RB139-06/07
R401.1, 401.2, Table R401.1 (New)

Proposed Change as Submitted:

Proponent: Charlie O. Everly, PE, CBO, representing the Building Officials Association of Florida

Revise as follows:

R401.1 Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for all buildings. In addition to the provisions of this chapter, the design and construction of foundations in areas prone to flooding as established by Table R301.2(1) shall meet the provisions of Section R324. Wood foundations shall be designed and installed in accordance with AF&PA Report No. 7.

Exception: The provisions of this chapter shall be permitted to be used for wood foundations ~~only in the following situations~~ subject to the following :

1. ~~In b~~ Buildings ~~that~~ shall have no more than two floors and a roof.
2. ~~When i~~Interior basement and foundation walls ~~are constructed~~ shall be provided at intervals not exceeding 50 feet.
3. Where the foundation uplift loads determined from Table R401.1 exceed 0 or where such uplift loads cannot be determined from Table R401.1, an engineered design shall be required.

R401.2 Requirements. Foundations shall be capable of resisting all loads from roof uplift and building overturn. Foundation uplift for light-frame wood or steel buildings shall be calculated or determined from Table R401.1. Masonry buildings within the dimensional scope of Table R401. 1 shall be assumed to be of adequate weight so as not to require uplift resistance greater than that provided by the structure and any normal foundation. Foundation construction shall also be capable of accommodating all gravity loads according to Section R301 and of transmitting the resulting loads to the supporting soil. Fill soils that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice. Gravel fill used as footings for wood and precast concrete foundations shall comply with Section R403.

Add new text as follows:

TABLE R401.1
FOUNDATION UPLIFT LIGHT STEEL AND WOOD FRAME
BUILDINGS IN EXPOSURE B (plf) [5,6]

Roof Angle	-	Bldg Width	Minimum Building Length	WIND VELOCITY / VELOCITY PRESSURE					
				100	110	120	130	140	150
				15	18	22	26	30	34
45	3 Stories[3]	20	12	173	276	389	512	644	787
		25	14	73	165	265	374	492	618
		30	19	0	81	174	275	384	502
		35	25	17	48	104	200	305	417
		40	35	33	69	109	152	240	349
	2 Stories[2]	20	12	64	126	195	270	350	437
		25	15	17	66	129	198	272	352
		30	22	38	62	90	146	217	294
		35	35	56	86	118	154	192	252
		40	40	74	108	146	186	230	277
	1 Story[1]	20	12	33	46	61	94	132	173
		25	22	57	75	96	118	142	167
		30	18	79	103	129	157	187	219
		35	16	100	128	159	192	229	267
		40	16	120	152	188	226	268	312
30	3 Stories[3]	20	12	92	177	271	373	483	601
		25	17	0	63	143	230	324	425
		30	25	0	23	52	125	209	300
		35	35	13	44	78	115	154	206
		40	40	28	64	102	145	190	239
	2 Stories[2]	20	13	1	50	103	162	224	292
		25	23	16	35	57	84	139	199
		30	30	36	60	87	116	148	181
		35	35	54	83	115	150	187	227
		40	36	71	104	141	181	224	270
	1 Story[1]	20	20	32	46	60	76	93	112
		25	15	56	74	95	117	140	166
		30	13	78	102	127	155	185	217
		35	14	99	127	157	190	226	264
		40	16	118	150	185	223	264	308

Roof Angle	-	Bldg Width	Minimum Building Length[4]	WIND VELOCITY / VELOCITY PRESSURE					
				100	110	120	130	140	150
				15	18	22	26	30	34
20	3 Stories[3]	20	12	113	203	301	408	523	647
		25	14	45	130	222	322	431	547
		30	17	4	85	177	277	385	501
		35	19	20	58	154	257	369	489
		40	21	35	72	141	249	367	493
	2 Stories[2]	20	12	43	100	163	231	304	384
		25	13	22	79	143	214	289	371
		30	15	42	72	141	217	298	386
		35	15	61	92	150	232	321	417
		40	16	78	114	164	254	352	457
	1 Story[1]	20	12	38	57	94	135	179	226
		25	12	62	82	122	171	223	280
		30	12	85	110	154	212	275	342
		35	14	107	136	190	257	330	409
		40	16	126	160	227	304	388	478

Rf Angle	-	Bldg Width	Minimum Building Length[4]	WIND VELOCITY / VELOCITY PRESSURE					
				100	110	120	130	140	150
	-			21	26	31	36	42	48
45	3 Stories[3]	20	12	370	515	673	845	1031	1231
		25	13	249	377	518	670	836	1013
		30	17	159	278	408	550	703	867
		35	21	89	203	328	463	610	767
		40	26	102	153	262	394	537	691
	2 Stories[2]	20	12	184	271	368	472	585	706
		25	13	119	200	288	385	489	601
		30	18	85	147	233	326	426	533
		35	24	113	155	200	284	383	489
		40	36	139	187	240	297	358	457
	1 Story[1]	20	12	58	95	140	189	243	300
		25	16	92	118	147	178	224	281
		30	19	124	157	193	233	275	321
		35	17	154	193	236	283	334	388
		40	16	182	227	277	331	389	452
30	3 Stories[3]	20	12	256	376	507	650	804	970
		25	15	130	232	344	466	598	740
		30	21	47	127	228	337	455	582
		35	31	72	116	163	241	351	469
		40	40	96	146	200	259	323	392
	2 Stories[2]	20	12	95	163	238	320	408	502
		25	18	53	85	151	223	301	385
		30	30	83	117	154	195	239	304
		35	35	110	150	195	244	296	353

		40	37	135	182	233	289	350	415
	1 Story[1]	20	20	58	76	97	119	143	169
		25	16	91	117	145	176	210	245
		30	13	123	156	191	230	272	317
		35	14	152	191	234	280	330	384
		40	16	179	224	273	327	384	446
Rf Angle	-	Bldg Width	Minimum Building Length[4]	WIND VELOCITY / VELOCITY PRESSURE					
				100	110	120	130	140	150
	-			21	26	31	36	42	48
20	3 Stories[3]	20	12	285	411	549	698	860	1034
		25	13	207	325	455	595	748	911
		30	15	162	280	409	549	701	863
		35	17	138	260	393	538	695	863
		40	18	124	252	392	545	709	886
	2 Stories[2]	20	12	152	233	320	416	519	630
		25	12	133	215	306	404	511	625
		30	13	130	219	316	422	536	658
		35	14	138	235	341	456	581	715
		40	16	150	257	373	500	636	783
	1 Story[1]	20	12	88	136	188	245	307	373
		25	12	114	172	235	303	377	457
		30	12	146	214	288	370	457	552
		35	14	180	259	346	441	543	653
		40	16	215	306	406	515	632	758

Notes to Tables 401.1B and 401.1C:

1. Based on 1st floor height = 10 ft. or 11 ft. floor to floor in multi-story.
2. Based on 2nd floor height = 8 ft. or 9 ft. floor to floor in multi-story.
3. Based on 3rd foot height = 8 ft.
4. Building length shall be equal to or greater than that shown in tables.
5. Roof and floor framing shall span in the same direction.
6. Includes provision for 2 foot roof overhang

Reason: To make it clear that foundations shall be capable of resisting uplift. The tables cover a wide range of building shapes and sizes to provide the user some guidance where the uplift might exceed the allowable uplift on the footing.

The current code only addresses gravity loads on foundations and neglects those instances where footing size needs to be increased to resist uplift.

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

Committee Action: **Disapproved**

Committee Reason: This is the Florida Code and it would be a major rewrite for this code. There is no need to bring this into a national code at this time. There is an ICC Consensus Committee working on an update to SSTD-10 and that will properly bring this into the code.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Robert Boyer, Building Officials Association of Florida, representing the Code Development Committee, requests Approval as Submitted.

Commenter's Reason: The prescriptive provisions in the International Residential Code are limited to jurisdictions with a basic wind speed of 110 mph or less. The states along the Gulf Coast and the Atlantic Ocean from Texas to Massachusetts and the coast of Alaska are exposed to basic wind speeds greater than 110 mph as well as numerous "Special Wind Regions" within the US. The International Residential Code should be expanded to provide prescriptive provisions for the individuals in these jurisdictions. This is a multiple region issue, which could affect as many as 22 states. The Wind issues aren't any different than Snow Loads or Seismic requirements being in the Code.

This is not just a Florida Issue and we believe it deserves to be reconsidered in Rochester.

Final Action: AS AM AMPC____ D

RB140-06/07
R401.4

Proposed Change as Submitted:

Proponent: Richard E. Bartell, Hanover County, VA, representing VBCOA, DHCD

Revise as follows:

401.4 Soil tests. In areas ~~likely~~ proven by quantifiable data created by accepted soil science methodologies to have expansive, compressible, shifting or other questionable soil characteristics, the building official shall determine whether to require a soil test to determine the soil's characteristics at a particular location. This test shall be made by an approved agency using an approved method.

Reason: The term "likely" is subjective and vulnerable to many interpretations. We feel the proposed language better addresses the criteria for when soil tests are needed. Our intentions are that any existing soil maps or documentation suggesting these soils are present in an area would fit the criteria for additional testing at a particular location within that area. This would limit requirements for testing all building sites in a jurisdiction simply because of isolated or low percentage problem areas.

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

Committee Action: **Approved as Submitted**

Committee Reason: This removes a subjective term in the code text and replaces it with proper text.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment 1:

Maureen Traxler, City of Seattle Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

401.4 Soil tests. ~~In areas proven by~~ Where quantifiable data created by accepted soil science methodologies indicate ~~to have~~ expansive, compressible, shifting or other questionable soil characteristics are likely to be present, the building official shall determine whether to require a soil test to determine the soil's characteristics at a particular location. This test shall be made by an approved agency using an approved method.

Commenter's Reason: This proposed modification relieves the building official from the requirement to prove the characteristics of soil on a site in order to require soil tests. As originally submitted, this provision could be construed to require the building official to perform a site-specific soils investigation in order to require an applicant to submit a soils report. This sequence does not make sense. This modification reintroduces the word "likely" into the section, but the addition of the requirement for "quantifiable data" created by scientific methodologies substantially reduces the subjectivity of the present code language. This modification gives the applicant a basis to challenge a building official's request for soil tests if the applicant believes the tests are not justified.

Public Comment 2:

Maureen Traxler, City of Seattle Department of Planning and Development, requests Disapproval.

Commenter's Reason: This proposal places the burden on the building official to prove that soil tests are required. The proof that this proposal requires the building official to produce is site-specific and is under the control of the property owner, not the building official. The maps referred to by the proponent are usually created from generalized information that doesn't prove anything about a specific site. "Quantifiable data" is available for only a very small number of sites.

Final Action: AS AM AMPC____ D

RB141-06/07

R402.3, R402.3.1 (New), Chapter 43 (New)

Proposed Change as Submitted:

Proponent: Brian D. Miller, National Precast Concrete Association

1. Revise as follows:

R402.3 Precast concrete. ~~Approved~~ Precast concrete foundations shall be designed and meet the minimum requirements of section R402.3.1 and shall be installed with the provisions of this code and the manufacturer's installation instructions.

2. Add new text as follows:

R402.3.1 Minimum requirements for materials used to make precast concrete foundations.

1. All concrete used in the manufacture of precast concrete foundations shall have a minimum compressive strength of 5000 psi (34,470 kPa) at 28 days. Concrete exposed to a freezing and thawing environment shall be air entrained with a minimum total air content of 5%.
2. Structural reinforcing steel shall meet the requirements of ASTM A615, A706 or A996. The minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). Steel reinforcement for precast concrete foundation walls shall have a minimum concrete cover of 5/8 in (16 mm).
3. Panel-to-panel connections shall be made with Grade II steel fasteners.
4. The use of non structural fibers shall conform to ASTM C 1116
5. Grout used for bedding precast foundations placed upon concrete footings shall meet ASTM C 1107.

CHAPTER 43
REFERENCED STANDARDS

ASTM C 1107-04 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1116-03 Standard Specification for Fiber-Reinforced Concrete and Shotcrete

Reason: The purpose of this change is to clarify code and add new requirements to code. In 2003, precast foundations were added to the IRC, additional information and guidance is needed to clarify details of their use for building officials. Since precast concrete foundations are pre-engineered systems, the addition of section R402.3.1 will ensure that minimum quality materials are used in their manufacturing.

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

Analysis: Results of review of the proposed standard will be posted on the ICC website by August 20, 2006.

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Reference Standards" provided at the code development hearings:

Analysis: Review of proposed new standard 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 quantifies the existing code language and adds the needed referenced standards for control.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Maureen Traxler, City of Seattle Department of Planning and Development, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R402.3.1 Minimum requirements for materials used to make precast concrete foundations.

1. All concrete used in the manufacture of precast concrete foundations shall have a minimum compressive strength of 5000 psi (34,470 kPa) at 28 days. Concrete exposed to a freezing and thawing environment shall be air entrained with a minimum total air content of 5%.
2. Structural reinforcing steel shall meet the requirements of ASTM A615, A706 or A996. The minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). Steel reinforcement for precast concrete foundation walls shall have a minimum concrete cover of ~~5/8~~ 3/4 in (~~16~~ 19.1 mm).
3. Panel-to-panel connections shall be made with Grade II steel fasteners.
4. The use of non structural fibers shall conform to ASTM C 1116
5. Grout used for bedding precast foundations placed upon concrete footings shall meet ASTM C 1107.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This modification increases the minimum concrete cover to 3/4 inch for consistency with ACI 318.

Final Action: AS AM AMPC____ D

RB142-06/07

R403.1, R403.4 (New), R403.4.1 (New), R403.4.2 (New), Table R403.4(1)-(New), Figure R403.4(1)-(New), Figure R403.4(2)-(New)

Proposed Change as Submitted:

Proponent: Brian D. Miller, National Precast Concrete Association

1. Revise as follows:

R403.1 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.

2. Add new text as follows:

R403.4 Footings for precast concrete foundations. Footings for precast foundations shall comply with Section R403.4.

R403.4.1 Crushed Stone Footings. Clean crushed stone shall have a maximum size of ½ inch (12.7 mm). Crushed stone footings for precast foundations shall be installed in accordance with Figure R403.4 (1) and Table R403.4 (1). Crushed stone footings shall be consolidated using a vibratory plate in a maximum of eight-inch lifts.

R403.4.2 Concrete Footings. Concrete footings shall be installed in accordance with Section 403.1 and Figure R403.4 (2).

TABLE R403.4(1)
MINIMUM DEPTH OF CRUSHED STONE FOOTINGS

Minimum Depth of Crushed Stone Footing (Inches)																	
		Load Bearing Value of Soil (psf)															
		1500				**2000**				**3000**				**4000**			
		MH, CH, CL, ML				**SC, GC, SM, GM, SP, SW**				**GP, GW**							
		Wall Width				**Wall Width**				**Wall Width**				**Wall Width**			
		6"	**8"**	**10"**	**12"**	**6"**	**8"**	**10"**	**12"**	**6"**	**8"**	**10"**	**12"**	**6"**	**8"**	**10"**	**12"**
Conventional light-frame construction																	
1 - Story	(1100 plf)	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story	(1800 plf)	8"	6"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
3 - Story	(2900 plf)	16"	14"	12"	10"	10"	8"	6"	6"	6"	4"	4"	4"	6"	4"	4"	4"
4-inch brick veneer over light frame or 8-inch hollow concrete masonry																	
1 - Story	(1500 plf)	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story	(2700 plf)	14"	12"	10"	8"	10"	8"	6"	4"	6"	4"	4"	4"	6"	4"	4"	4"
3 - Story	(4000 plf)	22"	22"	20"	18"	16"	14"	12"	10"	10"	8"	6"	4"	6"	4"	4"	4"
8-inch solid or fully grouted masonry																	
1 - Story	(2000 plf)	10"	8"	6"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story	(3600 plf)	20"	18"	16"	16"	14"	12"	10"	8"	8"	6"	4"	4"	6"	4"	4"	4"
3 - Story	(5300 plf)	32"	30"	28"	26"	22"	22"	20"	18"	14"	12"	10"	8"	10"	8"	6"	4"

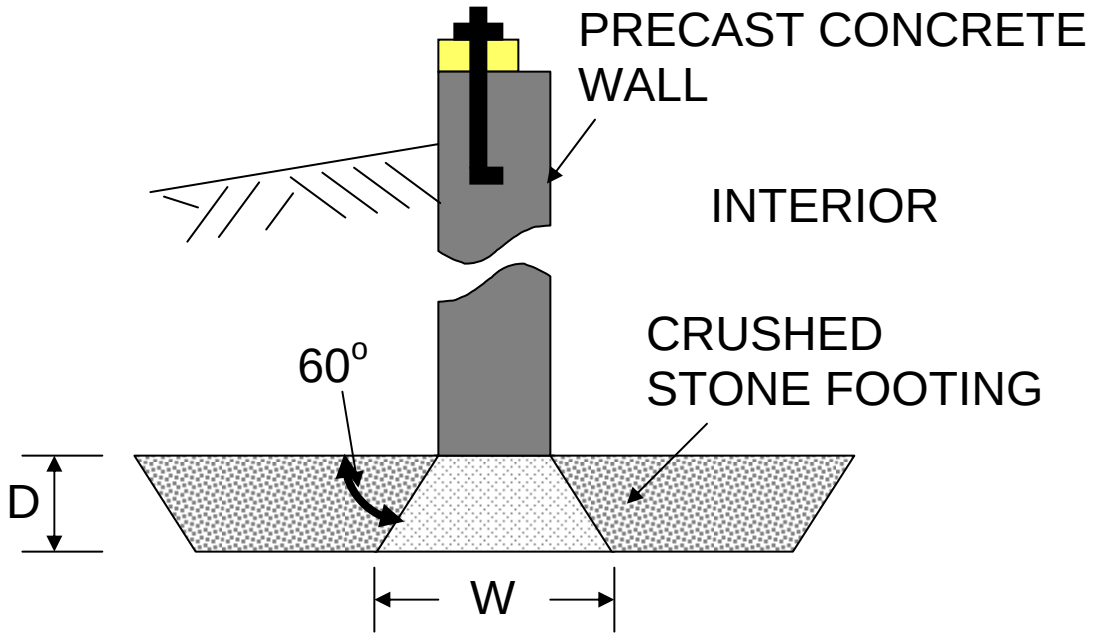


FIGURE R403.4(1)
BASEMENT OR CRAWL SPACE WITH PRECAST FOUNDATION WALL BEARING ON CRUSHED STONE

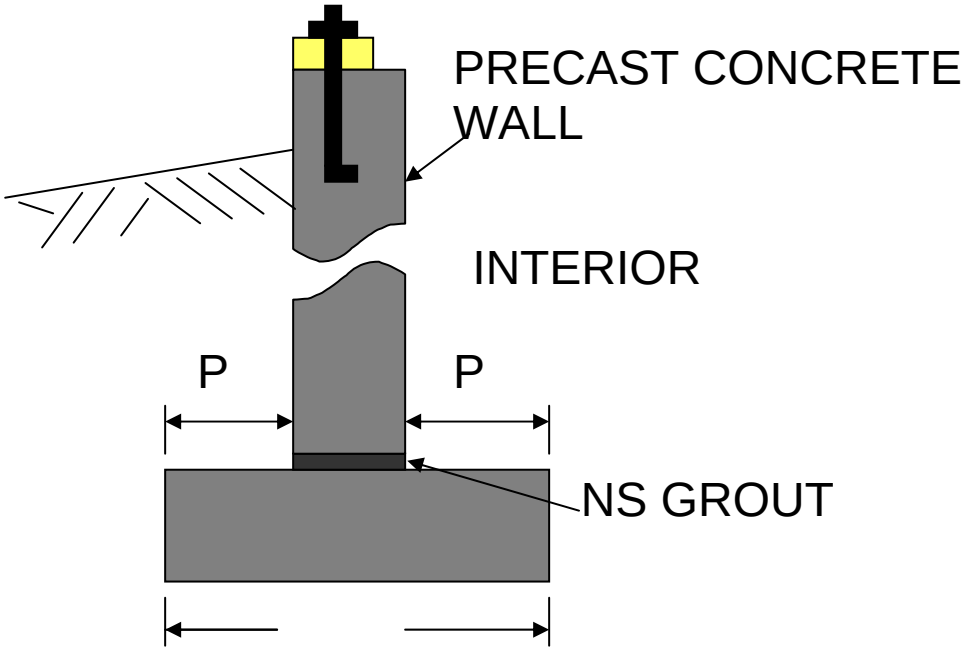


FIGURE R403.4(2)
BASEMENT OR CRAWL SPACE WITH PRECAST FOUNDATION WALL ON SPREAD FOOTING

Reason: The purpose of this change is to clarify the code. In 2003, precast foundations were added to the IRC, additional information and guidance is needed to clarify details of their use for building officials. This text and figures will provide for crushed stone footings, a common footing for precast concrete foundations. They will also provide necessary information to assist the building official.

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

Committee Action: **Disapproved**

Committee Reason: This proposal needs to reference a standard for the crushed stone. The figures for the crushed stone are confusing. This needs work with respect to the proper seismic design category. The proponent needs to rework this and bring back later.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Phillip B. Cutler, P.E., National Precast Concrete Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

TABLE R403.1
MINIMUM WIDTH OF CONCRETE, PRECAST OR MASONRY FOOTINGS (inches)[a]

(No change to table)

R403.4 Footings for precast concrete foundations. Footings for precast concrete foundations shall comply with Section R403.4.

R403.4.1 Crushed Stone Footings. Clean crushed stone shall ~~have a maximum size of ½ inch (12.7 mm)~~ be free from organic, clayey or silty soils. Crushed stone shall be angular in nature and meet ASTM C 33, with the maximum size stone not to exceed ½ inch (12.7 mm) and the minimum stone size not to be smaller than 1/16-inch (1.6 mm) . Crushed stone footings for precast foundations shall be installed in accordance with Figure R403.4 (1) and Table R403.4 (1). Crushed stone footings shall be consolidated using a vibratory plate in a maximum of eight-inch lifts. Crushed stone footings shall be limited to Seismic Design Categories A, B, and C.

TABLE R403.4(1)
MINIMUM DEPTH OF CRUSHED STONE FOOTINGS

Minimum Depth of Crushed Stone Footing (Inches), D																
	Load Bearing Value of Soil (psf)															
	1500				2000				3000				4000			
	MH, CH, CL, ML				SC, GC, SM, GM, SP, SW				GP, GW							
	Wall Width				Wall Width				Wall Width				Wall Width			
	6"	8"	10"	12"	6"	8"	10"	12"	6"	8"	10"	12"	6"	8"	10"	12"
Conventional light-frame construction																
1 - Story (1100 plf)	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story (1800 plf)	8"	6"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
3 - Story (2900 plf)	16"	14"	12"	10"	10"	8"	6"	6"	6"	4"	4"	4"	6"	4"	4"	4"
4-inch brick veneer over light frame or 8-inch hollow concrete masonry																
1 - Story (1500 plf)	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story (2700 plf)	14"	12"	10"	8"	10"	8"	6"	4"	6"	4"	4"	4"	6"	4"	4"	4"
3 - Story (4000 plf)	22"	22"	20"	18"	16"	14"	12"	10"	10"	8"	6"	4"	6"	4"	4"	4"
8-inch solid or fully grouted masonry																
1 - Story (2000 plf)	10"	8"	6"	4"	6"	4"	4"	4"	6"	4"	4"	4"	6"	4"	4"	4"
2 - Story (3600 plf)	20"	18"	16"	16"	14"	12"	10"	8"	8"	6"	4"	4"	6"	4"	4"	4"
3 - Story (5300 plf)	32"	30"	28"	26"	22"	22"	20"	18"	14"	12"	10"	8"	10"	8"	6"	4"

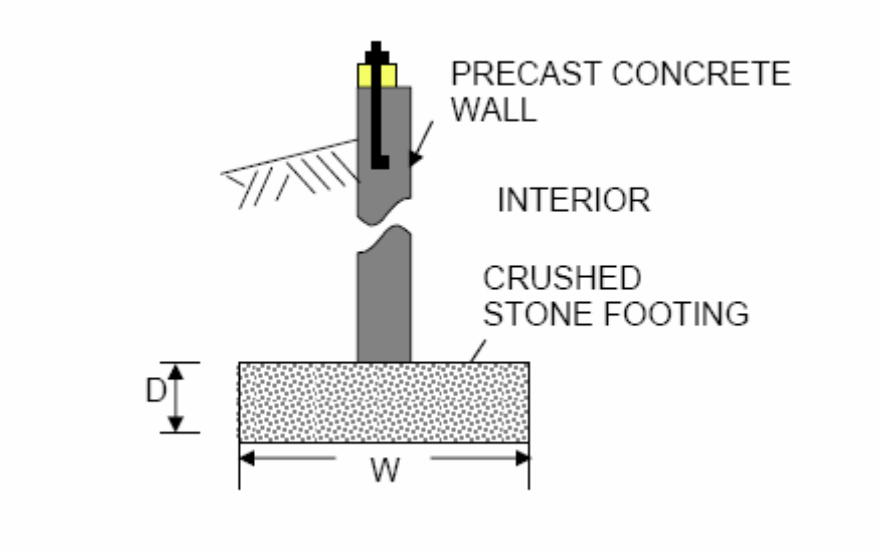


FIGURE R403.4(1)
BASEMENT OR CRAWL SPACE WITH PRECAST FOUNDATION WALL BEARING ON CRUSED STONE

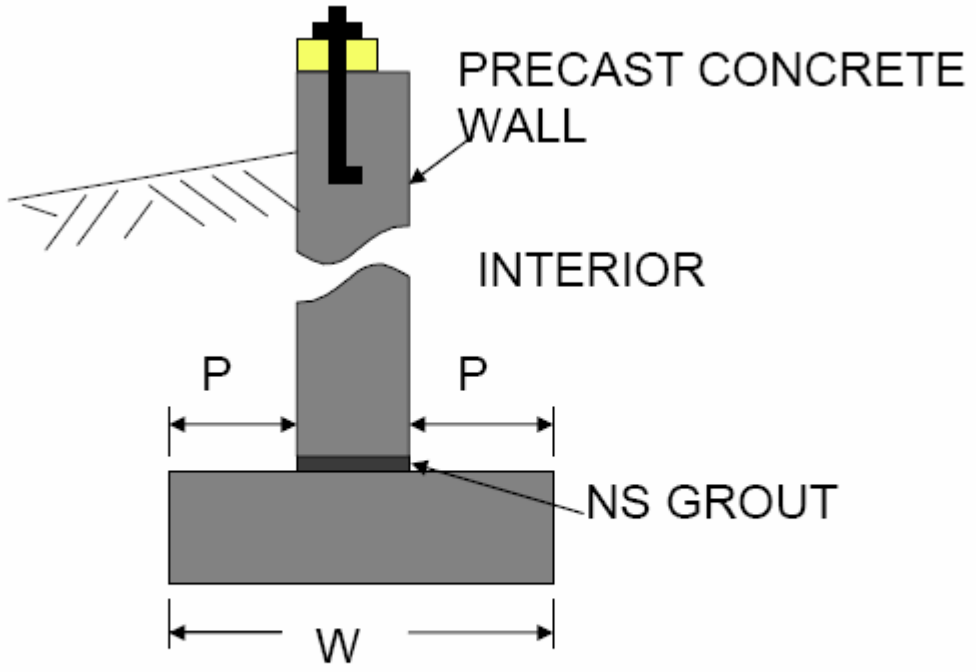


FIGURE R403.4(2)
BASEMENT OR CRAWL SPACE WITH PRECAST FOUNDATION WALL ON SPREAD FOOTING

Commenter's Reason: Crushed stone and gravel footings are permitted by the IRC (Section R403.2) for wood foundations and have been used for years by both wood foundations and precast concrete foundation systems. However, the information for precast concrete foundation systems is not in the IRC. This submission will provide clarity for the building official including tables for appropriate depth of footings and figures to illustrate proper installation. The submission was modified to address the committees concerns about seismic applications. Section R301.2.2 notes that "seismic provisions of this code shall apply to buildings constructed in Seismic Design Categories C, D_0, D_1 and D_2, thereby exempting Seismic Design Categories A & B. Furthermore, the exception notes that "detached one- and two-family dwellings located in Seismic Design Category C are exempt.

Final Action: AS AM AMPC____ D

RB144-06/07

R403.1.3.2, Figure R403.1.3.2 (New)

Proposed Change as Submitted:

Proponent: Jim W. Sealy, AIA and Kelly Cobeen, FEMA/BSSC Code Resource Support Committee

1. Revise as follows:

R403.1.3.2 Slabs-on-ground with turned-down footings. Slabs on ground with turned down footings shall have a minimum of one No. 4 bar at the top and the bottom of the footing.

Exception: For slabs-on-ground cast monolithically with the footing, one No. 5 bar or two No. 4 bars shall be permitted to be located in the middle third of the footing depth.

Where the slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks each end shall be provided in accordance with Figure R403.1.3.2.

2. Add new figure as follows:

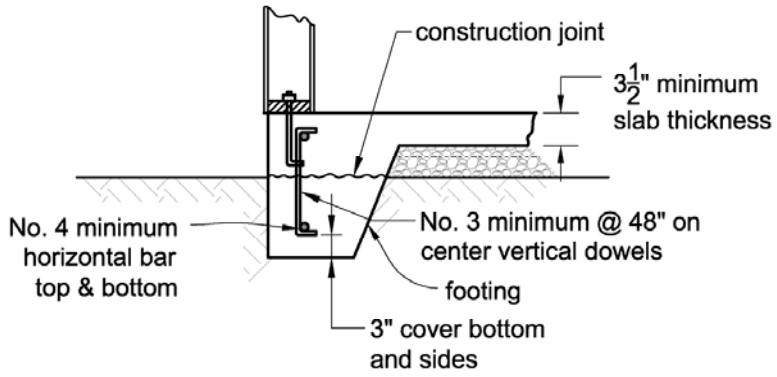


FIGURE R403.1.3.2
DOWELS FOR SLABS-ON-GROUND WITH TURNED-DOWN FOOTINGS

Reason: The exception is revised because placement of the reinforcing at the top and bottom of the footing provides much better crack control and stiffness and should always be an option. The addition of vertical dowels in slabs cast separately is in response to observation of wide-spread damage due to slippage on the construction joint during the 1994 Northridge Earthquake.

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

Committee Action: **Disapproved**

Committee Reason: The exception allows the reinforcement to be in the middle third of the footing depth. There is a question whether the No. 3 dowel at 4 feet on center is adequate.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Jim W. Sealy, FAIA and Kelly Cobeen, FEMA/BSSC Code Resource Support Committee, representing Building Seismic Safety Council of the National Institute of Building Sciences, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R403.1.3.2 Slabs-on-ground with turned-down footings. Slabs on ground with turned down footings shall have a minimum of one No. 4 bar at the top and the bottom of the footing.

> **Exception:** For slabs-on-ground cast monolithically with the footing, one No. 5 bar or two No. 4 bars shall be permitted to be located in the middle third of the footing depth <u>as an alternative to placement at the footing top and bottom</u>.

Where the slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks each end shall be provided in accordance with Figure R403.1.3.2. <u>Standard hooks shall comply with Section R611.7.1.5.</u>

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This comment clarifies language that the code development committee identified as potentially open to misinterpretation.

The code development committee questioned whether the capacity provided by the dowels would be adequate. Using shear friction principles in accordance with ACI 318-05, the vertical dowels are adequate to carry an ASD horizontal shear of approximately 520 plf for grade 60 reinforcing and 350 for grade 40. This capacity should be adequate for direct shear and shear for flexural development.

Final Action: AS AM AMPC____ D

RB148-06/07
R404.1

Proposed Change as Submitted:

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

Revise as follows:

R404.1 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318,ACI 332,NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards. When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).
4. Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mmby 102mm)blocking elsewhere.
5. Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio, L/W, shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.

   Exception: Foundation walls that are self-bracing may be considered to be laterally supported. Self-bracing walls do not need to comply with items 2 through 5 above, but shall meet all of the following conditions:

   1. Basement floor shall meet item 1, above.
   2. Basement walls shall form a complete closed loop around the enclosed basement, such that each length of basement wall shall have an adjoining wall segment at each end, perpendicular to the wall segment.
   3. Basement walls shall be concrete.
   4. Length of wall segments between corners shall be no greater than the following:
      - 4.1. 2 times the height of the concrete wall for concrete compressive strength f'c of 2,500 psi
      - 4.2. 3 times the height of the concrete wall for concrete compressive strength f'c of 3,000 psi
      - 4.3. 4 times the height of the concrete wall for concrete compressive strength f'c of 3,500 psi
   5. Walls shall meet the requirements of Table R404.1.1(5), except that footnotes h and i shall not apply.

Reason: When a basement wall is self-bracing, the walls do not span vertically as in the prescriptive retaining walls already described in the Code. Rather, they act like 2-D supported plates, spanning laterally from corner to corner. As a result, no bracing is required at the top of the wall.

Many older basements without top connections have been successfully functioning this way. If a basement can meet the geometric constraints, there is no reason why we cannot let new basement walls do similar. This cannot be a replacement for the current basement rules and tables, because not all new basements meet either the span limits or the fully enclosed requirements. It is a helpful new addition, though.

Analysis was performed on RISA 3-D finite element program. Plates were modeled as simply supported on three sides, as required by ACI-318, section 22.4.7.

Back check was performed by the following analytical references:
Theory of Plates and Shells – Timeshenko
Rectangular Concrete Tanks – PCA
Formulas for Stress and Strain – Roark and Young
Plate Design Nomograph – US Department of the Interior

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

Committee Action: **Disapproved**

Committee Reason: This change should not be limited to only concrete material. Masonry foundation walls should also be included.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Scott Beard, SE, City of Tacoma, WA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R404.1 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318,ACI 332,NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards. When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).
4. Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mmby 102mm)blocking elsewhere.
5. Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio, L/W, shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.

   Exception: Foundation walls that are self-bracing may be considered to be laterally supported.
   Self-bracing walls do not need to comply with items 2 through 5 above, but shall meet all of the following conditions:

   1. Basement floor shall meet item 1, above.
   2. Basement walls shall form a complete closed loop around the enclosed basement, such that each length of basement wall shall have an adjoining wall segment at each end, perpendicular to the wall segment.
   3. Basement walls shall be concrete <u>or masonry</u>.
   4. Length of wall segments between corners shall be no greater than the following:
      4.1. 2 times the height of the concrete wall for concrete compressive strength f'c of 2,500 psi
      4.2. 3 times the height of the concrete wall for concrete compressive strength f'c of 3,000 psi
      4.3. 4 times the height of the concrete wall for concrete compressive strength f'c of 3,500 psi
   5. Walls shall meet the requirements of Table R404.1.1(5), except that footnotes h and i shall not apply.

Commenter's Reason: This did not pass at Orlando, solely because at that time it did not include masonry. It only referred to concrete walls. Both the proponent and the masonry association wanted to add "masonry" as a floor amendment, but procedurally were unable to.
This is the revised text.
For many basements, the distance between wall corners is such that it allows the walls to brace each other for soil forces. For this situation, the extra requirements for top support of the wall in R404.1 are not required.
This will remove most house basements from the top restraint requirements. The houses that will still require top restraint are the ones that truly need some extra attention: Mega-houses with huge basements, and daylight basements that are open and cannot self-brace. Let's put the attention where it is needed.
This modification is based on 2-way plate action analysis.

Final Action: AS AM AMPC____ D

RB149-06/07
R404.1, Tables R404.1(1), R404.1(2) and R404.1(3)

Proposed Change as Submitted:

Proponent: Lionel Lemay, National Ready Mixed Concrete Association; Ed Sauter, AIA, Concrete Foundation Association; Stephen V. Skalko, P.E., Portland Cement Association; Edgar Sutton, P.E., National Association of Home Builders; Jason Thompson, P.E., National Concrete Masonry Association

1. Revise as follows:

R404.1 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318,ACI 332,NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards. When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

~~Foundation walls that meet all of the following shall be considered laterally supported:~~

1. ~~Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.~~
2. ~~Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).~~
3. ~~Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).~~
4. ~~Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mmby 102mm)blocking elsewhere.~~
5. ~~Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio, L/W, shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.~~

2. Delete without substitution:

~~TABLE R404.1(1)~~
~~TOP REACTIONS AND PRESCRIPTIVE SUPPORT FOR FOUNDATION WALLSa~~

~~TABLE R404.1(2)~~
~~MAXIMUM PLATE ANCHOR-BOLT SPACING FOR SUPPORTED FOUNDATION WALLa~~

~~TABLE R404.1(3)~~
~~MAXIMUM ASPECT RATIO, L/W FOR UNBALANCED FOUNDATIONS~~

Reason: The provisions for laterally supporting basement walls at the top and bottom in the 2000 & 2003 IRC and were previously in the CABO One and Two Family Dwelling Code for many years. Basement walls constructed in accordance with these provisions have performed successfully with no evidence of code deficiencies. Code change S89-04/05 revised the lateral support provisions based on engineering analysis that indicate the 2003 IRC provisions were unconservative. In the reason statement for the code change, the proponent suggested there have been failures of foundation walls built according to these provisions but no detailed data to substantiate these failures was provided. Absent sufficient technical justification for the change, the IBC Structural Committee correctly took action to recommend its disapproval.

During the challenge process public comments were submitted requesting that code change S89-05 be approved as modified. These challenges again alluded to foundation wall failures but no data to substantiate a deficiency with the existing provisions was offered. Unfortunately, the challenges to S89-05 were discussed in Detroit very late one evening of the public hearings. With a very small representation of the voting membership present, the action of the IBC Structural Committee was overturned and the foundation provisions revised to include three new tables and additional limitations to be evaluated for applying prescriptive provisions to foundation walls.

This proposed change deletes these new tables and additional limitations placed on foundation walls so that the requirements for constructing foundation walls will be permitted to follow the prescriptive provisions that have been in the national model residential codes and performed successfully for many years.

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

Committee Action: **Disapproved**

Committee Reason: The committee has received no technical data from the proponents or opponents as to the merits of this issue. This should be brought back in the public comment phase with proper data submitted by both parties.

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:

Gary Ehrlich, P.E., National Association of Home Builders (NAHB), requests Approval as Submitted.

Commenter's Reason: The modified provisions for foundation walls voted into the 2006 IRC were done so with no substantiation of the need for the additional provisions. The proponents did not provide the IRC committee or the assembly with documentation of widespread foundation wall failures or calculations demonstrating the existing IRC requirements for concrete and masonry foundation walls were inadequate. The new provisions are overly conservative, based only on theoretical assumptions, do not have research backing and have not been applied in conventional construction as they are intended to be here.

Little consideration has been given to the practical impact the additional provisions will have on conventional construction that will result in needless increases in housing costs for consumers as the 2006 edition of the IRC is adopted. The new provisions needlessly complicate framing and inspection practices, require exponentially more connectors in many cases, require bracing where it is not needed, and further complicate the installation of HVAC, electrical and plumbing. A rough estimate of the added construction costs ranges from $1300 for a partially-backfilled foundation wall in good soils to over $5500 for a fully-backfilled foundation wall in poor soils. And these are just the basic material/labor/equipment costs plus an overhead & profit allowance. They do not include the increased general conditions costs stemming from the added time needed in the builder's schedule to comply with the provisions, nor do they include the inspection costs, both of which will add substantially to the burden for builders and homeowners.

A review of the provisions raises a number of questions about the general approach used to develop the tabulated values and the claims that the approach was consistent with previous codes and standards (e.g. UBC, SSTD 10):

1. The anchor bolt spacing in Table R404.1(2) was determined using the most conservative assumptions possible: ½" anchor bolts in Spruce-Pine-Fir sill plates in perpendicular-to-grain loading. No thought is given to requiring a larger anchor bolt, double sill plates, or a higher-grade species of wood for the sill plate in order to reduce the more onerous anchor bolt spacing requirements in the table.
2 .No resistance to lateral pressures provided by the floor framing and floor diaphragm is taken into account.
3. The beneficial effects of dead load from exterior bearing walls in reducing bending stresses in the foundation walls are not considered.
4. Details in SSTD 10-99 showing clips at the band joist and floor framing, indicate 18 gage clips. S89-04/05 specified lower capacity 20 gage clips.
5. SSTD 10-99 only requires full depth blocking in the first two joist spaces and does not require flat blocking elsewhere.
6. SSTD 10-99 contains details for floor joists hung from a ledger bolted to the side of the wall, with an 18" minimum spacing for the ledger bolts.
7. UBC 1997 shows a detail for 18 gage angle clips each side of the floor joist with 4-8d nails each leg, and typical anchor bolt spacing in the sill.
8. The foundation wall reinforcing provisions and the new anchorage provisions are based on active pressures, which assume the top of the wall can move. The extremely tight anchor bolt spacing at the upper limits of the table coupled with the blocking requirements could introduce enough stiffness and restraint at the top of the foundation wall such that higher at-rest pressures develop, placing the wall at greater risk of cracking. The resultant cracks are almost certain to damage the waterproofing and result in infiltration, water damage, mold, mildew, etc.

In addition to the assumptions in item #1, the proponent uses the perpendicular-to-grain values for bolts in concrete from the AF&PA's NDS. These published values incorporate reduction factors intended to bring the actual values calculated from AF&PA's yield limit equations in line with nominal values published in previous editions of the NDS. (This is discussed in AF&PA's Technical Report #12, which also gives the unreduced yield limit equations.) Thus, using the "reduced" NDS values results in an overly conservative solution that does not reflect the true capacity of the connection. In addition, the engineered solution has not been "calibrated" to a rational solution reflecting the historically good performance of basement walls, particularly when constructed to the previous IRC provisions. This calibration to historical practice is an important consideration and is a typical step used in developing IRC provisions.

The proponent suggests there is a need for these provisions to deal with "daylight" (walkout) basements and hilly sites where there is unbalanced fill on opposing sides of the house. If this is true, a prescriptive limit should be incorporated into Section R404.1.3—Design Required specifying engineered solutions for those cases. Alternatively, prescriptive tables for just the worst-case basements should be provided, or local amendments submitted for those areas, particularly on the West Coast, where it is suggested daylight basements are the proponent's concern.

Existing IRC requirements without the added provisions in the 2006 edition have a proven record of accomplishment for providing sound, safe and durable foundations. There is not a widespread history of basement wall failures occurring due to the design of the wall. Rather, the observed failures have typically been due to unanticipated causes such as construction equipment striking or surcharging the wall. The provisions added to the 2006 IRC are therefore not needed and will needlessly burden builders who must contend with difficult-to-construct details and inspectors who are responsible for ensuring the provisions are met. This in turn will result in increased construction and inspection costs that consumers must bear without providing them a needed benefit. A number of states have already struck these provisions with their adoption of the 2006 IRC. NAHB asks for your support in approving RB149 as submitted and reversing the committee's action.

Reference:

AF&PA 1999, *Technical Report 12, General Dowel Equations for Calculating Lateral Connection Values*, American Forest & Paper Association, Inc., Washington, DC.

Public Comment 2:

J. Edward Sauter, Concrete Foundations Association (CFA), requests Approval as Submitted.

Commenter's Reason: Prior to the first hearing for 2006/07 code development cycle the Concrete Foundations Association conducted a survey of its members regarding wall failure using the anchor bolt spacing of the IRC-2003 which stipulated anchor bolt spacing of 6 feet o.c. with a maximum distance from wall corners of 12 inches.

The survey was sent to 200 members of which 87 responded. The survey respondents conduct business east of the Rocky Mountains. The respondents constructed an average of 41,000 basements per year and over 200,000 during the period covered by the survey. Respondents predominately use anchor bolts (67%). The predominant spacing was 6 feet. Spacings of 4 feet, 5 feet, and 6 feet covered 81% of respondents. One contractor in an area where they construct primarily walk-out basements, many of them 9 feet tall, used a 3 foot spacing.

Respondents were asked to identify problems associated with the sill plate, anchor bolt, and deck connections. There were a total of 41 problems reported in over 200,000 basements installed (00.02%). The dominant cause of the problems was heavy equipment either too close, or actually impacting the foundation. A separate case sited a series of missed anchor bolts and another cited a failure of the deck attachment to the plate. There were no failures reported from normal service conditions.

These survey results further validate the reason for proposing that the foundation anchorage provisions of the 2006 IRC revert back to the provisions in the 2003 IRC. Those provisions, like the provisions in the previous CABO OTFDC have proven themselves from years of successful application in the field.

Public Comment 3:

Scott Beard, Se, City of Tacoma, WA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R404.1 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318,ACI 332,NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards. When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).
4. Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mmby 102mm)blocking elsewhere.
5. Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio, L/W, shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.

Exception:

If the footing and basement wall meet all of the following:

1. The bottom of footing is 18 inches below the top of the basement slab.
2. There is a minimum of one No. 4 bar installed vertically between the footing and wall, not more than 4 feet on center
3. The vertical bar extends from 3 inches clear of the bottom of the footing and has a standard hook, and extends a minimum of 14 inches into the basement wall

Then, the following adjustments may be made to the table values:

1. The lateral force values in Table R404.1(1) may be divided by 2.
2. The prescriptive support method B may be used.
3. The bolt spacing values in table R404.1(2) may be multiplied by 2, to a maximum of 72 inches.
4. One inch may be added to the bolt spacing to make it match masonry modules.

Commenter's Reason: The proponents of RB-149 wish to remove the extra difficulties in construction, required by section 404.1.
Other public comments have made it clear that there really is a potential problem for failure if 404.1 is completely removed.
In the spirit of simplifying construction, which is the underlying goal of RB-149, we notice that a small adjustment to the detailing of the footing at the bottom of the wall, makes a substantial difference in the attachment required at the top. In many parts of the country, this detail is already being followed because of seismic.

What this looks like:

9' wall, 8' soil retained:	GW soil	GM soil	CL soil
Current bolt spacing	14" oc	9" oc	7" oc

New bolt spacing	28” oc	18” oc	14” oc
If Simpson BP5/8SKT used In place of ½” bolt	72” oc	54” oc	42” oc

RB-148 will eliminate top bracing for many walls.
RB-147 is removing the flat-blocking requirement in the floor deck
And this proposal brings bolting to a better spacing,
All without losing the safety against failure that we gained last code cycle.

For the technically minded:
Supporting calculations can be found on http:// briefcase.yahoo.com/indianola@prodigy.net

Public Comment 4:

Scott Beard, SE, City of Tacoma, WA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R404.1 Concrete and masonry foundation walls. Concrete and masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404 or in accordance with ACI 318,ACI 332,NCMATR68–A or ACI 530/ASCE 5/TMS 402 or other approved structural standards. When ACI 318, ACI 332 or ACI 530/ASCE 5/TMS 402 or the provisions of Section R404 are used to design concrete or masonry foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches (89 mm) thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall by the prescriptive method called out in Table R404.1(1), or; shall be connected with an approved connector with listed capacity meeting Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than per Table R404.1(2).
4. Floor shall be blocked perpendicular to the floor joists. Blocking shall be full depth within two joist spaces of the foundation wall, and be flat-blocked with minimum 2-inch by 4-inch (51mmby 102mm)blocking elsewhere.
5. Where foundation walls support unbalanced load on opposite sides of the building, such as a daylight basement, the building aspect ratio, L/W, shall not exceed the value specified in Table R404.1(3). For such foundation walls, the rim board shall be attached to the sill with a 20 gage metal angle clip at 24 inches (610 mm) on center, with five 8d nails per leg, or an approved connector supplying 230 pounds per linear foot (3.36 kN/m) capacity.

Exception:

Where all of the following conditions are met:

1. If plate washers are not otherwise required by R602.11.
2. Sill plate is 2x6 minimum.
3. Anchor bolts are a minimum 0.5” diameter, cast-in-place with 7 inches embedment.
4. 2 inch diameter by 0.125 inch thick washers are used.
5. Washers are countersunk 0.25 inches into the top of the sill plate.

Then, the bolt spacing does not need to be greater than the following:

1. GW, GP, SW, and SP soils - 72 inches oc.
2. GM, GC, SM-SC, and ML soils – 48 inches oc
3. SC, MH, ML-CL and I-CL soils - 40 inches oc.

Commenter’s Reason: The proponents of RB-149 wish to remove the extra difficulties in construction, required by section 404.1.
Other public comments have made it clear that there really is a potential problem for failure if 404.1 is completely removed.
In the spirit of simplifying construction, which is the underlying goal of RB-149, we notice that a small adjustment to the detailing of the bolt attachment at the top of the wall, makes a substantial difference in the required bolt spacing. This detail is available for the areas of the country that do not have high seismic. (The plate washer requirements in high seismic are incompatible with this method.)

What this looks like:

9’ wall, 8’ soil retained:	GW soil	GM soil	CL soil
Current bolt spacing	14” oc	9” oc	7” oc
New bolt spacing	72” oc	48” oc	40” oc

RB-148 will eliminate top bracing for many walls.
RB-147 is removing the flat-blocking requirement in the floor deck
And this proposal brings bolting to a better spacing,
All without losing the safety against failure that we gained last code cycle.

For the technically minded, this method was developed by Craig Oswell, PE, of Ulteig Engineers, Inc. A version of this has been adopted by the State of Minnesota.

Public Comment 5:

Scott Beard, SE, City of Tacoma, WA, requests Disapproval.

Commenter's Reason: Do not throw the baby out with the bathwater!

There are five things going on here:

1) There is another proposal being voted on (RB-148) that reduces the basements that top restraint is required, to the basements that truly need it: Mega-house basements, and daylight basements that are open. Nine foot tall basements with wall runs less than 37 feet between corners, will not need top restraint.
2) For the basements that remain, there are proposals being voted on (other RB-149 comments), that will allow much wider spacing of attachment bolts by making some small adjustments in wall detailing. This can increase bolt spacing for a 9 ft tall wall with 8 ft of soil from 7 inches out to 48 inches, for worst case soil. From 14 inches out to 72 inches for best case soils. The worst problems with restrained top basements go away, without loosing the safety against failure that we have now gotten into the Code.
3) RB-147 is already safely removing the flat-blocking requirement.
4) Using bolts for top of wall restraint is common, but not necessarily the most efficient method of providing restraint. The existing tables provide load values, so that proprietary hardware can be used without additional engineering. The metal framing clip industry has several very good clips that are used in some portions of the country for this application. New clips are being field tested as you read this. Reasonable spacings and attachments can be obtained from the current tables in the Code. (Use of Simpson BP5/8SKT, for instance, increases the allowable bolt spacing by 3 times. 7" becomes 21", 14" becomes 42")
5) The proponents are not playing straight with you:
    A) There have been basement failures across the country, due to lack of top of wall restraint. We will address this in more detail.
    B) Removing this section DOES NOT take us back to the "good old days". The legacy codes did not allow unrestrained-top basements for anything but the very best soils, and most did not allow unrestrained at all, without engineering.

Quick review of the Legacy Codes:

UBC -	All basements required engineering.
SSTD 10 & 13 (SBCCI)	Basements are either: Flush framed – joists attach by hangers to a ledger board bolted to the inside face of the basement wall. Or Joist to top of wall is connected through a steel angle attached to anchor bolt. (Similar to the new IRC provisions that are they are trying to eliminate.) Blocking of the floor diaphragm is required.
CABO	Only permitted in the best soil conditions – 30 pcf. All others require engineering. Floors must be attached to the top of wall before backfilling.

This is a far cry from what they are trying to turn the clock back to. We don't have a track record for unrestrained walls in poor soil, and our track record for unrestrained walls in better soil isn't all that good either.

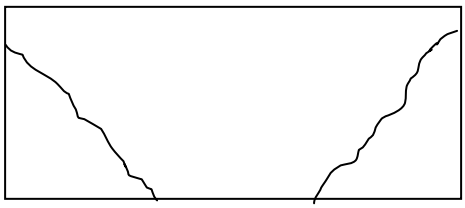
That we would have failures of unrestrained retaining walls should come as no surprise. The engineering numbers clearly predict it.

One good reference on this problem is "Diagnosing and Repairing House Structural Problems", by Edgar O Seaquist, PE. This is a classic in the field. He notes failures in the North-East, Mid-West, and California, (the areas where he did most of his forensics work).

There are many more failures involving cracking and movement, than there are complete collapses, although there are definitely complete collapses. Seaquist attributes this, in the cases he has seen, to the fact that many of walls that undergo movement end up running into floor framing, which stops them long enough to get repaired. Most of Seaquist's experience with this type of wall failure has been with block walls.

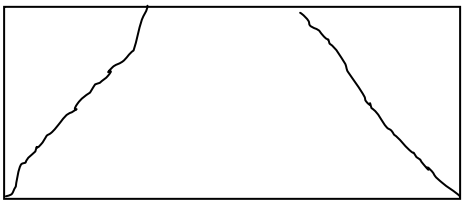
My personal experience, here in the Puget Sound area, has been with concrete basement walls. Here too, we see cracking and movement more often than collapse. (Although we have had a dramatic one.) My view is that concrete walls tend to crack in a two-stage pattern. This is illustrated in the first of the two diagrams below. The second illustration, is more typical of Seaquist's experience with concrete block. Which pattern appears can, be shown to be a function of aspect ratio, through yield-line analysis. Relative stiffness horizontally and vertically also can affect this. As a result, the failure pattern can be different for concrete than for block.

The first set of cracks to appear in the wall allows some movement, leading to water leakage, which in turn gets them repaired prior to complete failure. The crack pattern is often mistakenly diagnosed by repair contractors as being caused by settlement at the corners, due to the shape of the diagonal cracks.



A common initial crack pattern for this type of failure. The cracks are wider on the back side, so it leaks more than it looks like it should.

This is an intermediate step. Another crack is required before collapse.



Another common crack pattern for this type of failure. This immediately leads to collapse unless movement is blocked by other framing.

Which crack pattern you get depends on aspect ratio of the wall and CMU vs. concrete.

You can see why this is commonly mistake for settlement cracking in its first phases.

Others have noted these types of failures. James R McDonagh, PE, Fellow of American Association of Forensic Engineers, FASCE, has had 25 years forensic investigation experience in the St Paul area, where he has consulted on numerous cases of this type of failure.

A typical collapse looks like this:

Pictures from Daniel Kelsey, PE in Minnesota, where this is too common a problem.
An additional problem is daylight basements. These load the structural system of the house to a much greater degree than an ordinary basement. The load has to be transferred from the endwall, through the floor diaphragm, to the side walls. The attachments become critical, and often undersized unless an engineer has been involved.

Seaquist notes numerous failures and problems with daylight basements, and treats them in a separate chapter than the unrestrained wall failures. To understand the magnitude of the problem, he runs the calculation and shows that for a typical daylight basement, the lateral load that needs to be transferred through the house structure is about as large as the largest truck weight on the highway (about 40 tons).

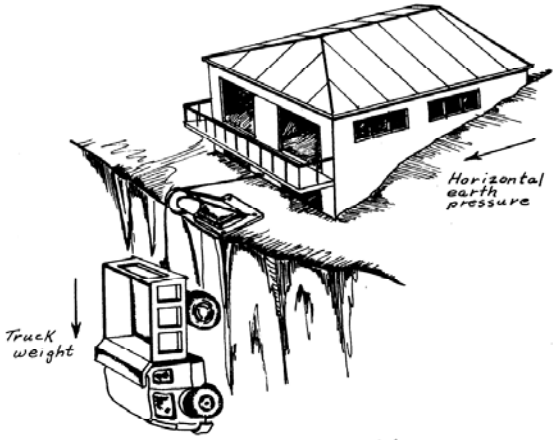


Fig. 2-12 Truck weight equivalent to hillside earth force.

26 DIAGNOSING AND REPAIRING HOUSE STRUCTURE PROBLEMS

In our local area, daylight basements are common and have historically been enough of a problem that they are most commonly now constructed as cantilevered retaining walls. (Most of our local jurisdictions have “prescriptive” solutions to the cantilevered retaining wall. It is possible to successfully design a restrained top retaining wall, but it takes extra effort – the measures that have been called for in Section R404.1 of the current IRC.

Why don't you see more failures in your local area?

1. A lot of "standard" houses in many areas of the country meet the requirements of proposal RB-148 (self-restraining basement walls), particularly older houses. These basements do not need top of wall restraint.
2. In some areas of the country, detailing of the footing at the base of the wall regularly meets the requirements of the other RB-149 proposed comment, in which case standard top of the wall attachment may be all that is required.
3. Most retaining walls don't fail right away. (We've all seen 8' vertical cuts stand 20 years, and then suddenly slide without warning.) Retaining walls need to be designed for their entire life. (And the safety of your life.)
4. They historically might not have been allowed in your legacy code, such as the UBC.
5. They historically might have been restrained already by code, such as SSTD-10 & 13 of SBCCI.
6. You might be in a really good soil area of CABO legacy.
7. They might be failing, but the repair crews treat them as settlement failures due to the diagonal cracking pattern.
8. There probably isn't anyone keeping track.

There are proposals in this code cycle to lessen the burden of construction for basement walls, yet maintain the safety that we need. Let's take that course, rather than simply react. There is clear history that this is a problem, but we have the alternate proposals before us to solve the safety problem without making construction difficult.

Final Action: AS AM AMPC____ D

RB150-06/07

R404.1.4 (New), R404.1.4.1 (New), R404.1.4.2 (New)

Proposed Change as Submitted:

Proponent: Charles O. Everly, PE, CBO, representing the Building Officials Association of Florida

Add new text as follows:

R404.1.4 Anchorage of wood and steel light-frame wall systems in high wind regions. In regions where the basic wind speeds from Figure R301.2(4) equal or exceed 100 miles per hour (45 m/s) in hurricane-prone regions, or 110 miles per hour (49m/s) elsewhere, anchorage of wood or steel light framed first story walls shall be in accordance with the following:

R404.1.4.1 For wood light-frame walls, sill plate anchorage, Wall stud to foundation uplift anchorage and hold down post anchorage shall be in accordance with AF&PA WFCM

R404.1.4.2 For steel light-frame walls, Wall bottom and braced wall chord stud anchorage shall be in accordance with AISI COFS/PM

Reason: This section is intended to direct the user to information on anchorage of light frame to foundation systems covered elsewhere in this code. Please note that the prescriptive documents referenced by the code do not contain foundation information. The intent is to fill that void.

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

Committee Action: **Disapproved**

Committee Reason: This is a Florida local issue and is not appropriate for a national standard. Also, it is redundant since the code already directs you to the proper reference standards for high wind.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Robert Boyer, Building Officials Association of Florida, representing the Code Development Committee, requests Approval as Submitted.

Commenter's Reason: The prescriptive provisions in the International Residential Code are limited to jurisdictions with a basic wind speed of 110 mph or less. The states along the Gulf Coast and the Atlantic Ocean from Texas to Massachusetts and the coast of Alaska are exposed to basic wind speeds greater than 110 mph as well as numerous "Special Wind Regions" within the US. The International Residential Code should be expanded to provide prescriptive provisions for the individuals in these jurisdictions. This is a multiple region issue, which could affect as many as 22 states. The Wind issues aren't any different than Snow Loads or Seismic requirements being in the Code.

This is not just a Florida Issue and we believe it deserves to be reconsidered in Rochester.

Final Action: AS AM AMPC____ D

RB153-06/07

R404.6 (New), R404.6.1 (New), R404.6.2 (New), R404.6.3 (New)

Proposed Change as Submitted:

Proponent: Brian D. Miller, National Precast Concrete Association

Add new text as follows:

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.

R404.6.2 Minimum design criteria for precast concrete foundation walls:

1. Total uniform load applied to the top of foundation walls, lbs/ft, 5300.
2. Lateral earth pressure, lbs/ft^2/ft of depth, 60.
3. Accommodate concentrated loads in excess of the uniform load.
4. Precast foundations are assumed not to be subject to hydrostatic pressure from ground water.

R404.6.3 Precast concrete foundation wall design drawings. 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

Reason: To clarify the code and add new requirements to code. In 2003, precast foundations were added to the IRC, additional information and guidance is needed to clarify details of their use for building officials. Precast foundation systems are pre-engineered systems with quality control in place at the manufacture, similar to trusses and other pre-engineered products. This language sets the minimum design criteria for precast concrete foundation systems and performance data that shall be communicated to the building official and contractor in the form of drawings.

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

Committee Action: **Disapproved**

Committee Reason: The design of concrete walls is already specified in Section R404. Precast foundations can be subjected to and can be designed for hydrostatic pressure.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Phillip B. Cutler, P.E., National Precast Concrete Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R404.6.2 Minimum design criteria for precast concrete foundation walls:

1. Total uniform load applied to the top of foundation walls, lbs/ft, 5300
2. Lateral earth pressure, lbs/ft^2/ft of depth, 60
3. Accommodate concentrated loads in excess of the uniform load.
4. ~~Precast foundations are assumed not to be subject to hydrostatic pressure from ground water~~

(Portion of proposal not shown remains unchanged)

Commenter's Reason: 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 provide to maintain a non-proprietary nature by not specifying one system. This section also requires manufacturers to provide key information for building officials.

Item 4, section 404.6.2, mentioning hydrostatic pressure, has been removed per the committee's comments. This should reduce any confusion, since precast foundation systems can withstand hydrostatic pressure.

Final Action: AS AM AMPC____ D

RB155-06/07
R405.1.1 (New)

Proposed Change as Submitted:

Proponent: Brian D. Miller, National Precast Concrete Association

Add new text as follows:

R405.1.1 Precast concrete foundation. Precast concrete foundation walls that retain earth and enclose habitable or useable space located below grade that rest on crushed stone footings shall have a perforated drainage pipe installed below the base of the wall on either the exterior or the interior side of the wall, at least one-foot (305 mm) beyond the edge of the wall. If the exterior drainage pipe is used, an approved filter membrane material must cover the pipe.

Reason: The purpose of the change is to clarify the code. In 2003, precast foundations were added to the IRC, additional information and guidance is needed to clarify details of their use for building officials. This section provides clarity on proper drainage systems for precast concrete foundation systems that utilize a crushed stone footing.

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

Committee Action: **Disapproved**

Committee Reason: The manufacturer's installation instructions will address this issue. The crushed stone footing will create a large french drain that will invite water intrusion. The change does not address how to drain the water away. The word "must" in the last sentence is not proper code language.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Phillip B. Cutler, P.E., National Precast Concrete Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R405.1.1 Precast concrete foundation. Precast concrete foundation walls that retain earth and enclose habitable or useable space located below grade that rest on crushed stone footings shall have a perforated drainage pipe installed below the base of the wall on either the exterior or the interior side of the wall, at least one-foot (305 mm) beyond the edge of the wall. If the exterior drainage pipe is used, an approved filter membrane material ~~must~~ shall cover the pipe. Drainage system shall discharge into an approved sewer system or to daylight.

Commenter's Reason: Section 405.1 addresses concrete and masonry foundations and Section R 405.2 addresses wood foundations and acknowledges crushed stone or gravel footings. Adding this section provides clarity to the building official when precast concrete systems are used. It is important that drainage pipe, tile, etc. be located at least 1-foot beyond the edge of the wall when precast concrete systems are used in conjunction with crushed stone footings, which this section clarifies and requires.

A section has been added to provide instruction on discharge of the drain based on the committee's comments.

Final Action: AS AM AMPC____ D

RB157-06/07

R406.4 (New), R406.4.1 (New), Chapter 43 (New)

Proposed Change as Submitted:

Proponent: Brian D. Miller, National Precast Concrete Association

Add new text as follows:

R406.4 Dampproofing for Precast Concrete Foundations. Precast concrete foundation walls that retain earth and enclose interior spaces and floors below grade shall be dampproofed in accordance with R406.1.

Exception: Where precast concrete foundations are manufactured according to ACI 318 durability standards (Table 4.2.1 and Table 4.2.2), no additional dampproofing materials are required.

R406.4.1 Panel Joints Sealed. Precast concrete foundation panel joints shall be sealed full height with a sealant meeting ASTM C920, Type S or M, Grade NS, Class 25, Use NT, M or A. Joint sealant shall be installed in accordance with manufacturer's installation instructions.

CHAPTER 43
REFERENCED STANDARDS

ASTM C 920-05 Standard Specification for Elastomeric Joint Sealants

Reason: The purpose of the change is to clarify the code. In 2003, precast foundations were added to the IRC, additional information and guidance is needed to clarify details of their use for building officials.

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

Analysis: Results of review of the proposed standard will be posted on the ICC website by August 20, 2006.

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Reference Standards" provided at the code development hearings:

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

Committee Action: **Disapproved**

Committee Reason: This will create a conflict in the code since habitable interior spaces already require waterproofing. The code already contains dampproofing of concrete.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Phillip B. Cutler, P.E., National Precast Concrete Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R406.4 ~~Dampproofing for Precast Concrete Foundations.~~ ~~Precast concrete foundation walls that retain earth and enclose interior spaces and floors below grade shall be dampproofed in accordance with R406.1.~~

~~**Exception:** Where precast concrete foundations are manufactured according to ACI 318 durability standards(Table 4.2.1 and Table 4.2.2), no additional dampproofing materials are required.~~

R406.4 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 R406.1.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This submission deals with dampproofing of precast concrete wall systems, including the filler material used in the joints between panels, which the existing code does not address. This is vital to the performance and water tightness of the system. This submission will provide much needed guidance to the building official in these areas.

Final Action: AS AM AMPC____ D

RB158-06/07
R502

Proposed Change as Submitted:

Proponent: Bob Boyer, Building Officials Association of Florida Code Development Committee, representing Building Officials Association of Florida

Delete current Section 502 and substitute as follows:

SECTION R502
WOOD FLOOR FRAMING

R502.1 General Requirements. Floor framing of light-frame wood construction shall be in accordance with the provisions of this Section.

R502.1.1 Identification. Load-bearing dimension lumber for joists, beams and girders shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20. In lieu of a grade mark, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section shall be accepted.

R502.1.1.1 Preservatively treated lumber. Preservatively treated dimension lumber shall also be identified as required by Section R319.1.

R502.1.1.2 Blocking and subflooring. Blocking shall be a minimum of utility grade lumber. Subflooring may be a minimum of utility grade lumber or No. 4 common grade boards.

R502.1.1.3 End-jointed lumber. Approved end-jointed lumber identified by a grade mark conforming to Section R501.2 may be used interchangeably with solid-sawn members of the same species and grade.

R502.1.1.4 Prefabricated wood I-joists. Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D 5055.

R502.1.1.5 Structural glued laminated timbers. Glued laminated timbers shall be manufactured and identified as required in AITC A190.1 and ASTM D3737.

R502.1.1.6 Structural log members. Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D 3957. Such structural log members shall be identified by the grade mark of an approved lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber-grading or inspection agency meeting the requirements of this section shall be permitted to be accepted.

R502.1.2 Draftstopping required. When there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m^2). Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below draftstopping shall be provided in floor/ceiling assemblies under the following circumstances:

1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members.

R502.1.2.1 Materials. Draftstopping materials shall not be less than 1/2-inch (12.7 mm) gypsum board, 3/8-inch (9.5 mm)wood structural panels, 3/8-inch (9.5 mm) Type 2-M-W particleboard or other approved materials adequately supported. Draftstopping shall be installed parallel to the floor framing members unless otherwise approved by the building official. The integrity of all draftstops shall be maintained.

R502.1.2.2 Fireblocking required. Fireblocking shall be provided in wood-frame floor construction and floor-ceiling assemblies in accordance with Section R602.8.

R502.1.3 Wood trusses.

R502.1.3.1 Design. Wood trusses shall be designed in accordance with approved engineering practice. The design and manufacture of metal plate connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1.

R502.1.3.2 Bracing. Trusses shall be braced to prevent rotation and provide lateral stability in accordance with the requirements specified in the construction documents for the building and on the individual truss design drawings. In the absence of specific bracing requirements, trusses shall be braced in accordance with the Building Component Safety Information (BCSI 1-03) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.

R502.1.3.3 Alterations to trusses. Truss members and components shall not be cut, notched, spliced or otherwise altered in anyway without the approval of a registered design professional. Alterations resulting in the addition of load (e.g., HVAC equipment, water heater, etc.), that exceed the design load for the truss, shall not be permitted without verification that the truss is capable of supporting the additional loading.

R502.1.3.4 Truss design drawings. Truss design drawings, prepared in compliance with Section R502.11.1, shall be provided to the building official and approved prior to installation. Truss design drawing shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span, and spacing.
2. Location of all joints.
3. Required bearing widths.
4. Design loads as applicable.
   - 4.1. Top chord live load.
   - 4.2. Top chord dead load.
   - 4.3. Bottom chord live load.
   - 4.4. Bottom chord dead load.
   - 4.5. Concentrated loads and their points of application.
   - 4.6. Controlling wind and earthquake loads.
5. Adjustments to lumber and joint connector design values for conditions of use.
6. Each reaction force and direction.
7. Joint connector type and description (e.g., size, thickness or gauge); and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
8. Lumber size, species and grade for each member.
9. Connection requirements for:
   - 9.1. Truss-to-truss girder.
   - 9.2. Truss ply-to-ply.
   - 9.3. Field splices.
10. Calculated deflection ratio and/or maximum description for live and total load.

11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents.
12. Required permanent truss member bracing location.

R502.2 Design and construction where basic wind speed is less than 100 mph (160.9 km/h) in hurricane-prone regions or 110 miles per hour (177.1 km/h) elsewhere. Floors shall be designed and constructed in accordance with the provisions of this Section and Figure R502.1 and Sections R319 and R320 or in accordance with AF&PA's NDS.

R502.2.1 Framing at braced wall lines. A load path for lateral forces shall be provided between floor framing and braced wall panels located above or below a floor, as specified in Section R602.10.8.

R502.2.2 Decks. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections to exterior walls or other framing members, shall be designed and constructed to resist uplift resulting from the full live load specified in Table R301.5 acting on the cantilevered portion of the deck.

R502.2.3 Allowable joist spans. Spans for floor joists shall be in accordance with Tables R502.2.3(1) and R502.2.3(2). For other grades and species and for other loading conditions, refer to the AF&PA Span Tables for Joists and Rafters.

R502.2.3.1 Sleeping areas and attic joists. Table R502.2.3(1) shall be used to determine the maximum allowable span of floor joists that support sleeping areas and attics that are accessed by means of a fixed stairway in accordance with Section R311.5 provided that the design live load does not exceed 30 psf (1.44 kPa) and the design dead load does not exceed 20 psf (0.96 kPa). The allowable span of ceiling joists that support attics used for limited storage or no storage shall be determined in accordance with Section R802.4.

TABLE R502.2.3(1)
FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES
(Residential sleeping areas, live load = 30 psf, L/Δ = 360

(No changes to existing tables or figures except for renumbering)

TABLE R502.2.3(2)
FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES
(Residential living areas, live load = 40 psf, L/ = 360)[b]

(No changes to existing tables or figures except for renumbering)

R502.2.3.2 Other floor joists. Table R502.3.1(2) shall be used to determine the maximum allowable span of floor joists that support all other areas of the building, other than sleeping rooms and attics, provided that the design live load does not exceed 40 psf (1.92 kPa) and the design dead load does not exceed 20 psf (0.96 kPa).

R502.2.3.3 Floor cantilevers. Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers constructed in accordance with Table R502.2.3.3(1) shall be permitted when supporting a light-frame bearing wall and roof only. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.2.3.3(2).

TABLE R502.2.3.3(1)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING
LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY[a,b,c,f,g,h]
(Floor Live Load ≤ 40 psf, Roof Live Load ≤ 20 psf

(No changes to existing tables or figures except for renumbering)

TABLE R502.2.3.3(2)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY[a,b,e,f]

(No changes to existing tables or figures except for renumbering)

R502.2.4 Joists under bearing partitions. Joists under parallel bearing partitions shall be of adequate size to support the load. Double joists, sized to adequately support the load, that are separated to permit the installation of piping or vents shall be full depth solid blocked with lumber not less than 2 inches (51 mm) in nominal thickness spaced not more than 4 feet (1219 mm) on center. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load.

R502.2.5 Allowable girder spans. The allowable spans of girders fabricated of dimension lumber shall not exceed the values set forth in Tables R502.2.5(1) and R502.2.5(2).

TABLE R502.2.5(1)
GIRDER SPANS AND HEADER SPANS$_a$ FOR
EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, southern pine and
Spruce-pine fir$_b$ and required number of jack studs)

(No changes to existing tables or figures except for renumbering)

TABLE R502.2.5(2)
GIRDER SPANS AND HEADER SPANS$_a$ FOR INTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, southern pine
And spruce-pine-fir$_b$ and required number of jack studs)

(No changes to existing tables or figures except for renumbering)

R502.2.6 Bearing. The ends of each joist, beam or girder shall have not less than 1.5 inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete except where supported on a 1-inch-by-4-inch (25.4 mm by 102 mm) ribbon strip and nailed to the adjacent stud or by the use of approved joist hangers.

R502.2.6.1 Floor systems. Joists framing from opposite sides over a bearing support shall lap a minimum of 3 inches (76 mm) and shall be nailed together with a minimum three 10d face nails. A wood or metal splice with strength equal to or greater than that provided by the nailed lap is permitted.

R502.2.6.2 Joist framing. Joists framing into the side of a wood girder shall be supported by approved framing anchors or on ledger strips not less than nominal 2 inches by 2 inches (51 mm by 51 mm).

R502.2.7 Lateral restraint at supports. Joists shall be supported laterally at the ends by full-depth solid blocking not less than 2 inches (51 mm) nominal in thickness; or by attachment to a full-depth header, band, or rim joist, or to an adjoining stud; or shall be otherwise provided with lateral support to prevent rotation.

Exception: In Seismic Design Categories D_0, D_1 and D_2, lateral restraint shall also be provided at each intermediate support.

R502.2.7.1 Bridging. Joists exceeding a nominal 2 inches by 12 inches (51 mm by 305 mm) shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1-inch-by-3-inch (25.4 mm by 76 mm) strip nailed across the bottom of joists perpendicular to joists at intervals not exceeding 8 feet (2438 mm).

R502.2.8 Drilling and notching. Structural floor members shall not be cut, bored or notched in excess of the limitations specified in this section. See Figure R502.2.8.

FIGURE R502.2.8
CUTTING, NOTCHING AND DRILLING

(No changes to existing tables or figures except for renumbering)

R502.2.8.1 Sawn lumber. Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches (102 mm) or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches (51 mm) to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches (51 mm) to the notch.

R502.2.8.2 Engineered wood products. Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

R502.2.9 Fastening. Floor framing shall be nailed in accordance with Table R602.3(1). Where posts and beam or girder construction is used to support floor framing, positive connections shall be provided to ensure against uplift and lateral displacement.

R502.2.10 Framing of openings. Openings in floor framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4 feet (1219 mm), the header joist may be a single member the same size as the floor joist. Single trimmer joists may be used to carry a single header joist that is located within 3 feet (914 mm) of the trimmer joist bearing. When the header joist span exceeds 4 feet (1219 mm), the trimmer joists and the header joist shall be doubled and of sufficient cross section to support the floor joists framing into the header. Approved hangers shall be used for the header joist to trimmer joist connections when the header joist span exceeds 6 feet (1829 mm). Tail joists over 12 feet (3658mm) long shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).

R502.3 Design and construction where basic wind speed equal or exceed 100 mph (160.9 km/h) in hurricane-prone regions or 110 miles per hour (177.1 km/h) elsewhere. Floor framing of light-frame wood construction shall be designed and constructed in accordance with the provisions of Section R301.2.1.1 and Section R502.1.

Reason: This modification reorganizes the provisions for wood-frame construction of floors by separating general provisions applicable to all wood construction from that of prescriptive wood-frame construction from that of engineered wood construction. This change adds new Section R502.1 General Requirements, revising Section R502.2 to clarify where the prescriptive construction applies and adding new Section R502.3 to clarify where an engineered construction is required.

Cost Impact: The code change proposal will not increase the cost of construction. This change merely reorganizes the provisions for wood-frame construction of floors by separating general provisions applicable to all wood construction from that of prescriptive, wood-frame construction from that of engineered wood construction.

Committee Action: **Disapproved**

Committee Reason: This is a local (Florida) issue and there is no data that this is needed on a national level. The existing code language is adequate as is.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Robert Boyer, Building Officials Association of Florida, representing the Code Development Committee, requests Approval as Submitted.

Commenter's Reason: The prescriptive provisions in the International Residential Code are limited to jurisdictions with a basic wind speed of 110 mph or less. The states along the Gulf Coast and the Atlantic Ocean from Texas to Massachusetts and the coast of Alaska are exposed to basic wind speeds greater than 110 mph as well as numerous "Special Wind Regions" within the US. The International Residential Code should be expanded to provide prescriptive provisions for the individuals in these jurisdictions. This is a multiple region issue, which could affect as many as 22 states. The Wind issues aren't any different than Snow Loads or Seismic requirements being in the Code.
This is not just a Florida Issue and we believe it deserves to be reconsidered in Rochester.

Final Action: AS AM AMPC____ D

RB159-06/07

R502.2.2.1 (New), Table R502.2.2.1 (New), R502.2.2.1.1 (New)

Proposed Change as Submitted:

Proponent: Richard E. Bartell, Hanover County, VA, representing the Virginia Plumbing and Mechanical Inspectors Association/Virginia Building and Code Officials Association

Add new text and table as follows:

R502.2.2.1 Deck ledger connection to band joist. For residential applications and a total design load of 50 psf, the connection between a pressure preservative treated southern pine, incised PPT hem-fir, (or approved decay-resistant species) deck ledger and a 2-inch nominal band joist bearing on a sill plate or wall plate shall be constructed with ½-inch lag screws or bolts with washers per Table R502.2.2.1.

TABLE R502.2.2.1
FASTENER SPACING FOR A RESIDENTIAL PPT SOUTHERN PINE OR HEM-FIR DECK LEDGER AND A 2-INCH NOMINAL SOLID-SAWN SPRUCE-PINE-FIR BAND JOIST (50 PSF TOTAL LOAD)[3,6]

Joist Span (ft)	6' and less	6'-1 to 8'	8'-1" to 10'	10'-1" to 12'	12'-1" to 14'	14'-1' to 16'	16'-1" to 18"
	On-Center Spacing of Fasteners[4,5]						
½" diameter Lag Screw with 15/32" sheathing[1]	30	23	18	15	13	11	10
½" diameter bolt with 15/32" sheathing	36	36	34	29	24	21	19
½" diameter bolt with 15/32" sheathing and ½" stacked washers[2]	36	36	29	24	21	18	16

1 The tip of the lag screw shall fully extend beyond the inside face of the band joist.
2 The maximum gap between the face of the ledger board and face of the house band joist shall be ½".
3 Ledgers shall be flashed to prevent water from contacting the house band joist.
4 Lag screws and bolts shall be staggered per R502.2.1.1.
5 Deck ledger shall be 2x8 PPT No.2 grade (minimum) or other approved method and material as established by standard engineering practice.
6 When solid-sawn PPT deck ledgers are attached to engineered lumber products (composite rimboard or LVL), the ledger attachment requirements in the product manufacturer's engineering report shall be followed.

R502.2.2.1.1 Placement of lag screws or bolts in residential deck ledgers. The lag screws or bolts shall be placed two inches in from the bottom or top of the deck ledgers and two inches in from the ends. The lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.

Reason: Researchers at Virginia Tech University and Washington University have tested simulated deck-ledger to house-band-joist connections in their respective laboratories. A practical range of pressure-preservative-treated (PPT) deck ledger lumber (incised Hem-fir and Southern Pine) was attached to a simulated Spruce-Pine-Fir band joist by ½-inch lag screws or bolts with washers. The deck ledger was separated from the house band joist by placing a piece of 15/32" wall sheathing in the connection, and in another test case for bolts only, a ½-inch stack of washers was inserted into the connection to produce a drainage plane. The specimens were tested to failure and the average test results ware divided by a factor of 3.0, intended to provide an adequate in-service safety factor, and further divided by 1.6 to convert from a "test duration" to a "normal duration" of ten years recognized by the NDS and IBC as the proper duration for occupancy live load.

The proposed on-center spacing is the closest spacing for the two cases of deck ledger lumber studied. Due to the limited investigation into the performance of composite type house rimboards (only DFL was evaluated) and the possibility of rimboards entering the market being a lower quality than what was tested at Washington State University, engineered rimboards are not included in the scope of the proposed fastener spacing table. Instead, footnote 6 is proposed to refer the contractor and official to the manufacturer of the rimboard product. The two papers cited in the Bibliography gives the testing procedure and results for the cases included in the caption to the proposed table.

Bibliography:
1. Carradine, D. M., D. A. Bender, J. R. Loferski, and F. E. Woeste. 2005. Wood Bits: Residential deck ledger design. Building Safety Journal (6): 4-7. www.iccsafe.org/news/bsj/1205_Woodbits.pdf
2. Loferski, J., F. Woeste, R. Caudill, T. Platt, and Q. Smith. 2004. Load-tested deck ledger connections. Journal of Light Construction 22(6): 71-78

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

Committee Action: **Approved as Submitted**

Committee Reason: This is a much needed addition to the code and it brings in a new table that is a good starting point for the attachment of the deck ledger to the band joist. The committee urges additional study of the attachment of the band joist to the framing.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment 1:

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

Modify proposal as follows:

R502.2.2.1 Deck ledger connection to band joist. For ~~residential applications and~~ decks supporting a total design load of 50 psf, (40 psf live load plus 10 psf dead load) the connection between a deck ledger of pressure-preservative-treated ~~southern~~ Southern ~~pine~~ Pine, incised pressure-preservative-treated ~~PPT~~ Hem-Fir, ~~(~~or approved decay-resistant species~~),~~ ~~deck ledger~~ and a 2-inch nominal band joist bearing on a sill plate or wall plate shall be constructed with ½-inch lag screws or bolts with washers per Table R502.2.2.1. Lag screws, bolts, and washers shall be hot-dipped galvanized or stainless steel.

TABLE R502.2.2.1
FASTENER SPACING FOR A ~~RESIDENTIAL PPT~~ SOUTHERN PINE OR HEM-FIR DECK LEDGER AND A 2-INCH NOMINAL SOLID-SAWN SPRUCE-PINE-FIR BAND JOIST ~~(60 PSF TOTAL LOAD)~~ [3,6,7]
(Deck Live Load = 40 psf, Deck Dead Load = 10 psf)

Joist Span (ft)	6'-0" and Less	6'-1 to 8'-0"	8'-1" to 10'-0"	10'-1" to 12'-0"	12'-1" to 14'-0"	14'-1' to 16'-0"	16'-1" to 18'-0"
Connection Details	On-Center Spacing of Fasteners[4,5]						
½" diameter Lag Screw with 15/32" maximum sheathing[1]	30	23	18	15	13	11	10
½" diameter bolt with 15/32" maximum sheathing	36	36	34	29	24	21	19
½" diameter bolt with 15/32" maximum sheathing and ½" stacked washers[2,8]	36	36	29	24	21	18	16

[1] The tip of the lag screw shall fully extend beyond the inside face of the band joist.
[2] The maximum gap between the face of the ledger board and face of the ~~house band joist~~ wall sheathing shall be ½".
[3] Ledgers shall be flashed to prevent water from contacting the house band joist.
[4] Lag screws and bolts shall be staggered per R502.2.2.1.1.
[5] Deck ledger shall be minimum 2x8 pressure-preservative-treated ~~PPT~~ No.2 grade ~~(minimum)~~ lumber, or other approved ~~method and~~ materials as established by standard engineering practice.
[6] When solid-sawn pressure-preservative-treated ~~PPT~~ deck ledgers are attached to engineered ~~lumber~~ wood products (structural composite lumber rimboard or ~~LVL~~ laminated veneer lumber), the ledger attachment ~~requirements in the product manufacturer's engineering report~~ shall be designed in accordance with accepted engineering practice ~~followed~~.
[7] A minimum 1x9-1/2 Douglas Fir laminated veneer lumber rimboard shall be permitted in lieu of the 2 inch nominal band joist.
[8] Wood structural panel sheathing, gypsum board sheathing, or foam sheathing not exceeding one inch in thickness shall be permitted. The maximum distance between the face of the ledger board and the face of the band joist shall be one inch.

R502.2.2.1.1 Placement of lag screws or bolts in ~~residential~~ deck ledgers. The lag screws or bolts shall be placed two inches in from the bottom or top of the deck ledgers and two inches in from the ends. The lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.

R502.2.2.2 Alternate deck ledger connections. Deck ledger connections not conforming to Table R502.2.2.1 shall be designed in accordance with accepted engineering practice. Girders supporting deck joists shall not be supported on deck ledgers or band joists. Deck ledgers shall not be supported on stone or masonry veneer.

Commenter's Reason: The deck ledger table and language as proposed by VPMIA and VBCOA, which was approved as submitted by the IRC Building/Energy Committee, certainly represented a good first step in providing some needed guidance for designers and building officials to insure that decks attached to a house are constructed properly and safely. However, the initial proposal contained a number of flaws in both the language and the technical content, which is why NAHB testified in opposition to the proposal at the Orlando hearings. After further reviewing the research from Virginia Tech and discussing a number of issues with Dr. Woeste, we have developed this modified version of the proposal that we believe resolves the concerns of NAHB staff and members.

Our revisions fall into two categories, editorial and technical. We have made a number of changes to the language to bring the terminology used in this proposal in line with the rest of the IRC. For example, we replaced the abbreviations "PPT" and "LVL" with their full descriptions, as the abbreviations are not defined in Section R202 as they are for other products (ICF's, for example). We also deleted the term "residential". This is the *International Residential Code.* Every item specified in this code is being used in a residential application. It is not necessary to restate this in the body of the code. We also changed "engineered lumber" to "engineered wood" and "composite" to "structural composite lumber" for consistency with other sections of the code (see R502.8.2, for example).

We have also made technical changes to the proposal. Consistent with the research, we have added the specification for the fasteners to be hot-dipped galvanized or stainless steel. Within the table itself, we identified the 15/32" sheathing as a maximum thickness. As originally written, 15/32" would be the only sheathing thickness allowed by the table. The research tested specimens with a 1x9-1/2" LVL rim board, so we added a footnote permitting the LVL to be substituted for the 2x8 band joist. We also added Section R502.2.2.2 clarifying requirements for an engineered design and prohibiting deck attachments to masonry veneer. Most importantly, we clarified with Dr. Woeste that it is permissible to use sheathing up to 1" in thickness, as long as the distance between the face of band joist and face of ledger is not larger than 1" and added a footnote accordingly. This is a critical clarification, as it allows the ledger table to be used for decks attached to houses sheathed with gypsum and foam sheathing, or with wood structural panel sheathing greater than 15/32" in thickness. This resolves our concern that the original proposal was creating an exclusionary specification for 15/32" wood structural panels.

We believe this proposed modification takes this table from a good, but flawed, first start and turns it into a big win for all parties. The modification provides clear direction for building officials and inspectors to use in reviewing and approving deck construction. At the same time, it provides engineers, designers, and builders with rational, testing-based prescriptive provisions that also maintain cost-effectiveness and flexibility in construction. NAHB asks for your support of this modified proposal.

Public Comment 2:

Greg Greenlee, P.E., USP Structural Connectors, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R502.2.2.1.1 Placement of lag screws or bolts in residential deck ledgers. The lag screws or bolts shall be placed two inches in from the bottom or top of the deck ledgers and between two and five inches in from the ends. The lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: In deck construction a joist hanger or angle connector is commonly installed at the end of the ledger board to support the deck rim joist. Often these members are double 2x members (three inch nominal width). This modification will allow the installer flexibility to locate the lag screw or bolt so that it does not interfere with the installation of the structural connector. Five inches will accommodate an inverted flange double 2x joist hanger.

Public Comment 3:

Jim W. Sealy, FAIA and Kelly Cobeen, FEMA/BSSC Code Resource Support Committee, representing Building Seismic Safety Council of the National Institute of Building Sciences, requests Approval as Modified by this Public Comment.

Modify proposal by adding new section and figure as follows:

R502.2.2.2 Deck lateral load connection. The lateral load connection required by Section R502.2.2 shall be permitted to be in accordance with Figure R502.2.2. Hold-down tension devices shall be provided in not less than two locations per deck, and each device shall have an allowable stress design capacity of not less than 1500 lb.

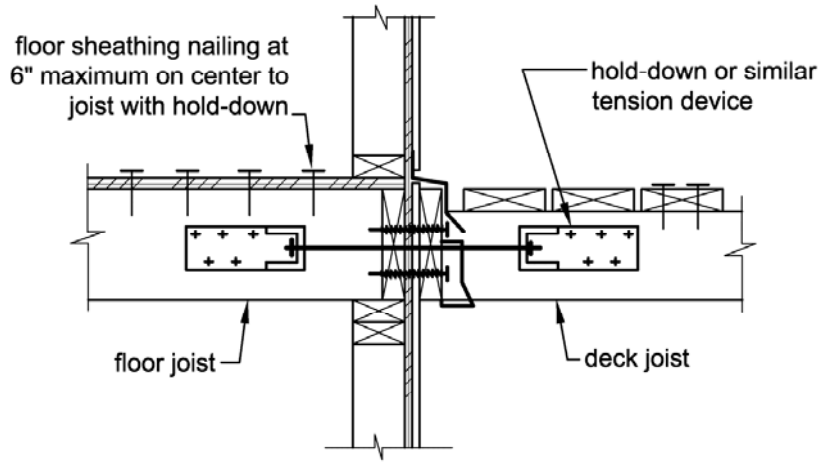


FIGURE R502.2.2
DECK ATTACHMENT FOR LATERAL LOADS

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This comment responds to the issue of band joist anchorage raised in the code development committee comments. Deck failures do occur where the deck is attached to the rim joist for lateral loads, but the rim joist is not adequately anchored into the floor system. Positive anchorage of the deck joists to the floor framing addresses this potential failure. The figure is based on a similar figure from FEMA 232.

Final Action: AS AM AMPC____ D

RB168-06/07
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)
FASTENER SCHEDULE STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c, d]	SPACING OF FASTENERS
~~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 do not change)

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]											

(Portions of table not shown do not change)

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m^2

a. through f. (No change to current text)

g. Applies to roof live load of 20 psf or less.

~~g.~~ h. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. When ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:

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, the listings in Table R602.3(1), which are being proposed for deletion in this proposal, 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: **Disapproved**

Committee Reason: This change refers only to vertical loads. This also needs to address lateral loads.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Dennis Pitts, American Forest & Paper Association, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

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

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This public comment addresses 2 matters that surfaced during the discussion of RB168-06/07 in Orlando. They were:

1. The title of Table R802.5.1(9) as printed in the code change proposal showed footnote "g" to be deleted. This isn't correct. Theaddition of new text into "g" moves the existing text of "g" into a new footnote "h" as indicated in the corrected title.
2. As discussed in the reason statement for RB168, the proposal is intended to correct inadvertent conflicts between Table R802.5.1(9) and Table R602.3(1). During the discussion of the deletions being proposed for Table R602.3(1), a question was raised by one of the committee members about whether the first items shown to be deleted, "Ceiling joists, laps over partitions, face nail," should actually be deleted. Time didn't permit a thorough review, so the committee voted to disapprove the proposal and suggested that the proposal be brought back as a public comment with any corrections that were needed. Deleting the first item is correct. The subject of nailing of ceiling joists laps over partitions is addressed by Table R802.5.1(9) in its footnote "e." Therefore, retaining the item in Table R602.3(1) creates a conflict.

Final Action: AS AM AMPC____ D

RB169-06/07
Table R602.3(1)

Proposed Change as Submitted:

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

Revise table as follows:

TABLE R602.3(1)
FASTENER SCHEDULE 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			
5/16″-1/2″	6d common (2″ X 0.113″) nail (subfloor, ~~wall~~) 8d common (21/2″ X 0.131″) nail (roof) wall	6	12[g]

(Portions of table not shown do not change)

Reason: This one came from around-the-table discussions at the Ad Hoc IRC Bracing.
When the bracing amounts for type 3 bracing were determined, 7/16 structural panel with 8d nails were used for the capacity. This proposal is to bring the specified construction in line with the assumed construction.
This is one of two proposals. One of which brings the nailing up to 8d, the other adjusting the panel thickness.
This situation has become more critical recently, due to changes in how gypsum board is being installed, greatly reducing its bracing capacity. This will not fully mitigate the gypsum problem, but will definitely help.

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

Committee Action: **Approved as Submitted**

Committee Reason: This change provides clarity and works in tandem with the action on S72-06/07, Part II.

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 Disapproval.

Commenter's Reason: This public comment is the result of additional consideration by the ICC Ad Hoc Committee on Wall Bracing in view of a number of changes made at the first hearing that relate to wall bracing methods. A series of changes were made at the first hearing in an attempt to reconcile IRC bracing requirements with the test data basis of those requirements including RB197 and S72 Part II. An evaluation of the combined effect of these changes and a closer look at the testing methods that formed the basis for the braced wall amounts in the IRC indicates that a further increase in nail size is unnecessary. Disapproving RB169 will provide safe answers and maintain the long standing practice of using 6d common and 8d gun nails for wall sheathing installation.

Final Action: AS AM AMPC____ D

RB172-06/07
R602.6.1

Proposed Change as Submitted:

Proponent: Randall Shackelford, Simpson Strong-Tie Co

Revise as follows:

R602.6.1 Drilling and notching of top plate. When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie of not less than 0.054 inch thick (1.37 mm) (16 ga) and 1 1/2 inches (38 mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight ~~16d~~ 10d (0.148" diameter) nails having a minimum length of 1 1/2 inches (38 mm) at each side or equivalent. See Figure R602.6.1.

~~Exception:~~ ~~When the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.~~

Reason: To revise code requirements.

0.148" by 1½" nails are common nails used to install metal ties (connectors). 16d nails tend to split the top plates, while 10d nails do not. A recent interpretation from ICC Staff indicates that the 16d nails currently specified could be 16d box nails. 10d nails have an equivalent or greater calculated capacity as 16d nails.

Table 11P of the 2005 NDS, standard reference number NDS–05 in the codes, provides allowable shear loads of a 16d box nail through a 16 gauge steel plate. They are:

- 88 pounds into Spruce-Pine-Fir
- 102 pounds into Douglas Fir-Larch
- 111 pounds into Southern Pine

Table 11P combined with footnote 3 provides allowable shear loads of a 10d common nail 1½ inches long (0.148" x 1.50") through a 16 gauge steel plate. They are:

- 97 pounds into Spruce-Pine-Fir
- 112 pounds into Douglas Fir-Larch
- 122 pounds into Southern Pine

Based on the allowable loads in the NDS, a 10d nail 1½ inches long exceeds the shear capacity of a 16d box nail in this application. The Exception is stricken because the wood structural panel sheathing does not provide equivalent capacity as the strap. There is no way to tell where the joint in the sheathing will be located. If it is located near the cut top plate, it will transfer very little load across the plate. Even if the panel were located exactly centered over the cut in the plates, there will only be four 6d common nails on each side of the cut.

Cost Impact: The code change proposal will only increase the cost of construction if sheathing is being used to splice cuts in plates

Committee Action: **Approved as Modified**

Modify proposal as follows:

R602.6.1 Drilling and notching of top plate. When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie of not less than 0.054 inch thick (1.37 mm) (16 ga) and 1 1/2 inches (38 mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d (0.148" diameter) nails having a minimum length of 1 1/2 inches (38 mm) at each side or equivalent. See Figure R602.6.1.

Exception: When the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.

Committee Reason: This change eliminates the potential of splitting the top plate by reducing the nail size. The modification retains the exception that will provide an alternative to the metal strap.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Scott Dornfeld, City of Delano, MN, representing the Association of Minnesota Building Officials, requests Approval as Modified by this Public Comment.

Further modify proposal as follows:

R602.6.1 Drilling and notching of top plates. When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie of not less than 0.054 inch thick (1.37 mm) (16 ga.) and 1 ½ inches (38mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d (0.148" diameter) nails having a minimum length of 1 ½ inches (38mm) at each side or equivalent. The metal tie must extend a minimum of 6 inches past the opening. See figure R602.6.1

Exception: When the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.

Commenter's Reason: This change will help maintain the top and tie plates as solid members, by extending the metal strap past each of those plates that are cut or notch.

Final Action: AS AM AMPC____ D

RB176-06/07
R602.8

Proposed Change as Submitted:

Proponent: Donald LeBrun, CBO, State of Indiana, representing the Indiana Association of Building Officials

Revise as follows:

R602.8 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 Section R1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

Reason: This proposal and a similar but opposite proposal are presented so that we may better understand the committee's intent and bring resolution to this issue. In past codes we were directed to use a non-combustible material in this location. Our present commentary also supports the use of a non-combustible material. Unfortunately, our current code language is lacking at best. It leaves the matter to each building official to determine what he will approve without clear guidance.

Building officials are being bombarded with product information, evaluation reports, sales hype and rumors on what products should be approved. As a result we have jurisdictions where non-combustible materials are required adjoining jurisdictions where combustible foams are approved. Quite honestly, this is not fair to either the building departments or the builders. The code should be clear in its intent so as to allow building officials and builders a better understanding as to what is really trying to be accomplished in these locations.

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

Committee Action: **Approved as Submitted**

Committee Reason: This change is needed and the added language is clear on intent but additional work is needed to add more clarity.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment 1:

Randy G. Clark, Manager Firestop Technologies, International Division, RectorSeal Corporation, representing Keith Brebner, NUCO, Ontario Canada, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.8 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.~~ Approved materials must meet the test requirements of ASTM E-136 or be listed for use in wood frame assemblies tested under ASTM E-814.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

Commenter's Reason: The proposed change that the fill material shall not be required to meet ASTM E-136 leaves building officials without any guidance as to what should constitute an approved fireblocking material.

In accordance with the intent of Section R602.8, fireblocking is to be provided to form an **effective fire barrier** and in the particular case of service penetrations under Item 4, the fill material must resist the free passage of flame and products of combustion. An ASTM E-136 fill material will meet the basic requirement of an effective fire barrier by resisting the free passage of flames while producing no products of combustion. By specifically citing ASTM E-136 the intent of this code section would be fulfilled and there would finally be uniformity in the interpretation.

The use of combustible foams for fireblocking applications (that have been evaluated under a modified ASTM E-814 test) should raise the specter of the Brown's Ferry Nuclear Plant fire of 1975 when a combustible polyurethane foam clearly demonstrated that it could not provide an effective fire barrier and indeed provided the impetus that ultimately led to the creation of the ASTM E-814 Standard. Clear guidance for building officials should therefore also include the option of using regulated fill materials that have been tested to ASTM E-814 in actual wood frame assemblies thereby insuring that the mandatory positive furnace pressure and hose stream test requirements have been met.

ASTM E-136 and E-814 fill materials are widely available at competitive prices and building officials could then be assured that these products meet consensus and not modified Life Safety Standards.

Public Comment 2:

Vickie J. Lovell, InterCode Inc., representing the 3M Company, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.8 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.~~ Approved materials shall have demonstrated that they comply with any of the following:
   a. Materials tested for noncombustibility in accordance with the requirements of ASTM E136
   b. Materials tested under the fire conditions of ASTM E814 or UL 1479
   c. Materials tested for use as a fireblocking material under the fire conditions of ASTM E119, and installed in accordance with the specifications under which the material was tested.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

Commenter's Reason: Although we are sympathetic with the predicament of the code officials who are trying to enforce this section of the code, we respectfully disagree with the committee decision to approve this code change as submitted for several reasons, and have proposed a modification. This change, as written, is confusing and unnecessary, and actually creates conflicts with other sections of the code.

A "requirement" to identify a type of material that is not required in the code is illogical. If we were to identify all the materials that are not required by the code, we would have a significantly bigger book. Therefore, we propose a better solution to the problem identified by the proponents would be to innumerate what materials would be appropriate for a code official's approval. We are proposing a modification that would provide guidance as to what the approvals should be based on.

Section R 602.8 states that fireblocks should “form an effective fire barrier between stories and between a top story and the roof space”. Fireblocking is used to subdivide or block off the stud cavity inside a wall, in a soffit over cabinets, between stair stringers at the top and bottom of a run, in an exterior cornice, or in the space between the combustible finish materials and the wall itself. The IBC Commentary states that fireblocks and draft stops are to prevent the spread of flame, smoke and gases. If a fire condition exists in a concealed space, the fireblocks and draftstops will help contain the fire until it can be suppressed”.

"Fireblocking" materials are identified in the code as generic materials, such as lumber, structural wood panels, gypsum board, cement fiberboard or particleboard, batts or blankets of glass, or mineral wool, installed within concealed spaces to resist or block the migration of fire and hot gases for an undetermined period of time. Loose-fill insulation material was also introduced in the 2000 International Building Code as a fireblock material if specifically tested in the form and manner intended for use, and if it can be shown to remain in place and to retard the spread of fire and hot gases. The acceptance of loose-fill insulation as a fireblock as permitted by the code may be subject to a review of the available test data from groups having conducted their own investigations, such as the Cellulose Insulation Manufacturing Association.

The legacy codes addressing fireblocks and draftstops historically required "noncombustible materials" to be used to protect penetrations such as piping, ducts, flues or vents that were located within the wall, ceiling or attic cavity as they passed through the members serving as fireblocks or draftstops. The 1996 National Building Code, the 1997 Uniform Building Code, and the 1997 Standard Building Code all had a subsection pertaining to combustible construction that reads along these lines:

"Fireblocking (some older code editions used the term "firestopping" inappropriately here) shall consist of approved noncombustible materials securely fastened in place at openings around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor levels."

The code sections that used to require the use of noncombustible materials as fireblocks in combustible construction that now read “approved” material puzzle some code-users and enforcers. The question has arisen as to whether the current intent of the code is to specify any approved material that conforms to the intent of a noncombustible fireblock, or whether only noncombustible materials are to be used to restore the integrity of combustible fireblocks, or are penetrations through fireblocks (inside the wall or floor cavity) required to be tested to determine their noncombustibility in accordance with ASTM E-136, "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C", or whether <u>any</u> material is acceptable.

The reason and the origin of the noncombustible fireblock requirement were not clearly conveyed in any of the legacy or current codes. However, the fact that chimneys and fireplaces are specified in these sections should give an indication as to the original intent for this requirement, since both of these heat-producing features require "clearance from combustibles."

Although it has been difficult to document, some sources have suggested that the earliest legacy code sections were originally developed in anticipation of high temperatures associated with the operation of mechanical equipment such as furnaces, fireplaces, and their related vents, chimneys and piping in combustible construction. As a precaution, the use of noncombustible materials was required to protect the combustible framing from close proximity or possible point contact with heat-producing appliances. A material that would not quickly ignite or contribute to the fuel load where these heat-producing items penetrate a combustible structural member or a wood fireblock seemed logical. A noncombustible material was used to restore the integrity of the fireblock or draftstop where penetrated by piping or vents, etc., and to provide protection from possible charring or ignition between the piping or vent and the combustible framing member.

As was mentioned by the proponent, there is no specific performance test for fireblocks. However, the intent of the legacy codes and the IBC are rational. - form an effective fire barrier between stories, and between a top story and the roof space. Code officials have historically been extended the latitude to make their decision based on locally accepted practice, although many have required the noncombustible materials to restore fireblocks to be tested in accordance with ASTM E-136. These AHJs cannot be criticized for using strictest interpretation since that is simply what the code used to say.

Some have pointed out that reason would dictate in combustible construction, it is not logical to require noncombustible fireblocking materials on combustible items that do not transfer heat, such as plastic DWV plumbing pipe. The code official may determine that a non-metallic plumbing pipe passing through the top plate must be protected as a through-penetration and may require an intumescent firestopf fill (caulking) material tested to ASTM E814, thus exceeding the generic requirements for fireblocking, but complying with the intent to form an effective barrier. Other jurisdictions are enforcing the original intent of the legacy codes, which compels them to enforce the use of materials that have been tested to ASTM E-136, a widely used test method to determine noncombustibility. This approach probably most closely follows the original spirit and intent of the fireblocking requirements for metallic penetrations. But the code does not state those words at this time. Others have decided to take a broader interpretation and are permitting a variety of products and materials in specific situations, even on the same jobsite. Each situation requires some thoughtful consideration based on the variables..

Finally, there are sections of the IRC that specify “noncombustible” fireblocks. Deliberately reducing the applications for materials tested to ASTM E 136 in R602.8 would create confusion on how to comply with these sections when cross referencing R602.8 with other code sections.

R502.13	Wood frame construction required to be fireblocked
R602.4 and R602.5	Interior load bearing and non load bearing walls to be fireblocked same as exterior walls
R1003.19	Chimney clearance and noncombustible fireblock requirements
R1003.12	Fireplace clearances and fireblock requirements
M1601.3.3 And 1601.3.4	Duct installations shall be fireblocked
M1801.9	Chimneys and vents shall be fireblocked
G2425.15.4	Chimneys and vents (using fuel gas) shall be fireblocked (noncombustible)

Therefore, it is not appropriate for the code to eliminate a specific type of testing criteria for a fireblock, since the very materials that have been eliminated may actually be the most appropriate in certain situations and would create conflicts with other sections of the code where noncombustible fireblocks are required. This code change should be disapproved in its current form.

If disapproved, a closer examination of the intent of this section provides enough direction to the code officials to “approve” appropriate materials, including materials that meet the requirements ASTM E 136.

However, we believe that this modification improves the proposal and addresses the proponents concerns. Regarding the modification, we have been more specific as to what types of materials should be permitted to be approved. The intent of the modification is not to eliminate any one category of material, but to require that any material used have some performance capability to function as an effective fire barrier (fireblock).

Clearly, ASTM E136 materials are appropriate in many locations as discussed previously. ASTM E814 fill materials have been tested under fire conditions in wood frame construction on many types of penetrating items. Those test results should provide enough information for a code official to render a judgment as to the intent of the code application and usefulness of the fill material as a fireblock. Also, various

manufacturers have documented the usefulness of their material as a fireblock under evaluation reports or under fire conditions, usually to the ASTM time temperature curve. We do not specify a time period, temperature, or other conditions in this modification since no test exists for fireblocks , but require that some evidence must be provided to the code official that a specific product can indeed comply with the intent of the code. Although the 2000 IBC was modified to read “approved” rather than “noncombustible”, code officials should not interpret that to mean that anything goes, and approvals must be based on the overarching intent of the fireblocking requirements as stated in RB602.8.

Sources:
PM Engineering Magazine: Firestopping & Fireblocking: What's the Difference? By Vickie J. Lovell August 7, 2001 Issue: 8/01
IBC Code Commentary, ICC.

Public Comment 3:

Jason C. Lynch, Flame Tech Inc., requests Disapproval.

Committee Reason: This code section has become less specific and more open to interpretation since the 2000 IRC. In the past, a noncombustible (ASTM – E136) standard was specified in all codes for protecting penetrations in non-rated, wood frame construction found in 1 & 2 family dwellings. This was adopted from the recommendations made by the American Forest & Paper Assoc. (along with the additional fireblocking materials, locations, materials, etc.) and has been a reliable standard for many years and enforced widely by inspectors in many parts of the country. The current code wording now reads “an approved material” to be used for this application, which, although still unclear as what is actually an “approved material”, allows the AHJ to make the determination of what types of materials are allowed for this application. To specifically discriminate and call out in writing that “ASTM-E136 rated products are not required” is not a good solution to specify what materials are appropriate. This will take away the authority from the AHJ who has had reliance on this test method for many years, allow for other “inappropriate” or “inadequate” materials to be used, and make this code section less clear and more open to interpretation than it stands now. In addition, the intent is to increase fire resistant integrity in the structure and to promote life safety and the current proposal does not support this at all. We should not be taking out one standard and not replacing it with another. If the material is not required to be ASTM-E136, than what is the material required to be?

Public Comment 4:

Thomas U. Potts, Insul Industries, Inc., requests Disapproval.

Commenter’s Reason: Past interpretations from the ICC, regarding various materials that can be used in a fire-blocking application as described section #4, of R602.8, dictate that any materials meeting ASTM E-814, ASTM E-119, ASTM E-136, or unfaced fiberglass insulation ARE ALL SUITABLE for use in the aforementioned application. THEREFORE, code change proposal # RB176 SHOULD BE DISAPPROVED because RB176 in no way clarifies the intent of section #4 of R602.8. FURTHERMORE proposal # RB176 discriminates against, and would cause unfair damage to numerous manufacturers of ASTM E-136 rated products.

I would strongly support any proposed code change language regarding section R602.8 that would indicate what approved materials are, RATHER THAN MISLEADING the building officials and contractors to materials that are not acceptable, or required.

Public Comment 5:

David Smith, Accumetric LLC, requests Disapproval.

Commenter’s Reason: By not requiring the material to meet ASTM E-136 requirements (non-combustible material), the proposed language change could be detrimental to life safety. It will allow the use of combustible materials such as polyurethane foam. When polyurethane foam is heated it releases toxic gases such as nitrogen oxides, isocyanates, hydrogen cyanide, carbon monoxide and carbon dioxide. These toxic gases spread at floor level. If trying to escape a fire by staying low to the ground the person/persons will come in contact and inhale these toxic gases possibly resulting in death.

ASTM E-136 materials (non-combustible) do not pose this life safety threat.

See the referenced MSDS, page 3, “Hazardous Combustion Products” for verification of the toxic gases released during a fire.

Bibliography:
Material Safety Data Sheet; March 17, 2004, Dow Chemical Company, Miidland, MI

Final Action: AS AM AMPC____ D

RB177-06/07
R602.8, M1501.2 (New)

Proposed Change as Submitted:

Proponent: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., representing In-O-Vate Technology, Inc.

1. Revise as follows:

R602.8 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.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
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 in accordance with Section M1501.2.

2. Add new text as follows:

M1501.2 Dryer exhaust duct penetrations. Where a clothes dryer exhaust duct penetrates a wall or ceiling membrane, the annular space shall be 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: 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.

Another concern with a dryer exhaust duct is the proper connection and installation of the duct behind the wall. The transition between the exposed duct and the duct in the wall must be properly installed. When flexible duct is used, an improper transition can distort the flexible duct leading to a greater buildup of lint in the duct. This can lead to a fire in the duct.

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.

This new section complements the fireblocking requirements in Section R602.8.

When a dryer exhaust duct penetrates a fire-resistance-rated assembly, the penetration must be properly protected. The last sentence references the appropriate section for penetration protection. There are available rated dryer exhaust vent through penetration assemblies.

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

Committee Action: **Disapproved**

Committee Reason: The code already adequately addresses this 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., JB Engineering and Code Consulting, P.C., representing In-O-Vate Technologies, requests Approval as Submitted.

Commenter's Reason: The Committee commented that Section R602.8 already adequately covers firestopping. However, there are no specific requirements for a dryer exhaust duct wall penetration. This will address the requirements to provide a proper firestopping to prevent a fire from getting into the wall cavity. The IMC Committee approved a similar change. This change will bring the IRC in line with the IMC.

Final Action: AS AM AMPC____ D

RB179-06/07
R602.10 through R602.11.2

Proposed Change as Submitted:

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

Delete Sections R602.10 through R602.11.2 and substitute as follows:

R602.10 Wall bracing. All exterior walls shall be braced in accordance with this section. In addition, interior braced wall lines shall be provided in accordance with Section R602.10.1. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with accepted engineering practice.

Exception: Detached one-and two-family dwellings located in Seismic Design Category C are exempt from the seismic bracing requirements of this section. Wind speed provisions for bracing shall be applicable to detached one- and two-family dwellings.

R602.10.1 Braced wall lines. Braced wall lines, both interior and exterior, shall be provided with braced wall panels in the amount and location specified in this section. Braced wall panels shall consist of construction methods listed in Section R602.10.2 or the alternate bracing panels described in Section R602.10.3.2.

R602.10.1.1 Amount of bracing. The amount of bracing along each braced wall line shall be in accordance with Table R602.10.1(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)

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

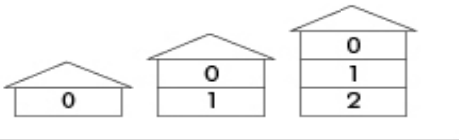
SEISMIC DESIGN CATEGORY (SDC) OR WIND SPEED	STORIES ABOVE BRACED WALL LINE[d]	METHOD OF BRACING PERMITTED	AMOUNT OF FULL-HEIGHT BRACING PER WALL LINE		MAXIMUM SPACING BETWEEN BRACED WALL LINES (FT)
			For Method 3 Bracing	For other methods permitted[e]	
SDC A and B ($S_s \leq$ 0.35g and $S_{ds} \leq$ 0.33g), $\leq$ 100 mph	0	Methods 1-8	16%	16%	35 (See Section R602.10.1.3 for exceptions)
	1	Methods 1-8	16%	25%	
	2	Methods 2-8	25%	35%	
SDC C ($S_s \leq$ 0.6g and $S_{ds} \leq$ 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 ($S_s \leq$ 1.25g and $S_{ds} \leq$ 0.83g), < 110 mph	0	Methods 2-8	20%	30%	25 (See Section R602.10.1.3.1 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 amounts are based on a soil site class "D." Interpolation of bracing amounts 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.



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 % bracing requirement.

TABLE R602.10.1 (2)
ADJUSTMENT FACTORS TO THE AMOUNT OF REQUIRED WALL BRACING [a]

ADJUSTMENT BASED ON:			MULTIPLY AMOUNT OF BRACING PER WALL LINE BY:	APPLIES TO:
Story height[b] (Section 301.3)		< 10 ft	1.0	All bracing methods - R602.10.2
		12 ft	1.2	
Braced wall line spacing in SDC A-C[b,d]		< 35 ft	1.0	
		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	25 psf	1.1	
	roof plus one story	25 psf	1.2	
Walls with stone of 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 amount 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 R602.10.1.3.
e. The adjusted amount of bracing shall not be less than that required for the site's wind speed.

R602.10.1.2 Braced wall panel location. Braced wall panels shall be located in accordance with Table R602.10.1(1) and Figure R602.10.1(1). Braced wall panels shall be no more than 12.5 feet (3810 mm) from each end of a braced wall line per Figure R602.10.1(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) per Figure R602.10.1(3). Braced wall segments shall be located in accordance with Section R602.10 and at least every 25-ft (7620 mm) o.c. but not less than the percentages given in Table R602.10.1(1).

R602.10.1.2.1 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 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 per Figure R602.10.1.2.1:

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, 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 (8007 N). The tie-down device shall be installed in accordance with the manufacturer's recommendations.

R602.10.1.2.1.1 Collectors in Seismic Design Categories D_0, D_1 and D_2. A designed collector shall be provided if a braced wall panel is not located at each end of a braced wall line as indicated in Section R602.10.1.2.1 or, when using the Section R602.10.1.2.1 Exception, if a braced wall panel is more than 8 feet (2438 mm) from each end of a braced wall line.

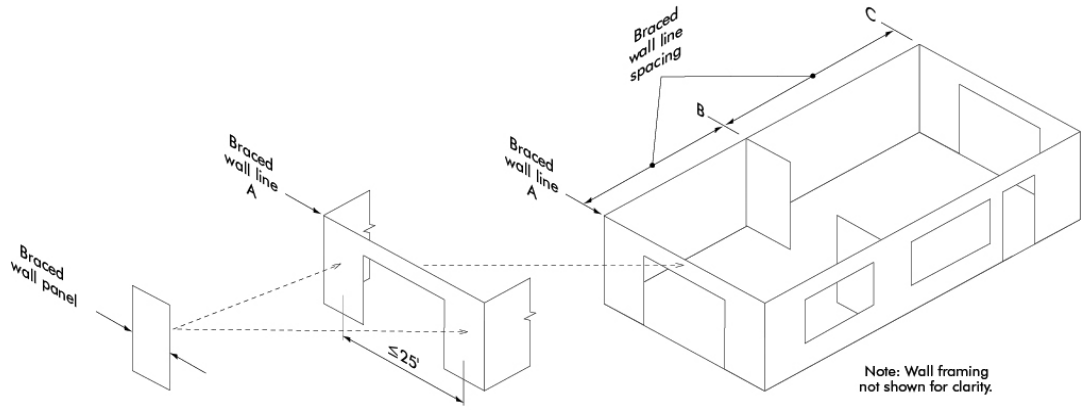


FIGURE R602.10.1(1)
BRACED WALL PANELS AND BRACED WALL LINES

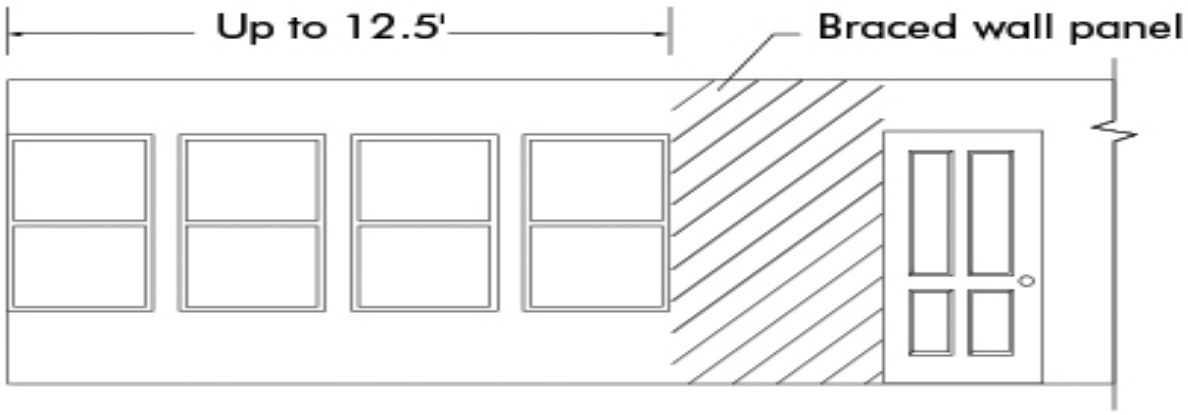


FIGURE R602.10.1(2)
PERMITTED BRACED WALL PANEL DISTANCES FROM ENDS OF A BRACED WALL LINE (SDC A, B and C)

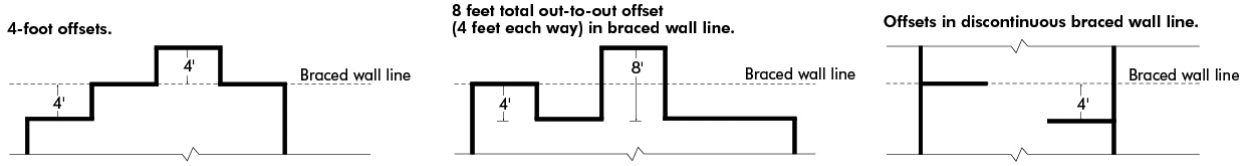


FIGURE R602.10.1(3)
OFFSETS PERMITTED FOR BRACED WALL LINES

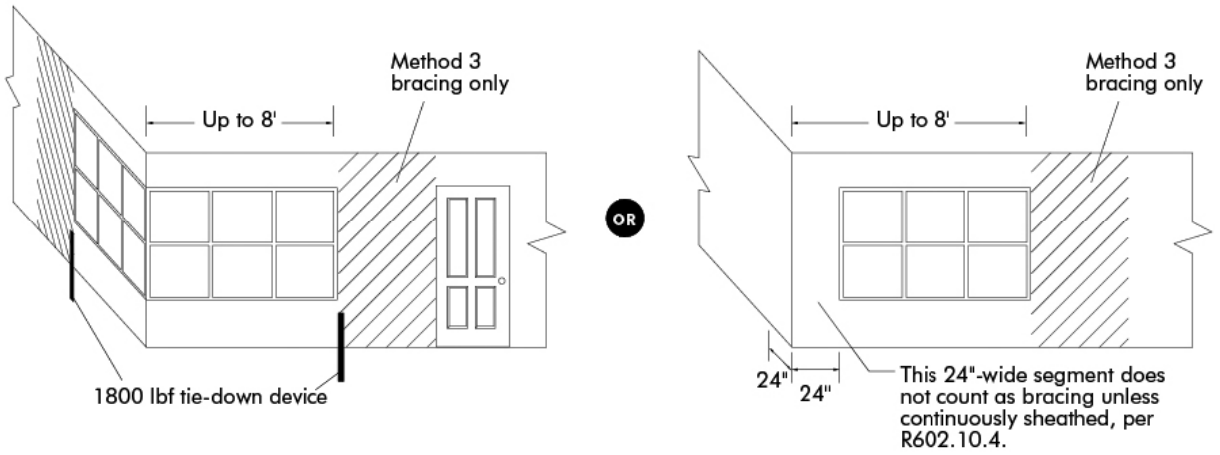


FIGURE R602.10.1.2.1
BRACED WALL PANELS AT BRACED WALL-LINE ENDS IN SEISMIC DESIGN CATEGORIES D_0, D_1 AND D_2.

R602.10.1.3 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 amount 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.

R602.10.1.3.1 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 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.

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 5/16 inch (7.9 mm) for 16-inch (406 mm) stud spacing and not less than 3/8 inch (9.5 mm) for 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 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.

R602.10.2.1 Adhesive attachment of sheathing in Seismic Design Categories C, D_0, D_1 and D_2. Adhesive attachment of wall sheathing shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

R602.10.3 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 of panel bracing required in Table R602.10.1(1), the effective length of the braced wall panel shall be equal to the actual length of the panel.

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.

R602.10.3.1 Adjustment of length of braced panels. When story height (H), measured in ft, exceeds 10 ft, in accordance with Section R301.3, the minimum length of braced wall panels specified in R602.10.2 shall be increased by a factor H/10. See Table R602.10.3.1. Interpolation is permitted.

TABLE R602.10.3.1
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_0, D_1 and D_2 Wind speed < 110 mph	2,3,4,6,7,8 and Method 5 when double sided	4'-0"	4'-0"	4'-0"	4'-5"	4'-10"
	Method 5, single sided	8'-0"	8'-0".	8'-0"	8'-10"	9'-8"

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

R602.10.3.2 Alternative bracing panels.

R602.10.3.2.1 Alternate braced wall panels. Alternate 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 R602.10.2. 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 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 at panel quarter points. 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 shall be provided on both faces, sheathing edge nailing spacing shall not exceed four inches on center, at least three anchor bolts shall be placed at one-fifth points.

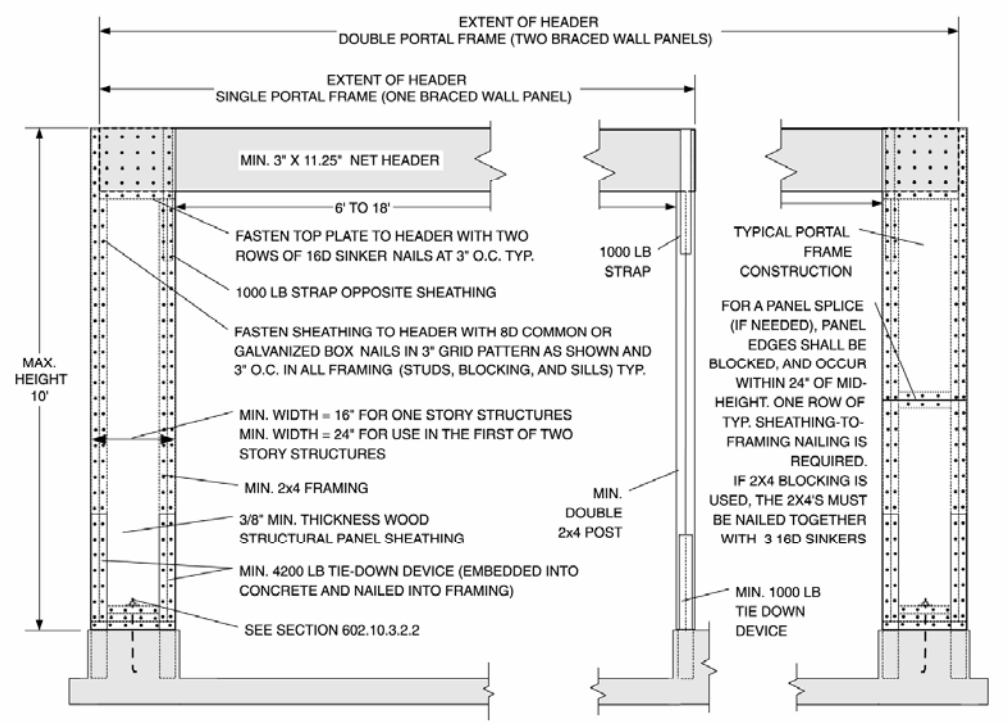
TABLE R602.10.3.2.1
MINIMUM LENGTH REQUIREMENTS AND TIE-DOWN FORCES FOR ALTERNATE BRACED WALL PANELS

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	Sheathed Length	2'-4"	2'-8"	2'-8"	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_0, D_1 and D_2 Wind speed < 110 mph	Sheathed Length	2'-8"	2'-8"	2'-8"	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 Newtons
a. NP = Not Permitted. Maximum height of 10 feet (3,048 mm).

R602.10.3.2.2 Alternate bracing wall panel adjacent to a door or window opening. Alternate 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 R602.10.2 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 R602.10.3.2.2. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed in accordance with Figure R602.10.3.2.2. 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 (18683 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 1000 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 1000 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).



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

FIGURE R602.10.3.2.2
ALTERNATE BRACED WALL PANEL ADJACENT TO A DOOR OR WINDOW OPENING

R602.10.4 Continuous wood structural panel sheathing. Continuous wood structural panel sheathing shall be constructed of wood structural panels with a thickness not less than 5/16 inch (7.9 mm) for 16-inch (406 mm) stud spacing and not less than 3/8 inch (9.5 mm) for 24-inch (610 mm) stud spacing. Wood Structural panels shall be installed in accordance with Table R602.3(3) and Figure R602.4(1). Percent bracing for the continuously sheathed method shall be as provided for in Table R602.10.1(1) for Method 3 bracing and shall be adjusted based on wall opening height as specified in Table R602.10.4(1).

When using continuous wood structural panel sheathing on all exterior walls, and interior braced wall lines, where required, including areas above and below openings, minimum braced wall panel lengths shall be in accordance with Table R602.10.4(2). Wood structural panel sheathing shall be installed at corners in accordance with Figure R602.10.4 (2).

TABLE R602.10.4 (1)
ADJUSTMENT FACTORS TO THE AMOUNT OF REQUIRED BRACING PER WALL LINE – CONTINUOUSLY SHEATHED

ADJUSTMENT BASED ON MAXIMUM WALL OPENING HEIGHT:		MULTIPLY AMOUNT 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. Amounts of bracing for continuous wood structural panel sheathing shall be based on Method 3 requirements.

TABLE R602.10.4(2)
LENGTH REQUIREMENTS FOR BRACED WALL PANELS IN A CONTINUOUSLY SHEATHED WALL [a,b,c]

MINIMUM LENGTH OF BRACED WALL PANEL (inches)			MINIMUM OPENING HEIGHT NEXT TO THE BRACED WALL PANEL (% of wall height)
8-foot wall	9-foot wall	10-foot wall	
48	54	60	100%
32	36	40	85%
24	27	30	65%

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

a. 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. 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 R602.10.3.2.2 and Figure R602.10.3.2.2 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-length 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.

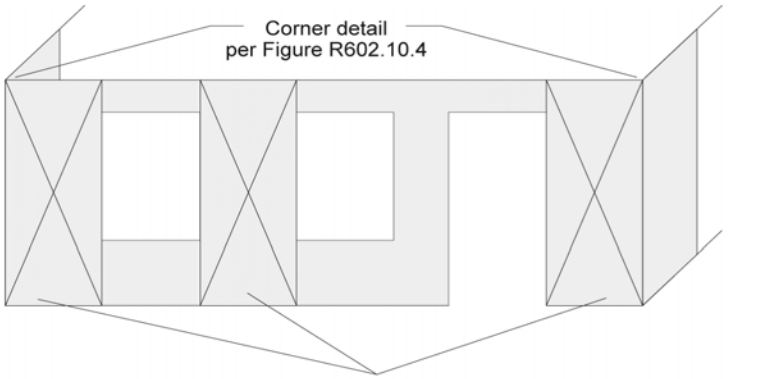
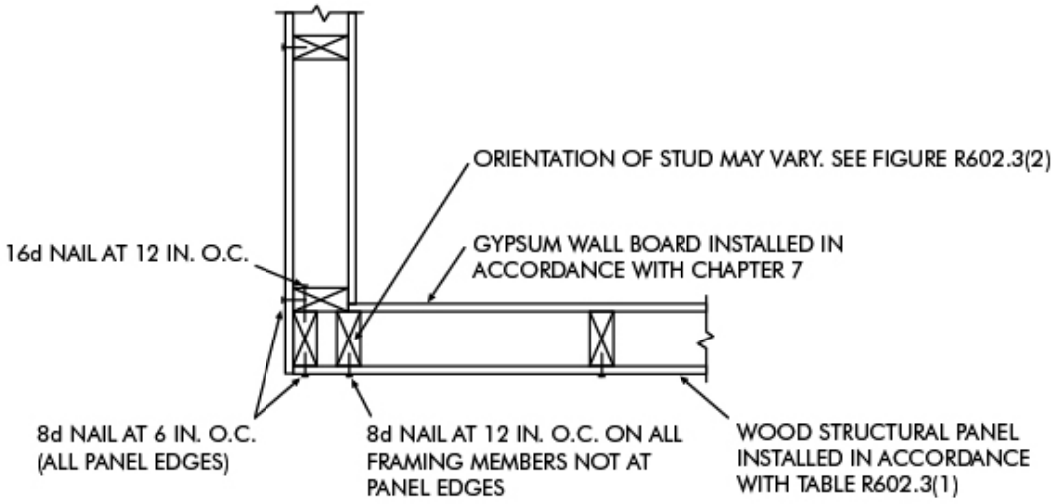
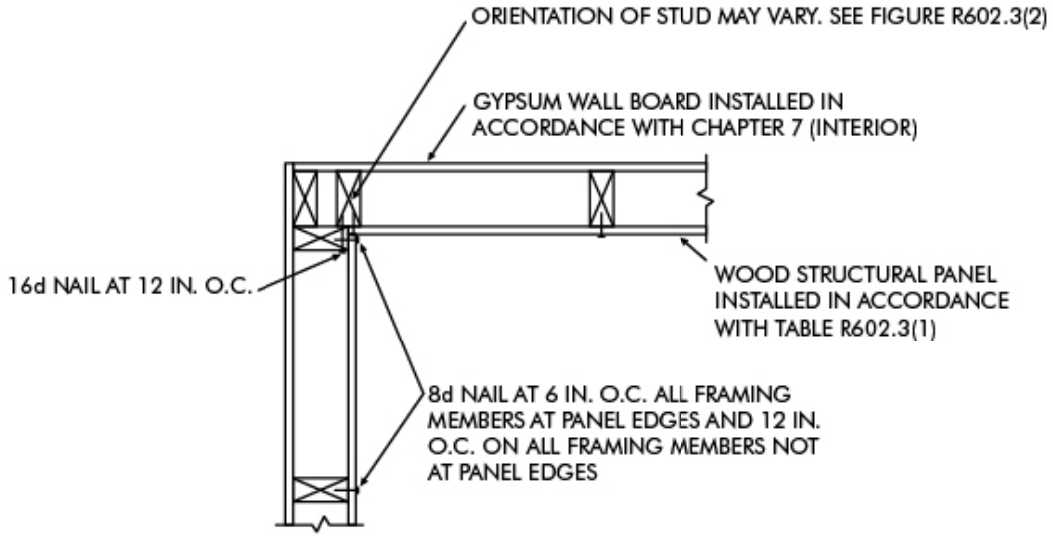


FIGURE R602.10.4(1)
TYPICAL CONTINUOUSLY-SHEATHED BRACED WALL LINE



(a) OUTSIDE CORNER DETAIL



(b) INSIDE CORNER DETAIL

For SI: 1 inch = 25.4 mm.
Gypsum board nails deleted for clarity.

FIGURE R602.10.4 (2)
TYPICAL EXTERIOR CORNER FRAMING FOR CONTINUOUS STRUCTURAL PANEL SHEATHING SHOWING REQUIRED STUD-TO-STUD NAILING

R602.10.5 Connections. 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. Where joists are perpendicular to the braced wall lines above, blocking shall be provided under and in line with the braced wall panels.

R602.10.5.1 Interior braced wall panel connections for Seismic Design Categories D_0, D_1 and D_2. Interior braced wall lines shall be fastened to floor and roof framing in accordance with Table R602.3(1), to required foundations in accordance with Section R602.11.1, and in accordance with the following requirements:

1. Floor joists parallel to the top plate shall be toe-nailed to the top plate with at least 8d nails spaced a maximum of 6 inches (150 mm) on center.
2. Top plate laps shall be face-nailed with at least eight 16d nails on each side of the splice.

R602.10.6 Interior braced wall support. In Seismic Design Categories A through D_1, interior braced wall lines shall be supported as provided in Section R502.4.

R602.10.6.1 Interior braced wall support for Seismic Design Category D_2. In one-story buildings located in Seismic Design Category D_2, interior braced wall lines shall be supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm). In two story buildings located in Seismic Design Category D_2, all interior braced wall panels shall be supported on continuous foundations.

Exception: Two-story buildings shall be permitted to have interior braced wall lines supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm) provided that:

1. The height of cripple walls does not exceed 4 feet (1219 mm).
2. First-floor braced wall panels are supported on doubled floor joists, continuous blocking or floor beams.
3. The distance between bracing lines does not exceed twice the building width measured parallel to the braced wall line.

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: 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 R602.10.2, braced-wall-panel construction Method 3 and Table R602.10.1(1), Method 3, or where permitted by the manufacturer's installation requirements for the specific sheathing material.

R602.10.8 Cripple wall bracing. In Seismic Design Categories other than D_2, cripple walls shall be braced with an amount and type of bracing as required for the wall above in accordance with Table R602.10.1(1) with the following modifications for cripple wall bracing:

1. The percent bracing amount as determined from Table R602.10.1(1) 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).

R602.10.8.1 Cripple wall bracing in Seismic Design Categories D_0, D_1 and D_2. In addition to the requirements of Section R602.10.8, where interior braced wall lines occur without a continuous foundation below, the length of parallel exterior cripple wall bracing shall be one and one-half times the length required by Table R602.10.1(1). Where cripple walls braced using Method 3 of Section R602.10.2 cannot provide this additional length, the capacity of the sheathing shall be increased by reducing the spacing of fasteners along the perimeter of each piece of sheathing to 4 inches (102 mm) on center.

In Seismic Design Category D_2, cripple walls shall be braced in accordance with Table R602.10.1(1).

R602.10.8.2 Redesignation of cripple walls. In any Seismic Design Category, cripple walls shall be permitted to be redesignated as the first story walls for purposes of determining wall bracing requirements. If the cripple walls are redesignated, the stories above the redesignated story shall be counted as the second and third stories respectively.

R602.11 Wall anchorage. Braced wall line sills shall be anchored to concrete or masonry foundations in accordance with Sections R403.1.6 and R602.11.1

R602.11.1 Wall anchorage for all buildings in Seismic Design Categories D_0, D_1 and D_2 and townhouses in Seismic Design Category C. Plate washers, a minimum of ¼ inch by 3 inches by 3 inches (6.4mm by 76 mm by 76 mm) in size, shall be 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 1-3/4 inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut.

R602.11.2 Stepped foundations. Where stepped foundations occur, the following requirements apply:

1. Where the height of a required braced wall panel that extends from foundation to floor above varies more than 4 feet (1220 mm), the braced wall panel shall be constructed in accordance with Figure R602.11.3.

2. Where the lowest floor framing rests directly on a sill bolted to a foundation not less than 8 feet (2440 mm) in length along a line of bracing, the line shall be considered as braced. The double plate of the cripple stud wall beyond the segment of footing that extends to the lowest framed floor shall be spliced by extending the upper top plate a minimum of 4 feet (1219 mm) along the foundation. Anchor bolts shall be located a maximum of 1 foot and 3 feet (305 and 914 mm) from the step in the foundation.
3. Where cripple walls occur between the top of the foundation and the lowest floor framing, the bracing requirements for a story shall apply.
4. Where only the bottom of the foundation is stepped and the lowest floor framing rests directly on a sill bolted to the foundations, the requirements of Section R602.11.1 shall apply.

Reason: The purpose of the proposal is to clarify the existing bracing provisions of the IRC through a reorganization of the existing bracing provisions without the addition of new provisions.

After the debacle at the last code hearing over bracing issues, a number of organizations representing a wide range of industries and interests formed a committee – The IRC Bracing Committee (a committee NOT formed under the auspicious of the ICC) – coordinated by Dr. Dan Dolan. This committee met twice to resolve the contentious issues associated with the bracing provisions and has future meetings planned to continue with this resolution. This specific proposal is one of this committee's action items. While the committee was not unanimous on this issue, the proposal represents the majority position.

The committee recognized unanimously that the current bracing provisions of the IRC had evolved to the point where they were very confusing and difficult to interpret and use. In order to properly determine the bracing requirements for a given structure, the user would have to know to use information in Chapters 3, 4 and 6. In addition, important information is currently "hidden" in footnotes that are often overlooked. In addition the seismic provisions for a given application are scattered around in Section R602.10 and in Chapter 3 in a seemingly random pattern.

These sections have evolved to the point where a number of state jurisdictions have already or are contemplating adoption of the bracing provisions of the 2000 IRC.

In order to correct/improve the bracing provisions, the IRC Bracing Committee decided on a two-pronged approach to correcting the deficiencies in the current provisions of the IRC. The first approach was to do a complete rewrite of the bracing provisions without making any technical changes in the existing provisions – this is called the non-technical rewrite – and the second was to develop technical code changes to improve the current bracing provisions of the building code. This proposal is the result of this committee's work on the non-technical rewrite of the bracing provisions of the IRC.

This proposal is simply a rewrite of the provisions that are already in the 2006 IRC. No new technical content has been added. Along with the reorganization, it was necessary to insert some text clarifying the intent of specific sections but not changing the current meaning. In addition a number of text sections have been replaced or supplemented with tables and/or figures where it was thought by the committee to clarify the intent of the existing provisions. During this reorganization, the seismic provisions were placed in the section where they were applicable. This eliminates the necessity to thumb back and forth throughout the code to ensure all of the provisions have been met for a specific section.

During the committee review process, an additional non-technical rewrite was considered as well as the proposed Code Masters format for the same subject. The attached proposal was modified to more closely follow the Code Masters format and material from the other non-technical rewrite that was considered superior in its presentation was added.

The committee was not unanimous on this issue, and the list below represents the committee participants and their organizations/interests that supported the proposal. At the end of the reason statement is a similar list of the opponents and their reasons for opposing the proposal. Per his specific request, Jay Crandall of ARES Consulting has been left off of both lists.

Organizations supporting the proposal:

Louis Wagner – American Fiberboard Association
Brad Douglas – American Forest and Paper Association
Ed Keith, B.J. Yeh, Zeno Martin - APA – The Engineered Wood Association
Scott Beard - City of Tacoma
Brian Foley, Chris McArtor - Fairfax County, Virginia
Ed Price - Georgia Pacific
James E. Russell - Engineer
Kelly Cobeen - Engineer
Randy Shakelford, Shane Vilasineekul, Steve Pryor – Simpson Strong-Tie
Dave Gromala – Weyerhaeuser
Taylor Blake, Ping Cheng – Louisiana Pacific
Susan Herrenbruck – Extruded Polystyrene Foam Association
David Geisler – Temple-Inland

Organizations opposed to the proposal:

Greg Bergtold - Dow Chemical
Edward Chan, Brad Allshouse – Covalence Coated Products

Reasons for opposition:

Greg Bergtold – I believe Jay Crandell's competing proposal had some clarifications that made sense to incorporate to help clarify this section of the code. Some time should have been spent to merge the two proposals and create a better product.
Edward Chan – Is opposed but was unable due to prior commitments to generate an opposing statement.

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

Committee Action: **Approved as Submitted**

Committee Reason: This is a good reorganization and a good non-technical rewrite of the wall bracing. This will make the code easier to use and to allow ease of future changes to the wall bracing.

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

Modify proposal as follows:

R602.10 Wall bracing. All exterior walls shall be braced in accordance with this section. In addition, interior braced wall lines shall be provided in accordance with Section R602.10.1. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with accepted engineering practice.

Exception: Detached one-and two-family dwellings located in Seismic Design Category C are exempt from the seismic bracing requirements of this section. Wind speed provisions for bracing shall be applicable to detached one- and two-family dwellings.

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

[For ease of representation, the entire proposal is not reproduced here. The intent of this portion of the public comment is to replace "amount" with "percentage" throughout the bracing provisions of Sections R602.10 and R602.11]

R602.10.1.2 Braced wall panel location. Braced wall panels shall be located in accordance with Table R602.10.1(1) and Figure R602.10.1(1). Braced wall panels shall be located at least every 25 feet on center and shall begin ~~be~~ no more than 12.5 feet (3810 mm) from each end of a braced wall line per Figure R602.10.1(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) per Figure R602.10.1(3). ~~Braced wall segments shall be located in accordance with Section R602.10 and at least every 25-ft (7620 mm) o.c. but not less than the percentages given in Table R602.10.1(1).~~

R602.10.3.2 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.

TABLE R602.10.4(1)
ADJUSTMENT FACTORS TO THE ~~AMOUNT~~ PERCENTAGE OF REQUIRED BRACING PER WALL LINE – CONTINUOUSLY SHEATHED

ADJUSTMENT BASED ON MAXIMUM WALL CLEAR OPENING HEIGHT:		MULTIPLY ~~AMOUNT~~ 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. ~~Amount~~ percentage s of bracing for continuous wood structural panel sheathing shall be based on Method 3 requirements.

R602.11.1 Wall anchorage for all buildings in Seismic Design Categories D_0, D_1 and D_2 and townhouses in Seismic Design Category C. Plate washers, a minimum of ~~¼~~ 0.229 inch by 3 inches by 3 inches (~~6.4~~ 5.8 mm by 76 mm by 76 mm) in size, shall be 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 1-3/4 inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: The ICC Ad Hoc Wall Bracing Committee has reviewed proposal RB 179 and has proposed a number of editorial changes as follows:

R 602.10.1 and throughout bracing section: As written the code is inconsistent in how it deals with how much bracing is required within a given wall line. Both "amount" and "percentage" are used interchangeably in various locations. The basic bracing table, Table R602.10.1 given bracing requirements in percentages, The Committee looked at the various uses of the two terms within the section and concluded that "percentage" best captures the proper meaning of the term.

R602.10.1.2: This Public Comment moves the 25-foot–spacing provision from the end of the paragraph to the beginning of the paragraph where panel location is discussed. This is a better fit given the information in the first part of the paragraph. Thus, the first half of the paragraph covers panel location while the second half covers offsets.

R602.10.3.2**:** RB 179, as proposed, had this section heading with no text behind it until the next subsection. "Empty" sections are not consistent with the IRC format and so an introductory sentence was added to the section heading to bring it in line with the accepted ICC style guidelines.

Table R602.10.4(1): The term "clear" was added to the heading in the first column to be consistent with the addition of the word "clear" to similar references as proposed by RB 201. RB 201 was recommended for approval by IRC-Building and Energy Code Committee. As stated in the reason statement for RB 201, the term "clear" was added clarify the intent of the code. Without the term, opening height has been improperly interpreted to mean the height of header above the floor line. The addition of "clear" to "opening height" was felt by ICC staff to better describe the intent of the code - vertical dimension of the wall opening itself.

R602.11.1: When drafting this change, the proponent of RB179 inadvertently used the old specification of ¼" for plate washers on anchor bolts in Seismic Design Categories D_0, D_1, and D_2. RB179 was meant to be an editorial rewrite only, with no substantive changes. The thickness of the plate washer for anchoring of sill plates in was changed from ¼" to 0.229" (3 ga.) in 2005 by code change S179-04/05, Part II. Since this was approved, the 2006 IRC requires 0.229" thick plate washers. We urge that this Public Comment be approved to reverse an accidental change. In addition, approval of this comment will prevent a conflict with the plate washer requirements of the IBC.

Public Comment 2:

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

Modify proposal as follows:

R602.10.5 ~~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. Where joists are perpendicular to the braced wall lines above, blocking shall be provided under and in line with the braced wall panels.~~ 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 shall be designed in accordance with accepted engineering practice.

(Portions of proposal not shown remain unchanged)

Commenter's Reason: This public comment is submitted to ensure that the resulting text from the re-formatting based on RB179-06/07 is correlated with the approval of code change RB225-06/07 which was modified by the committee at the Orlando hearings. This text is identical to the approval as modified of RB225-06/07.

Public Comment 3:

Kelly Cobeen, Cobeen & Associates, representing herself, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.11.2 Stepped foundations in Seismic Design Categories D_0, D_1 and D_2. Where stepped footings occur in buildings located in Seismic Design Categories D_0, D_1, or D_2, the following requirements apply:

(Portion of proposal not shown remain unchanged)

Commenter's Reason: RB179 appears to have inadvertently increased the applicability of this requirement to all Seismic Design Categories. The above modification will revert applicability to high seismic hazard areas, consistent with the 2006 IBC.

Final Action: AS AM AMPC____ D

RB183-06/07
R602.10.1

Proposed Change as Submitted:

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

Revise as follows:

R602.10.1 Braced wall lines. Braced wall lines shall consist of braced wall panel construction in accordance with Section R602.10.3. The amount and location of bracing shall be in accordance with Table R602.10.1 and the amount of bracing shall be the greater of that required by the seismic design category or the design wind speed.

Braced wall panels shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line. Braced wall panels that are counted as part of a braced wall line shall be in line, except that offsets out-of-plane of up to 4 feet (1219 mm) shall be permitted provided that the total out-to-out offset dimension in any braced wall line is not more than 8 feet (2438 mm).

There shall be a minimum of two braced wall panels on each braced wall line.

Reason: The current bracing provisions can be read to say that when a braced wall panel is moved up to 12.5 feet away from the corner, an the other corner is also within 12.5 ft, that a single braced wall panel can count for both end panels in the braced wall line.

This is not what the writers of the provisions had in mind when they wrote it, and it can lead to dangerously under designed conditions.

A quick not-so-technical way of thinking about it. Buildings have to resist both wind and seismic. The amount of wind bracing required only depends on the "sail" at the end of the house. It does not depend on the length of the walls perpendicular to that face. Seismic, on the other hand, depends on the length of the building in the direction of the load.

Our current bracing provisions cover both. The percentage of wall line that must be bracing takes care of the seismic portion. The requirement for 2 braced wall panels in a braced wall line takes care of the wind load. It is a constant requirement, regardless of the length of the braced wall. If we let one panel do double duty, it cuts our wind capacity in half.

For the more technically minded:

Please refer to the code change proposal about holddowns when braced walls are moved away from the corner. That is a separate problem, but when both of these effects combine, they are truly dynamite. In a nutshell, the Canadians have shown us through testing, that if we move a panel away from the corner, and do not provide holddowns (currently permissible in low seismic), it reduces the capacity to less than 1/3rd its restrained capacity.

With the Canadian test data in hand, we can calculate the expected capacity of a single unrestrained 4' braced wall panel. If we then take a typical 2 story 25' x 50' house in seismic category A or B, we can determine how our capacity compares with lateral wind on the structure. (Assume wind on 50' side, 3 braced wall lines, each with a single type 3, 4 ft wide panel.) We find that the bracing provides less than 10% of the required bracing amount. This leaves 90% of the required capacity to be resisted by gypboard wall that are not explicitly part of the lateral force resisting system. Granted there are "system effects", but in full scale testing of houses, system effects have been observed to be 40% or less. This 90% would overpower most houses, particularly if they are modern 'open concept' style houses.

This is dangerous and needs to be fixed.

Cost Impact: The code change proposal will increase the cost of construction. (But not when compared to 'traditional' construction. The quirk we are fixing is brand new.)

Committee Action: **Disapproved**

Committee Reason: This change is overly restrictive for short walls. The ICC Ad Hoc Committee is working on this to obtain a consensus.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment 1:

Scott Beard, SE, City of Tacoma, WA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.10.1 Braced wall lines. Braced wall lines shall consist of braced wall panel construction in accordance with Section R602.10.3. The amount and location of bracing shall be in accordance with Table R602.10.1 and the amount of bracing shall be the greater of that required by the seismic design category or the design wind speed. Braced wall panels shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line. Braced wall panels that are counted as part of a braced wall line shall be in line, except that offsets out-of-plane of up to 4 feet (1219 mm) shall be permitted provided that the total out-to-out offset dimension in any braced wall line is not more than 8 feet (2438 mm).

There shall be a minimum of two braced wall panels on each braced wall line except for a one story building, or the top story of a two or three story building.

Commenter's Reason: This is plugging an unintentional gap in the bracing requirements of the IRC. The original writers did not intend for there to be less than 2 braced wall panels on any braced wall line, ever. By a quirk of wording in the section about moving braced wall panels back from the corner, a loophole was created which can allow single braced wall panel on a braced wall line.

For the lower floors of multi-story, this will result in unsafe results. Bad enough that there is serious potential for structural collapse.

The original proposal at Orlando did not have the one-story and top-story exception, and was not passed because in those cases, two would not be necessary. This has corrected that problem. This requirement only applies to the cases that would be dangerous.

Someone in Orlando made the comment that for an 8 foot long building, you could not put a window in. This of course is an absolutely false statement. This is the very reason why the narrow "alternate braced wall panel" was created.

At some point, the IRC sheathing committee will solve this problem more comprehensively. Unfortunately, that time has not arrived. It is important that in the meantime, we plug this hole. It is not just a question of damage control this time, it is a question of life-safety.

Public Comment 2:

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

Modify proposal as follows:

R602.10.1 Braced wall lines. Braced wall lines shall consist of braced wall panel construction in accordance with Section R602.10.3. The amount and location of bracing shall be in accordance with Table R602.10.1 and the amount of bracing shall be the greater of that required by the seismic design category or the design wind speed. Braced wall panels shall begin no more than 12.5 feet (3810 mm) from each end of a braced wall line. Braced wall panels that are counted as part of a braced wall line shall be in line, except that offsets out-of-plane of up to 4 feet (1219 mm) shall be permitted provided that the total out-to-out offset dimension in any braced wall line is not more than 8 feet (2438 mm).

There shall be a minimum ~~of two braced wall panels~~ length of 48" of bracing on each braced wall line. When braced wall panels are constructed in accordance with Section R602.10.5, only panels meeting the minimum lengths of Table R602.10.5 shall count toward the total required length.

Exception: Alternate braced wall panels constructed in accordance with R602.10.6 shall be considered to be equivalent to 48" of bracing.

Commenter's Reason: This cycle, two changes were submitted to require a minimum of two braced wall panels on each braced wall line, RB183 and RB185. These were recommended for disapproval because the committed felt two was overly restrictive. However, a minimum of one braced wall panel is not overly restrictive. The real reason this is required is that when the continuous sheathing method of R602.10.5 is used, braced wall panel lengths of less than 4' are permitted. It is quite possible that total lengths less than 48" could be used and still meet the minimum percentages in low seismic regions. But using less than what would be provided by a minimum braced wall panel is a significant reduction in bracing over what has been historically permitted. This will maintain the historical minimum amount of bracing that has been provided on a wall.

Final Action: AS AM AMPC____ D

RB190-06/07

R602.10.2.1, R602.10.2.2, R602.10.2.3, R602.10.2.4 (New), Table R602.10.1

Proposed Change as Submitted:

Proponent: Joseph Hill, RA, New York State Department of State, Codes Division

1. Revise as follows:

R602.10.2.1 Seismic design categories other than D_1, D_2 and E. In Seismic Design Categories other than D_1, D_2, and E, cripple walls shall be braced with an amount and type of bracing as required for the wall above in accordance with Table R602.10.1 with the following modifications for cripple wall bracing:

1. The percent bracing amount as determined from Table R602.10.1 shall be increased by 15 percent and
2. The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

R602.10.2.2 Seismic Design Category D_1, D_2 and E. In Seismic Design Category D_1, D_2, and E, cripple walls shall be braced in accordance with Table R602.10.1.

R602.10.2.3 Redesignation of cripple walls. In ~~any~~ seismic design categor~~y~~ies, other than D_1, D_2 and E, cripple walls are permitted to be redesignated as the first story walls for purposes of determining wall bracing requirements. If the cripple walls are redesignated, the stories above the redesignated story shall be counted as the second and third stories, respectively.

2. Add new text as follows:

R602.10.2.4 Nailing of cripple wall bracing. Spacing of edge nailing for required wall bracing shall not exceed 6 inches (152mm) o.c. along the foundation plate and the top plate of the cripple wall. Nail size, nail spacing for field nailing and more restrictive boundary nailing requirements shall be as required elsewhere in the code for the specific bracing material used.

3. Revise table as follows:

TABLE R602.10.1
WALL BRACING

SEISMIC DESIGN CATEGORY OR WIND SPEED	CONDITION	TYPE OF BRACE[b, c]	AMOUNT OF BRACING[a, d, e]
Category D_2 or less than 110 mph	One story Top of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 25% of braced wall line for Method 3 or 40% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 55% of braced wall line for Method 3 or 75% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
<u>Category D_1, D_2 and E or less than 110 mph</u>	Cripple walls	Method 3	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 75% of braced wall line.

(Portions of table and footnotes not shown do not change)

Reason: The proposed change to the *International Residential Code* is critical to cripple wall construction and is based on provisions of the *International Building Code*, Chapter 2308 conventional light frame construction, and specific to cripple wall construction. The change would require bracing method #3, wood structural panel sheathing to be used on cripple walls in all D and E seismic design categories, and also adds the edge nailing requirements for cripple walls, per the *Building Code,* Section 2308.9.4.2

The current requirements of *International Residential Code* Table R602.10.1 are that cripple walls in Seismic D2 areas only are required to be sheathed using wood sheathing. The *Building Code of New York State*, Section 2308.12.4., and Table 2308.12.4 requires solid wood sheathing (sheathing method #3) for wall bracing in seismic design categories D and E. The same table requires an <u>engineered design</u> for seismic design categories D and E for wall bracing in instances where the braced wall is designated as a third story wall, meaning that further engineering of the wall is required, beyond the prescriptive requirements of the tables. In the *International Building Code*, Section 2308.9.4.1, Cripple walls are *required* to be designated as an additional story where the height of the wall exceeds 14 inches in height. *The International Residential Code*, Section R602.9, Cripple walls are *permitted* to be designated as an additional story. This proposal would make the IRC Table R602.10.1 *similar* to the requirements of the IBC for cripple wall bracing, requiring solid wood sheathing in all seismic "D" and E" areas, and edge nailing of cripple walls, without adding the IBC requirement for engineered wall provisions, and redesignation of the cripple wall as a story when exceeding 14" in height.

A cripple wall creates in effect a hinge point in the wall of a building at the point the cripple wall connects to the foundation. Building failures in seismic events have been seen to fail at the cripple wall /foundation wall connection. Since there is absent a floor or ceiling diaphragm at this intersection (which generally is present at all other building floor/ceiling intersections), there is no structural component present to transfer lateral forces (wind, seismic) at the point where the cripple wall bears on the foundation. This proposal strengthens the code section for buildings in areas of significant seismic risk. Typically, shear wall construction which requires the use of sheathing method #3 (solid wood panel sheathing only) for sheathing of the wall to resist lateral forces. Although this code change proposes to add the IBC section for edge nailing of the cripple wall, it should be noted that shear wall construction typically has further requirements for tighter nailing schedules which are not a part of this code change proposal.

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

Committee Action: **Disapproved**

Committee Reason: Seismic Design Category E is outside the scope of the IRC therefore this is not appropriate. The fastening requirement may not be appropriate for all types of bracing material. The ICC Ad Hoc Committee objects to this proposal.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Joseph P. Hill, RA, New York State Department of State, Codes Division, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

R602.10.2.1 Seismic design categories other than D_0, D_1 and D_2, ~~and E.~~ In Seismic Design Categories other than D_0, D_1, and D_2, ~~and E,~~ cripple walls shall be braced with an amount and type of bracing as required for the wall above in accordance with Table R602.10.1 with the following modifications for cripple wall bracing:

1. The percent bracing amount as determined from Table R602.10.1 shall be increased by 15 percent and
2. The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

R602.10.2.2 Seismic Design Category D_0, D_1 and D_2, ~~and E~~ In Seismic Design Category D_0, D_1, and D_2, ~~and E,~~ cripple walls shall be braced in accordance with Table R602.10.1.

R602.10.2.3 Redesignation of cripple walls. In seismic design categories other than D_0, D_1, and D_2, ~~and E,~~ cripple walls are permitted to be redesignated as the first story walls for purposes of determining wall bracing requirements. If the cripple walls are redesignated, the stories above the redesignated story shall be counted as the second and third stories, respectively.

R602.10.2.4 Nailing of cripple wall bracing. Spacing of edge nailing for required wall bracing shall not exceed 6 inches (152mm) o.c. along the foundation plate and the top plate of the cripple wall. Nail size, nail spacing for field nailing and more restrictive boundary nailing requirements shall be as required elsewhere in the code for the specific bracing material used. Bracing of cripple wall construction in Seismic Design Categories D_0, D_1, and D_2, is limited to wall bracing method #3. See Table R602.10.1.

TABLE R602.10.1
WALL BRACING

SEISMIC DESIGN CATEGORY OR WIND SPEED	CONDITION	TYPE OF BRACE[b, c]	AMOUNT OF BRACING[a, d, e]
Category D_2 or less than 110 mph	One story Top of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 25% of braced wall line for Method 3 or 40% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of two story	Methods 2, 3, 4, 5, 6, 7 or 8	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 55% of braced wall line for Method 3 or 75% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
Category D_0, D_1 and D_2 ~~and E~~ or less than 110 mph	Cripple walls	Method 3	Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 75% of braced wall line.

Commenter's Reason: The Committee disapproved this proposal on the reason that seismic design category "E" is outside the scope of the IRC. Seismic Design Category "E" has been removed from the proposal, since there is a belief that category "E" is not contained within the scope of the International Residential Code. This change brings the proposal in line with the International Residential Code.
The Committee also objected to the fastening requirement, reasoning that it may not be appropriate for all types of bracing material.
The fastening schedule is appropriate, since this code change proposal limits the bracing of cripple walls to the use of method #3, or wood structural panel sheathing, by the change which was proposed to Table 602.10.1. In additional (new) code language has been added by this proposed modification to further clarify this restriction (**See New Section added - R602.10.2.4)**

The reason behind the proposed change to limit bracing method of cripple walls to Method #3 is to give cripple wall construction a defined rigidity, something that can be quantified as a shear wall assembly. This is also the reason for the edge nailing requirement, which was taken from the IBC for cripple wall construction. This change makes IRC requirements for cripple walls more like the IBC without being as restrictive as the IBC requirements. Without this change, cripple walls in high seismic risk areas (Do and D1 seismic areas) can be braced by any method, which seems irresponsible.

There are publications which suggest Seismic retrofit of residential buildings in high seismic areas. Sheathing of knee walls using structural wood panel sheathing with tight perimeter nailing is always required by these retrofit guides. It seems reasonable that the code would require a more structurally stable knee wall in high seismic areas if such retro fit guides make this knee wall sheathing methodology mandatory.

Final Action: AS AM AMPC____ D

RB192-06/07
R602.10.2.1

Proposed Change as Submitted:

Proponent: Jim W. Sealy and Kelly Cobeen, FEMA/BSSC Code Resource Support Committee

Revise as follows:

R602.10.2.1 Seismic Design Categories Other Than D_2. In Seismic Design Categories other than D_2, cripple walls having a stud height of 14 inches or greater shall be considered a story and shall be braced in accordance with Table R602.10.1. ~~with an amount and type of bracing as required for the wall above in accordance with Table R602.10.1 with the following modifications for cripple wall bracing:~~

1. ~~The percent bracing amount as determined from Table R602.10.1 shall be increased by 15 percent, and~~
2. ~~The~~ The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

Reason: Coordination between IBC and IRC. A framed and sheathed cripple wall has the structural behavior of a story, and needs to be treated as such. The proposed language clarifies this, and is consistent with IBC Section 2308.9.4 and is similar to 2003 NEHRP Section 12.4.2.2. Clarification is not needed for SDC D_2, which specifically identifies cripple wall requirements. Without this change, buildings with cripple walls of unlimited height and up to three stories above could be constructed under IRC provisions; the wind and seismic loads generated by this building size would be significantly in excess of the available capacity.

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

Committee Action: **Disapproved**

Committee Reason: Based on the testimony, the intent of the proponent has not been made clear in the proposed code language and could lead to misinterpretation. The 14 inch limit would leave no prescriptive requirements for cripple walls less than 14 inches in height.

Assembly Action: **None**

Individual Consideration Agenda

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

Public Comment:

Jim W. Sealy, FAIA and Kelly Cobeen, FEMA/BSSC Code Resource Support Committee, representing Building Seismic Safety Council of the National Institute of Building Sciences, requests Approval as Modified by this Public Comment.

Replace proposal with the following:

R602.10.2.1 Seismic Design Categories Other Than D_2. In Seismic Design Categories other than D_2, cripple walls having a stud height of 14 inches or greater shall be considered a story for purposes of bracing and shall be braced in accordance with Table R602.10.1.

In Seismic Design Categories other than D_2, cripple walls having a stud height of less than 14 inches (356 mm), as permitted by R602.9, shall be braced with an amount and type of bracing as required for the wall above in accordance with Table R602.10.1 with the following modifications for cripple wall bracing:

1. The percent bracing amount determined from Table R602.10.1 shall be multiplied by 1.15, ~~increased by 15 percent~~ and
2. The braced wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

Commenter's Reason: In response to code development committee concerns, existing IRC language is retained to address cripple wall studs less than 14 inches in height. The language for shorter studs has been modified to correlate with RB179-06/07 (R602.10.8).

Final Action: AS AM AMPC____ D