-foot wood structural panel bracing. Concerns about mixing the 6:1 portal frame in line with other existing permitted bracing constructed with wood structural panels are not supported by the test results.

Further details of the large scale three-dimensional testing are available [2].

Common Misperceptions

Some common misperceptions regarding this proposal are that the 16-inch-wide bracing will replace 48-inches of bracing, and that this will lead to less bracing used. This misperception focuses on the 16-inch width compared to 48-inch width, but leaves out many important factors, including equal amounts of bracing, test results, and the logical reasons of why three separate 16–inch-wide segments can perform better than a single 48–inch segment (an equal amount of bracing).

One misperception is that a single 16–inch-wide portal frame-bracing segment replaces, or counts as a 48–inch-wide bracing segment. In the 2006 IRC, 16-inch portal frame bracing is only worth 16 inches of bracing. In code change proposal RB214-06/07, explicit language is included that states the actual width of the portal frame bracing is all that can count toward meeting the total amount of bracing required. Another misperception is that the 16–inch-wide portal frame segments reduce the amount of bracing required. This is a false assumption in that it does not in any way change the amount of bracing required. The amount of bracing required for a certain case is not changed by using a portal frame. All bracing options, portal frame included, must still meet the total amount of bracing required by the IRC. Additional details addressing these common misunderstandings are available [3].

ICC Bracing Committee

The ICC Bracing Committee created a list of issues to address before supporting this code change proposal. The main issue was the wind resistance normal to the wall surface, as discussed and addressed by the modifications in this public comment. Other issues were also presented and addressed [4].

Based on the overwhelming evidence, including independent test data from the opponents, this code change proposal is very conservative compared to existing permitted bracing, allows flexibility for code users, and provides more bracing options. The modifications in this public comment have the support of the ICC Bracing Committee and we urge your support.

References:

[1] Independent Test Data Supports Use of APA Narrow Wall Bracing Method. http://www.apawood.org/pdfs/TSD/Independent_Testing.pdf

[2] 3-D Testing with 6:1 Aspect Ratio Portal Frame Wall Bracing, Progress Report #4, APA Form #3D-004. http://www.apawood.org/level_c.cfm?content=pub_searchresults&pK=3d-004&pT=Yes&pD=Yes&pF=Yes&CFID=4399831&CFTOKEN=87254048

[3] APA Narrow Wall Bracing Method: Soft Story and Other Common Misperceptions. http://www.apawood.org/pdfs/TSD/Common_Misperceptions.pdf

[4] Issues identified by ICC ad hoc wall bracing committee on RB214-06/07. http://www.apawood.org/pdfs/TSD/ICC_bracing_com_RB214_issues.pdf

Final Action: AS AM AMPC____ D

RB219-06/07
R602.10.5, Figure R602.10.5

Proposed Change as Submitted:

Proponent: Louis Wagner, American Fiberboard Association

1. Add new text as follows:

R602.10.5 Continuous fiberboard structural panel sheathing. The continuous fiberboard structural sheathing option shall be permitted on any story or stories regardless of the bracing methods used on other stories. Continuous fiberboard structural sheathing shall be permitted on any wall line. When continuous fiberboard structural sheathing is used on only a selected wall line or lines, all other braced wall lines on the same story shall be either Method 4 or fiberboard structural panel sheathing. The bracing amounts in Table R602.10.1 for Method 4 shall be permitted to be multiplied by a factor of 0.9 for walls with a maximum opening height that does not exceed 85 percent of the wall height, or a factor of 0.8 for walls with a maximum opening height that does not exceed 67 percent of the wall height.

Continuous fiberboard structural sheathing braced wall lines shall be provided with a minimum of 2-foot length fiberboard structural panel at both sides of a corner at the ends of a braced wall line and shall be constructed in accordance with Figure R602.10.5.

Exception: In lieu of the 2-foot fiberboard structural sheathing corner return, a tie-down device shall be 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 allowable uplift design value of at least 1800 lb (816.5 kg). The tie down device shall be installed in accordance with the manufacturers' recommendation.

(Renumber existing Section R602.10.5)

2. Delete Figure R602.10.5 and substitute as follows:

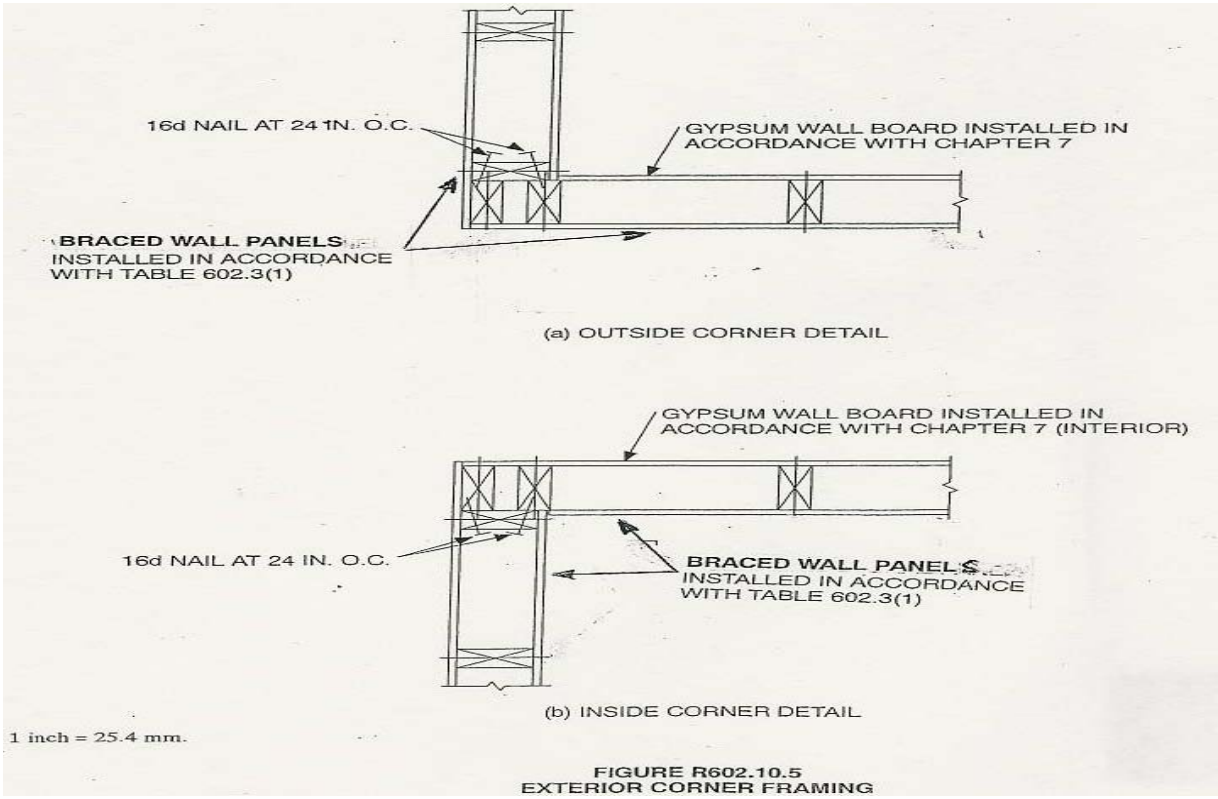


FIGURE R602.10.5
EXTERIOR CORNER FRAMING

Reason: The purpose of this change is to clarify the code in instances where continuous structural fiberboard sheathing is used as a wall bracing method.

Since the 2000 IRC was published, there has been a series of changes to this section which have been construed caused confusion among builders and code officials. Addition of a new section for fiberboard based on recent discussions on using continuous sheathing clarifies at least part of the issue.

Equivalency to other bracing methods is established in Table R602.10.1. The reduction factors requested in the new section are consistent with and were established in the 2000 IRC Section R602.10.5. For further information on the performance of fiberboard structural sheathing consult the test reports cited in the bibliography.

A coordinated change to Figure R602.10.5 is submitted to broaden the use of the figure for fiberboard structural panel sheathing and wood structural panel sheathing braced wall panel construction method.

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

Committee Action: Disapproved

Committee Reason: Figure R602.10.5 implies that gypsum board must be used and the committee feels that other materials should be allowed. There are issues that were identified in the failed modification and this should be reworked into a full complete package and brought back to give ample time for full review.

Assembly Action: None

Individual Consideration Agenda

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

Public Comment:

Louis Wagner, American Fiberboard Association, requests Approval as Modified by this Public Comment.

Delete original proposal and replace with the following:

R602.10.5 Continuously-sheathed braced wall line using Method 4 (structural fiberboard sheathing). Continuously-sheathed braced wall lines using structural fiberboard sheathing 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 R602.10.5.5.

R602.10.5.1 Continuously-sheathed braced wall line requirements. Continuously-sheathed braced wall lines shall be in accordance with Figure R602.10.4(1) and shall comply with all of the following requirements:

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

R602.10.5.2 Braced wall panel length. In a continuously-sheathed structural fiberboard braced wall line, the minimum braced wall panel percentage shall be permitted to be in accordance with Table R602.10.1.

R602.10.5.3 Braced wall panel location and corner construction. A braced wall panel shall be located at each end of a continuously-sheathed braced wall line. A minimum 32-inch structural fiberboard sheathing or minimum 24-inch wood structural panel corner return shall be provided at both ends of a continuously-sheathed braced wall line in accordance with Figure R602.10.4.3 In lieu of the corner return, a tie-down device with a minimum uplift design value of 800 lb shall be fastened to the corner stud and to the foundation or framing below in accordance with Figure R602.10.4.3 (1).

Exception: The first braced wall panel shall be permitted to begin 12.5-feet from each end of the braced wall line in Seismic Design Categories A, B, and C provided one of the following is satisfied:

1. A minimum 32-inch-long, full-height fiberboard structural sheathing panel is provided at both sides of a corner constructed in accordance with Figure R602.10.4.3 at the braced wall line ends in accordance with Figure R602.10.4.3(2), or
2. The braced wall panel closest to the corner shall have a tie-down device with a minimum uplift design value of 800 lb fastened to the stud at the edge of the braced wall panel closest to the corner and to the foundation or framing below in accordance with Figure R602.10.4.3 (3).

R602.10.5.4 Braced wall percentage. In addition to bracing percentage adjustments specified elsewhere in this code, the braced wall percentages for Method 4 from Table 602.10.1 shall be permitted to be multiplied by a factor in accordance with Table R602.10.4,4 limited to a minimum length of braced wall panel of 32-inches.

R602.10.5.5 Continuously-sheathed braced wall lines. Where a continuously-sheathed braced wall line is used in Seismic Design Categories D_0, D1, and D_2 or regions where the basic wind speed exceeds 100 miles per hour, the braced wall line shall be designed in accordance with accepted engineering practice and the provisions of the International Building Code. Also all other exterior braced wall lines in the same story shall be continuously-sheathed.

(Renumber existing section R602.10.5)

Commenter's Reason: During their early deliberations, the ICC Ad Hoc Committee on Wall Bracing agreed to support the original proposal if it was modified to agree with RB209 including formatting issues, limits on Seismic and Wind zones and replacement of the two foot return wall with a tiedown. At the Public Hearing, that modification was submitted and judged to be too complex for consideration. It and the proposed change were denied.

At subsequent meetings of the Ad Hoc Committee, a modification to RB209 was developed. A parallel proposal for modification to RB219 was also developed and is hereby submitted. Note that the section numbers are to be assigned by ICC Staff, but the intent is to follow R602.10.4 through R602.10.4.5 as developed by the ICC Ad Hoc Committee on Wall Bracing as shown in the latest modifications of RB209 and RB179.

Use of a 32" structural fiberboard panel mentioned in Section R602.10.5.3 is based on a conservative interpretation of new test data. Fiberboard shear wall segments with aspect ratios of 1:1, 2:1, 3:1 and 4:1 were cyclically tested using ASTM E2126. Cross head displacement was controlled per the CUREE protocol. Hold downs were used at each end of the segments. The fiberboard complied with the requirement of a minimum of 5200 pounds maximum load when tested monotonically using ASTM E72. Roofing nails were spaced at 3" on panel edges and at 6" on any intermediate studs. Unit shear and deflection data is reported in Report Number EG3209-031506 which is available at www.fiberboard.org.

The Ad Hoc Committee was concerned that current data was not available to justify continuous fiberboard sheathing in high wind and seismic conditions. Wording omitted in the exception under R602.10.5.3 and added in section R602.10.5.5 should allay those concerns.

Analysis: The missing figures and tables referenced in this Public Comment are to be as shown in the Public Comments by the ICC Ad Hoc Committee for RB179-06/07 and RB209-06/07. Staff will correlate RB219-06/07 with RB179-06/07 and RB209-06/07.

Final Action: AS AM AMPC____ D

RB223-06/07
R602.10.7

Proposed Change as Submitted:

Proponent: Richard E. Bartell, Hanover County, VA, Virginia Building and Code Officials Association, Virginia Department of Housing and Community Development, Virginia Plumbing and Mechanical Inspectors Association

Revise as follows:

R602.10.7 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 of 1-1/2 inch (38 mm) thickness.

~~**Exception:** Blocking is not required behind horizontal joints in Seismic Design Categories A and B and detached dwellings in Seismic Design Category C when constructed in accordance with Section R602.10.3, braced-wall-panel construction method 3 and Table R602.10.1, method 3, or where permitted by the manufacturer's installation requirements for the specific sheathing material.~~

Exceptions:

1. Blocking at horizontal joints shall not be required in wall segments that are not counted as braced wall panels.
2. Omission of blocking at horizontal joints shall be permitted on any braced wall line where the bracing amount provided is at least twice the minimum amount required by Table R602.10.1.

Reason: Substitute new or revised material for current provision of the Code. When horizontal joints in Method 3 structural sheathing are not blocked, testing has shown that this reduces the bracing strength by approximately 50%.

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

Committee Action: **Approved as Modified**

Modify the proposal as follows:

R602.10.7 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 of 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. ~~Omission of~~ Blocking at horizontal joints shall ~~be permitted on any~~ not be required in braced wall ~~line~~ panels constructed using Methods 3, 4, 5, 6, 8 unless ~~where~~ the bracing amount provided is at least twice the minimum amount required by Table R602.10.1.

Committee Reason: This change clarifies that blocking is only required at braced wall panels and adds an alternate that permits omission of blocking. The modification clears up the double negative in Exception 2 and clarifies that the alternate does not apply to all bracing methods.

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, Chair, ICC Ad Hoc Committee on Wall Bracing, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.10.7 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.

Exception:

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 blocking at horizontal joints shall not be required in braced wall panels constructed using Methods 3, 4, 5, 6, or 8 ~~unless the bracing amount provided is at least twice the minimum amount required by Table R602.10.1.~~

Commenter's Reason: The IRC code development committee approved this item, but made an editorial modification that inadvertently changed the technical implications of the proposal. The intent of the original proposal's language (and the committee's modification) was to allow braced wall panels with horizontal joints to be unblocked only when the bracing percentage provided is twice that required by Table R602.10.1. However, the committee's modification to exception #2 says the opposite (i.e., blocking at horizontal joints shall not be required, but is required when bracing percentage is doubled). This was clearly not the intention of the original proposal or the committee's modification. Therefore, this public comment provides an editorial correction that restores the technical intent of the proposal and the IRC committee's actions.

Final Action: AS AM AMPC____ D

RB225-06/07
R602.10.8

Proposed Change as Submitted:

Proponent: Richard E. Bartell, Hanover County, VA, Virginia Building and Code Officials Association, Virginia Department of Housing and Community Development, Virginia Plumbing and Mechanical Inspectors Association

Revise as follows:

R602.10.8 ~~Connections~~ Braced wall panel support ~~Braced wall panel sole plates shall be fastened to the floor framing and top plates shall be connected to the framing above in accordance with Table R602.3(1). Sills shall be fastened to the foundation or slab in accordance with Sections R403.1.6 and R602.11.~~ Braced wall panels shall be supported on floor framing or foundations as follows:

1. Where joists are perpendicular to ~~the~~ braced wall lines above or below, blocking shall be provided between the joists at braced wall panel locations to permit fastening of wall plates in accordance with Table R602.3(1). ~~under and in line with the braced wall panels. Where joists are perpendicular to braced wall lines below, blocking shall be provided over and in line with the braced wall panels.~~
2. Where joists are parallel to braced wall lines above or below, a rim joist or other parallel framing member shall be provided at the wall to permit fastening of wall plates per Table R602.3(1)
3. Braced wall panels shall be permitted to be supported on cantilevered floor joists meeting the cantilever limits of Section R502.3.3 provided joists are blocked at the nearest bearing wall location, except such blocking shall not be required in Seismic Design Categories A, B, and C for cantilevers not exceeding 24 inches.

4. Elevated post or pier foundations supporting braced wall panels shall be braced in accordance with accepted engineering practice.

Reason: Substitute new or revised material for current provision of the Code.

The primary focus of this section is related to proper support conditions for braced wall lines and braced wall panels. Thus, a more fitting title is proposed. The deleted text from this section is redundant with other familiar parts of the code and is adequately addressed in those parts. Items #1 and #2 contain existing text that has been editorially improved. Item #3 addresses support of braced wall panels on cantilevered joists and coordinates with requirements in Chapter 5 for floor cantilevers. Item #4 addresses a condition that the code does not currently address with prescriptive solutions to ensure adequate support of braced wall panels; thus, the requirement to use accepted engineering practice is clarified.

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

Committee Action: **Approved as Modified**

Modify the proposal as follows:

R602.10.8 Braced wall panel support Braced wall panels shall be supported on floor framing or foundations as follows:

1. Where joists are perpendicular to braced wall lines above or below, blocking shall be provided between the joists at braced wall panel locations to permit fastening of wall plates in accordance with Table R602.3(1).
2. Where joists are parallel to braced wall lines above or below, a rim joist or other parallel framing member shall be provided at the wall to permit fastening of wall plates per Table R602.3(1)
3. Braced wall panels shall be permitted to be supported on cantilevered floor joists meeting the cantilever limits of Section R502.3.3 provided joists are blocked at the nearest bearing wall location, except such blocking shall not be required in Seismic Design Categories A, B, and C for cantilevers not exceeding 24 inches where a full height rim joist is provided.
4. Elevated post or pier foundations supporting braced wall panels shall be ~~braced~~ designed in accordance with accepted engineering practice.

Committee Reason: This change is necessary to provide the load path when braced wall panels are supported on cantilever floor joists. Also, provides guidance on what to do when the support is pier foundation. The modification provides clarification when blocking is not required.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment 1:

Robert Rice, representing Josephine County Building Safety, Southern Oregon Chapter of ICC, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.10.8 Braced wall panel ~~support~~ connections. Braced wall panels shall be connected ~~supported on floor framing or foundation~~ as follows:

1. Where ~~joists~~ floor or roof framing members are perpendicular to exterior braced wall lines above or below, full height blocking shall be provided between the ~~joists~~ framing members at braced wall panel locations~~. to permit fastening of wall plates in accordance with~~ Roof or floor sheathing above shall be attached to the full height blocking and the full height blocking shall be attached to top of wall per Table R602.3(1).

   Where floor or roof framing members are perpendicular to interior braced wall lines above or below, blocking shall be provided between the framing members at braced wall panel locations and attached per Table R602.3(1). Blocking at interior braced wall panels need not extend to floor or roof sheathing above.
2. Where ~~joists~~ floor or roof framing members are parallel to braced wall lines above or below, a rim joist or other parallel framing member shall be provided at ~~the~~ braced wall panels. ~~to permit fastening of wall plates per Table R602.3(1).~~ Roof or floor sheathing above shall be attached to the framing member and the framing member shall be attached to top of wall plates per Table R602.3(1)

~~3. Braced wall panels shall be permitted to be supported on cantilevered floor joists meeting the cantilever limits of Section R502.3.3 provided joists are blocked at the nearest bearing wall location, except such blocking shall not be required in Seismic Design Categories A, B, and C for cantilevers not exceeding 24 inches where a full height rim joist is provided.~~

~~4. Elevated post or pier foundations supporting braced wall panels shall be designed in accordance with accepted engineering practice.~~

Commenter's Reason:

1. The intent of the original code section, "R602.10.8 Connections", is to describe braced wall connections to framing above and below to provide a complete load path for lateral forces (i.e. wind or seismic). In the proposal, as submitted, the change in the first sentence, "supported on floor framing or foundation ", changes the focus of the section and seems to exclude connections to framing above. In spite of that, item 1 of the proposal specifically accounts for the connection of braced walls below to framing above directly conflicting with the proposed title and first sentence. Furthermore, in the original code text it says, "…shall be connected to the framing above….". I propose changing the title and first sentence to reflect the intent of the section.

2. I propose changing the word “joists” to “floor or roof framing members” and “framing members” as applicable. Considering item 1, the braced wall could be connecting to floor joists, ceiling joists, rafters or trusses. The term “framing members” is already used in the current code language. (See RB46 for additional information)
3. I propose adding the term “full height” to blocking in item 1 and separate exterior braced wall connections from interior braced walls. The intent of the required blocking in the original code language is to provide a complete load path of the lateral forces in the floor or roof sheathing above to the braced wall line. Also, when the braced walls are above typically the blocking provides bearing as well. (See RB46 for additional information)
4. In both items 1 and 2 the language for the reference to Table R602.3(1) has been modified from the original proposal that more clearly states where and how attachments are to occur. The attachment requirements themselves do not change with this modification.
5. Item 3 is deleted because:
    a. The topic of cantilevers supporting bearing walls is already addressed in the current code in Section R502.3.3 and Table R502.3.3(1).
    b. Cantilevers supporting braced wall panels in higher seismic design categories is already addressed in the existing R301.2.2.2.2, item 1 and is referred to in footnote “f” of Table R502.3.3(1).
    c. Blocking is already required above and below braced walls regardless of seismic or wind category as stated in the current code section, “*R602.10.8 Connections: …Where joists are perpendicular to braced wall lines above, blocking shall be provided under and in line with braced wall panels. Where joists are perpendicular to braced wall lines below, blocking shall be provided over and in line with the braced wall panels….*” Per sections noted in items “A” and “B” above cantilevers are allowed but, incorporating R602.10.8, blocking would still occur at the braced wall line.
6. Item 4 is deleted. This condition is already covered by other code sections and confuses this section. The existing code states;
    a. Section "**R602.10 Wall bracing**. All exterior walls shall be braced in accordance with this section."
    b. Section "**R403.2 General**. All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, wood foundations, or other approved structural systems....."

The code currently requires that all exterior walls are braced wall lines and are to be on foundations per code. If they are not, it already requires design.

Public Comment 2:

George Thomas, City of Pleasanton, CA, representing Peninsula, East Bay, and Monterey Bay Chapters, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.10.8 Braced wall panel support. Braced wall panels shall be supported on floor framing or foundation as follows:

1. Where joists are perpendicular to braced wall lines above or below, blocking shall be provided between the joists at braced wall panel locations to permit fastening of wall plates in accordance with Table R602.3(1).
2. Where joists are parallel to braced wall lines above or below, a rim joist or other parallel framing member shall be provided at the wall to permit fastening of wall plates per Table R602.3(1).
3. Braced wall panels shall be permitted to be supported on cantilevered floor joists meeting the cantilever limits of Section R502.3.3 provided joists are blocked at the nearest bearing wall location, except such blocking shall not be required in Seismic Design Categories A, B and C for cantilevers not exceeding 24 inches where a full height rim joist is provided.
4. Elevated post or pier foundations supporting braced wall panels <u>are permitted to be used in Seismic Design Categories A, B and C</u> ~~shall be~~ <u>when</u> designed in accordance with accepted engineering practice.

Commenter’s Reason: The use of post or pier foundations below braced walls in light-framed buildings has proven in past earthquakes (e.g., Northridge 1994, Loma Preita 1989) to be a source of collapse of the level where the posts occur. This occurs because of the significant stiffness difference between the wall bracing used in the story above the posts, and the post and pier system. Consequently we would like to limit the use of a post or pier foundation to the lower Seismic Design Categories, even when the system is engineered. This is because no accepted engineering practice currently exists for making a post or pier foundation system reliable to resist the level of seismic forces expected in the higher design categories, where the required bracing of the walls above the post level (first story) will be quite substantial. The absence of any mention in IRC Chapter 4 of what a post or pier foundation system may consist of, also creates a concern that warrants limiting its use.

Final Action: AS AM AMPC____ D

RB227-06/07

R602.10.11.1, Table R602.10.11.1 (New)

Proposed Change as Submitted:

Proponent: Ed Sutton, National Association of Home Builders (NAHB)

1. Revise as follows:

R602.10.11.1 Braced wall line spacing. Spacing between braced wall lines in each story shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

Exceptions:

1. In one- and two-story buildings, spacing between two adjacent braced wall lines shall not exceed 35 feet (~~10,363~~ 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).
2. 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 is multiplied by the appropriate adjustment factor from Table R602.10.11.1 and the length-to-width ratio for the floor diaphragm does not exceed 3:1.

2. Add new table as follows:

TABLE R602.10.11.1
ADJUSTMENT OF BRACING AMOUNTS FOR BRACED WALL LINES GREATER THAN 25 FEET[a & b]

BRACED WALL LINE SPACING (feet)	MULTIPLY BRACING AMOUNT IN TABLE R602.10.1 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.

Reason: This proposal will restore a needed exception to the limit placed on the braced wall line spacing for homes constructed in higher seismic areas that was eliminated from the 2003 IRC. Limiting the braced wall line spacing to 25 feet or less in Seismic Design Categories D0, D1 and D2 can be very restrictive to the layout of a home, particularly for a townhouse. This requirement will often force a builder to totally revise the layout of a home that he offers in lower seismic areas in order to accommodate an interior braced wall that will be required when that same model of home is to be built in an area in Seismic Design Category D0 and higher. While the existing exception to this requirement in the 2006 IRC does provide some flexibility by allowing a single large room to be accommodated, the proposed additional exception is still needed.

This proposal will not reduce the seismic resistance provided by the braced wall lines. The adjustment factors will ensure that the total amount of wall bracing provided to the building is equivalent to that provided when the braced wall line spacing is limited to 25 feet. Further, limits are placed on the length-to-width ratio for the floor diaphragm to ensure that lateral loads can be transferred to the braced wall lines.

It will, however, restore needed flexibility to the layout of a home. The new exception will limit the braced wall line spacing to 35 feet, which is equivalent to the limit for Seismic Design Category C and lower. By doing so, it will allow builders to use the same home plans for all the seismic zones in which they build, simply by increasing the amount of wall bracing provided.

NAHB asks your support of this needed exception that will provide greater design flexibility to homes constructed under the IRC while maintaining an equivalent level of seismic resistance in the braced wall lines provided.

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

Committee Action: **Approved as Modified**

Modify proposal as follows:

R602.10.11.1 Braced wall line spacing. Spacing between braced wall lines in each story shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

Exceptions:

1. 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).
2. 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 is multiplied by the appropriate adjustment factor from Table R602.10.11.1, ~~and~~ the length-to-width ratio for the floor diaphragm does not exceed 3:1, and the top plate splice is increased to 6 feet (12-16d nail).

(Portions of proposal not shown remain unchanged)

Committee Reason: This change provides design flexibility for braced wall line spacing while maintaining adequate wall bracing. The modification provides the needed top plate splice for the increased wall line spacing.

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, Chair, ICC Ad Hoc Committee on Wall Bracing, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.10.11.1 Braced wall line spacing. Spacing between braced wall lines in each story shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

Exceptions:

1. 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).

2. 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 is multiplied by the appropriate adjustment factor from Table R602.10.11.1, the length-to-width ratio for the floor floor/roof diaphragm does not exceed 3:1, and the top plate lap splice face nailing shall be twelve 16 d nails on each side of the splice splice is increased to 6 feet (12 16d nail).

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The change to requiring a specific number of nails of a specific size for the top plate splice is being proposed to insure that the minimum necessary capacity of the connection is provided. The previous use of a length of splice does not require a specific number of nails or specify the minimum size of nail, which is the governing parameter for a nailed connection capacity.

Final Action: AS AM AMPC____ D

RB234-06/07
R602.11.1

Proposed Change as Submitted:

Proponent: James Bela, Oregon Earthquake Awareness

Revise as follows:

602.11.1 Wall anchorage. Braced wall line sills shall be anchored to concrete or masonry foundations in accordance with Sections R403.1.6 and R602.11. For all buildings located in Seismic Design Categories D_0, D_1 and D_2 and townhouses in Seismic Design Category C, plate washers, a minimum of 0.229 3/16 inch by 3 2 inches by 3 2 inches (5.8 4.8 mm by 76 51 mm by 76 51 mm) or 2 $^1/_4$ inches (57 mm) in diameter in size, shall be installed provided between the foundation sill plate and the nut. The hole in the plate washer is permitted to be diagonally slotted with a width of up to $^3/_{16}$ inch (5 mm) larger than the bolt diameter and a slot length not to exceed 1 ¾ inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut.

Exception: Detached one-and two-family dwellings in Seismic Design Categories D_0 and D_1.

Reason: To substitute new or revised material for current provisions of the Code.

"The Building Code should be a consensus; it's not something to 'chip-away' at, because then you don't know what you've got!" --George Housner

This deletion of the requirements for flat bearing plate washers "a minimum of 0.229 inch [nominal $^1/_4$ inch] by 3 inches by 3 inches (5.8 mm [6.4] mm by 76 mm by 76 mm) in size" in Seismic Design Categories D_0 and D_1 (as an Exception for "Detached one- and two-family dwellings"); and also for townhouses in Seismic Design Category C -- thereby restricts their usage only to Seismic Design Category D_2. In addition, in this Code Change Proposal, the minimum size of the sill plate washers reverts back to the language of the 2000 IRC: $^3/_{16}$ inch by 2 inches by 2 inches (4.8 mm by 51 mm by 51 mm) in size. An errata in the first printing (January 2000) of the 2000 IRC listed the thickness as $^1/_4$ inch; and this was corrected in the Second Printing (March 2001).

Section R403.1.6 Foundation anchorage. – specifies that: "A nut and washer shall be tightened on each bolt to the plate."

Field observation of construction practice in the Portland, OR metropolitan area (Seismic Design Category D_1 – 2000 & 2003 IRC; now Seismic Design Category D_0 – 2006 IRC) has shown that when the standard round $^1/_2$ inch cut washer is used (as is allowed in Oregon in Seismic Design Category D_1, but not in the IRC); the nut may be over-tightened into the wood of the sill plate (1/8 inch or so) - and splitting the sill. See the attached "separate graphic file provided". The code is silent as to the location of the anchor bolts with respect to the centerline of the sill plate. I have observed 2 x 6 inch sill plates, where the bolts are located off-center because the bolts were set by hand in wet concrete for a standard 2 x 4 inch sill plate. For seismic loading, it is probably preferable to place the anchor bolt about 2 inches from the outside edge of the 2 x 6 sill plate (rather than dead center), as this should reduce the eccentric loading on the sill (theoretically) and thereby reduce its possibility of splitting. This could help if the sill is already "split" before the walls are framed and attached!

Also, the code is apparently silent on the grade of lumber that can be used in a sill plate; and (from discussions with others elsewhere in the country) in many cases the grade appears to be (and can be) "utility"? The code does not appear to require that a "non-split" piece of lumber constitute the sill plate.

The requirements of SECTION R319 PROTECTION AGAINST DECAY require (under subsection R319.3 Fasteners.): that "fasteners for pressure preservative and fire-retardant-treated wood be of hot-dipped galvanized steel, stainless steel, silicon bronze or copper." The cost of the flat bearing plate washers has risen from about $ 0.80 each in the 2000 IRC to now around $2.79 - $ 3.60 each, largely due to the requirement for "hot-dipped galvanized steel." Although these are only technically required for the conditions where "use of naturally durable wood or wood that is preservative treated in accordance with AWPA U1 for the species, product, preservative and end use" is required by R319.1 Location required. No. 2: "All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground." - it may be common practice in many areas of the country to use "preservative treated wood" for the sill plate, even when more than 8 inches from the exposed ground.

Since the requirements of section R602.11.1 Wall anchorage. – are integrally linked to sections R403.1.6 Foundation anchorage. - and to R403.1.6 Foundation anchorage in Seismic Design Categories C, D_0 , D_1 and D_2. [Previously R403.1.6.1 Foundation anchorage in Seismic Design Categories C, D_1 and D_2. – of the 2003 Edition IRC]; see also Code Change Proposal to section R403.1.6 Foundation anchorage. , and to section R403.1.6.1 Foundation anchorage in Seismic Design Categories C, D_0, D_1 and D_2.

State of Oregon Amendment to 2000 IRC: Code Change Proponent – Patrick Bridges: on behalf of Oregon Building Industry Association (OBIA) and Oregon Building Officials Association (OBOA)
State of Oregon Amendment to 2003 IRC: adopted as the "base code" for 2005 OREGON RESIDENTIAL SPECIALTY CODE (effective date of April 1, 2005)

Code Change Proponent – Richard Rogers, Structural Program Chief, Oregon Building Codes Division: on behalf of Oregon Building Codes Division

These changes to model code language of the *International Residential Code (IRC)* were effected by basically just "voting them in" by members of the Oregon Building Codes Division's (a) code development committees; (b) appropriate Advisory Boards; and (c) finally the concurrence of the BCD Administrator. Where technical supporting information was presented in the Oregon code change process, that same information is presented here. Where none was given in the Oregon code change process, the "supporting information" is "voting yes" in support by all of the above - to change the model code.

Finally, one reasonably expects that the Board of Directors of the ICC, the "People Helping People Build a Safer World™" see nothing in conflict with the Vision, Mission and Values of the ICC, since they agreeably have printed them under their copyright ownership now for two code cycles (2003 & 2005):

Vision: Protecting the health, safety, and welfare of people by creating better buildings and safer communities.
Mission: Providing the highest quality codes, standards, products, and services for all concerned with the safety and performance of the built environment
Values: Customer value, Integrity and trust, Member-focus, Professionalism, Public service, Quality

The fact that these revisions do not conform to ASCE 7-05, below, therefore should be considered "non-persuasive" – which presumably is the concurring view of the ICC Board and it's CEO, James Lee Witt. Even though a "uniform adoption would lead to consistent code enforcement and higher quality construction," the continued evisceration of the ICC copyright protections can continue to provide, well, "*A New Era of Building and Fire Safety"* -- throughout the seismic regions of the West, and particularly the Pacific Northwest, which is subject to Magnitude 9 subduction zone earthquakes, as have occurred in Chile (1960), Alaska (1964), and Sumatra (2004).

SECTION 11
SEISMIC DESIGN CRITERIA

11.1.4 Alternate Materials and Methods of Construction. Alternate materials and methods of construction to those prescribed in the seismic provisions of this standard shall not be used unless approved by the authority having jurisdiction. Substantiating evidence shall be submitted demonstrating that the proposed alternate, for the purpose intended, will be at least equal in strength, durability, and seismic resistance.

Bibliography:
ASCE 7-05, Minimum Design Loads for Buildings and Other Structures, including Supplement No. 1; American Society of Civil Engineers Structural Engineering Institute, Reston, VA.
2005 OREGON RESIDENTIAL SPECIALTY CODE, 2005 Edition (Effective date April 1, 2005), copyright 2005 by International Code Council, Inc., Falls Church, VA., 516 p. + 6 p. errata.
State of Oregon One- and Two-Family Dwelling Specialty Code, 2003 Edition, (Effective date April 1, 2003, copyright 2002 by International Code Council, Inc., Falls Church, VA., 350 p. (Remove 2000 IRC Page / Insert 2003 Oregon Page)
Bela, J. (2006). Building Codes Division Public Hearing February 21, 2006: Oregon's Building Codes Adoption Process Rules, Oral Testimony, 10 p.
Bela, J. (2006). Building Codes Division Public Hearing February 21, 2006: Oregon's Building Codes Adoption Process Rules, Additional Written Testimony, 23 p.
Bela, J. (2002). Building Codes Division Public Hearing September 17, 2002: Adopting 2000 Edition of International Residential Code "Approved as amended/use IRC as base document/allow for Oregon amendments", Written Testimony (FAX) withdrawing Code Change Proposal IRC-02-01 to adopt 2000 Edition of the IRC, 4 p.

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

Committee Action: **Disapproved**

Committee Reason: There was no technical data submitted to support this change.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

James Bela, Oregon Earthquake Awareness, requests Approval as Submitted.

Final Action: AS AM AMPC____ D