CITY OF PALO ALTO

DEVELOPMENT SERVICES – BUILDING INSPECTION

INSPECTION GUIDELINES: ROOF/EXTERIOR SHEATHING/STRUCTURAL FRAME

INSPECTION CODE: 216

SCOPE: RESIDENTIAL

CODES ENFORCED: 2016 CBC, CRC, CPC, CMC, CEC, CALGreen, CEnC, and PAMC

The information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.

IMPORTANT

☐ Failure to complete the items below prior to the City of Palo Alto (CPA) inspection will result in a re-inspection fee.

☐ The "Construction Hours" sign and address shall be posted on all job sites prior to inspection.

☐ If utilities such as gas/electric are being used, but are found to be unsafe at time of inspection, they will be removed and will not be reconnected until Final Inspection.

☐ Following approval of this inspection, when exterior lath/type "D" paper is installed and approved by a Building Inspector, it should be covered immediately (typically within 7 days and no longer than the time allowed by the manufacturer) by stucco or other approved building finish wall materials.

☐ NOTE: This inspection cannot be phased. At time of this inspection, all structural work shall be completed, including but not limited to: shear transfers, load paths, nailing (roof and walls), straps, hold downs, clips, fasteners, engineered panels, moment frames. Temporary weather protection of structure shall not obstruct inspection. (CBC 110.5, CBC 110.3.4)

☐ This inspection must be scheduled in conjunction with Daylight Plane (Inspection Code 215).

PRE-INSPECTION

☐ Prior to inspection, all required sequential inspections and correction notices must be completed.

DEFERRED SUBMITTALS

☐ All deferred submittals, including trusses, shall be stamped by architect and/or engineer, approved by CPA, and be on site at the time of this inspection.

PLAN REVISIONS

☐ Any changes from the approved plans shall be revised and be CPA-approved prior to this inspection.

SPECIAL INSPECTION REPORTS

☐ All special inspection field reports, such as shop and field welding, installation of epoxy and expansion anchors, etc., shall be on site at time of inspection. A copy of the report shall be sent to the City of Palo Alto with job address, permit number, and type of inspection. Field reports shall include a copy of the Special Inspectors ICC Certification/ID.

BASEMENTS

☐ All structures require joist inspection prior to installation of subfloor including buildings with a basement. DO NOT install the subfloor prior to the joist inspection—NO EXCEPTIONS. Contractor is subject to a Stop Work Order and re-inspection fee when covering work or joists without inspection. The contractor will be required to provide equipment (i.e. scaffolding) and lighting to do the joist inspection if this step is skipped.

ENGINEERED TRUSS SYSTEMS

☐ See "Trusses" Inspection Checklist for more information.

INSPECTION

FRAMER AND ENGINEER/SPECIAL INSPECTOR REPORT

☐ The framer must be on site for inspection.

☐ Provide the building inspector with the engineer of record site observation report, if required, per approved plans. (CBC 1704.6)

☐ Field and shop reports shall be on site at time of inspection. (CBC 1704.2.4)

- Note: City of Palo Alto Building Inspectors do not perform Special Inspections.

ENERGY REQUIREMENTS (TITLE 24)

☐ Verify the energy requirements in the Title 24 sheet to determine if radiant barrier is required in roof sheathing. Radiant barrier sheathing is also required to be installed at the gable end walls. (CEC 150.1(c)2)

DAYLIGHT PLANE

☐ Verify daylight plane per approved plans. Daylight plane is measured at the required side setbacks and from the average grade. Average grade is established using existing grade, before any paving or fill (not measured from top of slab or foundation). (PAMC 18.12.040)

☐ Upon request by the Building Inspector, contractor to provide a certification (usually from a surveyor) that the structure, as built, complies with the daylight plane provisions (although it is recommended to have the certification at the jobsite at time of inspection). (PAMC 18.12.040 (ii))

ANCHORAGE

GENERAL

☐ Verify sill plate is sized per plan specifications and sealant, adhesive or gasket is installed between slab/foundation and sill plate to limit infiltration and exfiltration. (CEC 110.7)

☐ Verify that all anchor bolts and holdowns anchors are sized and spaced per shearwall schedule. Install minimum 2 anchor bolts/straps per piece of sill plate. (CBC 2308.3.1)

☐ Sill plate washer size shall be a minimum of 0.229" x 3" x 3". The hole in the washer may be slotted provided a standard cut washer is placed between the plate washer and the nut. (CBC 2308.3.2)

☐ Bolts shall be installed not less than 4" from end of the sill and not more than 12" from end of sill for each piece. (CBC 2308.3.1)

☐ Minimum anchor bolt size of 5/8" diameter and 7" embedment are required. (CBC 2308.3.1, Exceptions 1 and 2)

HOLDOWNS

☐ Openings, including air vents, are not allowed under hold-downs (see CPA Figure 038). Holdowns must be installed flush or raised off the sill plate. If raised off the sill plate, install per the manufacturer's recommendations.

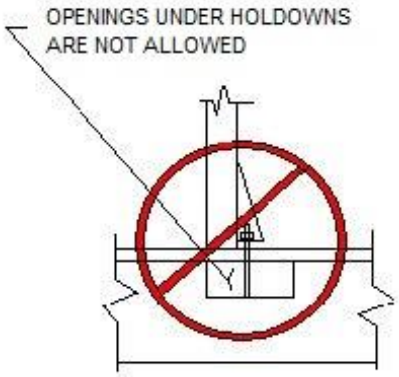


Figure CPA 038 – Openings under Holdowns

☐ Install full-height posts at all hold-downs. The grade of posts must be No. 2 or better. Posts may consist of multiple members, provided they are connected independently of the holdown fasteners.

☐ Verify beam, joist, post and rafter size, grade, and connections (including second floor joist and beam connections).

EPOXIED, POST-INSTALLED, AND EXPANSION ANCHORS

☐ Epoxy anchor bolt installation requires special inspection. (CBC 1705.1.1(3), CBC 1705.12.2 (2))
- Oversized holes are no longer expectable; the maximum oversize tolerance is 1/8".
- Verify if fire rated walls/systems allow for epoxy anchor bolts. Epoxy is not recommended because it melts under high heat; expansion anchor bolts are recommended.
- *Note: Epoxy anchor bolts must be installed per the manufacturer's recommendations and must abide by the installation instructions listed in the ICC ES report (or equivalent).*

☐ Post-installed screw anchor bolts, such as Titen HD, require special inspection. (CBC 1705.1.1(3), CBC 1705.12.2 (2))
- Placement of individual anchors for missing bolts may be inspected by project engineer.
- Requires 3" x 3" plate washer.
- Minimum size 3/4" diameter. (Note: ICC-ESR report does not include 5/8" diameter bolt.)
- *Note: Post-installed screw anchor bolts must be installed per the manufacturer's recommendations and must abide by the installation instructions listed in the ICC ES report (or equivalent).*

☐ Expansion anchors, including torque of expansion anchors, require special inspection. (CBC 1705.1.1(3), CBC 1705.12.2 (2))
- Expansion anchor bolt shall have a clearance not less than 2-1/2" from foundation/slab/CMU edge; 2x6 members, and larger, works with this requirement, so a 2x4 mudsill would not work.
- Verify that the expansion anchor bolt is the correct size for the mudsill, cross check the symbol on top of anchor bolt with the manufacturers table, and verify the maximum offset.
- *Note: Expansion anchor bolts must be installed per the manufacturer's recommendations and must abide by the installation instructions listed in the ICC ES report (or equivalent).*

FLOORS

GENERAL

☐ See attached CBC Fastening schedule Table 2304.10.1

☐ Floor joists, ceiling joists, and roof rafters shall be laterally supported at ends and at each support with solid blocking, except when the ends are nailed to a header, rim joist, or by other approved methods. (CBC 2308.8.2, CBC 2308.4.2.3) (See Figure CPA 033).

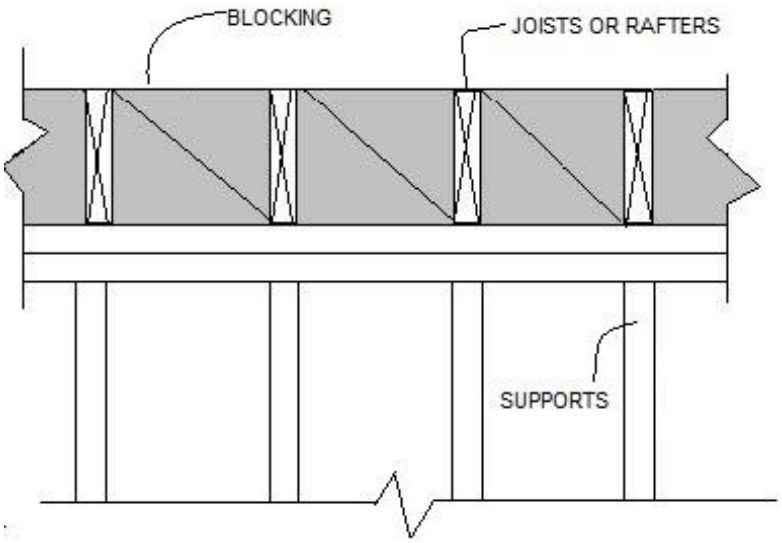


Figure CPA 033 – Blocking at Joists/Rafters

☐ Verify camber of pre-engineered beam is "Top Up".

☐ Install double joist under bearing walls. (See Figure CPA 034). (CBC 2308.4.5)

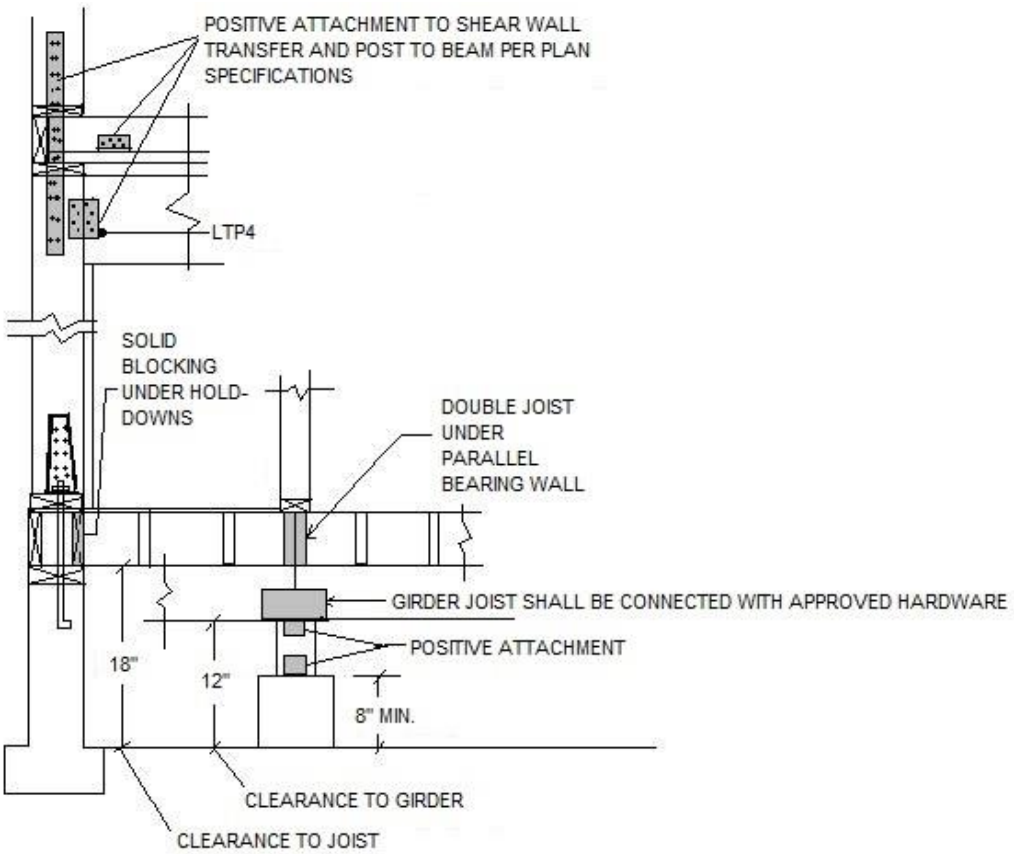


Figure CPA 034 – Double Joist under Parallel Bearing Wall

PROTECTION AGAINST WOOD DECAY AND PRESERVATIVE TREATED (PT) WOOD

- ☐ Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6" from the ground or less than 2" measured vertically from concrete steps, porch slabs, patio slabs, and similar horizontal surfaces exposed to the weather shall be naturally durable wood or wood that is preservative-treated. (CRC R317.1 (5))
- ☐ Wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8" from the exposed ground shall be naturally durable wood or pressure treated. (CRC R317.1(2))

- ☐ Fasteners for pressure treated wood and fire-retardant-treated wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. (CBC 2304.10.5.1)

- ☐ Connectors that are used in exterior applications and in contact with preservative-treated wood shall have coating types and weights in accordance with the treated wood or connector manufacturer's recommendation. (CBC 2304.10.5.1)
    - Joist hangers/post brackets/flashing (all hardware) shall be hot-dipped galvanized or Simpson's Zmax line. (Zmax and HDG are two separate coating options.)

- ☐ Ends of all pressure-treated lumber shall be treated with copper green per Western Wood Preservers Institute.

STAIRS

- ☐ Make sure that headroom clearance at stairs is a minimum of 6'-8" (6'-6"for spiral stairs) (CRC R311.7.2, CRC R311.7.10.1)

ACCESS OPENINGS

- ☐ Crawl space openings shall be a minimum of 18" x 24." (CRC R408.4)
- ☐ When an attic has a clear height of 30" or more, an opening of at least 20"x30" shall be provided with headroom of 30" minimum. When mechanical equipment is installed in the attic, the size of the opening shall be a minimum of 22"x30" or as required by the CMC Chapter 9. (CRC R807, CMC 9).

DRAFTSTOPPING

- ☐ Draftstopping is required in Group R-3 building with two dwelling units. (CBC 718.3.2)
    - Exception: Not required in building with an automatic fire sprinkler system installed in the combustible concealed spaces where the draftstopping is being omitted.

- ☐ Draftstopping materials shall be not less than (CBC 718.3.1):
    - 1/2" gypsum board
    - 3/8" particle board
    - 1" nominal lumber
    - Cement fiberboard, batts or blankets of mineral wool or glass fiber
    - Other approved materials adequately supported

WALLS

GENERAL

☐ Verify that wall and roof framing will accommodate required insulation (need to cross check the Title-24 requirements and with the structural framing requirements). (CEC 150.0(c))

☐ Remove all shiners (nails) in roof and wall sheathing and re-nail into framing member. (CBC 2308.8.2)

☐ Verify exterior elevations are per approved plan. Plans shall be revised and CPA-approved when adding, eliminating doors, windows, etc. prior to this inspection.

☐ Studs shall be sized and spaced per plans. (CBC 2304.2, CBC 2304.3)

FIREBLOCKING

☐ Fireblocking shall be provided in the following locations (CRC R302.11):

- Vertically at the ceiling and floor levels
- Horizontally at intervals not exceeding 10’ (including concealed and furred wall spaces)
- At interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, and cove ceilings
- In concealed spaces between stair stringers at the top and bottom of the run
- Furred construction at fire rated walls such as dwelling and garage separation

☐ Fire blocking materials shall be (CRC R302.11.1)

1. Two-inch nominal lumber
2. Two thicknesses of 1” nominal lumber with broken lap joints,
3. One thickness of 23/32” wood structural panels with joints backed by 23/32” wood structural panels
4. One thickness of 3/4" particleboard with joints backed by 3/4" particleboard
5. One 1/2" gypsum board
6. One 1/4" cement-based millboard
7. Batts or blankets of mineral wool or glass fiber or other approved materials listed in such a manner as to be securely retained in place.
8. Cellulose insulation installed as tested in accordance with ASTM E119 or UL 263, for the specific application.

☐ 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 (such as Touch ‘n Seal Gun Foam II or listed fire blocking caulk). (CRC R302.11 (4))

☐ At chimneys, minimum 1” thick noncombustible fire blocking securely fastened between wood framing and masonry chimney and shall be supported on metal lath and no closer than 2” clearance from chimney to framing (see CPA Figure 039). (CBC 2111.12, CBC 2111.13, CBC 2113.20)

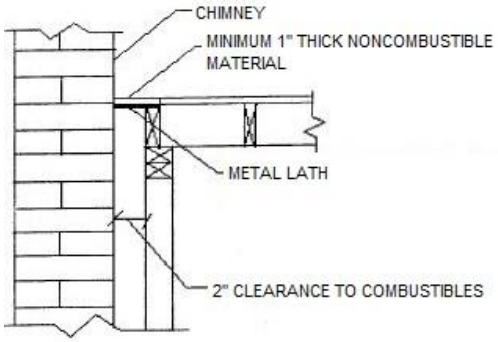


Figure CPA 039 – Chimney Fireblocking

FIREWALLS

☐ Firewalls are required per Tables R302.1(1) and R302.1(2).

TABLE R302.1(1)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119 or UL 263 with exposure from both sides	< 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside[a, b]	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	N/A	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.
N/A = Not Applicable.
a. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
b. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.

TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS *AND ACCESSORY BUILDINGS WITH AUTOMATIC RESIDENTIAL FIRE SPRINKLER PROTECTION*

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119 or UL 263 with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet[a]
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside[b, c]	2 feet[a]
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	N/A	< 3 feet
	Unlimited	0 hours	3 feet[a]
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet[a]

For SI: 1 foot = 304.8 mm.
N/A = Not Applicable

a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section *R313*, the fire separation distance for nonrated exterior walls and rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.
b. The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
c. The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.

☐ When concrete foundation stem wall spalls, exposing plastic pipes in foundation stem wall or fire rated wall separations, the pipe shall be protected with a metal plate and intumescent fire barrier striping secured with masonry screws (see CPA Figure 040).

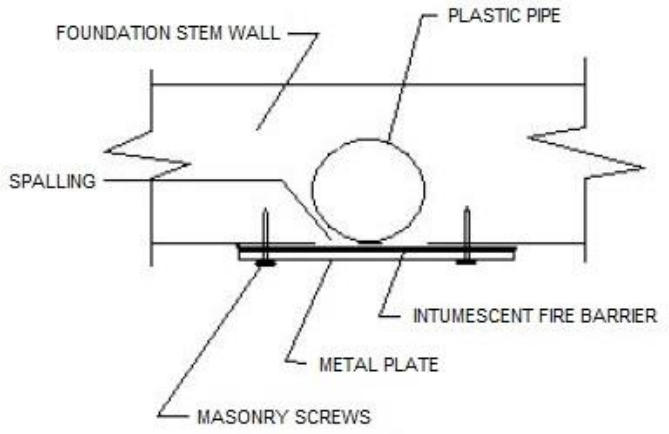


Figure CPA 040 – Pipes in Stem Walls

SHEAR WALLS

☐ All nailing shall be complete (e.g., boundary nailing, sill, shear, etc.) prior to inspection. (CBC 110.3.4)

☐ Strap around corners and over ridge where top plates are not overlapped. (CBC 2308.8.2)

☐ Mark type of shear wall nailing on plywood (e.g., 4/12 for a wall with 4" on center nail spacing).

☐ Double shear walls panel edges shall be staggered (see CPA Figure 035).

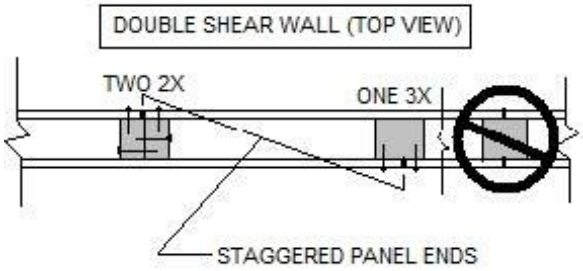


Figure CPA 035 – Staggered Sheathing on Double Shear Walls

☐ Where framing members are not continuous from foundation sill to roof, the members shall be secured to ensure a continuous load path. Verify shear transfer/Load path to all floors with galvanized steel sheet metal clamps, ties or clips (see Figure CPA 034). (CBC 2304.10.6)

☐ Verify blocking at interior and exterior shearwalls is a minimum 4' on center when joist is parallel to walls, boundary nailing 5-10d., edge nailing (see CPA Figure 036).

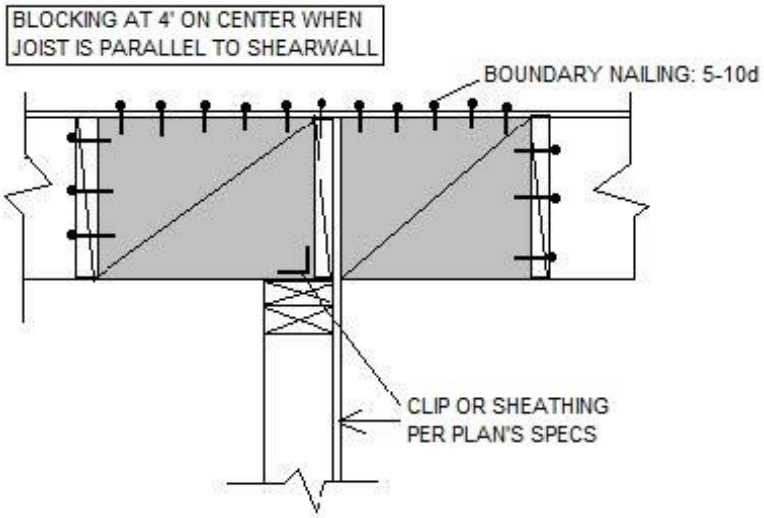


Figure CPA 036 – Blocking at Shearwalls

☐ Openings in shearwalls are not allowed unless fully detailed on approved plans by engineer of record, and shall have their edges adequately reinforced to transfer all shearing stresses. (CBC 2305.1.1)

- Surface mounting electrical panels is recommended.

☐ Common misapplication of systems such as Hardy Panels and Simpson Strong-Tie walls include: missing bearing plates, cripple walls over shear assembly, oversized filler block, wrong size screws, etc. Please verify installation instructions and contact the engineer of record for discrepancies.

☐ Unless otherwise directed by panel manufacturer, provide 1/8" space at panel ends and edges. American Plywood Association (see CPA Figure 037). (CBC 2306.3)

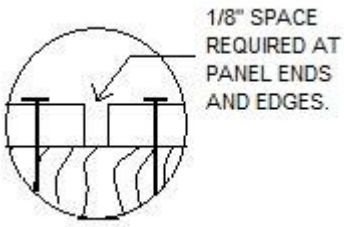


Figure CPA 037 – Panel Edges

☐ Complete all shearwalls and transfer per details. (ASCE 7)

☐ Install all hardware (e.g., anchor bolts, hold-downs, straps and clips, bolts and screws). (CBC 2308.8.2)

☐ Verify nailing for underfloor blocking at shearwalls and at exterior walls where joists run parallel. Mark with paint for easy identification. (CBC 2308.8.2)

☐ Openings under shearwalls, such as air vents, shall be indicated on approved plans. !

MANUFACTURED SHEAR ASSEMBLIES

☐ Periodic special inspection is required for installation of manufactured shear panels/seismic-force-resisting systems. (CBC 1707.1)
- The engineer of record is allowed to provide special inspection/report for R-3 and U occupancies only.
- The special inspector shall verify the following in a written report prior to CPA Inspection:
  - Proper holdown anchor size and placement with respect to embedment length, spacing, and edge distance
  - Snug-tight conditions of bolting
  - Proper connections to the member above in accordance with the approved plans

☐ The approved set of plans shall specify the maximum height of filler/blocking over shear assemblies and must not be more than 12”.
- NOTE: The manufacturer’s generic details do not waive the required engineering for maximum height of blocking above shear panel, and must be stated on plans—no exceptions (see Figure CPA 041).

- ☐ Manufactured shear assemblies such as Hardy Frames and Simpsong Strong-Walls, shall be installed per manufacturer's specifications.
  - Verify crush/bearing plates, screws, straps are installed per plan specifications.
  - Verify washers are installed and nuts are tightened until "snug-tight" then complete with one full turn or per manufactured specifications.
  - Verify solid 4x blocking below raised floor system. (Recommend PSL or LSL to reduce shrinkage). For existing covered floor, the contractor shall provide inspector with photo of solid blocking or drill hole in floor and provide a video inspection of blocking or remove floor sheathing for visual inspection.
  - Verify if oversize concrete is required.

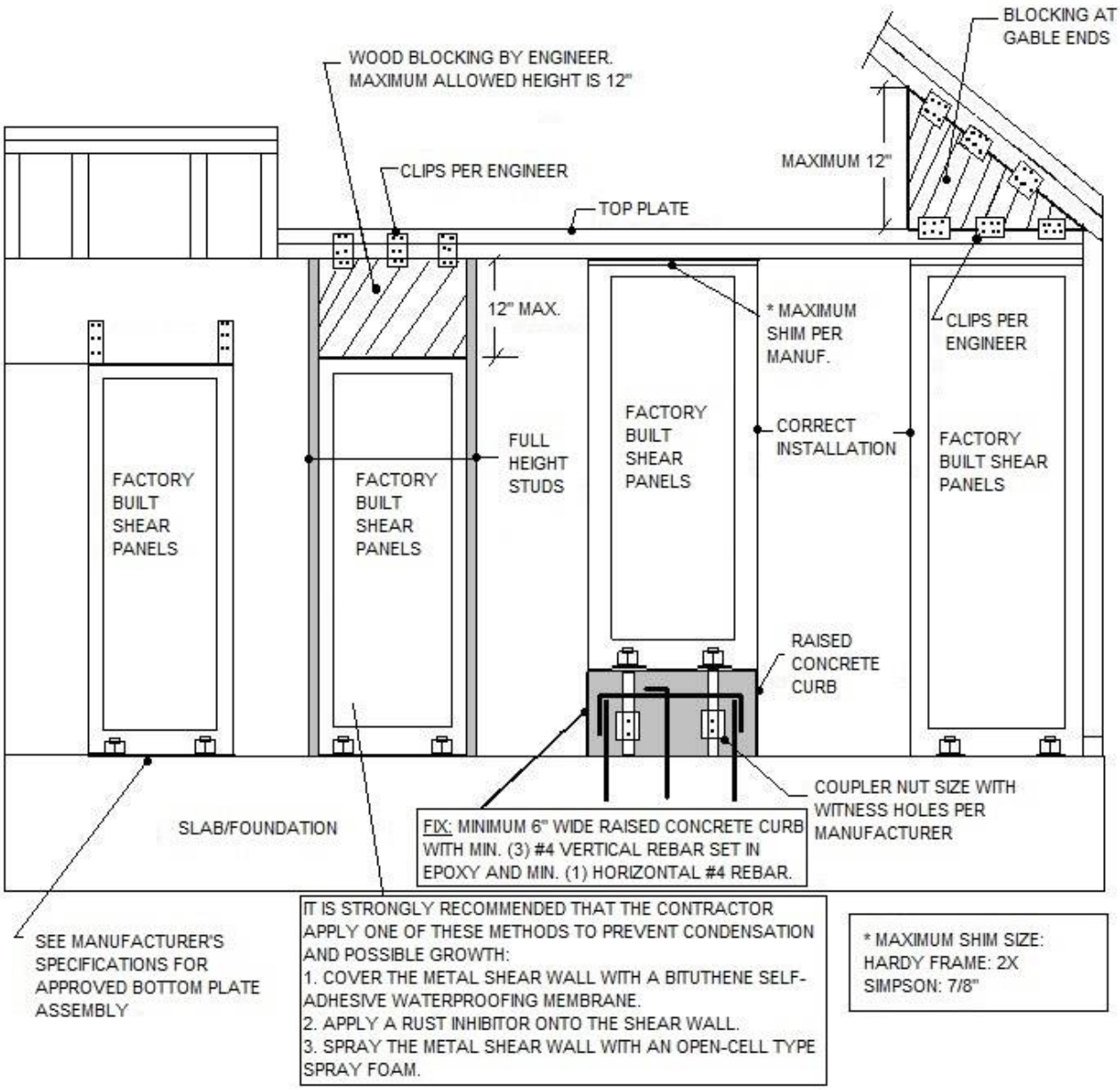


Figure CPA 041 – Manufactured Shear Walls

PLATES

☐ Bearing and exterior wall studs shall be capped with double top plates. (CBC 2308.5.3.2)

☐ End joints shall be offset a minimum of 48” and nailed with a minimum of eight 16d on each side of joint. Plates shall be a nominal 2” in depth and have a width not less than the width of the stud. (CBC 2308.5.3.2)

☐ Single top plate is allowed if adequately tied at joint, corners and intersections with a minimum 3”x 6”x 0.036” thick galvanized steel plate that is nailed to each wall or segment with a minimum six 8d nails provided rafter, joist, or trusses are centered over the stud with a tolerance of no more than 1”. (CBC 2308.5.3.2, Exception)

☐ When studs are spaced 24” on center under top plate, joist or trusses shall bear within 5” of studs or a third plate shall be insatlled. (CBC 2308.5.3.2)

CEILINGS/ROOFS

OPENINGS AND SKYLIGHTS

☐ Trimmer and header joists shall be doubled where the span of the header exceeds 4’. The end of the header joists more than 6’ long shall be supported by joist hangers or anchor clips. (CBC 2308.4.4)

☐ Unit skylights installed with a pitch flatter than three units vertical in 12 units horizontal (25% slope), shall be mounted on a curb extending not less than 4” above the plane of the roof unless otherwise specified by the manufacturer’s installation instructions. (CRC R308.6.8)

☐ Ceiling joists and rafters shall be nailed to each other and nailed to the top plate. Where ceiling joists are not parallel to rafters, an equivalent rafter tie shall be installed at a spacing no more than 4’ on center. (CBC 2308.7)

☐ Verify low roof/wall shear transfer and blocking, if applicable, at roof and at first floor framing. Leave plywood un-nailed for inspection at this area. (CBC 2305.1)

VENTILATION

☐ Enclosed rafter spaces shall have cross ventilation for each separate space (CRC R806.2)

- Provide 50 % of the required ventilating area at the upper portion of the space and the balance at the eave/lower area of the space.
- Minimum 1” airspace is required between insulation and roof sheathing.
- Net free ventilating area shall not be less than 1 square foot/150 square feet of the space ventilated.
  - Exception: Spray foam insulation

☐ For cathedral ceiling ventilation, see Figure CPA 042.

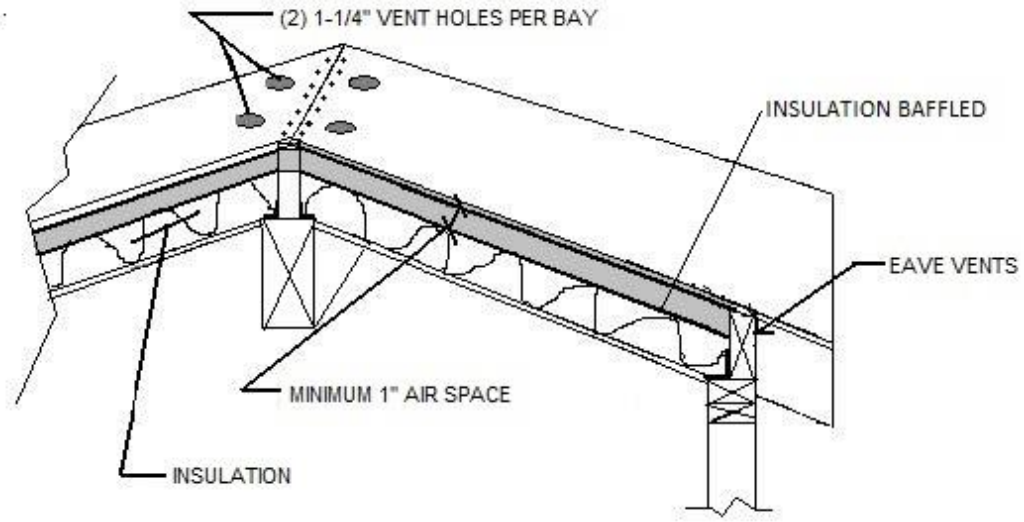


Figure CPA 042 – Ridge Ventilation

CONNECTIONS

GENERAL

☐ Provide positive attachment from post to beam, girder and header, use LPT-4 (flattened A-35 is not allowed) (see Figure CPA 034). (CRC R502.9 , CBC 2304.10.7)

☐ Notching of wood framing to accommodate hanger is a miss-application of hanger and diminishes the engineered load capacity of the framing member. (CBC 2308.8.2)

☐ Engineering letter required for use of hanger in this application stating engineer checked span and calculations, and application is acceptable to engineer of record. (CBC 2308.8.2)

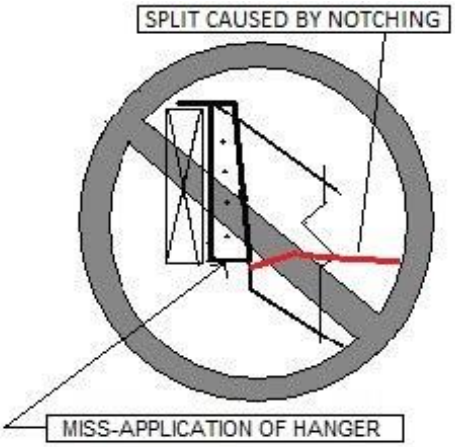


Figure CPA 043 – Miss-application of Hanger

☐ Coil strapping is a suggestion only to be approved by engineer of record by letter stating gage, size and nail specifications or wood framing member to be replaced. (CBC 2308.8.2)

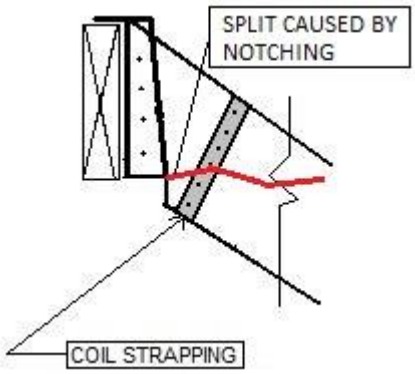


Figure CPA 044 – Coil Strapping

☐ When hanger is required, recommend skewed/sloped hanger such as LSSU. (CBC 2308.8.2)

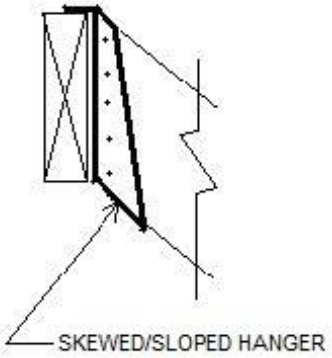


Figure CPA 045 – Skewed/Sloped Hanger such as LSSU.

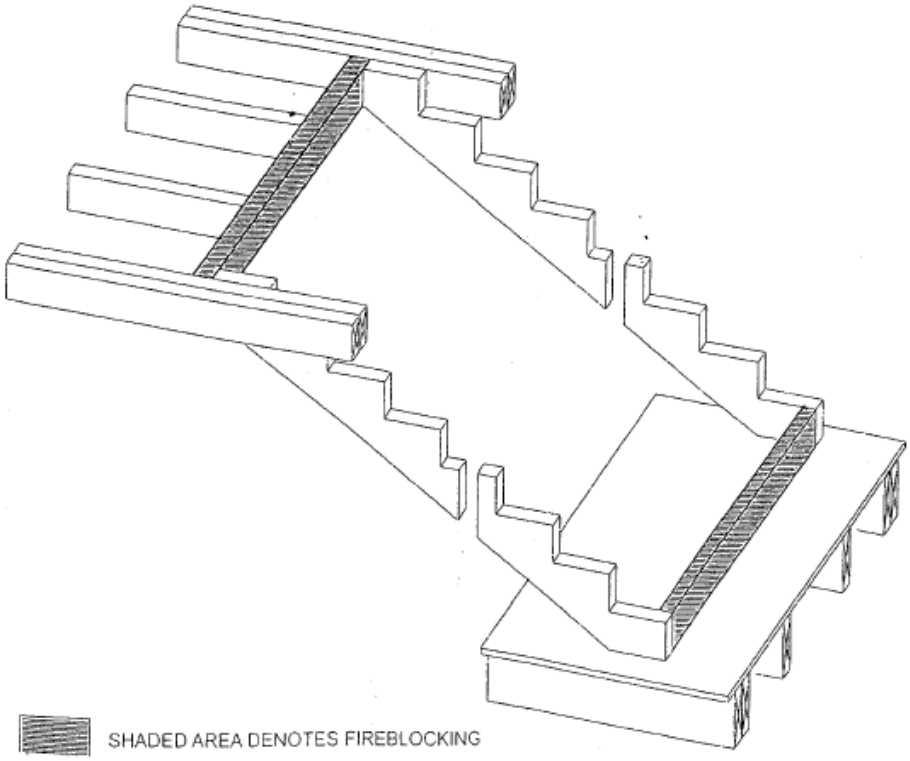


Figure 717.2.4
FIREBLOCKING—STAIRS

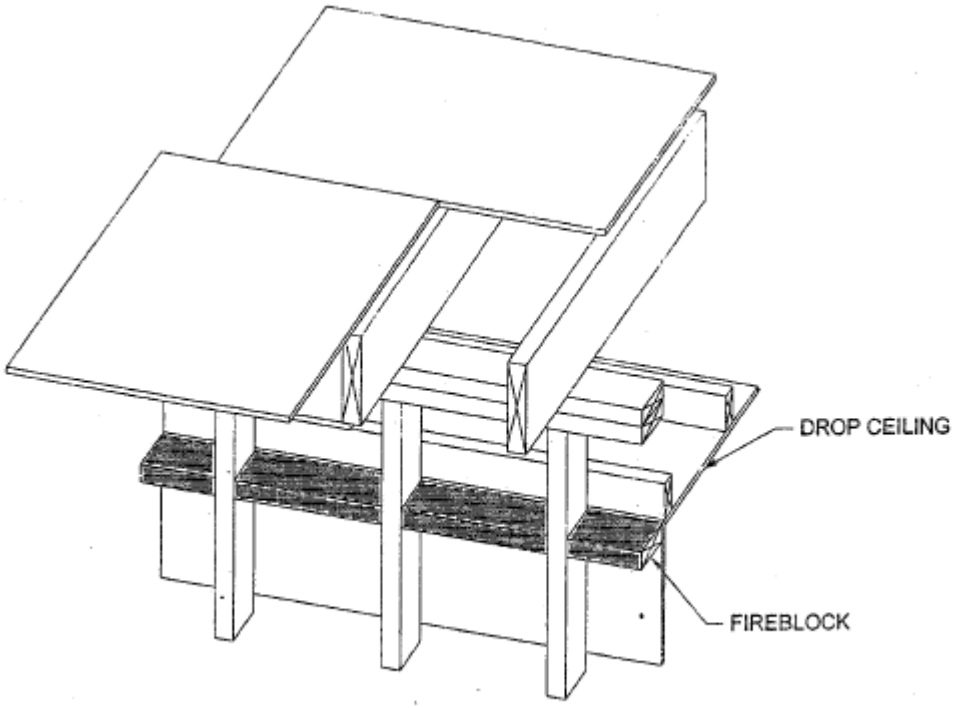


Figure 717.2.3(2)
FIREBLOCKING—DROP CEILINGS

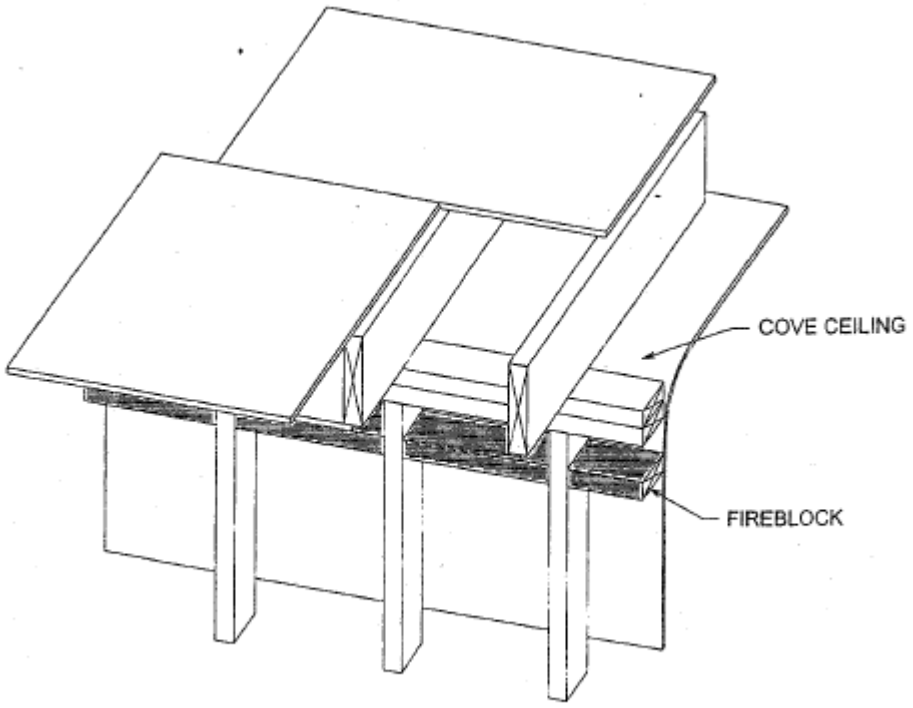


Figure 717.2.3(3)
FIREBLOCKING—COVE CEILING

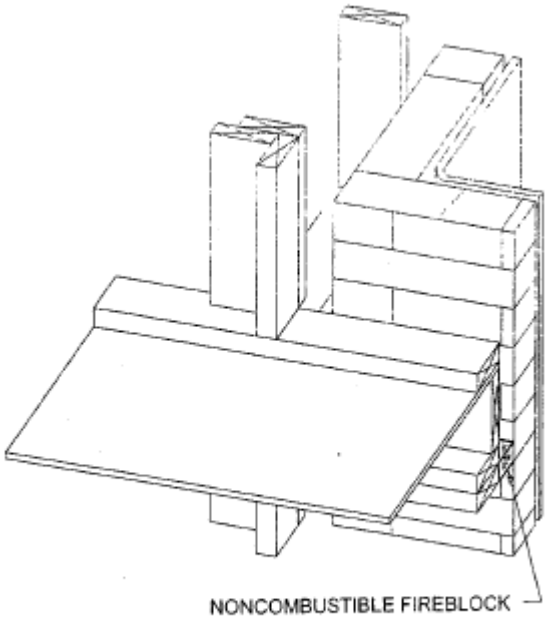


Figure 717.2.5(1)
FIREBLOCKING—CHIMNEYS

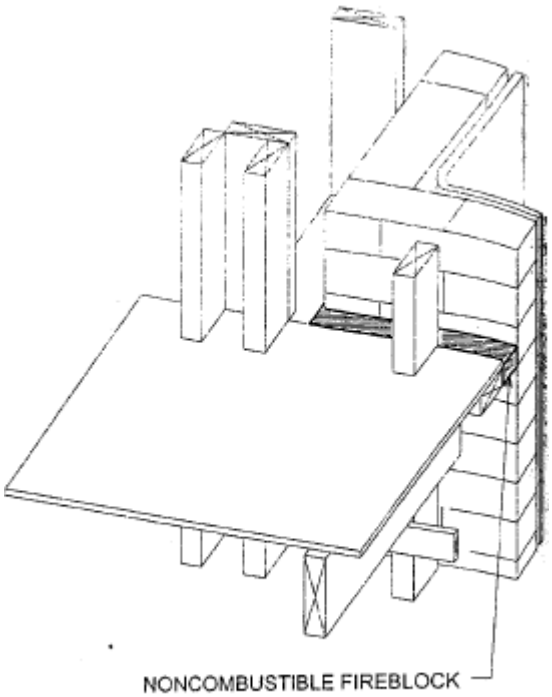


Figure 717.2.5(2)
FIREBLOCKING—CHIMNEYS

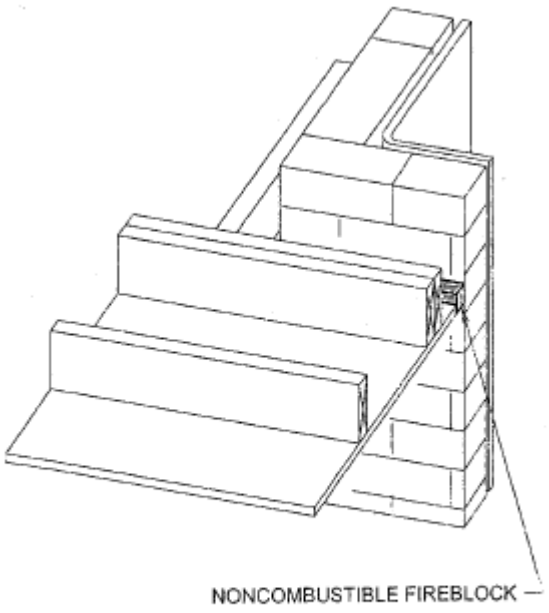


Figure 717.2.5(3)
FIREBLOCKING—CHIMNEYS

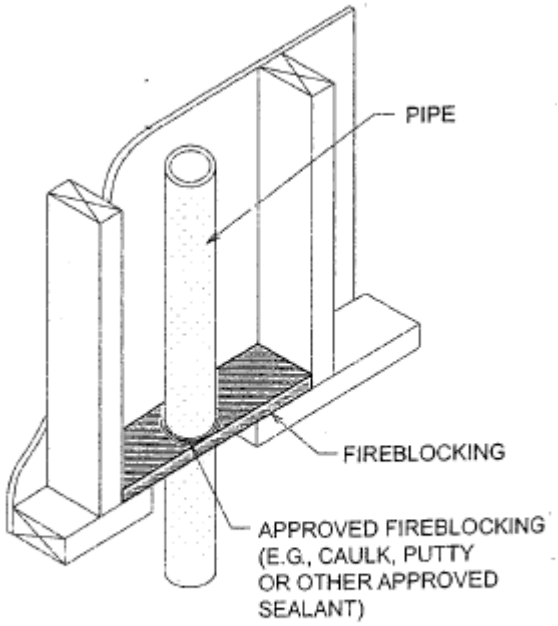
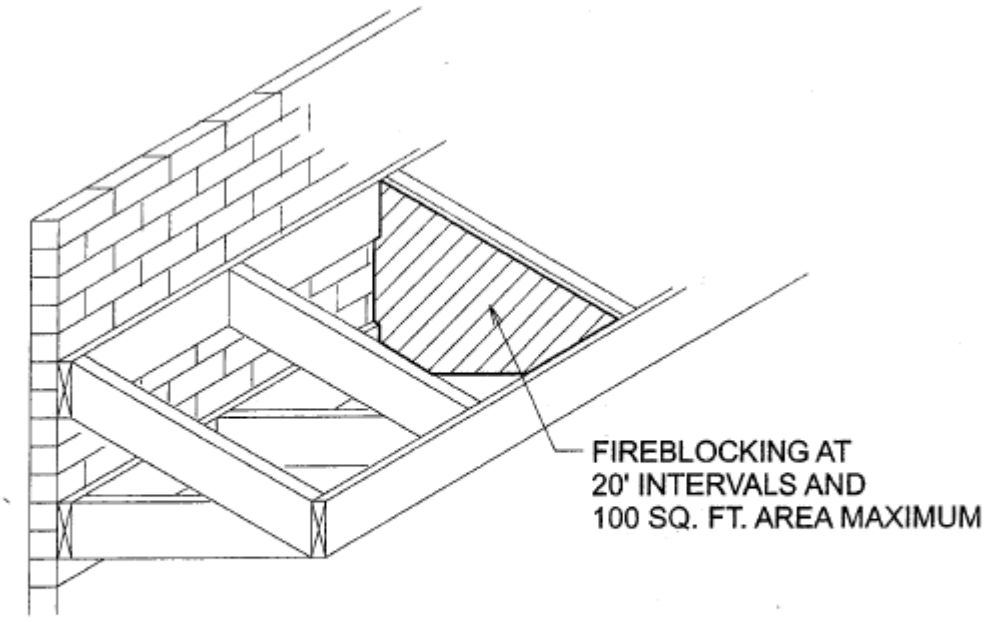


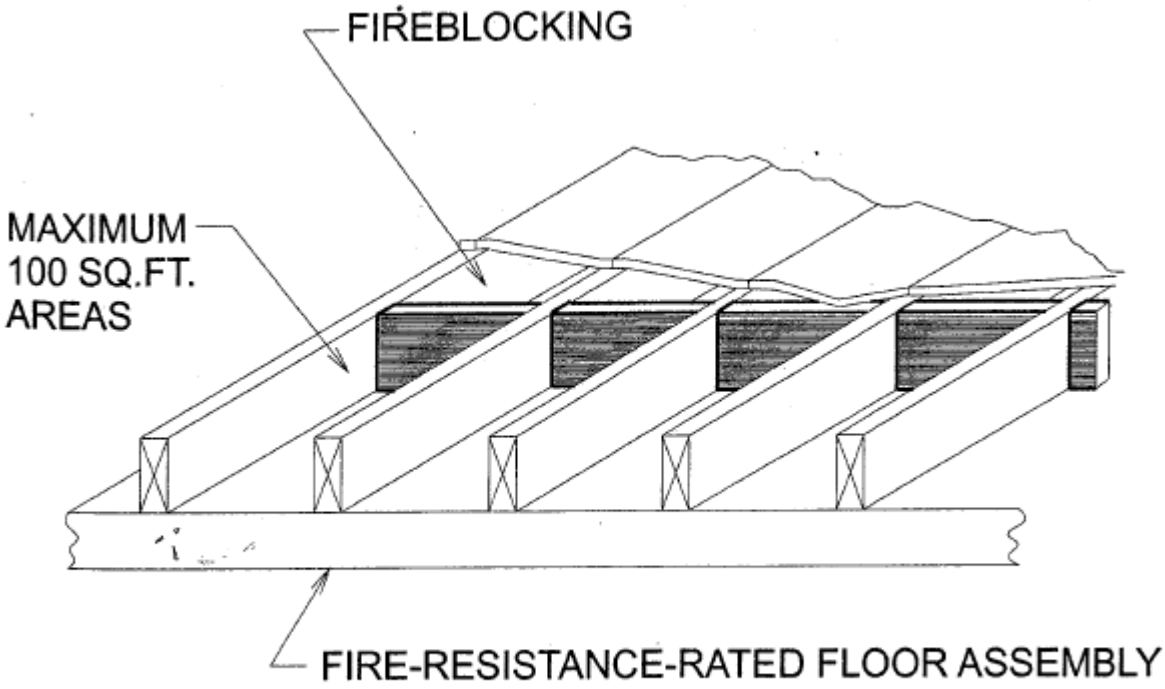
Figure 717.2.5(4)
FIREBLOCKING—PIPES



FIREBLOCKING USED EVERY 20' IN AN EXTERIOR CORNICE

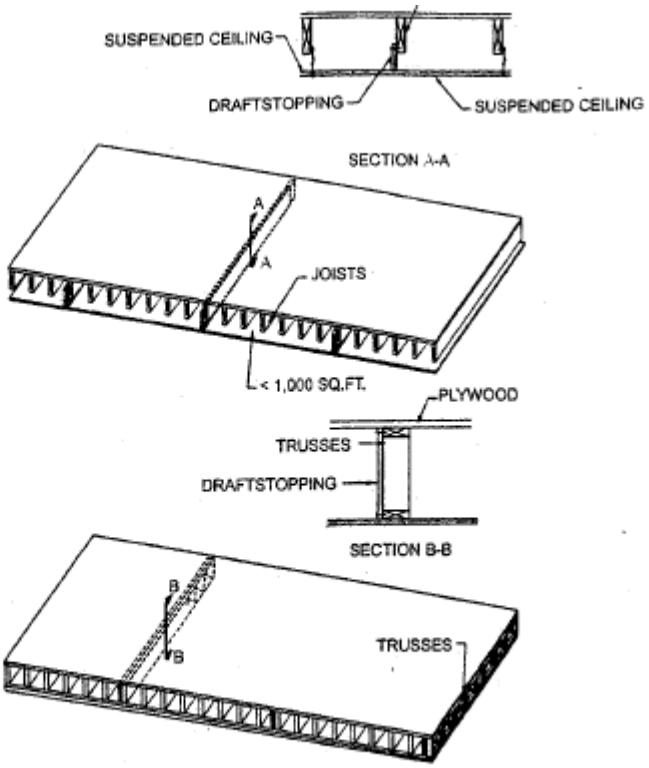
For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2.

Figure 717.2.6
FIREBLOCKING—ARCHITECTURAL TRIM



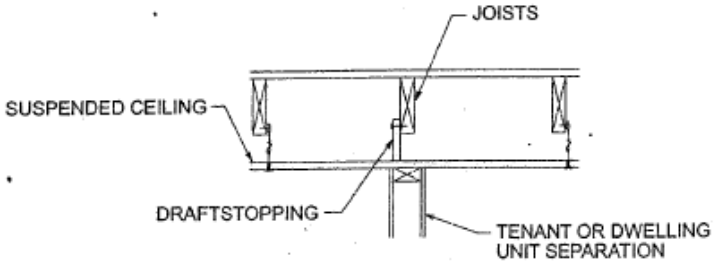
For SI: 1 square foot = 0.0929 mm².

Figure 717.2.7
FIREBLOCKING—CONCEALED FLOOR SPACES



For SI: 1 square foot = 0.0929 mm².

Figure 717.3.3
DRAFTSTOPPING—CONCEALED FLOOR SPACES, OTHER GROUPS



SECTION A-A

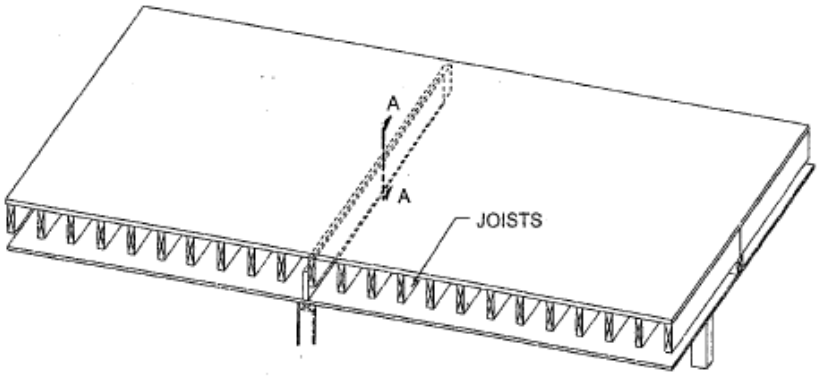


Figure 717.3.2
DRAFTSTOPPING—GROUPS R-1, R-2, R-3 AND R-4 AT TENANT AND DWELLING UNIT SEPARATIONS

TABLE 2304.10.1
FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION
Roof		
1. Blocking between ceiling joists, rafters or trusses to top plate or other framing below	3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Each end, toenail
Blocking between rafters or truss not at the wall top plate, to rafter or truss	2-8d common ($2^1/_2$″ × 0.131″) 2-3″ × 0.131″ nails 2-3″ 14 gage staples	Each end, toenail
	2-16 d common ($3^1/_2$″ × 0.162″) 3-3″ × 0.131″ nails 3-3″ 14 gage staples	End nail
Flat blocking to truss and web filler	16d common ($3^1/_2$″ × 0.162″) @ 6″ o.c. 3″ × 0.131″ nails @ 6″ o.c. 3″ × 14 gage staples @ 6″ o.c	Face nail
2. Ceiling joists to top plate	3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Each joist, toenail
3. Ceiling joist not attached to parallel rafter, laps over partitions (no thrust) (see Section 2308.7.3.1, Table 2308.7.3.1)	3-16d common ($3^1/_2$″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131" nails; or 4-3″ 14 gage staples, $^7/_{16}$″ crown	Face nail
4. Ceiling joist attached to parallel rafter (heel joint) (see Section 2308.7.3.1, Table 2308.7.3.1)	Per Table 2308.7.3.1	Face nail

5. Collar tie to rafter	3-10d common (3″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, 7/16″ crown	Face nail
6. Rafter or roof truss to top plate (See Section 2308.7.5, Table 2308.7.5)	3-10 common (3″ × 0.148″); or 3-16d box (3 1/2″ × 0.135″); or 4-10d box (3" × 0.128″); or 4-3″ × 0.131 nails; or 4-3″ 14 gage staples, 7/16″ crown	Toenail[c]
7. Roof rafters to ridge valley or hip rafters; or roof rafter to 2-inch ridge beam	2-16d common (3 1/2″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, 7/16″ crown; or	End nail
	3-10d common (3 1/2″ × 0.148″); or 3-16d box (3 1/2″ × 0.135″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, 7/16″ crown	Toenail

(continued)

TABLE 2304.10.1—continued
FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION
Wall		
8. Stud to stud (not at braced wall panels)	16d common (3 1/2″ × 0.162″);	24″ o.c. face nail
	10d box (3″ × 0.128″); or 3″ × 0.131″ nails; or 3-3″ 14 gage staples, 7/16″ crown	16″ o.c. face nail
9. Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d common (3 1/2″ × 0.162″); or	16″ o.c. face nail
	16d box (3 1/2″ × 0.135″); or	12″ o.c. face nail
	3″ × 0.131″ nails; or 3-3″ 14 gage staples, 7/16″ crown	12″ o.c. face nail
10. Built-up header (2″ to 2″ header)	16d common (3 1/2″ × 0.162″); or	16″ o.c. each edge, face nail
	16d box (3 1/2″ × 0.135")	12″ o.c. each edge, face nail
11. Continuous header to stud	4-8d common (2 1/2″ × 0.131″); or 4-10d box (3″ × 0.128″)	Toenail
12. Top plate to top plate	16d common (3 1/2″ × 0.162″); or	16″ o.c. face nail
	10d box (3″ × 0.128″); or 3″ × 0.131″ nails; or 3″ 14 gage staples, 7/16″ crown	12″ o.c. face nail
13. Top plate to top plate, at end joints	8-16d common (3 1/2″ × 0.162″); or 12-10d box (3″ × 0.128″); or 12-3″ × 0.131″ nails; or 12-3″ 14 gage staples, 7/16″ crown	Each side of end joint, face nail (minimum 24" lap splice length each side of end joint)
14. Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3 1/2″ × 0.162″); or	16" o.c. face nail
	16d box (3 1/2″ × 0.135″); or 3″ × 0.131″ nails; or 3″ 14 gage staples, 7/16″ crown	12" o.c. face nail
15. Bottom plate to joist, rim joist, band joist or blocking at braced wall panels	2-16d common (3 1/2″ × 0.162″); or 3-16d box (3 1/2″ × 0.135″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, 7/16″ crown	16" o.c. face nail

16. Stud to top or bottom plate	4-8d common ($2^1/_2$″ × 0.131″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, $^7/_{16}$″ crown; or	Toenail
	2-16d common ($3^1/_2$″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	End nail
17. Top or bottom plate to stud	2-16d common ($3^1/_2$″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	End nail
18. Top plates, laps at corners and intersections	2-16d common ($3^1/_2$″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Face nail

(continued)

TABLE 2304.10.1—continued
FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION
Wall		
19. 1″ brace to each stud and plate	2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2-3″ × 0.131″ nails; or 2-3″ 14 gage staples, $^7/_{16}$″ crown	Face nail
20. 1″ × 6″ sheathing to each bearing	2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″)	Face nail
21. 1″ × 8″ and wider sheathing to each bearing	3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″)	Face nail
Floor		
22. Joist to sill, top plate, or girder	3-8d common ($2^1/_2$″ × 0.131″); or floor 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Toenail
23. Rim joist, band joist, or blocking to top plate, sill or other framing below	8d common ($2^1/_2$″ × 0.131″); or 10d box (3″ × 0.128″); or 3″ × 0.131″ nails; or 3″ 14 gage staples, $^7/_{16}$″ crown	6" o.c., toenail
24. 1″ × 6″ subfloor or less to each joist	2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″)	Face nail
25. 2″ subfloor to joist or girder	2-16d common ($3^1/_2$″ × 0.162″)	Face nail
26. 2″ planks (plank & beam – floor & roof)	2-16d common ($3^1/_2$″ × 0.162″)	Each bearing, face nail
27. Built-up girders and beams, 2″ lumber layers	20d common (4″ × 0.192″)	32" o.c., face nail at top and bottom staggered on opposite sides
	10d box (3″ × 0.128″); or 3″ × 0.131″ nails; or 3″ 14 gage staples, $^7/_{16}$″ crown	24" o.c. face nail at top and bottom staggered on opposite sides
	And: 2-20d common (4″ × 0.192″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Ends and at each splice, face nail

28. Ledger strip supporting joists or rafters	3-16d common ($3^1/_2$″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, $^7/_{16}$″ crown	Each joist or rafter, face nail
29. Joist to band joist or rim joist	3-16d common ($3^1/_2$″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ 14 gage staples, $^7/_{16}$″ crown	End nail
30. Bridging or blocking to joist, rafter or truss	2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2-3″ × 0.131″ nails; or 2-3″ 14 gage staples, $^7/_{16}$″ crown	Each end, toenail

(continued)

TABLE 2304.10.1—continued
FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION	
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing[a]			
		Edges (inches)	**Intermediate supports (inches)**
31. $^3/_8$″ – $^1/_2$″	6d common or deformed (2″ × 0.113″) (subfloor and wall)	6	12
	8d box or deformed ($2^1/_2$″ × 0.113″) (roof)	6	12
	$2^3/_8$″ × 0.113″ nail (subfloor and wall)	6	12
	$1^3/_4$″ 16 gage staple, $^7/_{16}$″ crown (subfloor and wall)	4	8
	$2^3/_8$″ × 0.113″ nail (roof)	4	8
	$1^3/_4$″ 16 gage staple, $^7/_{16}$″ crown (roof)	3	6
32. $^{19}/_{32}$″ – $^3/_4$″	8d common ($2^1/_2$″ × 0.131″); or 6d deformed (2″ × 0.113″)	6	12
	$2^3/_8$″ × 0.113″ nail; or 2″ 16 gage staple, $^7/_{16}$″ crown	4	8
33. $^7/_8$″ – $1^1/_4$″	10d common (3″ × 0.148″); or 8d deformed ($2^1/_2$″ × 0.131″)	6	12
Other exterior wall sheathing			
34. $^1/_2$″ fiberboard sheathing[b]	$1^1/_2$″ galvanized roofing nail ($^7/_{16}$″ head diameter); or $1^1/_4$″ 16 gage staple with $^7/_{16}$″ or 1″ crown	3	6
35. $^{25}/_{32}$″ fiberboard sheathing[b]	$1^3/_4$″ galvanized roofing nail ($^7/_{16}$″ diameter head); or $1^1/_2$″ 16 gage staple with $^7/_{16}$″ or 1″ crown	3	6

Wood structural panels, combination subfloor underlayment to framing			
36. 3/4″ and less	8d common (2 1/2″ × 0.131″); or 6d deformed (2″ × 0.113″)	6	12
37. 7/8″ – 1″	8d common (2 1/2″ × 0.131″); or 8d deformed (2 1/2″ × 0.131″)	6	12
38. 1 1/8″ – 1 1/4″	10d common (3″ × 0.148″); or 8d deformed (2 1/2″ × 0.131″)	6	12
Panel siding to framing			
39. 1/2″ or less	6d corrosion-resistant siding (1 7/8″ × 0.106″); or 6d corrosion-resistant casing (2″ × 0.099″)	6	12
40. 5/8″	8d corrosion-resistant siding (2 3/8″ × 0.128″); or 8d corrosion-resistant casing (2 1/2″ × 0.113″)	6	12

(continued)

TABLE 2304.10.1—continued
FASTENING SCHEDULE

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER	SPACING AND LOCATION	
Wood structural panels (WSP), subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing[a]			
		Edges (inches)	Intermediate supports (inches)
Interior paneling			
41. 1/4″	4d casing (1 1/2″ × 0.080″); or 4d finish (1 1/2″ × 0.072″)	6	12
42. 3/8″	6d casing (2″ × 0.099″); or 6d finish (Panel supports at 24 inches)	6	12

For SI: 1 inch = 25.4 mm.

a. Nails spaced at 6 inches at intermediate supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.

b. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).

c. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule and the ceiling joist is fastened to the top plate in accordance with this schedule, the number of toenails in the rafter shall be permitted to be reduced by one nail.