2018 QUICK-CARDS®

SHEAR WALLS & SHEATHING

A UNIQUE QUICK-REFERENCE GUIDE

Based on the 2018 IRC®

Builder's Book, Inc.
BOOKSTORE • PUBLISHER
8001 Canoga Avenue, Canoga Park, CA 91304
1-800-273-7375 • 1- 818-887-7828
www.buildersbook.com

LOADS & SHEAR WALLS

LOADS *(Based on IRC R301.1; R202)*

- Buildings and structures must be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads.
- Buildings and structures must provide a complete load path that meets the requirements for the transfer of loads from their point of origin through the load-resisting elements to the foundation.

Vertical Loads

- Act vertically on a building.
- Include dead loads and live loads.
  - Dead loads: weight of construction materials incorporated into the building, including: walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and other similar architectural/structural and fixed service equipment.
  - Live loads: loads produced by the use and occupancy of the building or other structure.

    They do not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load or dead load.

Lateral Loads

- Act horizontally on a building.
- Includes loads produced by wind and earthquakes.

WEIGHT OF MATERIALS *(Based on IRC R301.2.2.2)*

- Average dead loads must not exceed:
  - 15 lbs. per sq. ft. for the combined roof and ceiling assemblies (on a horizontal projection)
  - 10 lbs. per sq. ft. for floor assemblies, except as further limited by Section R301.2.2.
- Dead loads for walls above grade must not exceed:
  - 15 lbs. per sq. ft. for exterior light-frame wood walls.
  - 14 lbs. per sq. ft. for exterior light-frame cold-formed steel walls.
  - 10 lbs. per sq. ft. for interior light-frame wood walls.
  - 5 lbs. per sq. ft. for interior light-frame cold-formed steel walls.
  - 80 lbs. per sq. ft. for 8-inch-thick masonry walls.
  - 85 lbs. per sq. ft. for 6-inch-thick concrete walls.
  - 10 lbs. per sq. ft. for SIP walls.

WIND DESIGN CRITERIA *(Based on IRC R301.2.1)*

Buildings and portions thereof must be constructed according with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(5)A.

MIN. UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot) *(Based on IRC Table R301.5)*

Use	Live Loads
Uninhabitable attics without storage	10
Uninhabitable attics with limited storage	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks	40
Fire escapes	40
Guards and handrails	200
Guard in-fill components	50
Passenger vehicle garages	50
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40

STORY HEIGHT *(Based on IRC R301.3)*

The wind and seismic provisions of this code apply to buildings with story heights not exceeding the following story heights:

Wood wall framing: 11 ft. 7 in. and the laterally unsupported bearing wall stud height permitted by Table R602.3(5).

Cold-formed steel wall framing: 11 ft. 7 in. and the unsupported bearing wall stud height not exceed 10 ft.

Masonry walls: 13 ft. 7 in. and the bearing wall clear height must not exceed 12 ft.

Insulating concrete form walls: 11 ft. 7 in. and the max. unsupported wall height per story as permitted by Section R608 tables must not exceed 10 ft.

Structural insulated panel (SIP) walls: 11 ft. 7 in. and the bearing wall height per story as permitted by Section R610 tables must not exceed 10 ft.

Note: Where the story height limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads must comply with the IBC.

SEISMIC PROVISIONS *(Based on IRC R301.2.2)*

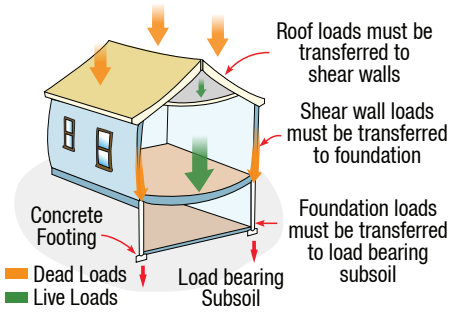
The seismic provisions of this code apply to:

- Townhouses in Seismic Design Categories C, D_0, D_1 and D_2.
- Detached one- and two-family dwellings in Seismic Design Categories, D_0, D_1 and D_2.
- Buildings in Seismic Design Category E must be designed to resist seismic loads according with IBC.
- Wood-framed buildings must be limited to 3 stories above grade plane or the limits given in Table R602.10.3(3).
- Cold-formed, steel-framed buildings must be limited 3 stories above grade plane according to AISI S230.
- Mezzanines as defined in Section R202 that comply with Section R325 must not be considered as stories.
- Structural insulated panel buildings must be limited to 2 stories above grade plane.

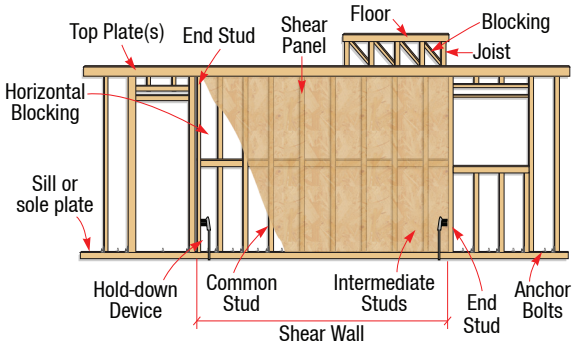
SNOW LOADS *(Based on IRC R301.2.3)*

- Wood-framed construction, coldformed, steel-framed construction and masonry and concrete construction and structural insulated panel construction in regions with ground snow loads 70 lbs. per sq. ft. or less, must comply with Chapters 5, 6 and 8.
- Buildings in regions with ground snow loads greater than 70 lbs. per sq. ft. must be designed in accordance with accepted engineering practice.

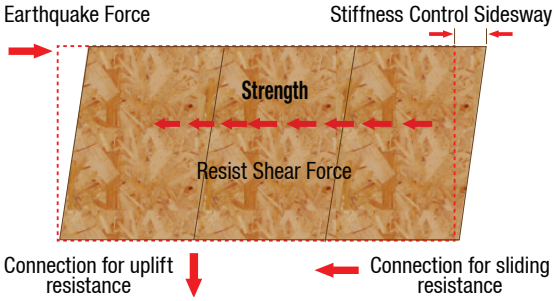
VERTICAL LOADS



TYPICAL SHEAR WALL



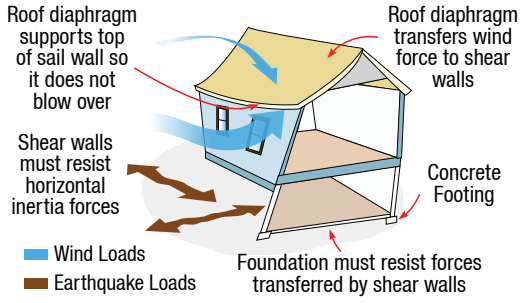
SHEAR PANEL



SHEAR WALLS

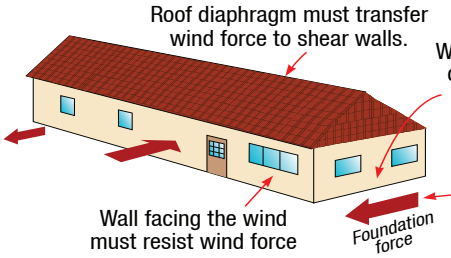
- Shear walls resist lateral loads.
- Lateral loads act horizontally on a building.
- Lateral loads and are produced by earthquakes, winds, floodwater and pressure from earth banks.
- Shear walls don't support vertical loads. Bearing walls support vertical loads but have no ability to resist a lateral force.
- Shear walls are vertical elements of the horizontal force resisting system. Shear walls are composed of the following four parts:
  - framing members • sheathing • nails • hold-downs
- Shear wall is determined by the location of the hold-downs.
- Lateral forces are collected by many small members and connections spread over a large area and concentrate at shear walls.
- Many custom houses have many windows, doors, bays, recesses and open floor plans, these components and design don't provide adequate stability for the house to withstand lateral loads without the careful design and construction of shear walls.
- Forces on all four edges of a shear wall must balance each other.
- The shear wall must be strong enough to transfer forces from each edge to opposite edge.
- The shear wall must connect a complete load path.
- Panels of plywood and Oriented Strand Board (OSB) are the most common materials used for sheathing.

LATERAL LOADS

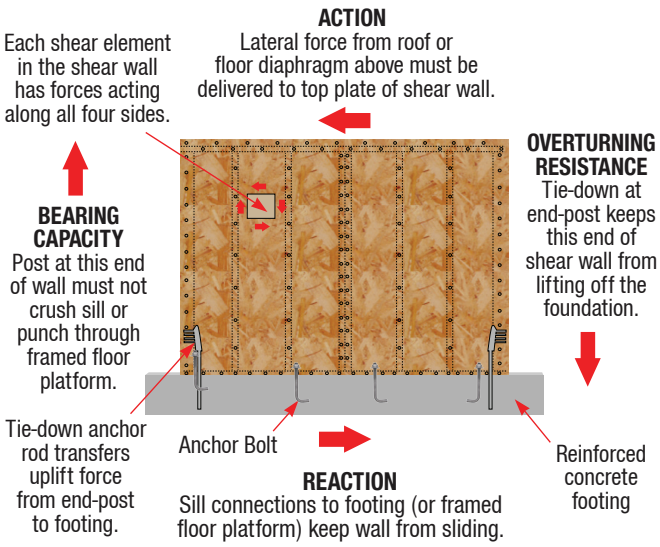


SHEAR WALLS – GENERAL

WIND FORCE – SHEAR WALL DIAGRAM



SHEAR WALL FORCES



SHEAR WALL PRINCIPLES

Shear walls and shear wall segments must follow the principles below to successfully function:

Action

- Lateral forces must be transferred to the shear wall.
- The shear wall must extend all the way up to the roof (or floor) diaphragm above.
- The roof (or floor) diaphragm must connect to the shear wall's top plate.

Reaction

- The shear wall must connect to the footing.
- The connection to the footing or floor platform must resist the force delivered to the top of the wall.

Tie downs

- End-posts must connect to the footing.
- Installing tie-downs at each end of the shear wall segment and connecting it to the footing prevents the shear wall segments from rolling over, "overturning."
- Simple tie-down: includes steel traps that are cast into footing concrete at both ends of each shear wall segment.
- Tie-downs for large overturning forces: includes welded or formed steel tie-downs that are bolted, nailed or screwed to the end studs of the shear wall and also connect to an anchor rod cast into the footing.

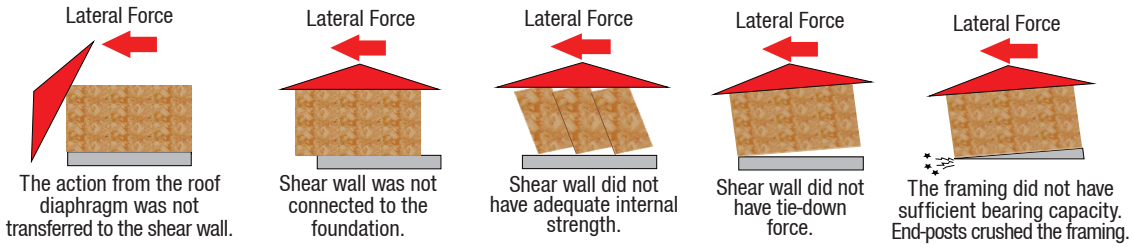
Bearing capacity

- End-posts must not punch through the floor platform or crush the sill or sole plate.
- Both ends of the shear wall must have bearing capacity under the end-posts and the ability to resist uplift since the "action" force on the wall could come from either direction.

SHEAR WALL – INTERNAL STRENGTH

- The shear wall must be strong enough to hold together under lateral forces.
- The plywood or OSB sheathing that covers the wall is referred to as a shear wall because it is a "shear element."
- A shear element is a very small square of material that has forces acting parallel to each of its edges.
- The 4 forces on the square are all equal.
- Forces on the top and bottom act in opposite directions, side forces act opposite each other as well.
- The direction of the side forces must also oppose the tendency for the square to rotate due to the top and bottom forces.
- The simplest shear wall has a single piece of sheathing covering the whole wall, however buildings often require more than a single piece of sheathing.
- So long as the nails are installed at the same spacing along all four edges of each sheathing panel:
  - the shear wall will function how it's supposed to because each nail around the perimeter of each piece of sheathing exerts the same force.
  - the shear wall will have the exact number of nails needed along each particular edge to transfer the action, reaction and overturning forces into the panel.

SHEAR WALL FAILURES



TERM ALERT!

Shear Wall: A general term for walls that are designed and constructed to resist racking from seismic and wind by use of masonry, concrete, cold-formed steel or wood framing. Shear walls significantly reduce lateral sway of the building and thereby reduces damage to structure and its contents.

SHEATHING MATERIALS – PLYWOOD & ORIENTED STRAND BOARD (OSB)

PLYWOOD & OSB PANELS

- Plywood and Oriented Strand Board (OSB) panels are both manufactured (engineered) from various wood products and by-products.
- Plywood is manufactured from thin layers of wood veneer that are glued together with adjacent layers, having their wood grain rotated up to 90° to one another.
- OSB panels are made from wood that has been ground into thin wood strands. The strands are then mixed with wax and adhesives and hot pressed to form wood sheets.
- Both are made with glue or resin and cured under heat and pressure.
- These products are used for shelving, subfloors, sheathing and a number of other applications.

PLYWOOD VS. OSB

PLYWOOD – PROS & CONS

Pros	Cons
• Stiffness 10% greater than OSB. • 40% less water absorption than OSB; fast drying times. • lighter than solid wood; easier to maneuver and hang. • less likely to split when nailed or screwed at the edges due to it's cross-grain construction. • less likely to swell, contract or warp due to the balanced tension across the grains of adjacent veneers.	• more expensive than OSB • weak spots in the sheets - panel voids • Less expensive veneers can have inconsistencies in the surface due to knots in the wood. • limited sizes: 8 ft. to 10 ft. max. lengths

ORIENTED STRAND BOARD (OSB) – PROS & CONS

Pros	Cons
• Economical: less expensive than plywood. • Versatile: formulations can be made to fit various climates and budgets. • Available in large sizes: up to 16 foot lengths. • No weak spots: panels are dense and solid throughout. • 2x greater in shear strength than plywood. • Dimensions are more accurate than plywood. • More sustainable product: manufactured from a wide range of fast-growing species, often farm raised and processed to use the maximum amount of wood fiber from each tree.	• heavy - heavier to handle • higher thermal conductivity - less R-value than plywood • lower moisture tolerance • prone to swelling edges and telegraphing if exposed to significant amounts of water or moisture.

FLOOR & ROOF SHEATHING

FLOOR – LUMBER SHEATHING *(Based on IRC R503.1)*

Max. allowable spans for lumber used as floor sheathing must conform to Tables R503.1, R503.2.1.1(1) and R503.2.1.1(2).

FLOOR – END JOINTS *(Based on IRC R503.1.1)*

- End joints in lumber used as subflooring must occur over supports unless end-matched lumber is used, in which case each piece must bear on not less than 2 joists.
- Subflooring must be permitted to be omitted where joist spacing does not exceed 16" and a 1-inch nominal tongue-and-groove wood strip flooring is applied perpendicular to the joists.

FLOOR – WOOD STRUCTURAL PANEL SHEATHING *(Based on IRC R503.2.1 - R503.2.3)*

- Wood structural panel sheathing used for structural purposes must conform to CSA O325, CSA O437 DOC PS 1 or DOC PS 2.
- Panels must be identified for grade, bond classification and Performance Category by a grade mark or certificate of inspection issued by an approved agency.
- The Performance Category value must be used as the "nominal panel thickness" or "panel thickness".
- Where used as subflooring or combination subfloor underlayment, wood structural panels must comply with Table R503.2.1.1(1).
- Where sanded plywood is used as combination subfloor underlayment, the grade, bond classification and Performance Category must comply with Table R503.2.1.1(2).
- The max. allowable span for wood structural panels used as subfloor or combination subfloor underlayment must be as set forth in Table R503.2.1.1(1), or APA E30.
- The max. span for sanded plywood combination subfloor underlayment must be as set forth in Table R503.2.1.1(2).
- Wood structural panels used as subfloor or combination subfloor underlayment must be attached to wood framing must comply with Table R602.3(1) and must be attached to cold-formed steel framing (see Table R505.3.1(2)).

FLOOR – PARTICLEBOARD *(Based on IRC R503.3)*

- Particleboard must conform to ANSI A208.1 and must be identified by a grade mark or certificate of inspection.
- Particleboard floor underlayment must conform to Type PBU and must be 1/4" Min. in thickness.
- Particleboard underlayment must be installed in according with the recommendations of the manufacturer and attached to framing in accordance with Table R602.3(1).

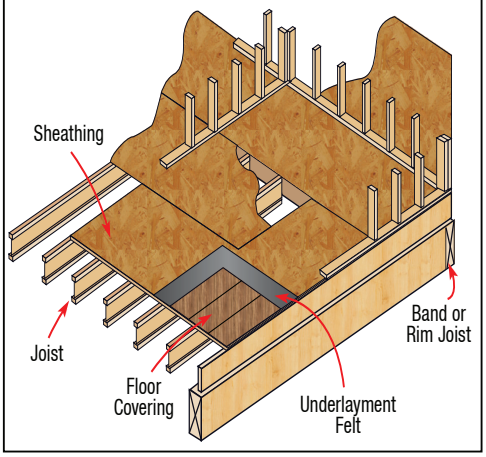
ROOF – LUMBER SHEATHING *(Based on IRC R803.1)*

- Allowable spans for lumber used as roof sheathing must conform to Table R803.1.
- Spaced lumber sheathing for wood shingle and shake roofing must conform to the requirements of Sections R905.7 and R905.8.
- Spaced lumber sheathing is not allowed in Seismic Design Category D2.

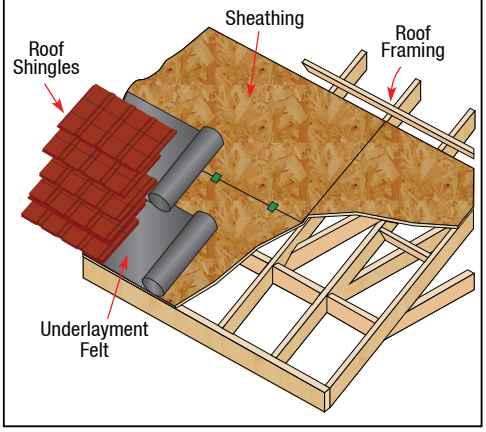
FLOOR – WOOD STRUCTURAL PANEL SHEATHING *(Based on IRC R803.2)*

- Wood structural panels must conform to DOC PS 1, DOC PS 2, CSA O437 or CSA O325 and must be identified for grade, bond classification and performance category by a grade mark or certificate of inspection (by approved agency).
- Wood structural panels must comply with the grades specified in Table R503.2.1.1(1).
- Wood structural panels, permanently exposed in outdoor applications, must be of an exterior exposure durability.
- Wood structural panel roof sheathing exposed to the underside must be permitted to be of interior type bonded with exterior glue, identified as Exposure 1.
- Allowable unit stresses for fire-retardant-treated plywood, including fastener values, must be developed from an approved method of investigation that considers the effects of anticipated temperature and humidity to which the plywood will be subjected, the type of treatment and redrying process.
- Fire-retardant-t reated plywood must be graded by an approved agency.
- The max. allowable spans for wood structural panel roof sheathing must not exceed the values set forth in Table R503.2.1.1(1) or APA E30.
- Wood structural panel used as roof sheathing must be installed with joints staggered or not staggered in accordance with Table R602.3(1), APA E30 for wood roof framing or with Table R804.3 for cold-formed steel roof framing.
- Wood structural panel roof sheathing in accordance with Table R503.2.1.1(1) must not cantilever more than 9" beyond the gable endwall unless supported by gable overhang framing.

FLOOR SHEATHING



ROOF SHEATHING



MINIMUM THICKNESS OF LUMBER FLOOR SHEATHING *(Based on IRC Table R503.1)*

Joist or Beam Spacing (inches)	Minumum Net Thickness	
	Perpendicular to joist	Diagonal to joist
24	11/16	3/4
16	5/8	5/8
48	1½ T & G	N/A
54		
60		

MINIMUM THICKNESS OF LUMBER ROOF SHEATHING *(Based on IRC Table R803.1)*

Joist or Beam Spacing (inches)	Minumum Net Thickness (inches)
24	5/8
48	1½ T & G
60	
72	

ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF & SUBFLOOR SHEATHING & COMBINATION SUBFLOOR UNDERLAYMENT *(Based on IRC Table R503.2.1.1(1))*

Span Rating	Min. Nominal Panel Thickness (inches)	Allowable Live Load (psf)		Max. Span (inches)		Load (pounds per square foot, at maximum span)		Max. Span (inches)
		Span @ 16" o.c.	Span @24" o.c.	With edge support	Without edge support	Total Load	Live Load	
Sheathing				Roof				Subfloor
16/0	3/8	30	–	16	16	40	30	0
20/0	3/8	50	–	20	20	40	30	0
24/0	3/8	100	30	24	20	40	30	0
24/16	7/16	100	40	24	24	50	40	16
32/16	15/32, 1/2	180	70	32	28	40	30	16
40/20	19/32, 5/8	305	130	40	32	40	30	20
48/24	23/32, 3/4	–	175	48	36	45	35	24
60/32	7/8	–	305	60	48	45	35	32
Underlayment, C-C Plugged, Single Floor				Roof			Combination Subfloor Underlayment	
16 o.c.	19/32, 5/8	100	40	24	24	50	40	16
20 o.c.	19/32, 5/8	150	60	32	32	40	30	20
24 o.c.	23/32, 3/4	240	100	48	36	35	25	24
32 o.c.	7/8	–	185	48	40	50	40	32
48 o.c.	1-3/32, 1-1/8	–	290	60	48	50	40	48

ALLOWABLE SPANS FOR SANDED PLYWOOD COMBINATION SUBFLOOR UNDERLAYMENT *(Based on IRC Table R503.2.1.1(2))*

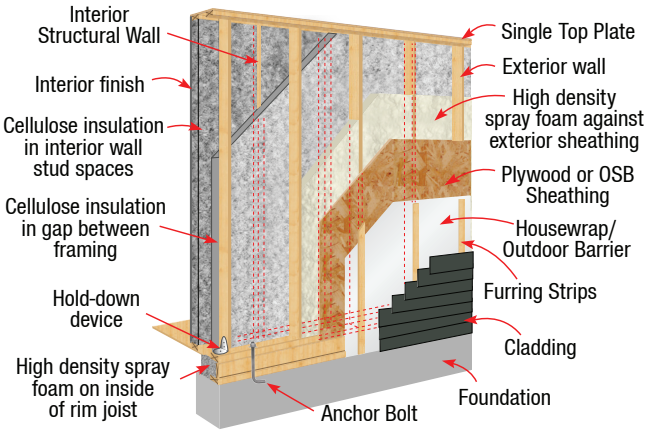
Identification	Spacing of Joists (inches)		
	16	20	24
Species Group	–	–	–
1	1/2	5/8	3/4
2, 3	5/8	3/4	7/8
4	3/4	7/8	1

FRAMING & WALL BRACING

TERM ALERT!

- **Braced wall line:** A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.
- **Braced wall line, continuously sheathed:** A braced wall line with structural sheathing applied to all sheathable surfaces including the areas above and below openings.
- **Braced wall panel:** A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel's length must meet the requirements of its particular bracing method and contribute toward the total amount of bracing required along its braced wall line, see Section R602.10.1.

WALL COMPONENTS



WOOD WALL FRAMING

(IRC R602.1.8; R602.1.9; R602.2; R602.3 & R602.3.1)

- Wood structural panel sheathing must conform to DOC PS 1, DOC PS 2 or CSA O325 or CSA O437, if manufactured in Canada.
- Particleboard must conform to ANSI A208.1.
- Panels and particleboards must be identified by a grade mark or certificate of inspection by an approved agency.
- Studs must be a min. No. 3, standard or stud grade lumber.
- Wall sheathing must be fastened directly to framing members.
- Sheathing placed on the exterior side of an exterior wall, must be capable of resisting the wind pressures listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) and must comply with Table R602.3(3).
- Wall sheathing used only for exterior wall covering must comply with Section R703.
- Studs must be continuous from support at the sole plate to a support at the top plate to resist loads perpendicular to the wall.
- Support must be a foundation or floor, ceiling or roof diaphragm.
- The size, height and spacing of studs must comply with Table R602.3(5).

WALL BRACING *(Based on IRC R602.10.1.)*

Length.

- The length of a braced wall line must be the distance between its ends.
- The end of a braced wall line must be the intersection with a perpendicular braced wall line, an angled braced wall line or an exterior wall.

Offsets.

- Exterior walls parallel to a braced wall line must be offset not more than 4 ft. from the designated braced wall line location.
- Interior walls used as bracing must be offset not more than 4 ft. from a braced wall line through the interior of the building.

Spacing.

- The spacing between parallel braced wall lines must be comply with Table R602.10.1.3.
- Intermediate braced wall lines through the interior of the building are permitted.

Angled walls.

- Any portion of a wall along a braced wall line must be permitted to angle out of plane for a max. diagonal length of 8 ft.
- Where the angled wall occurs at a corner, the length of the braced wall line must be measured from the projected corner.
- Where the diagonal length is greater than 8 ft., it is considered a separate braced wall line and must comply with the requirements of a braced wall line.

FASTENING SCHEDULE *(Based on IRC Table R602.3(1))*

Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing

Description of Building Elements	Number and Type of Fastener	Spacing of Fasteners	
		Edges (inches)	Intermediate Supports (inches)
3/8" – 1/2"	6d common (2" × 0.113") nail (subfloor, wall) 8d common (2½" × 0.131") nail (roof); or RSRS-01 (2⅜" × 0.113") nail (roof)	6	12
19/32" – 1"	8d common nail (2½" × 0.131"); or RSRS-01; (2⅜" × 0.113") nail (roof)	6	12
1⅛" – 1¼"	10d common (3" × 0.148") nail; or 8d (2½" × 0.131") deformed nail	6	12

Other Wall Sheathing

Description of Building Elements	Number and Type of Fastener	Spacing of Fasteners	
		Edges (inches)	Intermediate Supports (inches)
1/2" structural cellulosic fiberboard sheathing	1½" galvanized roofing nail, 7/16" head diameter, or 1¼" long 16 ga. staple with 7/16" or 1" crown	3	6
25/32" structural cellulosic fiberboard sheathing	1¾" galvanized roofing nail, 7/16" head diameter, or 1½" long 16 ga. staple with 7/16" or 1" crown	3	6
1/2" gypsum sheathing	1½" galvanized roofing nail; staple galvanized, 1½" long; 1¼" screws, Type W or S	7	7
5/8" gypsum sheathing	1¾" galvanized roofing nail; staple galvanized, 1⅝" long; 1⅝" screws, Type W or S	7	7

Wood structural panels, combination subfloor underlayment to framing

Description of Building Elements	Number and Type of Fastener	Spacing of Fasteners	
		Edges (inches)	Intermediate Supports (inches)
3/4" and less	6d deformed (2" × 0.120") nail; or 8d common (2½" × 0.131") nail	6	12
7/8" – 1"	8d common (2½" × 0.131") nail; or 8d deformed (2½" × 0.120") nail	6	12
1⅛" – 1¼"	10d common (3" × 0.148") nail; or 8d deformed (2½" × 0.120") nail	6	12

Note: This is an abridged table. For complete table see 2018 IRC Table R602.3(1).

REQUIREMENTS FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES *(Based on IRC Table R602.3(3))*

Minimum Nail		Min. Wood Structural Panel Span Rating	Min. Nominal Panel Thickness (inches)	Max. Wall Stud Spacing (inches)	Panel Nail Spacing		Ultimate Design Wind Speed V_{ult} (mph)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind Exposure Category		
							B	C	D
6d Common (2.0" × 0.113")	1.5	24/0	3/8	16	6	12	140	115	110
8d Common (2.5" × 0.131")	1.75	24/16	7/16	16	6	12	170	140	135
				24	6	12	140	115	110

ALLOWABLE SPANS FOR PARTICLEBOARD WALL SHEATHING *(Based on IRC Table R602.3(4))*

Thickness (inch)	Grade	Stud Spacing (inches)	
		Where siding is nailed to studs	Where siding is nailed to sheathing
3/8	M-1 Exterior glue	16	–
1/2	M-2 Exterior glue	16	16

BRACED WALL LINE SPACING *(Based on IRC Table R602.10.1.3)*

Application	Condition	Building Type	Braced Wall Line Spacing Criteria	
			Max. Spacing	Exception to Maximum Spacing
Wind Bracing	Ultimate design wind speed 100 mph to < 140 mph	Detached Townhouse	60 feet	None
Seismic Bracing	SDC A – C	Detached	Use wind bracing	
	SDC A – B	Townhouse	Use wind bracing	
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).
	SDC D_0, D_1, D_2	Detached, townhouses, one and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines must not exceed 25 feet.
	SDC D_0, D_1, D_2	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).

BRACED WALL PANELS & SHEATHING

BRACING METHODS
(Based on IRC R602.10.4)

- Intermittent sheathed braced wall panels must be constructed in accordance with Section R602.10.4.1.
- Continuously sheathed braced wall panels must be constructed in accordance with Section R602.10.4.2
- Intermittent and continuously sheathed braced wall panels must comply with Table R602.10.4.

Intermittent Bracing Methods

- **LIB**: Let-in-bracing
- **DWB:** Diagonal wood boards
- **WSP:** Wood structural panel
- **BV-WSP:** Wood structural panels with stone or masonry veneer
- **SFB:** Structural fiberboard sheathing
- **GB:** Gypsum board
- **PBS:** Particleboard sheathing
- **PCP:** Portland cement plaster
- **HPS:** Hardboard panel siding
- **ABW:** Alternate braced wall
- **PFH:** Portal frame with hold-downs
- **PFG:** Portal frame at garage

Continuous Sheathing Methods

- **CS-WSP:** Continuously sheathed wood structural panel
- **CS-G:** Continuously sheathed wood structural panel adjacent to garage openings
- **CS-PF:** Continuously sheathed portal frame
- **CS-SFB:** Continuously sheathed structural fiberboard

BRACED WALL PANELS *(Based on IRC R602.10.2)*

- Braced wall panels must be full-height sections of wall without vertical or horizontal offsets.
- Braced wall panels must be constructed and placed along a braced wall line in accordance with this section and the bracing methods specified in Section R602.10.4.

Braced wall panel uplift load path.

- The bracing lengths in Table R602.10.3(1) apply only when uplift loads are resisted in accordance with Section R602.3.5.

Location of braced wall panels

- A braced wall panel must begin within 10 ft. from each end of a braced wall line as determined by Section R602.10.1.1 the length of the braced wall line.
- The distance between adjacent edges of braced wall panels along a braced wall line must not exceed 20 ft.

Location of braced wall panels in Seismic Design Categories D_0, D_1 and D_2

- Braced wall panels must be located at each end of a braced wall line.

Minimum number of braced wall panels

- Braced wall lines with a length of 16 ft. or less must have a minimum of:
  - 2 braced wall panels of any length or
  - 1 braced wall panel equal to 48" or more.
- Braced wall lines greater than 16 ft. must have not less than 2 braced wall panels.

CONTINUOUS SHEATHING METHODS
(Based on IRC R602.10.4.2)

Continuous sheathing methods require structural panel sheathing to be used on all sheathable surfaces on one side of a braced wall line including areas above and below openings and gable end walls and must meet the requirements of Section R602.10.7.

REQUIRED LENGTH OF BRACING *(Based on IRC R602.10.3)*

The length of bracing along each braced wall line must be determined as follows:

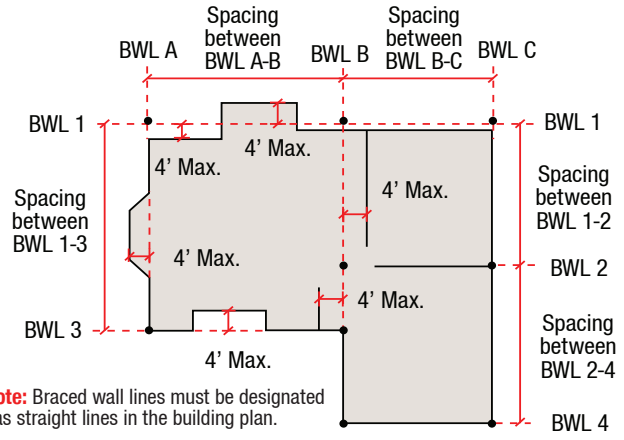
1. All buildings in Seismic Design Categories A and B must use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).
2. Detached buildings in Seismic Design Category C must use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).
3. Townhouses in Seismic Design Category C must use the greater value determined from Table R602.10.3(1) or R602.10.3(3) and the applicable adjustment factors in Table R602.10.3(2) or R602.10.3(4), respectively.
4. All buildings in Seismic Design Categories D_0, D_1 and D_2 must use the greater value determined from Table R602.10.3(1) or R602.10.3(3) and the applicable adjustment factors in Table R602.10.3(2) or R602.10.3(4).

Only braced wall panels parallel to the braced wall line must contribute toward the required length of bracing of that braced wall line.

MIN. LENGTH OF A BRACED WALL PANEL *(Based on IRC R602.10.5)*

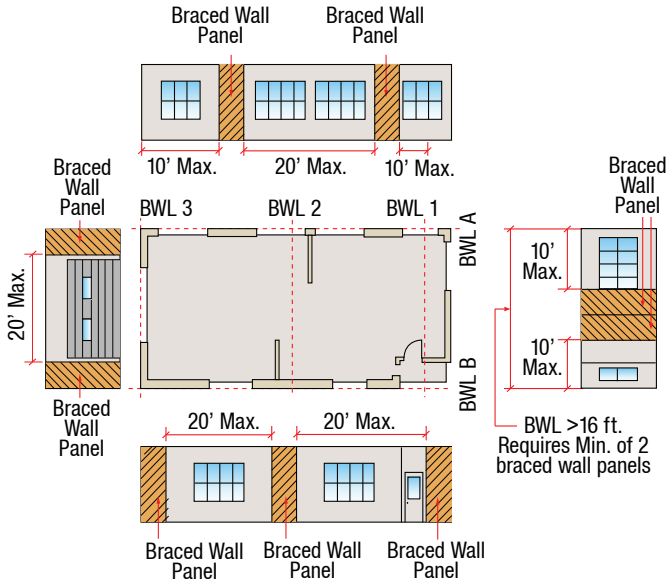
- The min. length of a braced wall panel must comply with Table R602.10.5.
- For Methods CS-WSP and CS-SFB, the min. panel length must be based on the adjacent clear opening height, see Table R602.10.5.
- Where a panel has an opening on either side of differing heights, the taller opening height must be used to determine the panel length.
- For computing required length of bracing in Tables R602.10.3(1) & (3), the contributing length of each braced wall panel must be as specified in Table R602.10.5.
- For Methods DWB, WSP, SFB, PBS, PCP and HPS in Seismic Design Categories A, B and C, panels between 36" and 48" in length are considered a braced wall panel and are permitted to partially contribute toward the required length of bracing in Tables R602.10.3(1) and R602.10.3(3), and the contributing length must be determined from Table R602.10.5.2.

TYPICAL BRACED WALL LINE PLAN



Note: Braced wall lines must be designated as straight lines in the building plan.

LOCATION OF BRACED WALL PANELS



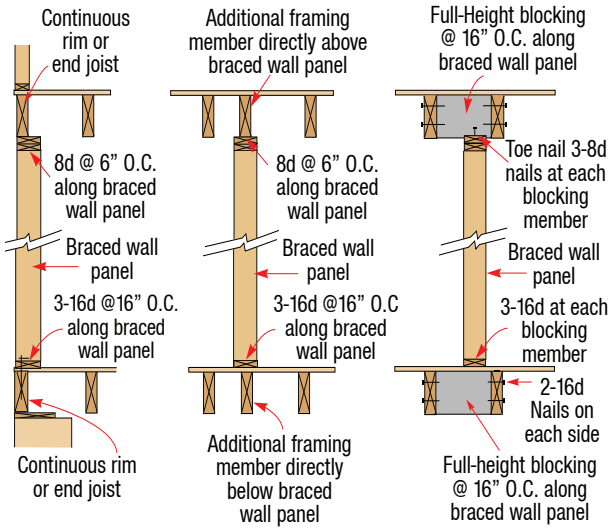
MINIMUM LENGTH OF BRACED WALL PANELS *(Based on IRC Table R602.10.5)*

Method		Minimum Length (inches) Wall Height 8 ft.	9 ft.	10 ft.	11 ft.	12 ft.	Contributing Length (inches)
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual
LIB		55	62	69	NP	NP	Actual
CS-G		24	27	30	33	36	Actual
ABW	SDC A, B and C, ultimate design wind speed < 140 mph	28	32	34	38	42	48
	SDC D_0, D_1 and D_2, ultimate design wind speed < 140 mph	32	32	34	NP	NP	
CS-WSP, CS-SFB	Adjacent clear opening height (inches)						
	≤ 64	24	27	30	33	36	Actual
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
Method (See Table R602.10.4)		**Portal header height 8 ft.**	**9 ft.**	**10 ft.**	**11 ft.**	**12 ft.**	
PFH	Supporting roof only	16	16	16	Note c	Note c	48
	Supporting one story and roof	24	24	24	Note c	Note c	
CS-PF	SDC A, B and C	16	18	20	Note e	Note e	1.5 × Actual
	SDC D_0, D_1 and D_2	16	18	20	Note e	Note e	Actual
PFG		24	27	30	Note d	Note d	1.5 × Actual

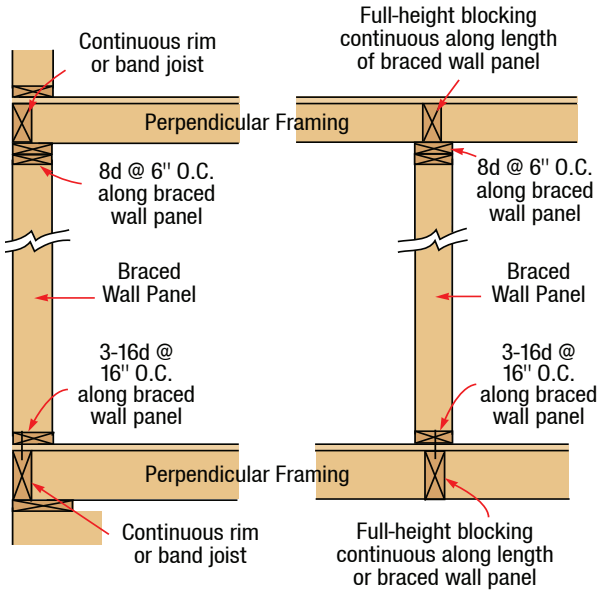
Note: This is an abridged table. For complete table see 2018 IRC Table R602.10.5

BRACED WALL CONNECTIONS

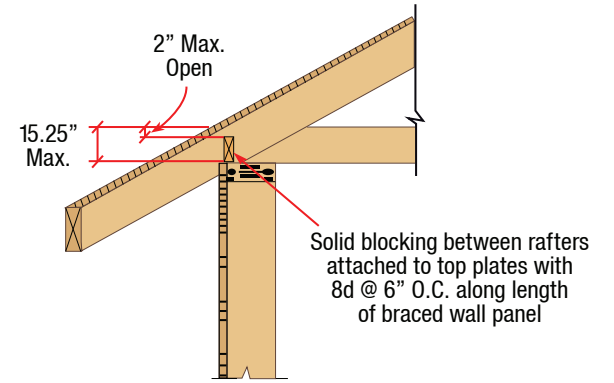
BRACED WALL PANEL CONNECTION WHEN PARALLEL TO FLOOR/CEILING FRAMING



BRACED WALL PANEL CONNECTION WHEN PERPENDICULAR TO FLOOR/CEILING FRAMING



BRACED WALL PANEL CONNECTION TO PERPENDICULAR RAFTERS



ENDS OF BRACED WALL LINES WITH CONTINUOUS SHEATHING *(Based on IRC R602.10.7)*

Each end of a braced wall line with continuous sheathing must have one of the conditions shown in End Conditions For Braced Wall Lines With Continuous Sheathing figure.

BRACED WALL PANEL CONNECTIONS

(Based on IRC R602.10.8 - R602.10.8.1)

Braced wall panels must be connected to floor framing or foundations as follows:

- Where joists are perpendicular to a braced wall panel above or below, a rim joist, band joist or blocking must be provided along the entire length of the braced wall panel.
- Fastening of top and bottom wall plates to framing, rim joist, band joist or blocking must comply with Table R602.3(1).
- Where joists are parallel to a braced wall panel above or below, a rim joist, end joist or other parallel framing member must be provided directly above and below the braced wall panel.
- Where a parallel framing member cannot be located directly above and below the panel, full-depth blocking at 16-inch spacing must be provided between the parallel framing members to each side of the braced wall panel.
- For fastening of blocking and wall plates see Table R602.3(1).
- Connections of braced wall panels to concrete or masonry must comply with Section R403.1.6.
- Seismic Design Categories D_0, D_1 and D_2: Braced wall panels must be fastened to required foundations and top plate lap splices must be face-nailed with not less than eight 16d nails on each side of the splice. See Section R602.11.1.

CONNECTIONS TO ROOF FRAMING

(Based on IRC R602.10.8.2)

- Top plates of exterior braced wall panels must be attached to rafters or roof trusses above. See Table R602.3(1).
- Blocking between rafters or roof trusses must be attached to top plates of braced wall panels and to rafters and roof trusses. See Table R602.3(1).
- A continuous band, rim or header joist or roof truss parallel to the braced wall panels is permitted to replace the blocking required by this section.
- Blocking is not required over openings in continuously sheathed braced wall lines.
- Lateral supports must be provided for rafters and ceiling joists and trusses. See Section R802.8 and R802.10.3.
- Roof ventilation must comply with Section R806.1.

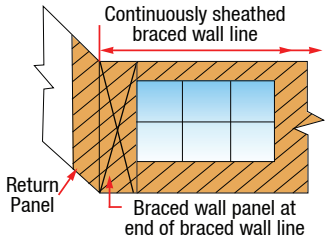
Seismic Design Categories A, B and C

- Where the distance from the top of the braced wall panel to the top of the rafters or roof trusses above is 9¼" or less, blocking between rafters or roof trusses is not required.
- Where the distance from the top of the braced wall panel to the top of the rafters or roof trusses above is between 9¼" and 15¼, blocking between rafters or roof trusses must be provided above the braced wall panel.

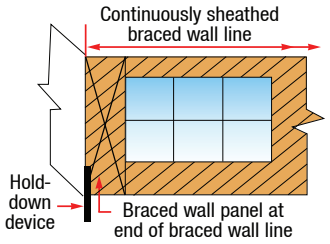
Seismic Design Categories D_0, D_1 and D_2

- Where the distance from the top of the braced wall panel to the top of the rafters or roof trusses is 15¼ or less, blocking between rafters or roof trusses must be provided above the braced wall panel.
- Where the distance from the top of the braced wall panel to the top of rafters or roof trusses exceeds 15¼", the top plates of the braced wall panel must be connected to perpendicular rafters or roof trusses above with one or more of the following methods: Soffit blocking panels, Vertical blocking panels, Blocking panels, blocking or other methods.

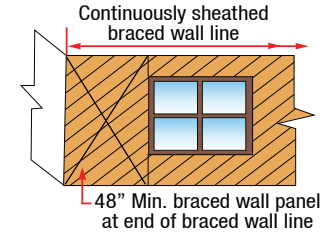
END CONDITIONS FOR BRACED WALL LINES WITH CONTINUOUS SHEATHING



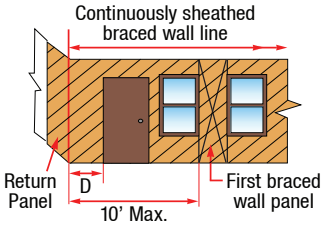
End Condition 1



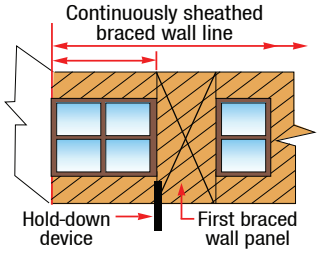
End Condition 2



End Condition 3



End Condition 4



End Condition 5

Return panel: 24" for braced wall lines sheathed with wood structural panels. 32" for braced wall lines sheathed with structural fiberboard.

Distance D: 24" for braced wall lines sheathed with wood structural panels. 32" for braced wall lines sheathed with structural fiberboard.

Hold-down device: 800 lbs. capacity fastened to the edge of the braced wall panel closest to the corner and the foundation or floor framing below.

BUILDER'S BOOK, INC. BOOKSTORE & PUBLISHER For additional copies, a full line of Codes, Reference Books, or other resources related to this topic, call 1 (800) 273-7375 or Fax (818) 887-7990 or visit the store at 8001 Canoga Avenue, Canoga Park CA 91304. or the website: www.buildersbook.com.

ISBN-13:978-1-62270-190-2
ISBN-10:1-62270-190-9
U.S. $9.95