



CONSTRUCTION GUIDELINES FOR RESIDENTIAL CONSTRUCTION

2019 California Residential Code

Based on the 2018 International Residential Code

2019 California Building Code

Based on the 2018 International Building Code

2019 California Electrical Code

Based on the 2017 National Electrical Code

2019 California Plumbing Code

Based on the 2018 Uniform Plumbing Code

2019 California Mechanical Code

Based on the 2018 Uniform Mechanical Code

2019 California Energy Code

San Jose Reach Code and Ordinances

These construction guidelines are for residential projects within the City of San Jose. This handbook is not exhaustive in scope, nor is it intended as installation guide for untrained construction workers. It is merely a guideline for some common items found during the inspection of typical single family and duplex residential construction. The standards, codes, ordinances, interpretations and practices described in this handbook may be changed, updated, or corrected at any time without correcting or re-publishing this handbook. Refer to the adopted Codes for full requirements.

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LOCAL CLIMATIC AND GEOGRAPHIC DESIGN

CRITERIA

Ground Snow Load	0
Wind Design Speed (mph)	110 Ultimate
Presumptive soil load-bearing value	1500 psi
Topographic Effects	No
Seismic Design Category	D1 through E
Subject to Damage from	
• Weathering:	Negligible
• Termite:	Very High
• Frost Line Depth:	5 inches
Winter Design Temp (°F)	40
Ice Barrier Underlayment	Not required
Air Freezing Index (Table 403.3(2))	1500
Mean Annual Temp (°F)	59.7

FREQUENTLY USED TABLES

BUILDING

- FLOOR JOIST SPAN TABLE
- FIRE SETBACKS - Sprinklered & Non-Sprinklered
- RAFTER/CEILING JOIST HEEL JOINT
- GIRDER AND HEADER SUPPORT
- STUD SIZE AND SPACING
- WALLS CEILING JOIST SPANS FOR COMMOM
- LUMBER NOTCHING AND BORING
- RAFTERS SPAN TABLES

PLUMBING

- PLUMBING TABLES & CLEANOUT REQ
- WATER SUPPLY TABLES
- GAS CALCULATIONS TABLE
- METHODS FOR SIZING GAS PIPE

ELECTRICAL

- ELECTRICAL TABLES
- AFCI PROTECTED RECEPTACLE REQ

FREQUENTLY USED DIAGRAMS

- PROPERTY LINE CLEAN-OUT DIAGRAM
- BACKWATER VALVE DIAGRAM
- LOOP VENT DIAGRAM
- CSST BONDING DIAGRAM
- BOLLARD INSTALLATION
- WATERHEATER IN BASEMENT
- DRYWELL INSTALLATION

Part I
BUILDING REQUIREMENTS
2019 California Residential Code
2019 California Building Code

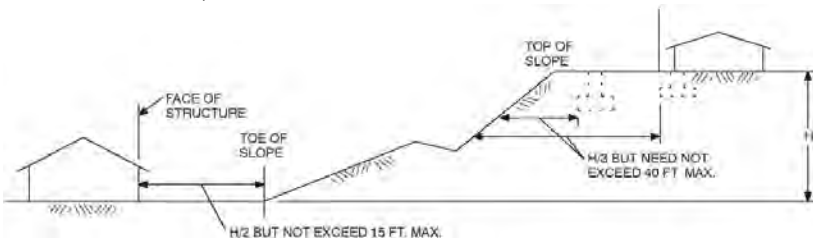
FOUNDATION INSPECTION
(CRC Chapter 4 or CBC Chapter 18)

Setbacks

- Property lines are clearly marked or easily determined from existing references. If references not clearly identified, or discrepancy occurs, survey letter can be requested.

ADU: verify required fire separation between main SFR and detached ADU per plan. Min 6' wall to wall.

- Setbacks conform to zoning, Easements, and must allow room for construction of required rated and/or high energy performance wall assembly if occurs.
- Setbacks from slopes are OK (i.e. Refer to figure R403.1.7.1 or CBC 1808.7.1 below)

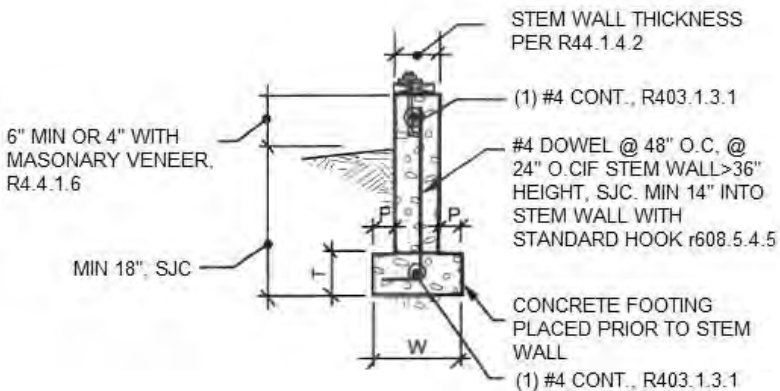


- Review soils report if applicable for new footing/pad - SJC 17.04.340)
- Verify soils engineer inspection for compaction and/or backfill if applicable

Footings

Existing pier and grade beam footing (deep footing) shall be shown on plan. Footing for new addition to be designed and approved for such condition. Generally, T footing or turn-down slab footing (shallow footings) are not allowed to tie in to pier and grade beam system, do not proceed without plan check approval.

- Footing depth & dimensions conform to plan and minimum code requirements (see Table R403.1(1))
- 6" stem wall thickness ok if stem wall height is less than 4'-6" (R404.1.4.2) Manufactured shear walls may require 8" minimum stem wall and spread/deepened footing, check manufacture details on plan.
- Verify Steel grade, size, laps, ties & clearances
 - Horizontal steel: 2-#4 min., 1 T & B (Per R403.1.3.1 & Table R404.1.2(1)) Grade 40 min.
 - Additional horizontal #4 18" o.c if stem wall height exceeds 24" (City of San Jose)
 - Steel rebar laps: 20" for #4 splice unless engineered (Table R608.5.4(1))
 - Clearances: 3" min to earth, 1-1/2" min to forms, 3/4" when not exposed to weather or earth (R404.1.3.3.7.4)
 - When horizontal construction joints exist, vertical steel, #4 @ 48" o.c. with standard hooks and extends min 14" into stem wall (Grade 60 min. per R403.1.3.1)
 - Vertical #4 @ 24" o.c if stem wall height exceeds 36" (CSJ)



- Foundation elevation
 - Top of exterior footing must be a min of 12” plus 2% above the street gutter per R403.1.7.3, and if in a flood zone, it will need to be high enough for floor to achieve min 12” above flood elevation.
 - 6” min fall within 10 ’to slope away from building foundation (R401.3)
- Top of footings must be level, slope at bottom of footing not to exceed exceeds 1 in 10 (R403.1.5)
- Plumbing is wrapped to accommodate expansion and contraction where embedded in concrete
- Trenches are clean, free of debris & no soil cracking
- HD placements ok, i.e. diameter of bolts, embedment depth, edge distances-conform to plan & manufacture’s recommendations. (Hold down anchored must be secured in place, no wet set). Hardware for manufactured shear walls may require embedment into footing or grade beam, not JUST stem wall. Manuf. Template must be used.
- Min 1/2” diameter foundation anchor bolts with a min embedment of 7”; spaced at no more than 6 ’o.c. for up to 2 stories and 4 ’o.c. for over 2 stories (R403.1.6 & R403.1.6.1). Located in middle 1/3 of Mudsill

Piers

(CRC R403.1.1 requires footing size based on tributary load and allowable soil pressure)

- 20” round, 16” square, 18” deep or per soil report/engineer’s design.
- Min. 8” above grade
- Piers larger than 30” x 30” require a bottom mat of 2-#4 EW

Slab -Verify under slab plumbing approval

ADU: During conversion of accessory structure converted to ADU, if whole or part of existing slab, without moisture barrier, to remain in conditioned space envelope, topical application of listed moisture barrier required prior to framing walls. Alternative methods shall require plan check approval. Also, accessory structures often have open side(s) and top of slab flush with grade. Construction needs to address drainage and 8” wood to earth clearance.

- 3-1/2" min thickness (R506.1/CBC 1910)
- Base rock requirements 4" (R506.2.2)
- Vapor barrier requirements 6 mil min. directly placed under concrete with min 6" lap at joints. (R506.2.3)
- Reinforcement installed per plan
- Perimeter insulation installed if required per T-24

Grounding Electrode

- 20 '#4 rebar ground in bottom 3" of footing, or
- 20 '#4 bare copper ground in bottom 3" of footing, or
- L shaped rebar with 20" lap at bottom bar and extends min 6" above mud sill

Flood Resistant Construction (R322)

- Slab not part of foundation of structure
 1. Shall not have turn-down edge, nor reinforcement, no dowels
 2. Shall have isolation joints at foundation or columns and control or construction joints max 4' o.c in both directions
 3. Shall not be more than 4" thick at any point.
- Substantial improvement in flood zone (SJC 17.08.280)
- Verify flood vents in stem walls matching flood vent calculation for area enclosed under flood elevations.
 - Min 2 vents on different sides of each enclosed area
 - Bottom of each vent shall not be more than 1' above the higher of interior floor and the finished exterior grade. Flood vents are often blocked out in foundation stem walls.
 - Total net vent area shall be not less than 1 square inch for each square foot of enclosed area.
- For new structures, Provide Elevation Certificate and contact Public Work for inspections and Final approval (Contact Arlene Lew @ 408-535-6827)

UNDERFLOOR/SUBFLOOR INSPECTION (R502/CBC 2304)

ADU: Identify location of all rated walls. Rated wall assembly needs to continue from foundation to roof, extends through concealed spaces. Attached ADU shall not share crawlspace with main dwelling. Rated wall below floor to be completed prior to under floor frame approval.

Triple 2x rimboard or blocks under 1 hr rated exterior walls ok.
Foundation vents are permitted in rated walls (CRC302.1 exception 5)

- Foundation/setback must be previously approved for Under Floor area to be inspected.
- Subfloor must be approved prior to plating next floor walls.

Girders and Posts

- Girder supporting single floor min 4 x 6, with spans less than 6', spaced max 8' oc (CBC2308.4.1)
- Girder bearing (R502.6/CBC 2308.4.1& 2304.11.2)
 - 1-1/2" min on wood or metal
 - 3" min on masonry or concrete
 - 4x min P.T post @ splices & ends tied with ST 12 or equal 317.1.4
 - Piers elevated 8" min above earth @ under floor and earth is covered by moisture barrier, or use pressure treated post (R317.1.4/ CBC 1809.8)
 - 1/2" air spaces @ sides, ends & top with mudsill bearing in girder masonry pockets (R317.1 #4)
 - Girder to post connection (R502.9/CBC 2304.11.2)
- 12" min earth to girders (R317.1/CBC 2304.12.1.1)
- End of girders to have min 1/2 air gap from concrete or protected by hardware/flashing.
- Check load path to foundation, squash blocks required under all posts above floor.

Mudsill

- Pressure treated lumber with accredited agency label (R504.3/CBC 2304.12.1) or naturally durable wood.
- 2x or larger plate or sill having a width at least equal to the width of the studs (R602.3.4/CBC 2304.3.1)

General Mud sill Bolting (R403.1.6/CBC 2308.3.1 & City Policy)

- 6' o.c. max for 1 & 2 story buildings
- 4' o.c. max for over 2 stories (R403.1.6 #4/CBC 2308.3.1, except. 2)
- A.B spacing must be per shear schedule for engineered shear walls
- Min 2 bolts per each piece, 1/2" diameter min with 3"x3"x229" plate washers (R602.11.1/CBC 2308.3.2)
 - Min 7 bolt diameters and max 12" from splices or ends (R403.1.6) Min 4" & max 12" from ends of plates (CBC 2308.3.1)
 - Within middle 1/3 of plate width.

Edge distance: Min 1^{1/8"} for 2x4 plate or 1^{3/4"} for 2x6 plate

Floor Joists

- Bearing (R502.6/CBC 2308.4.2.2)
 - 1-1/2" min on wood or metal
 - 3" min on masonry or concrete
- Joist laps (R502.6.1/CBC 2308.4.2.3)
 - 3" min laps with 3-10d's face nails
 - 1-1/2" min bearing and butts strapped with ST9 or equal
 - Joist blocking (R502.7/CBC 2308.4.2.3)
 - At ends and all bearing points with 2x full depth blocking, 2x12 joists with solid blockings @ max 8' oc
- Joist nailing Table (Table R602.3(1),(2)/CBC 2304.10.1)
 - To sill or girder with 4-8d box or 3-8d common
 - Sole plate to joist or blocking 2-16d common @ 16" oc
 - 2x subfloor to joist or girder face nail with 2-16d common
- Double Joist under all bearing walls (R502.4/CBC 2308.4.5)
- Manufactured floor joists and trusses per plan & manufacturer's details
- 18" min earth to bottom of joists (R317.1/CBC 2304.12.1.1)

FLOOR JOIST SPAN TABLES R502.3.1(1)/CBC2308.4.2.1(1)
 With 30 psf live load and 10 psf dead load Deflection = 1/360
Residential Sleeping Areas

		Douglas Fir		Hem Fir	
Size	Spacing	#1	#2	#1	#2
2 x 6	12"	12'-0"	11'-10"	11'-7"	11'-0"
	16"	10'-11"	10'-9"	10'-6"	10'-0"
	24"	9'-7"	9'-3"	9'-2"	8'-9"
2 x 8	12"	15'-0"	15'-7"	15'-3"	14'-6"
	16"	14'-5"	14'-2"	13'-10"	13'-2"
	24"	12'-4"	11'-8"	12'-1"	11'-4"
2 x 10	12"	20'-3"	19'-10"	19'-5"	18'-6"
	16"	18'-5"	17'-5"	17'-8"	16'-10"
	24"	15'-0"	14'-3"	14'-10"	13'-10"
2 x 12	12"	24'-8"	23'-4"	23'-7"	22'-6"
	16"	21'-4"	20'-3"	21'-1"	19'-8"
	24"	17'-5"	16'-6"	17'-2"	16'-1"

FLOOR JOIST SPAN TABLES R502.3.1(2)/CBC2308.4.2.1(2)

With 40 psf live load and 10 psf dead load Deflection = 1/360

Residential Living Areas other than sleeping areas

		Douglas Fir		Hem Fir	
Size	Spacing	#1	#2	#1	#2
2 x 6	12"	10'-11"	10'-9"	10'-6"	10'-0"
	16"	9'-11"	9'-9"	9'-6"	9'-1"
	24"	8'-8"	8'-3"	8'-4"	7'-11"
2 x 8	12"	14'-5"	14'-2"	13'-10"	13'-2"
	16"	13'-1"	12'-9"	12'-7"	12'-0"
	24"	11'-0"	10'-5"	10'-10"	10'-2"
2 x 10	12"	18'-5"	18'-0"	17'-8"	16'-10"
	16"	16'-5"	15'-7"	16'-0"	15'-2"
	24"	13'-5"	12'-9"	13'-3"	12'-5"
2 x 12	12"	22'-0"	20'-11"	21'-6"	20'-4"
	16"	19'-1"	18'-1"	18'-10"	17'-7"
	24"	15'-7"	14'-9"	15'-5"	14'-4"

Shear Connection

- Identify shear wall type and length for each shear wall.
- Shear transfer connection per shear wall table
- Verify installation of drag blockings and straps
- HDs extended to engage posts for full load capacity
- Max 18" from top of stem wall/slab to bottom of HD.

Crawlspace Access (R408.4/CBC 1209.1)

- 18" x 24" min opening unobstructed by pipes, ducts and etc.
- Pipes, ducts and other construction shall not interfere with the accessibility to or within underfloor areas

Cripple Walls (R602.9/CBC 2308.6.6.2)

- See Prescriptive Wall Bracing Table 2308.9.3(1) & (2)
 - >4' high—frame wall as an additional story
 - <14" high—sheath one side between top and bottom plates or solid blocked
 - Cripple wall to be supported on continuous foundation

Under-floor Ventilation (R408/CBC 1203.4.1)

- Cross flow provided on at least two opposite sides, equally distributed, and within 3' to corners to remove dead air
- At additions, maintain & extend existing vents and add required ventilation of new addition
- 1 sq. ft. per 150 sq. ft. of new floor area

Unvented Crawlspace (R408.3)

- Exposed earth is cover with class I vapor retarder, 6" overlap at seams, and 6" up and attached to the stem wall, all edges to be sealed or taped. **AND** one of the followings:
 - Continuous running mechanical exhaust or conditioned air supply sized at 1cfm or each 50sf of crawlspace, with air transfer pathway (grille or duct) to the common area.
 - **Or**, Dehumidification sized to provide 70 pints of moisture per day for every 1000sf of crawlspace area.

Sub-floor Nail

Second floor framing is inspected at the time of sub-floor nailing with drags and collectors before plating.

- Check floor framing to verify conformance with plan
- $\frac{3}{4}$ " wood subfloor fastened to framing with 8d common, 0.131 x2^{1/2} nails @6" o.c edge and 12" o.c in field, T 602.3(2). Joints staggered
- Min 24" wide unless blocked and edge nailed

Fire Protection of Floor (R302.13)

If crawlspace or basement houses fuel burning appliance or is used as storage space, it will be protected with 1/2" drywall or 5/8 structural panel or equivalent, from underside.

Exception:

- Space is protected with fire sprinklers,
- Allow up to 80sf aggregate unprotected with fire blockings at perimeter
- Floor joists are solid lumber equal to or greater than 2x10.

TIPS

T-24: Check T-24's Required HERS features if ductwork to be located in conditioned space.

REACH CODE: No gas line for new buildings with permit issued on or after Jan 1st, 2020.

SHEAR INSPECTIONS

Roof structure, interior, exterior shear walls can be looked at in one inspection or separate inspections. At each inspection, however, all connections for the entire load path and lateral distribution path must be complete and the framing supporting the shear system is as per plan.

CSJ amendment to CBC 2308.6.9: All braced wall panels shall extend to the roof sheathing and shall be attached to parallel roof rafters or blocking above with framing clips.

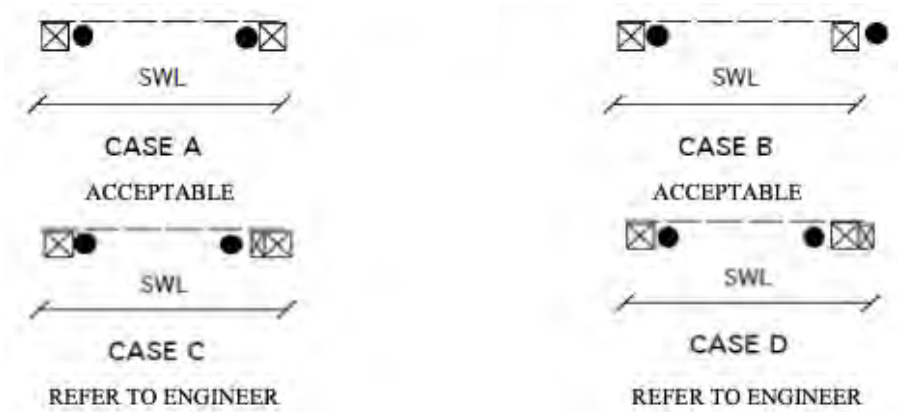
General Requirements CBC 2308.6 & Table 2306.3(1) Footnotes

- ❑ Where panels are applied on both faces of a wall and fastener spacing is less than 6" o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3" nominal or thicker at adjoining panel edges.
- ❑ In Seismic Design Category D, E or F, where shear design values exceed 350 plf, all framing members receiving edge fastening from abutting panels shall not be less than a single 3" nominal member, or two 2x nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered at the panel edges. See AF&PASDPWS for sill plate size and anchorage requirements.

Hardware

- ❑ Uplift and compression posts are properly sized
- ❑ Sill attachment must be complete and per schedule.
- ❑ Hold Downs are installed per manufacture installation instruction.
- ❑ Retrofit HD's are to be inspected by special inspection, or engineer of record, either at time of installation or by pull test after installation and provide approval letter. Epoxy installation can be inspected by San Jose Building Inspector for conventional braced walls.
- ❑ Straps are extended on uplift posts for full nailing with specified nails
- ❑ All transfer connections to roof & floor system must be installed at the time of each inspection

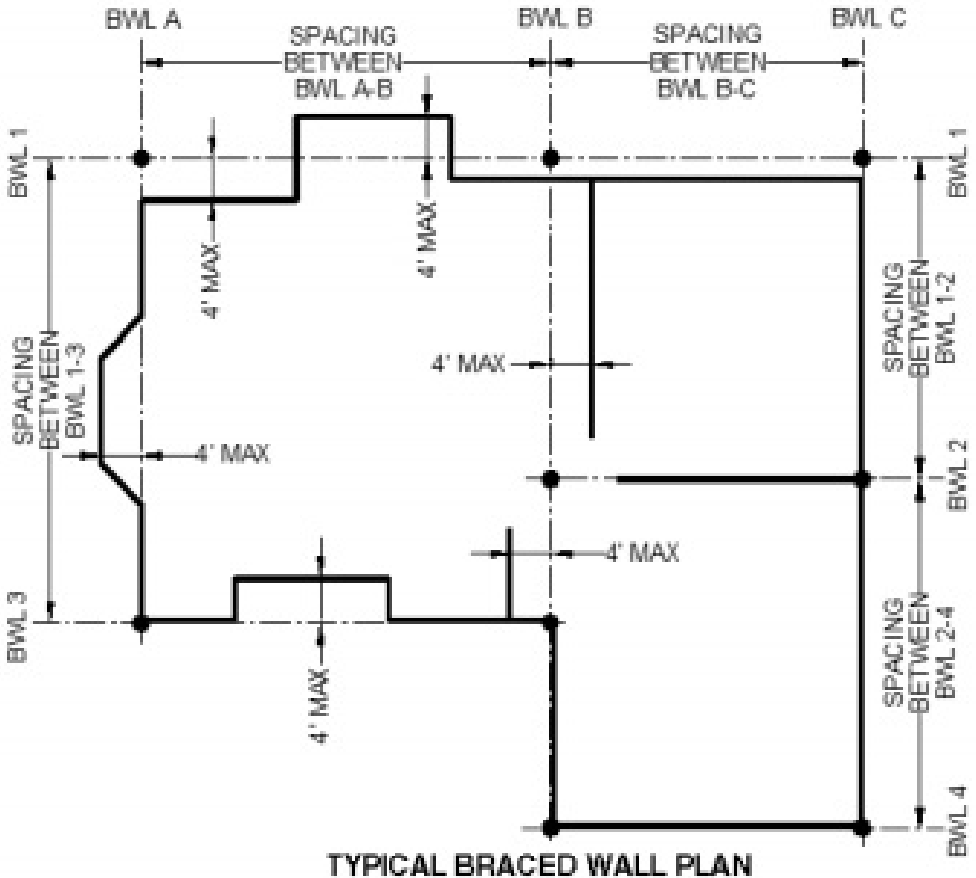
- All drag blocking and straps must be installed and transferred to shear walls
- On a shear wall less than 4 feet in length, if the hold down post and hold down are installed away from the end, or closer to the middle of the wall, the engineer of record needs to provide written verification that hold down placement is acceptable. (SJC-Field Note 301)



Diaphragm

- Shear ply is nailed to uplift posts with edge nailing
- Blocked diaphragms must have all blockings installed and zone nailing completed
- Plywood grade/plies & thickness match plan
- Nail size and spacing matches plan
- Nail heads should not penetrate face ply
- 3/8" min edges distance must be maintained
- If double plate system is utilized, bottom top plate is installed and nailed as per shear table
 - Min splice in top plates is 48" with 8-16d's or as required by plan (CBC 2308.5.3.2) - engineer designs

PRESCRIPTIVE WALL BRACING (R602.10.1.4/CBC 2308.9.3.1)



Diaphragm Material (Table R602.10.3(3)) & SJC Amendment

- ❑ Wood structural panels (WSP), diagonal boards (DWB), particleboard (PBS), fiberboard (SFB), hardboard panels (HPS) etc.
- ❑ Portland cement plaster (PCP) on studs spaced at 16" o.c. for single story buildings only (R-3 & U)
- ❑ Nominal 1x4 let-in braces or Gypsum boards not allowed (CSJ)

Braced Wall Lines

- ❑ Provided on the exterior, and on interior at 25' max spacing (Table R602.10.1.3)
- ❑ In one- and two-story buildings, one room or equal not exceeding 900 sq. ft. may have walls not more than 35' apart. Table 602.10.1.3
- ❑ Walls within a braced wall line must not be offset by more than 4' (R602.10.1.2)
- ❑ Wall panels must start within 10' of the end of a braced wall line. 1800lb Hold Down required at closest end of first braced wall if not located at end of braced wall line. (R602.10.2.2.1)
- ❑ Distance between adjacent brace panel edges shall not be greater than 20' (R602.10.2.2)
- ❑ Floor and roof diaphragms must be supported on all edges by braced wall lines. *Exception:* Portions of roofs or floors that do not support braced walls sections above may extend 6' beyond a braced wall line (R301.2.2.2.5, Irregular Building Section)
- ❑ Braced wall lines must be provided in two perpendicular directions
- ❑ Any portion of a wall along braced wall line permitted to be angle out of plan for max 8'. (R602.10.1.4)
- ❑ Min splice in top plates is 24" with 8-16d common or 12-16d box nails or as required by plan (Table R602.3(1) item 13) - for CRC conventional designs

Braced wall types

Braced Wall Panel (BWP)

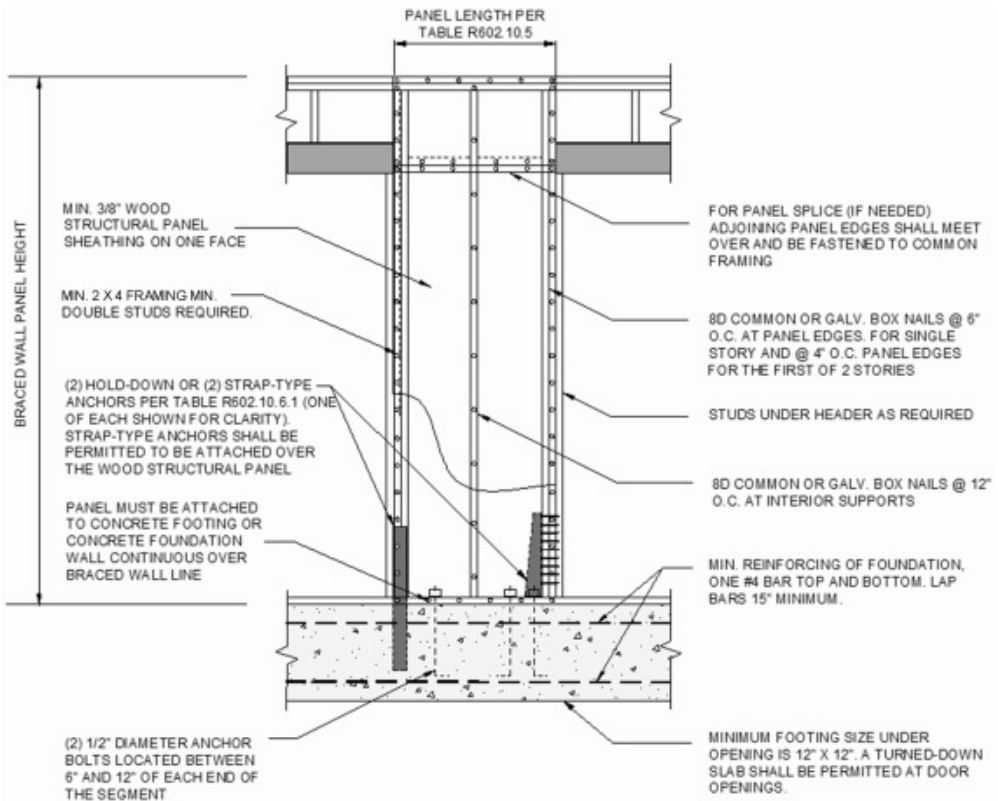
(City Ordinance, 602.10.5)

- ❑ Each panel must be not less than 48 inches in length
- ❑ Vertical joints of panel sheathing shall occur over studs and adjacent panel joints shall be nailed to common framing members. 602.10.4.4
- ❑ Horizontal joints shall occur over blocking or other framing equal in size to the studding.
- ❑ Sole plates shall be nailed to the floor framing in accordance with Table R602.3(1). Where joists are perpendicular to braced wall lines above, blocking shall be provided under and in line with the braced wall panels.
- ❑ Top plates shall be connected to the framing above in accordance with R602.10.8.2 and CSJ Ordinance.

Alternate Braced Wall Panel (ABW)

(Table R602.10.6.1 & Figure R602.10.6.1)

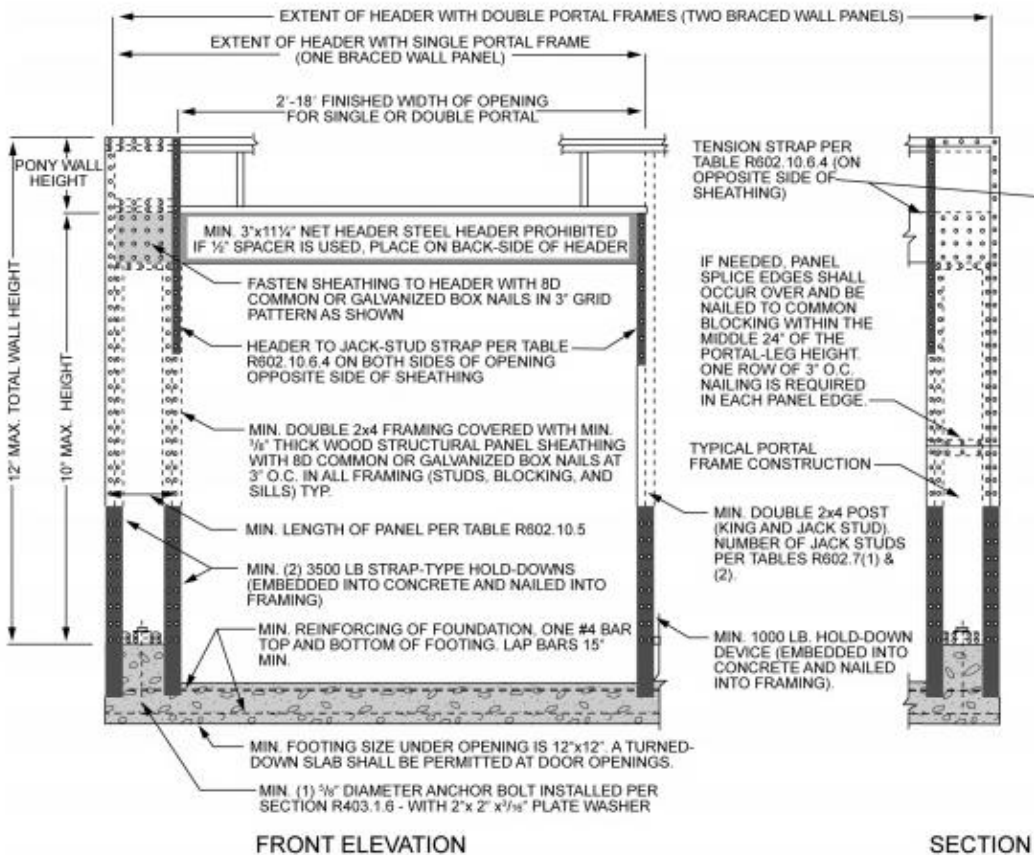
- ❑ Min 2'-8" by max 9' height or 2'-10" by 10' max with Hold Downs at each end (Table R602.10.5)
- ❑ Min 3/8" ply nailed 6" & 12" with 8d on one face for single story, 4" & 12" for 2 stories
- ❑ Min (2) 1/2" diameter anchor bolts and 1800# tie-downs embedded in continuous foundation
- ❑ First story of 2 stories: Requires 3000# tie downs



Portal Frame with Hold Down (PFH)

CRC602.10.6

- Min 16" (W) by 10' max (H) if only supporting roof
- Min 24" (W) by 10' max (H) if supporting one floor and roof
- Can be constructed in accordance with Figure CRC602.10.6.2 below



Irregular Building exceptions

Irregular portions of structures, if not in one of the exceptions below, shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system

- Walls in plane vertically from the foundation to the uppermost story except: R301.2.2.2.5
 - Floors that are cantilevered or setback not exceeding 4 times the depth of the joist and comply with the followings
 - Joists are 2 x 10 or greater and not spaced more than 16” o.c.
 - Ratio of back span to cantilever is at least 2:1
 - Joists at ends of braced wall panels are doubled
 - A continuous rim is used at the cantilever end, splices must be secured with galvanized metal tie of 16 gauge and 1-1/2” wide connector (6-16d nails min) on each side of splice or a block of same rim side with 8-16d on each side of splice
 - Gravity loads are limited to uniform wall and roof only and header reactions of 8’ or less span
- Braced wall panels must not extend more than 1’ horizontally over an opening below unless the header below is at least 2-2 x 12 and opening not more than 8’ wide
- Floor levels cannot be vertically offset unless they lapped or tied together per R502.6.1 or equal or are supported directly by continuous foundation at the perimeter of the building
- Walls may be supported by continuous footings at exterior and at 50’ intervals provided: (R602.10.9.1/R403.1.2)
 - Cripple walls do not exceed 4’ high
 - 1st floor braced walls are supported by doubled floor joists, or continuous blocking between floor beam
 - Distance between braced wall lines does not exceed twice the building width

Cripple Walls (R602.9/CBC 2308.6.6.2)

- Stud heights 14” min or solid blocked or sheathed
- Stud heights exceeding 14” shall be braced per (Table R602.3 (1)#30/CBC Table 2308.6.1)
 - 1 story: 3/8” wood structural panel nailed with 8d at 6”/12” for 48% of wall length
- Stud height exceeding 4’ shall be the same size as studs for an additional story

TIPS

T24:

With Exterior shear approved, check exterior wall construction assembly for compliance. If high performance wall proposed in T-24, exterior sheath insulation to be installed and inspected over building paper and prior to lath installation (underlayment directly over stud, sheathing)

WUI(CRC337.3):

Non-combustible wall covering at exterior. Exterior walls to be 1h rated. Roof and floor projections to be protected with 5/8 gyp or stucco. Glazing to be 20’ rated or tempered. 20’ rated or 1-3/8” solid core exterior doors

ROOF STRUCTURE/NAIL

Framing

- Min. Design Criteria Dead Load = 10psf, Live Load = 20psf
- Portion of roof for solar zone can omit panel weight (exception 2, CRC 324.4.1.1)

conventional design (CRC802)

- Ridge boards/hips/ valleys (CRC802.3)
 - Ridge board shall be not less than 1-inch (25 mm) nominal thickness and not less in depth than the cut end of the rafter.
 - Valley or hip rafter not less than 2-inch (51 mm) nominal thickness and not less in depth than the cut end of the rafter.
- Rafter size & spacing Table R802.4.1(1) or (2)
 - Shall be framed not more than 1¹/₂-inch offset from each other to ridge board or directly opposite from each other with a gusset plate as a tie
 - Purlins to be same size or larger than rafters R802.4.5
 - Purlin struts go to bearing walls, are 45° min from horizontal @ max 4' oc with 2 x 4 braces & are laterally braced if greater than 8'
- Ceiling Joists/Rafter ties and Heel connection (R802.5.2)
 - Joist size & spacing per CRC Table 802.5(1) or (2)
 - Where joists are parallel to rafters, ceiling joist must be nailed to per Table R802.5.2
 - Where not parallel, rafter ties shall be min 2 x 4 installed at just above ceiling joists nailed to rafters per Table R802.5.2 and increased by adjustment factor per footnote (g)
 - Joist/rafter tie to be continuous, or splice to have same connection as heel connection

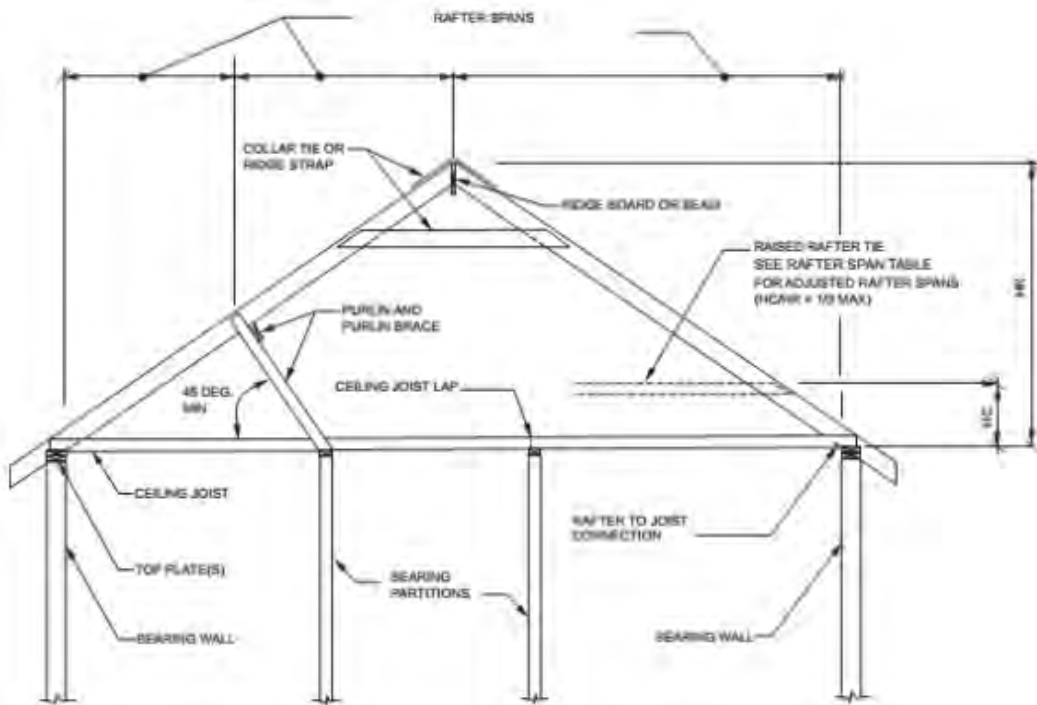


Figure R802.4.5

- Collar ties (R802.4.6)
 - Nailed to rafters with (3)-10d common or (4)-10d box
 - Install 1x4 collar ties or 1-1/4" by 20g ridge straps to resist uplift at the upper 1/3 of attic space @ 4' o.c max.

HEEL CONNECTION TABLE CRC802.5.2

RAFTER SLOPE	RAFTER SPACING (inches)	20lb snow load or less			
		Roof span (feet)			
		12	20	28	36
		number of 16d common per heel joint splices			
3:12	12	4	6	8	10
	16	5	8	10	13
	24	7	11	15	19
4:12	12	3	5	6	8
	16	4	6	8	10
	24	5	8	12	15
5:12	12	3	4	5	6
	16	3	5	6	8
	24	4	7	9	12
7:12	12	3	4	4	5
	16	3	4	5	6
	24	3	5	7	9
9:12	12	3	3	4	4
	16	3	4	4	5
	24	3	4	6	7
12:12	12	3	3	3	3
	16	3	3	4	4
	24	3	4	4	5

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

TABLE R802.5.1(1)/CBC 2308.10.2(1)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
 (inhabitable attics without storage, live load = 10 psf)

JOIST SPAC- ING	SPECIES GRADE &	DEAD LOAD = 5 psf			
		2 x 4	2 x 6	2 x 8	2 x 10
		Max ceiling joist spans			
12"	Douglas fir #1	12'-8"	19'-11"	> 26'-0"	> 26'-0"
	Douglas fir #2	12'-5"	19'-6"	25'-8"	> 26'-0"
	Hem- fir #1	12'-2"	19'-1"	25'-2"	> 26'-0"
	Hem-fir #2	11'-7"	18'-2"	24'-0"	> 26'-0"
16"	Douglas fir#1	11'-6"	18'-1"	23'-10"	> 26'-0"
	Douglas fir #2	11'-3"	17'-8"	23'-4"	> 26'-0"
	Hem- fir #1	11'-0"	17'-4"	22'-10"	> 26'-0"
	Hem-fir #2	10'-6"	16'-6"	21'-9"	> 26'-0"
24"	Douglas fir #1	10'-0"	15'-9"	20'-1"	24'-6"
	Douglas fir #2	9'-10"	14'-10"	18'-9"	22'-11"
	Hem- fir #1	9'-8"	15'-2"	19'-7"	23'-11"
	Hem-fir #2	9'-2"	14'-5"	18'-6"	22'-7"

RAFTERS SPAN TABLE
 20 lb live load & 10 lb deadload
 Table R802.4.1(1)/CBC Table 2308.10.3(1)
 Ceiling not attached to rafters

Size	Spacing	Douglas fir		Hem Fir	
		#1	#2	#1	#2
2 x 4	12" oc	11'-1"	10'-10"	10'-7"	10'-1"
	16" oc	10'-0"	9'-10"	9'-8"	9'-2"
	24" oc	8'-7"	8'-2"	8'-5"	7'-11"
2 x 6	12" oc	17'-4"	16'-10"	16'-8"	15'-11"
	16" oc	15'-4"	14'-7"	15'-2"	14'-2"
	24" oc	12'-6"	11'-11"	12'-4"	11'-7"
2 x 8	12" oc	22'-5"	21'-4"	22'-0"	20'-8"
	16" oc	19'-5"	18'-5"	19'-2"	17'-11"
	24" oc	15'-10"	15'-1"	15'-8"	14'-8"
2 x 10	12" oc	> 26'	26'-0"	> 26'	25'-3"
	16" oc	23'-9"	22'-6"	25'-3"	21'-11"
	24" oc	19'-5"	18'-5"	19'-2"	17'-10"
2 x 12	12" oc	> 26'	> 26'	> 26'	> 26'
	16" oc	> 26'	26'-0"	> 26'	25'-5"
	24" oc	22'-6"	21'-4"	22'-2"	20'-9"

RAFTERS SPAN TABLE
 20 lb live load & 10 lb deadload
 Table R802.4.1(2)/CBC Table 2308.10.3(1)
 Ceiling attached to rafters

Size	Spacing	DF#1	DF#2	Hem Fir #1	Hem Fir #2
2 x 4	12" oc	10'-10"	9'-10"	9'-8"	9'-2"
	16" oc	9'-10"	8'-11"	8'-9"	8'-4"
	24" oc	8'-0"	7'-10"	7'-8"	7'-3"
2 x 6	12" oc	15'-9"	15'-6"	15'-2"	14'-5"
	16" oc	14'-4"	14'-1"	13'-9"	13'-1"
	24" oc	12'-6"	11'-11"	12'-0"	11'-5"
2 x 8	12" oc	20'-10"	20'-5"	19'-11"	19'-0"
	16" oc	18'-11"	18'-5"	18'-1"	17'-3"
	24" oc	15'-10"	15'-1"	15'-8"	14'-8"
2 x 10	12" oc	> 26'	26'-0"	25'-5"	24'-3"
	16" oc	23'-9"	22'-6"	23'-1"	21'-11"
	24" oc	19'-5"	18'-5"	19'-2"	17'-10"
2 x 12	12" oc	> 26'	> 26'	> 26'	> 26'
	16" oc	> 26'	26'-0"	> 26'	25'-5"
	24" oc	22'-6"	21'-4"	22'-2"	20'-9"

Manufacture Trusses

- review approved truss plans & details
 - Compressive webs are laterally supported as per truss details if required
 - Trusses designed for lateral loads are connected to shear walls & match truss details
- Truss bearing: verify point load locations from truss plan.
(SJC Field Note 303)
 - Stud directly beneath truss with bearing 1500 - 2500lbs in 2x4 wall, 2000 –4000lbs in 2x6 walls
 - Two studs or 4x directly beneath truss with bearing 2501-4000 lbs in 2x4 wall, 4001 –6000lbs in 2x6 walls
 - For reaction loads exceed 4000lbs and 6000lbs in 2x4 and 2x6 walls respectively, Engineer Design required
- Mechanical connections
 - Hangers at header conditions match reaction loads listed on truss details
 - Uplift conditions greater than 500lbs, require verification of connection for uplift forces
 - Verify hurricane ties where trusses/rafters spaced more than 24” o.c.
 - Trusses shall be cambered for full dead load and maintain clearance to non-bearing walls once loaded, STC clips to be installed at head of non-bearing walls to trusses. (SJC-Plan Review Note #16)

Post and Beam Roof Framing

- Verify beams match span, type, and size on plan
- Post to beam connections per details and hardware schedule
- Beam to have full bearing post and full transfer to foundation or beam below.
- Notches on beams must be within allowable parameters in manufacture guidelines for engineer beams or not more than allowed per CRC502.8.1 for sawn lumber

Roof Deck

- Wood structural panels shall conform to DOC PS 1, DOC PS 2, CSA O437 or CSA O325, and shall be identified for grade, bond classification and performance category by a grade mark (CRC803.2.1)
- Shall not cantilever more than 9 inches beyond the gable end wall unless supported by gable overhang framing. (CRC803.2.3)
- Verify nailing per schedule at all collectors
- Typical 6”o.c nailing at edges and 12”o.c at field.
- Blocking and nailing at all blocked diaphragm (if any) to be completed
- Plywood with any dimension less than 16” to be blocked and edge nailed at all sides, and at least 3 sides for panel with any dimension from 16” to 24”
- Verify eave proximity to property line (Table R302.1(1) or (2)). No eave projection in 2 ’side setback, rear 15 ’setback, front porch overhang (using 5 ’setback exception), Front overhang into Front Building Setback (for lots with Front Building Setback Easement)
- Spaced lumber sheathing is not allowed in Seismic Design Category D₂ (R803.1)

Attic Ventilation

- The minimum net free ventilating area shall be $\frac{1}{150}$ of the area of the vented space.
- OR, The minimum net free ventilation area shall be $\frac{1}{300}$ if not less than 40 percent and not more than 50 percent of the venting located in the upper portion of the attic not more than 3 feet below the ridge or highest point of the space, vertically. The balance shall be located in the bottom one-third of the attic space. (CRC806.2)
- Min 1” air space to be maintained between roof deck, except high performance attic “option B” insulation can be installed directly below roof deck, and insulation and at location of the vent.

Unvented roof assembly (R806.5, vapor diffusion not required in CZ4)

- air-impermeable insulation, most closed cell spray foam types, applied in direct contact with the underside of roof deck
- OR, Where air-permeable insulation is installed directly below the structural sheathing, R-5 rigid board or sheet insulation shall be installed directly above the structural roof sheathing.

TIPS: T24, WUI

- Unvented roof with air-permeable insulation requires sheet insulation above roof deck
- In WUI area, roof vents & eave vents shall be listed to ASTM E2886

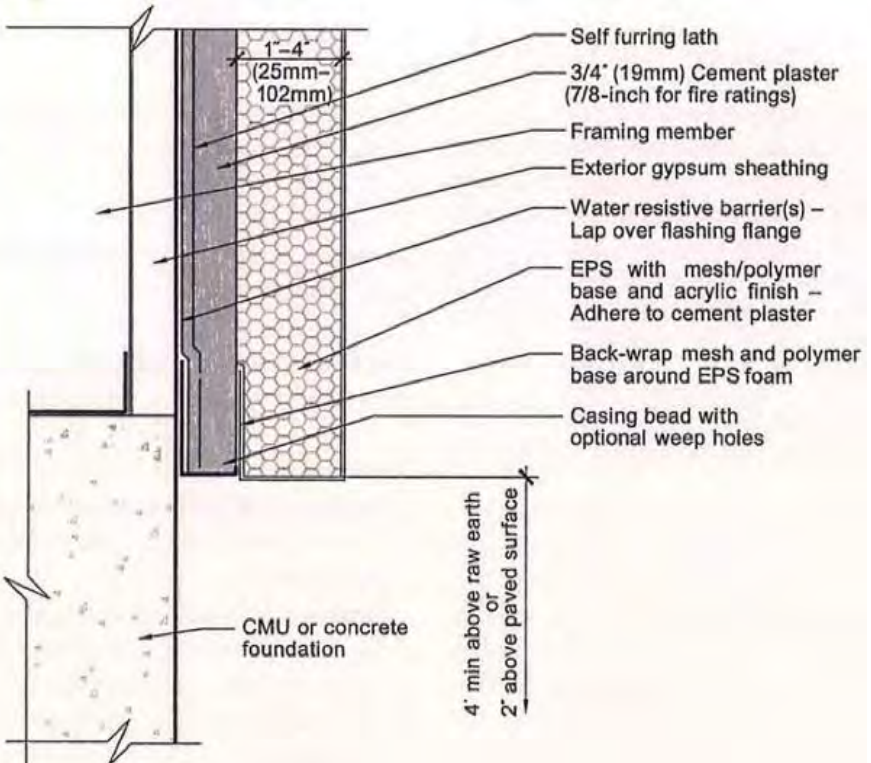
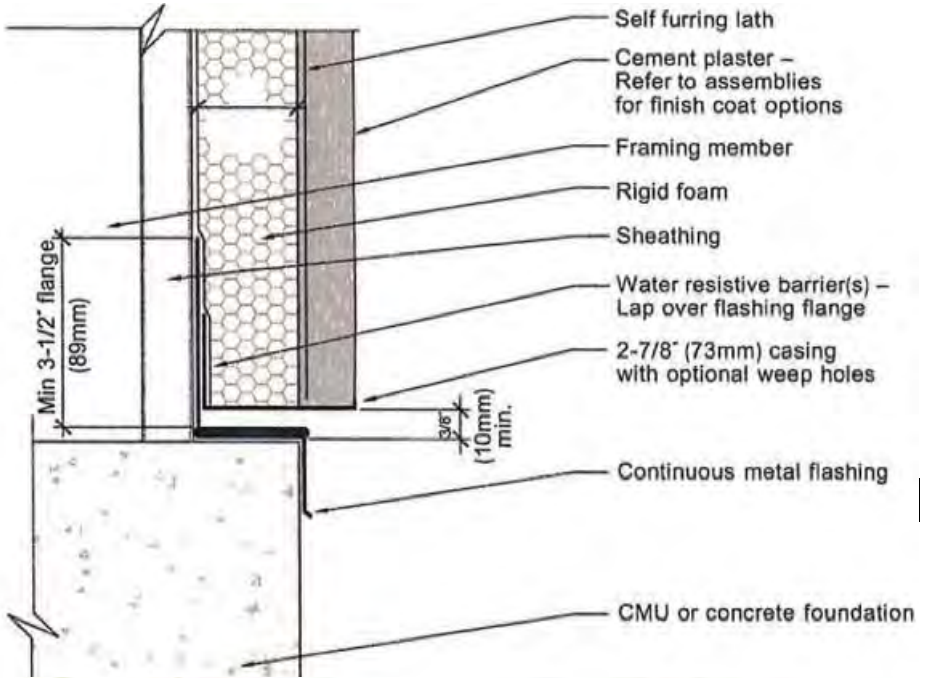
LATH INSPECTION (R703.7/CBC2507)

- ❑ Check plan for lateral bracing requirements, and shear inspection signed off on permit
- ❑ When installed over solid wood backing, 2 layers type D paper installed independently with separate continuous plane and any flashing is placed between layers. (R703.7.3)
- ❑ Windows flashed, counter flashed & caulked
- ❑ Paper laps are 2" min horizontal & 4" min vertical (R703.2)
- ❑ Wire laps are one diamond min ASTM C1063
- ❑ Break backs & tie-ins did not damage existing paper
- ❑ Lath fastened at 6" oc to studs, plates or blocking with 11 gage 1-1/2" long 7/16" head nails or 16 gage 7/8" head staples must penetrate 3/4" into framing members (R703.7.1).
- ❑ Expanded rib lath attached to horizontal wood framing member with nails or staples with not less than 1^{3/4}" penetration in to horizontal wood framing member (ASTM 1063-03)
- ❑ Corners reinforced per ASTM C1063-03
- ❑ 3-1/2" 26 gage galvanized weep screed installed 4" above earth & 2" above concrete (R703.7.2.1)

Samples of Exterior 1 hr rated wall with continuous sheet insulation from Wall and Ceiling Conference. Setbacks must have been checked at foundation to accommodate construction of wall assembly with added foam

PWA-104

PWA-105



ROUGH FRAME INSPECTION

Mandatory Inspection Condition

- ❑ Exterior weatherproof at time of Frame Inspection (R701.2), Siding is on or lath installed, and roof covered
- ❑ Exterior to be weather tight before electrical installation has begun.
- ❑ Electrical, plumbing & mechanical must be completed, inspected and approved by the time of rough frame approval (R109.1.4/CBC 110.3.4). Can be inspected at the same time with Frame Inspection.
- ❑ Fire alarm/Fire sprinkler must be completed and approved by SJFD
- ❑ No gas appliances under new REACH Code

Fire Blocks and Draft Stops (R302.11/CBC 718.2)

- ❑ Fire blocking in combustible construction
 - 2” lumber, 2 layers of 1 x, 23/32” structural plywood, 3/4” type 2-M particle board, 1/2” gypsum, 1/4” cement-based millboard, or glass fiber
 - In walls both vertical at ceiling and floor levels, and horizontal @ 10’ spacing max
 - Between vertical & horizontal spaces @ soffits, drop or cove ceilings & furred spaces
 - Concealed stair stringer spaces at top & bottom of the run
 - Openings around vent pipes, ducts, chimneys, fireplaces, and at floor and ceiling levels
 - Cornices of a two-family dwelling at separation line
- ❑ Draft stops combustible construction for R-3 (R302.12)
 - 1/2” gypsum, 3/8” plywood, 3/8” particle board, 1 x lumber, cement board, glass fiber
 - At 1000 sq ft max in floors where there is usable space above & below
 - Ceiling is suspended under the floor framing
 - Truss-type or open-web perforated member floor framing
 - In roof/ceiling assemblies between dwelling units
 - Not required in single family attics unless it’s a duplex.

Fire-Resistance construction (CRC302)

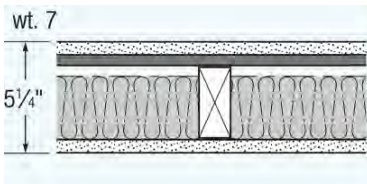
- ❑ Exterior wall rating to comply with table 302.1(1) & (2)
- ❑ Dwelling units in two-family dwellings (attached ADUs, Duplexes) shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating. (CRC302.3)
- ❑ Rating underside of roof projection can be omitted if fire blocks installed from wall top plate to underside of roof

TABLE R302.1(1) EXTERIOR WALLS BUILDINGS WITHOUT AUTOMATIC FIRE SPRINKLER PROTECTION			
EXTERIOR WALL ELEMENT		MIN FIRE-RESISTIVE RATING	SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hr-tested in accordance with ASTM E119 or UL263 with exposure form both sides	0'
	Not fire-resistance rated	0 hour	≥ 5'
Projections	Not allowed	N/A	< 2'
	Fire-resistance rated	1 hour on the underside	≥2' - 5'
	Not fire-resistance rated	0 hour	≥ 5'
Openings in walls	Not allowed	N/A	< 3'
	25% max of wall area	0 hour	3' - 5'
	Unlimited	0 hour	≥ 5'
Penetrations	All	Comply with Section R302.4	< 3'
		None required	≥ 3'

**TABLE R302.1(2) EXTERIOR WALLS-BUILDINGS WITH
AUTOMATIC FIRE SPRINKLER PROTECTION**

EXTERIOR WALL ELEMENT		MIN FIRE-RESISTANCE RATING	SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour-tested in accordance with ASTM E 119 or UL 263 with exposure from outside	0'
	Not fire-resistance rated	0 hour	≥ 3'
Projections	Not allowed	N/A	< 2'
	Fire-resistance rated	1 hour on the underside	2'
	Not fire-resistance rated	0 hour	≥ 3'
Openings in walls	Not allowed	N/A	< 3'
	Unlimited	0 hour	≥ 3'
Penetrations	All	Comply with Section R302.4	< 3'
		None required	≥ 3'

Commonly implemented 1hr rated wall assembly UL Des U327. Similar assembly can be used at exterior wall, substitute 5/8" gyp with 7/8" stucco at exterior. (CBC TABLE 721.1(1))

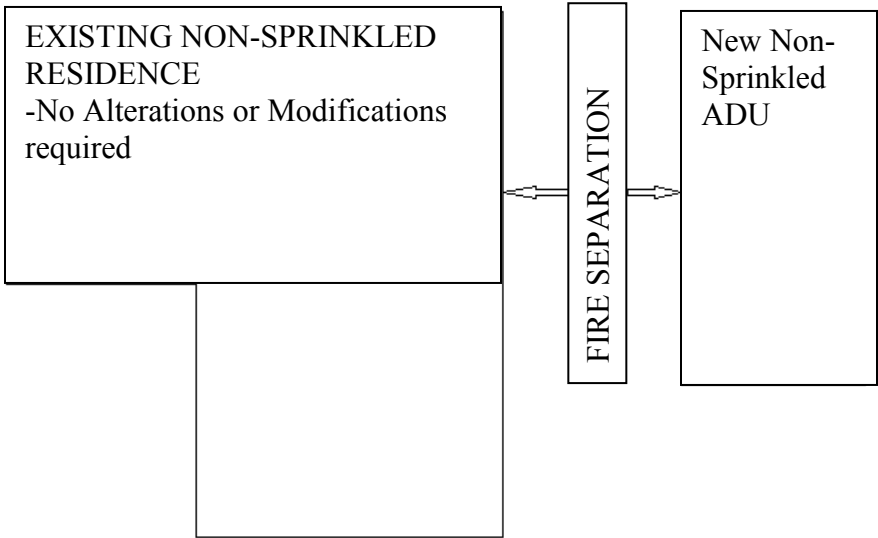


- 5/8" SHEETROCK FIRECODE C Core gypsum panels
- 2 x 4 wood stud 16" or 24" o.c.
- 3" THERMAFIBER SAFB
- RC-1 channel or equivalent one side joints finished

UL Des U327

Common ADU Fire Separation base on T302.1

A fixed imaginary property line between detached ADU and SFR shall be utilized to determine Fire Separation Distance and compliance for Both Buildings. Attached ADU not to have air transfer between units. All rated walls extend from foundation to roof.



Imaginary Property line shall be at 5ft from exterior of existing SFR.

Fire Separation Distance	Exterior Wall Requirements
Less than 6ft	<ul style="list-style-type: none"> Separation Distance under 6ft not allowed per planning division
6ft up to 8ft	<ul style="list-style-type: none"> One-hour separation wall required at new ADU No openings, except foundation vents, allowed on wall facing existing residence.
8ft up to 10ft	<ul style="list-style-type: none"> One-hour separation wall required at new ADU 25% openings and foundation vents, allowed on wall facing existing residence
10' or greater	<ul style="list-style-type: none"> One-hour separation not required Unlimited openings

Structural Bearing

- Check notching and boring - See Table. In no case shall the edge of the bored hole be nearer than 5/8" to the edge of the stud. (R602.6). Simpson Stud shoes HSS or SS can be used.

NOTCHING AND BORING			
	Notching		Boring
Joist, Rafters	1/6 allowed in 1st 1/3 of span	25% allowed at ends	D/3 allowed 2" from top & bottom
2 x 6	7/8"	1-3/8"	1-13/16"
2 x 8	1-1/4"	1-7/8"	2-7/16"
2 x 10	1-1/2"	2-3/8"	3-1/8"
2 x 12	1-7/8"	2-7/8"	3-13/16"
2 x 14	2-1/4"	3-3/8"	4-1/2"
STUDS	Notching		Boring
Bearing Members	25% allowed		40% allowed or 60% w/ double studs for 2 bays
2 x 4	7/8"		1-3/8"
2 x 6	1-3/8"		2-3/16"
NonBearing Members	40% allowed		60% allowed
2 x 4	1-3/8"		2-3/16"
2 x 6	2-3/16"		3-1/4"

- Strap top plate if less than 50% width remaining with 16 gauge thick and 1-1/2" wide strap fastened with 8-10d nails at each side of notch or hole, or as specified on plan.
- Engineered wood products: Cuts, notches and bores are prohibited except where permitted per manufacture's recommendations or such

alteration specifically designed by EOR (R502.8.2) Check structural notes for limits on notches and bores.

- Check allowable stud heights - See Table

STUD SIZE & SPACING (TABLE R602.3(5)/cbc 2308.9.1)						
	Bearing Walls				Non-Bearing Walls	
	Height	Max Stud Spacing Supporting			Height	Spacing
		Roof	1-floor	2-floor		
2 x 3	-	-	-	-	10'	16"
2 x 4	10'	24"	16"	-	14'	24"
3 x 4	10'	24"	24"	16"	14'	24"
2 x 6	10'	24"	24"	16"	20'	24"

Or, From for D.F#2, 115mph wind load

STUD HEIGHT	SUPPORTING	STUD SPACING ^a	Maximum roof/floor span ^c	
			12 ft.	24 ft.
11 ft.	Roof Only	12 in.	2 x 4	2 x 4
		16 in.	2 x 4	2 x 4
		24 in.	2 x 6	2 x 6
	Roof Table R602.3(6) and One Floor	12 in.	2 x 4	2 x 6
		16 in.	2 x 6	2 x 6
		24 in.	2 x 6	2 x 6
12 ft.	Roof Only	12 in.	2 x 4	2 x 4
		16 in.	2 x 4	2 x 6
		24 in.	2 x 6	2 x 6
	Roof and One Floor	12 in.	2 x 4	2 x 6
		16 in.	2 x 6	2 x 6
		24 in.	2 x 6	2 x 6

Footnote – Table 602.3(6)

- A. Wall studs not exceeding 16 inches on center shall be sheathed with minimum $\frac{1}{2}$ -inch gypsum board on the interior and $\frac{3}{8}$ -inch wood

structural panel sheathing on the exterior. Wood structural panel sheathing shall be attached with 8d (2.5" x 0.131") nails not greater than 6 inches on center along panel edges and 12 inches on center at intermediate supports, and all panel joints shall occur over studs or blocking.

- B. N/A for San Jose Area, due to windspeed
- C. The maximum span is applicable to both single- and multiple-span roof and floor conditions. The roof assembly shall not contain a habitable attic.

Headers

- Header span and support: Per engineer design or Table R602.7(1) & R602.7(2)

Top of header is laterally braced by perpendicular framing, or the tabulated spans for 2x8 size and larger shall be multiplied by 70%, footnote (f) from both tables.

- Full Height Studs: In addition to the required jack studs, each end of header also supported by full height studs, attached to header with min 4-16d. Where framing hardware is used to support header in lieu of jack studs, the minimum number of studs will be from 140mph, exposure B column (footnote (b)Table R602.7.5)

TABLE R602.7(1)

GIRDER SPANS AND HEADER SPANS FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas fir, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	Building width					
		12'		24'		36'	
		Span ^f	NJ ^d	Span ^f	NJ ^d	Span ^f	NJ ^d
Roof and ceiling	1-2 × 6	4-0	1	3-1	2	2-7	2
	1-2 × 8	5-1	2	3-11	2	3-3	2
	1-2 × 10	6-0	2	4-8	2	3-11	2
	1-2 × 12	7-1	2	5-5	2	4-7	3
	2-2 × 4	4-0	1	3-1	1	2-7	1
	2-2 × 6	6-0	1	4-7	1	3-10	1
	2-2 × 8	7-7	1	5-9	1	4-10	2

	2-2 × 10	9-0	1	6-10	2	5-9	2
	2-2 × 12	10-7	2	8-1	2	6-10	2
	3-2 × 8	9-5	1	7-3	1	6-1	1
	3-2 × 10	11-3	1	8-7	1	7-3	2
	3-2 × 12	13-2	1	10-1	2	8-6	2
	4-2 × 8	10-11	1	8-4	1	7-0	1
	4-2 × 10	12-11	1	9-11	1	8-4	1
	4-2 × 12	15-3	1	11-8	1	9-10	2
Roof, ceiling and	1-2 × 6	3-3	1	2-7	2	2-2	2
one center-	1-2 × 8	4-1	2	3-3	2	2-9	2
bearing floor	1-2 × 10	4-11	2	3-10	2	3-3	3
	1-2 × 12	5-9	2	4-6	3	3-10	3
	2-2 × 4	3-3	1	2-6	1	2-2	1
	2-2 × 6	4-10	1	3-9	1	3-3	2
	2-2 × 8	6-1	1	4-10	2	4-1	2
	2-2 × 10	7-3	2	5-8	2	4-10	2
	2-2 × 12	8-6	2	6-8	2	5-8	2
	3-2 × 8	7-8	1	6-0	1	5-1	2
	3-2 × 10	9-1	1	7-2	2	6-1	2
	3-2 × 12	10-8	2	8-5	2	7-2	2
	4-2 × 8	8-10	1	6-11	1	5-11	1
	4-2 × 10	10-6	1	8-3	2	7-0	2
	4-2 × 12	12-4	1	9-8	2	8-3	2
Roof, ceiling	1-2 × 6	2-11	2	2-3	2	1-11	2
and one clear-	1-2 × 8	3-9	2	2-10	2	2-5	3
span floor	1-2 × 10	4-5	2	3-5	3	2-10	3
	1-2 × 12	5-2	2	4-0	3	3-4	3
	2-2 × 4	2-11	1	2-3	1	1-10	1
	2-2 × 6	4-4	1	3-4	2	2-10	2
	2-2 × 8	5-6	2	4-3	2	3-7	2
	2-2 × 10	6-7	2	5-0	2	4-2	2
	2-2 × 12	7-9	2	5-11	2	4-11	3
	3-2 × 8	6-11	1	5-3	2	4-5	2
	3-2 × 10	8-3	2	6-3	2	5-3	2
	3-2 × 12	9-8	2	7-5	2	6-2	2
	4-2 × 8	8-0	1	6-1	1	5-1	2
	4-2 × 10	9-6	1	7-3	2	6-1	2
	4-2 × 12	11-2	2	8-6	2	7-2	2

Roof, ceiling and two center- bearing floors	1-2 × 6	2-8	2	2-1	2	1-10	2
	1-2 × 8	3-5	2	2-8	2	2-4	3
	1-2 × 10	4-0	2	3-2	3	2-9	3
	1-2 × 12	4-9	3	3-9	3	3-2	4
	2-2 × 4	2-8	1	2-1	1	1-9	1
	2-2 × 6	4-0	1	3-2	2	2-8	2
	2-2 × 8	5-0	2	4-0	2	3-5	2
	2-2 × 10	6-0	2	4-9	2	4-0	2
	2-2 × 12	7-0	2	5-7	2	4-9	3
	3-2 × 8	6-4	1	5-0	2	4-3	2
	3-2 × 10	7-6	2	5-11	2	5-1	2
	3-2 × 12	8-10	2	7-0	2	5-11	2
	4-2 × 8	7-3	1	5-9	1	4-11	2
	4-2 × 10	8-8	1	6-10	2	5-10	2
4-2 × 12	10-2	2	8-1	2	6-10	2	
Roof, ceiling, and two clear- span floors	1-2 × 6	2-3	2	1-9	2	1-5	2
	1-2 × 8	2-10	2	2-2	3	1-10	3
	1-2 × 10	3-4	2	2-7	3	2-2	3
	1-2 × 12	4-0	3	3-0	3	2-7	4
	2-2 × 4	2-3	1	1-8	1	1-4	1
	2-2 × 6	3-4	1	2-6	2	2-2	2
	2-2 × 8	4-3	2	3-3	2	2-8	2
	2-2 × 10	5-0	2	3-10	2	3-2	3
	2-2 × 12	5-11	2	4-6	3	3-9	3
	3-2 × 8	5-3	1	4-0	2	3-5	2
	3-2 × 10	6-3	2	4-9	2	4-0	2
	3-2 × 12	7-5	2	5-8	2	4-9	3
	4-2 × 8	6-1	1	4-8	2	3-11	2
	4-2 × 10	7-3	2	5-6	2	4-8	2
4-2 × 12	8-6	2	6-6	2	5-6	2	

Footnote:

- A. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine, and spruce-pine-fir.
- B. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

TABLE R602.7(2): GIRDER SPANS AND HEADER SPANS FOR INTERIOR BEARING WALLS

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING Width ^c (feet)					
		12		24		36	
		Span ^e	NJ ^d	Span ^e	NJ ^d	Span ^e	NJ ^d
One floor only	2-2 × 4	4-1	1	2-10	1	2-4	1
	2-2 × 6	6-1	1	4-4	1	3-6	1
	2-2 × 8	7-9	1	5-5	1	4-5	2
	2-2 × 10	9-2	1	6-6	2	5-3	2
	2-2 × 12	10-9	1	7-7	2	6-3	2
	3-2 × 8	9-8	1	6-10	1	5-7	1
	3-2 × 10	11-5	1	8-1	1	6-7	2
	3-2 × 12	13-6	1	9-6	2	7-9	2
	4-2 × 8	11-2	1	7-11	1	6-5	1
	4-2 × 10	13-3	1	9-4	1	7-8	1
4-2 × 12	15-7	1	11-0	1	9-0	2	
Two floors	2-2 × 4	2-7	1	1-11	1	1-7	1
	2-2 × 6	3-11	1	2-11	2	2-5	2
	2-2 × 8	5-0	1	3-8	2	3-1	2
	2-2 × 10	5-11	2	4-4	2	3-7	2
	2-2 × 12	6-11	2	5-2	2	4-3	3
	3-2 × 8	6-3	1	4-7	2	3-10	2
	3-2 × 10	7-5	1	5-6	2	4-6	2
	3-2 × 12	8-8	2	6-5	2	5-4	2
	4-2 × 8	7-2	1	5-4	1	4-5	2
	4-2 × 10	8-6	1	6-4	2	5-3	2
4-2 × 12	10-1	1	7-5	2	6-2	2	

Room Dimensions (R304)

- Hall widths 3' min (R311.6)
- Min habitable room size: 7' min dimension & 70 sq. ft. except kitchen (R304)
- Min ceiling heights—habitable room 7' min in CRC, but 7'6" min in CBC (R305.1) Refer to (R305.1) for sloped ceilings
- Bathrooms, storage rooms, & laundry rooms min ceiling height 6'8"
- Habitable basement: min 6'-8" ceiling height, 6'4" under beams, girders, ductworks (R305.1.1 exceptions)
- Bathrooms
 - 24" min depth in front & 30" min width at water closet & min 15" from center line of water closet to wall or obstruction (CPC 402.5)
 - Shower 30" min dimension & 1024 sq. in. min per (CPC 408.6)

Emergency Escape and Rescue (R310.1), Means of Egress (R311)

- Window or Door to Exterior (R310/CBC 1030) required for bedrooms, habitable attics and basements
- 20" min width and 24" min height
- 5.7 sq. ft. (821 sq. in.) min net clear opening except on or below grade floor openings can be 5 sq. ft. min net clear opening when outside grade to opening is 44" or less
- 44" max to opening from floor
- Bedroom doors are not allowed into garages (R302.5.1)
- Egress Door with opening below grade shall open to an Area Well (R310.3.2), with
 - Proper drainage, connecting to building foundation drainage system or approved alternative
 - Ladder has rungs with min 12" inside width, max 18" o.c vertical spacing, min 3" clear from wall. Alternatively, steps can be provided. Compliance to Stairs (R311.7) not mandatory.

Exception:

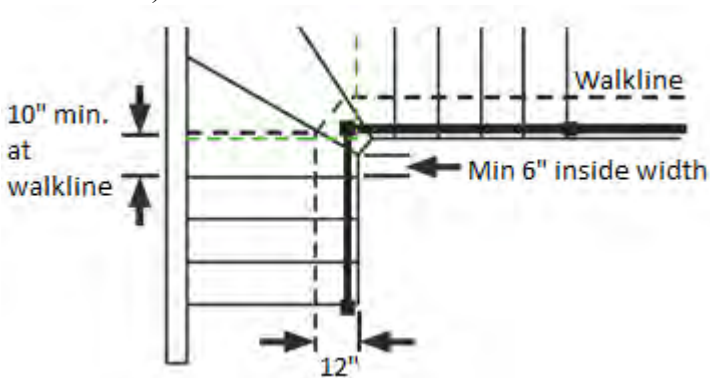
- Basement houses only mechanical equipment, less than 200 sf.
- Basement alteration or repair, no new bedroom created
- New basement addition with egress from new bedroom

- New basement addition connecting to existing basement with Egress.
- Basement, equipped with fire sprinklers and having 2 means of egress complying with R311, can have bedroom with no egress

Stairs for R-3 occupancy (R311.7)

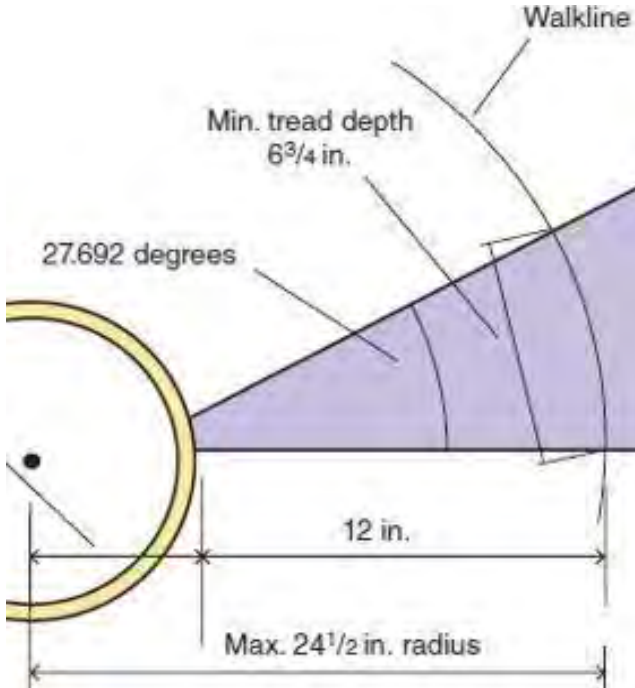
- Width:
 - Min 3' clear width above and handrail, no reduction until above 6'8"
 - Min 31^{1/2}" at hand rail and below with handrail installed on 1 side, and min 27" with handrails installed on both sides.
- Max. 151" stair rise between floor levels or landing
- 10" min tread depth with min 3/4" & max 1-1/4" nosing/11" min without nosing
- 7-3/4" max risers, solid risers or max 4" sphere @opening.
- 3/8" max variance between all risers and between all treads.
- 6'-8" minimum headroom
- Landings 36" min depth, same width as stairs served at bottom of stairs. No landing at top of interior stairs required, provided no door swing over the stairs.
- Floodzone requirement
 - Part of stairs below lowest level will have open or partially open guard rail and risers (not more than 4")
 - Area below stairways shall not be enclosed
 - Designed to resist flood load independently or break away.

Winder (R311.7.5.2.1)



- Min 6” tread depth at narrow end of walk-line and not less than 10” at wide end of walk-line, walk-line: located 12” from the narrower side of winders.
- Nosing min 3/4” and max 1-1/4” with solid risers
- 3/8” tolerance allowed on rise and run

Spiral Stair(R311.7.10.1/)



- Min clear width 26” below handrail, with 6’6” headroom
- Walkline radius is not greater than 24^{1/2} inches
- Min 6^{3/4}” tread at walk line, treads shall be identical
- Max 9^{1/2}” rise, open risers permitted
- Headroom min 6’6”

Tip: the compliant spiral staircase has 13 treads per revolution

Guardrail and Handrail: see Building Final, provide blockings for attachment.

Smoke Alarms (R314.3/CBC 907.2.11.2)

- Locations
 1. One every floor
 2. Rooms or hallways giving access to bedrooms
 3. Every bedroom
 4. Occupiable Basements & habitable attics
- Power (R314.4)
 - AC direct power with battery backup for new construction, built-in 10 yr. battery power or direct power for remodels & additions and when bedroom is added the direct power is required.
- Smoke detectors shall sound an alarm audible in all sleeping areas of the dwelling. (R314.5)
- Specific requirements
 - Min 3' from bathroom opening, heat register, tip of fan blade
 - Min 20' from permanent cooking surface, ok to reduce to 10' with ionization alarm with silencing switch, ok to reduce to 6' with photo-electric smoke alarm
 - Max 12" vertically down from the ceiling highest point
- Interconnection (CRC314.4)
 - Where New building, Alteration, Addition, Repairs that required a permit, SFR shall be equipped with Smoke alarms as new dwellings
 - Physical interconnection required, unless wireless alarms are installed and all alarms sound upon actuation of one alarm.

Carbon Monoxide Alarms (R315)

- Required for dwelling units and sleeping units with fuel-burning appliances and/or with attached garage
- Locations
 1. Rooms or hallways giving access to bedrooms
 2. One every level including basement & habitable attic
 3. In bedroom if gas burning appliance installed within bedroom or its attached bathroom.
- Power & Alarm Audibility
 - Same as smoke detectors
- Interconnection (CRC315.5)
 - Physical interconnection required, unless wireless alarms are installed and all alarms sound upon actuation of one alarm.

Exception: Where works do not result removal of wall/ceiling finishes exposing the structure and no access from basement, crawlspace or attic.

Attic Ventilation (R806)

See Roof Structure/Nail section for additional information

- Min 1/16" & max 1/4" corrosion resistant metal mesh screen required
- Check for isolated and unvented attic spaces
- Must be vented top & bottom @ 1/150 if radiant barrier is required with 30% min at the top (California Energy Code)

Light, Ventilation & Heating(R303)

- Habitable rooms
 - Min 8% of floor area for natural light
 - Min opening 4% of floor area for ventilation
 - For light & ventilation purposes, any room may be considered as part of an adjoining room when 1/2 of the common wall area is open & unobstructed. The opening shall also be a min of 1/10 of the floor area of the interior room or min 25 sq ft, whichever is greater.
 - Exterior windows open to yards or courts, min 3 'wide yard or court spaces (CBC 1206.2)
 - Must meet ASHREA 62.2 standards
- Required Heating
 - Every dwelling unit shall be provided with heating facilities capable of maintaining a room temperature of not less than 68°F at a point 3 feet above the floor and 2 feet from exterior walls in habitable rooms. Portable space heaters shall not be used to achieve compliance with this section.
- Bathrooms & Laundry Rooms, Water Closet compartment (R303.3/ASHREA62.2)
 - 1-1/2 sq ft min opening of a 3 sq ft window to exterior or mechanical ventilation capable of 50 cu ft per minute for intermittent ventilation or 20 cu ft per minute for continuous

ventilation. Exhaust shall terminate directly to the outdoors at point of discharge min 3' from any openings into the building and min 3' from a property line (CMC 504.5)

- Exhaust device is required for humidity control, even when an operable window is in place (R303.3.1)

Safety Glazing (R308.4/CBC 2406)

- All glazing in doors, see exceptions for decorative glazing and opening size limits a 3" diameter sphere to pass
- All glazing adjacent to door, less than 60" above floor and meet any of the followings:
 - within 24" of either vertical edge of the door, in plane with the door in a closed position,
 - Within 24" of hinge side, on a wall less than 180 degrees from the plane of an in-swing door.

Exception: decorative glazing, where an intervening wall or permanent barrier between door & glazing. The access door to a closet or storage area $\leq 3'$ deep, and glazing adjacent to fixed panel of patio door

- Glazing adjacent to bottom landing of a stairway and less than 3' above the landing within 5' horizontal arc less than 180 degrees from the bottom tread nosing.

Exception: Protected by a guard and plane of glass is more than 18" from guard.

- Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers & indoor or outdoor swimming pools where the bottom exposed edge of the glazing is $< 60''$ above standing or walking surface and glazing is less than 60" measured horizontally from the water edges of these fixtures.

Note: When there is no shower door or curtain installed the bathroom becomes the enclosure for tub & shower.

- All glazing in guards and railings

- Glazing adjacent stairs & ramps where the bottom exposed edge of glazing is < 36” above walking surface of stairways and intermediate landings, unless a rail installed between 34” & 38” above walking surface
- All glazing that is within 36” of a walking surface if it conforms to the following:
 - Greater than 9 sq ft on an individual pane
 - Bottom edge is less than 18” above the floor
 - Top edge is greater than 36” above the floor
 - Not protected by barrier at 34” to 38”

Protection from Water Damage (R307/CBC 1210)

- Wood framing must have water protection at shower walls, smooth, nonabsorbent surface min for 70” above the drain inlet (CBC 1210.2.3)
- Shower walls shall be finished with a nonabsorbent surface extend to 6’ min above the floor (R307.2)

FIREPLACES AND CHIMNEYS

Mechanical Fireplaces

- Installed as per manufacturers' installation instructions
- Hearth insulation underlayment installed, i.e. MICORE

Wood Burning Appliances

See City of San Jose Ordinance 26133/Field Note 34

- Wood burning appliances must be pellet-fueled, listed gas appliance, or EPA certified wood burning heater
- Existing wood burning appliances that are repaired or reconstructed or are within 12" of a building remodel or renovation (measured on a plane of the wall where the appliance is located; walls at right angles are exempt) must comply as new

Exception: Repairs to existing costing less than \$1759 (adjusted annually on July 1st) in valuation

Chimney Repairs (R1003)

- Up to 40" wide, up to 5' high 4 #4 vertical bars, upsize to #5 bars when height exceed 5', chimney > 8', it must be engineered
- > 40" wide, 2 additional #4 vertical bars for each additional 40" in width or fraction thereof
- Ties—1/4" steel 90° bends with 6" min extensions at ends & 18" oc max, 2 ties at each bend in vertical bars
- Anchor—install at each floor, ceiling or roof line with 2^{3/16"} x 1" straps cast 12" into chimney, hooked around the outer bars and extend 6" beyond the bend and fastened to min 4 floor joists with 2 1/2" diameter bolts each. If framing does not run parallel to straps, install 2x runner nailed with 2 16d's to min 4 joists with 2^{1/2"} bolt straps to runner. Anchor ties are not required for interior chimneys (R1001.4.1)
- Flue liner must be bedded in mortar & joints smoothed on the inside per ASTM C199 (R1003.12)
- Chimney flue size see Table R1003.14(1) & (2)
- Chimney termination extends at least 2' higher than any portion of a building within 10', but not less than 3' above the highest point where chimney passes through the roof (R1003.9)
- An approved spark arrestor required at final inspection (R1003.9.2)
- A cricket or saddle required for 30" or wider chimney. (R903.2.2)

ROOFING (CRC CHAPTER 9/CBC 1507)

Only Final inspection is required

Composition (slopes 2:12 or greater) R905.2, Read instructions on bundles.

- ❑ 1 overlay is allowed (R908.3.1.11)
- ❑ Solid sheathing required or over existing comp shingles R905.2.1/CBC1507.2.1
- ❑ 15lb underlayment required unless overlaying existing comp per Table R905.1.1(1) with 2" horizontal lap and 4" end lap.
- ❑ Nails 12 gage 3/8" heads or meets ASTM F1667
- ❑ Fasteners must penetrate 3/4" into or through sheathing, or reduced to sheathing thickness at overhangs
- ❑ Number of fasteners and exposure as per manufacturer's instructions, but not less than 4 fasteners per strip shingle or 2 fasteners per individual shingle (R905.2.6)
- ❑ Slopes 2:12 to 4:12 are as above except where 2 layers of 15lb underlayment are required with 19" overlap & shingles must be self-sealing (R905.1.1)
- ❑ Check bundle for nailing location requirement
- ❑ Exposed edges of sheathing to be covered with L-metal or equal (R905.2.8.5)
- ❑ Counter flashing required when flashing meets vertical surface (R905.2.8.3)

Wood Shake

- ❑ Slopes 3:12 or greater (R905.8)
- ❑ Fire treated required for new or additions or re-roofs (R902.2)
- ❑ 18" wide of strips of not less than 30lb interlayment is required between courses (R905.8.7)
- ❑ Corrosion-resistant fasteners 2 per shake, 3/4" penetration into sheathing (R905.8.6)
- ❑ Exposure per Table R905.8.6, most common 7^{1/2}"
- ❑ Side lap 1^{1/2}" min, shakes spaced 3/8" to 5/8" apart
- ❑ Nail location approximately 1" from edge & 2" above exposure

- ❑ Slopes of 3:12 are OK with 15lb underlayment in addition to all of the above in CRC only. CBC (1507.9.2) requires 4:12 min slope
- ❑ Open porches > 1-1/2:12 are OK with 90lb underlayment

Roof Tiles R905.3/CBC 1507.3 (installed as per manufacturer's installation instructions)

- ❑ Re-roofs to be lightweight tile unless supporting structure is approved for heavyweight tile
- ❑ Slope 2-1/2:12 up to 4:12 with double 30lb felt, 4:12 or greater with 30lb felt
- ❑ Solid structural sheathing
- ❑ Underlayment:
 - 30lb felt must be installed with all flashings and roof jacks integrated in a weatherboard fashion and sealed to the felt to provide a weather tight temporary roof cover
 - Valley flashing at 3:12 slope-min 36" wide, 1 layer of 15lb
 - Greater than 4:12 slope-1 layer of 30lb
 - Low slopes up to 4:12-2 layers of 30lb with 19" starter course and 36" overlapping
- ❑ Fastening
 - If lightweight tiles (< 9 psf), one nail on every tile
 - If heavy weight tile (> 9 psf), see Table R905.3.7
 - Slopes up to 5:12, nail perimeter for 3' border
 - Slopes > 5:12, see manufacturer's instructions for additional nailing requirements or Table R905.3.7
 - Corrosion resistant nails not less than 11 gauge, 5/16" head with 3/4" penetration, wire ties min 0.083"
 - 26 gage galvanized flashing and see manufacturer's instruction

Built Up/Modified Bitumen/Single-Ply/Sprayed Foam Roofing/ Liquid-applied coatings (R905.9)

- ❑ Min slope of 1/4" per foot
- ❑ See manufacturer's installation instruction

Metal Roof (R905.10)

- ❑ Slope 3:12 or greater for no lap sealant and see manufacturer installation instruction
- ❑ Install underlayment per manufacturer's instruction
- ❑ Fasteners per manufacturer's instruction or
- ❑ Galvanized fasteners for steel roofs
- ❑ Copper, brass, bronze, copper alloy & 300 series stainless steel fasteners for copper roofs
- ❑ Stainless steel fasteners are acceptable for metal roofs

Skylights (for more information see SJC Bulletin #280, plan check, and rough inspection required)

- ❑ Operating skylights are to be located:
 - 10 feet from or 3 feet below a plumbing vent
 - 4 feet from or 1 foot below a gas flue
 - 3 feet from and 1 foot below an air exhaust duct

If unable to meet these location criteria, it must be a fixed type.

- ❑ Skylights must be dual glazed and have a min. U-value of .75.
- ❑ Plastic skylights must have ICC Listing number provided.
- ❑ Glass skylights must be listed by an approved agency.

REACH code (2019 CalGreen, with CSJ Amendments)

Electric Vehicle Charging Infrastructure (Calgreen 4.106)

- Required in new single- and two- family dwellings, ADUs and townhouses with attached private garages (CRC309.8)

Exception: ADU and Junior ADU without additional parking facilities.

- Install raceway dedicated 240-volt branch circuit for min. 40Amp
- Originates at main service or subpanel (label space for EV OCPD)
- Terminates at listed cabinet, box or other enclosure, in close proximity to parking space
- Termination location stamped “EV capable” (4.106.4.2)

Electric Water Heater readiness

- 3-10AWG for water heater with 1 unused conductor cap
- Space for 120V to 240V circuit conversion in panel, labeled “Future Water Heater circuit”

Gas Ban (CSJ Ordinance, Government Code Section 65913.4)

- Affect Newly Constructed Low-Rise Residential Buildings and ADUs.
- Gas line shall not be extended to any system or device within a building.

Exception:

1. Gas Ban shall not apply to attached Accessory Dwelling Units in existing mixed-fuel buildings.
2. An applicant may request an exemption or modification from the Director Of Building Department. The burden shall be on the applicant to demonstrate the grounds for any Hardship exemption.

Solar-Readiness (*California Energy Code 110.10*)

- Solar Zone:
 - Minimum total of 250 sf solar zone that can be comprised of areas of minimum 80 sf with no dimension less than 5'. In WUI area, building with a whole house fan can have total solar zone no less than 150sf. Solar zone to be away from any shading object a distance of twice the height difference.
 - Solar zone, location reserved for inverters metering equipment with pathway for conduit routing, or plumbing path for water solar heating, to be indicated in construction document

Ridge Setback/Pathways (CRC324.6.1 & 324.6.2.1)

- Non sprinklered Building: Min Ridge setback of 18" from ridge when array covers less than 33% of roof, otherwise 36" from ridge for each roof plane.
 - Fully sprinklered Building: Min Ridge setback of 18" from ridge when array covers less than 66% of roof, otherwise 36" from ridge for each roof plane.
 - Min. 2 pathways to ridge, one on the street or driveway side, one on each roof plane with PV array.
- Raceways for PV installed with reserved space for 240V back-feed breaker, labeled "Future PV"
 - Main service panel with 200amp bus bar min., and space for double pole breaker, permanently marked "For Future Solar"

ENERGY CONSERVATION INSPECTION **(Prescriptive, CA Energy Code T150.1-A)**

Under floor, walls & batt ceiling insulation is inspected at same time.
Blown-in insulation is inspected at Final. Field Note 29.

Building Envelope ()

- R-Values of Insulation Match CF1 Form for Performance package or Prescriptive package, as follow
- Max 1:12 slope ceiling for blown in insulation
- Faced insulation has to be in substantial contact with approved wall or ceiling material or has to meet 25 flame index and 450 smoke index. (CRC 302.10)

Attic

Wall above lower ceiling to be insulated as attic

There are three options that may be used to comply:

Option A:

Removed from 2019 California Energy Code, but can be implemented as an alternative to Option B, see footnote 2

Option B:

- Ducts and air handler may be located in the attic
- Install R-38 insulation at ceiling
- Install below roof deck insulation (at rafter) R-13 with air space above insulation/ R-18 with no space

Option C:

- Ducts and air handler must be located in conditioned space
- Install attic radiant barrier
- Install R-30 insulation at ceiling

Walls

New Dwellings

2x6 @ 16" OC framing—R19 cavity + R5 continuous

2x4 @ 16" OC framing—R15 cavity + R8 continuous

Additions

Install R-15 in 2x4 framing

Install R-19 in a 2x6 framing

Underfloor

- Faced batts have facing toward conditioned area, paper face

(not required) but to be in substantial contact with drywall if used.

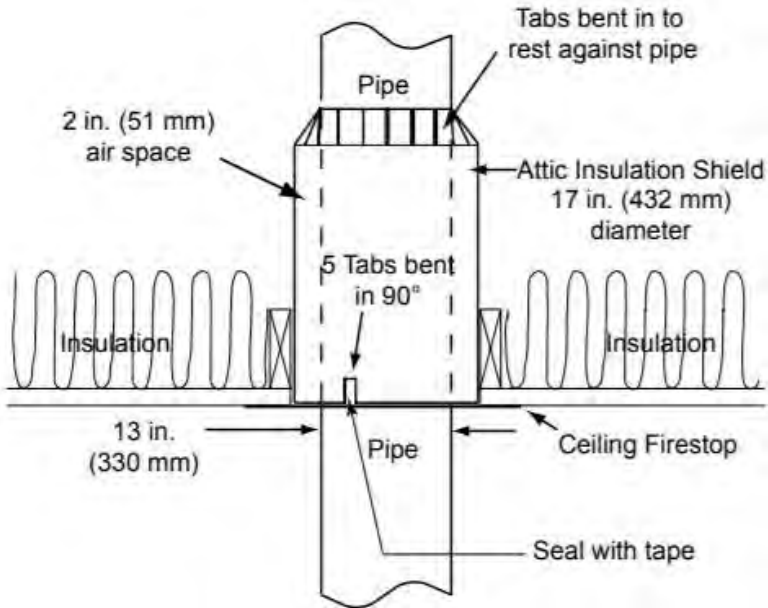
- Secure insulation if not held in place by finishes
- Cripple walls to have same insulation as underfloor
- A Class I or II vapor retarder is required on unvented attic space side with air permeable insulation (R806.5)

All exposed insulation must have a flame spread rating of 25

Or less and a smoke-developed index of not more than 450 (CBC 720.3)

Chimney shield (CRC1005.8 & CPC 509.6.1.7)

- Factory Built chimneys, which have minimum clearance requirement to insulation, are now required to have insulation shield to pro-



vide clearance.

AS10 Attic Insulation Shield Straight Hearth Home Technologies

Fenestrations & Penetrations

- U-Factor of Windows Match CF1 Form
- Glazing to be inspected at frame inspection

- ❑ Prescriptive is .30 U-factor/labeled/.23 SHGC
- ❑ SHGC may be impacted by approved permanent shading device
- ❑ Exterior Openings Sealed to Prevent Infiltration
- ❑ Exterior openings around doors, windows & exterior penetrations are sealed (California Energy Code 110.6(b))
- ❑ Sill plates are sealed at floor line on slab floors (California Energy Code 110.7)
- ❑ Penetrations in plates are sealed between attic and under floor
- ❑ Exterior sheathing is sealed to prevent openings into wall cavities

Ventilation

- ❑ Attic & Under Floor Vents Maintained Open, unless prohibited due to rating
- ❑ If attic has blown in insulation, wind blocks must be installed at eave vents
 - Block-outs must not restrict vent openings
 - Cathedral ceilings require vents top and bottom and 1” min air space

Unvented roof assembly

- ❑ air-impermeable insulation, most closed cell spray foam types, applied in direct contact with the underside of roof deck
- ❑ OR, Where air-permeable insulation is installed directly below the structural sheathing, R-5 rigid board or sheet insulation shall be installed directly above the structural roof sheathing.

Table 150.1-A COMPONENT PACKAGE – STANDARD BUILDING DESIGN FOR CLIMATE ZONE 4

Building Envelope				
Roofs/Ceilings	Option B (meets §150.1(c)9A)	Below Roof Deck Insulation ^{1,2} (With Air Space)	R 19	
		Ceiling Insulation	R 38	
		Radiant Barrier	NR	
	Option C (meets §150.1(c)9B)	Ceiling Insulation	R 30	
		Radiant Barrier	REQ	
	Walls	Above Grade	Framed ³	U 0.048
Mass Wall Interior ^{4,5}			U 0.077 R 13	
Mass Wall Exterior ^{4,5}			U 0.125 R 8.0	
Below Grade		Below Grade Interior ⁶	U 0.077 R 13	
		Below Grade Exterior ⁸		U 0.200 R 5.0
Floors		Slab Perimeter	NR	
		Raised	U 0.037 R 19	
		Concrete Raised	U 0.269 R 0	
Quality Insulation Installation (QII)			Yes	
Roofing Products	Low-sloped	Aged Solar Reflectance	NR	
		Thermal Emittance	NR	
	Steep-sloped	Aged Solar Reflectance	NR	
		Thermal Emittance	NR	
Fenestration	Maximum U-factor		0.30	
	Maximum SHGC		0.23	
	Maximum Total Area		20%	
	Maximum West Facing Area		5%	
Door	Maximum U-factor		0.20	

Table 150.1-A COMPONENT PACKAGE - Continued

HVAC SYSTEM	Space Heating ⁹	Electric-Resistance Allowed		No
		If gas, AFUE		MIN
		If Heat Pump, HSPF ⁷		MIN
	Space Cooling	SEER		MIN
		Refrigerant Charge Verification or Fault Indicator Display		NR
		Whole House Fan ⁸		NR
	Central System Air Handlers	Central Fan Integrated Ventilation System Fan Efficacy		REQ
	Ducts ¹⁰	Roof/Ceiling Options B	Duct Insulation	R-8
			§150.1(c)9A	NA
		Roof/Ceiling Option C	Duct Insulation	R-6
§150.1(c)9B			REQ	
Water Heating	All Buildings - System shall meet Section 150.19c08			

FOOTNOTE REQUIREMENTS TO TABLE 150.1-A

1. Install the specified R-value with an air space present between the roofing and the roof deck. Such as standard installation of concrete or clay tile.
2. R-values shown for below roof deck insulation are for wood-frame construction with insulation installed between the framing members. Alternatives including insulation above rafters or above roof deck.
3. Assembly U-factors for exterior framed walls can be met with cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in an assembly U-factor equal to or less than the U-factor shown. Use Reference Joint Appendices JA4 Table 4.3.1, Table 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to be less than or equal to the required max. U-factor.

4. Mass wall has a heat capacity not less than to 7.0 Btu/h-ft².
5. "Interior" denotes insulation installed on the inside surface of the wall. "Exterior" denotes insulation installed on the exterior surface of the wall.
6. Below grade "interior" denotes insulation installed on the inside surface of the wall; and Below grade "exterior" denotes insulation installed on the outside surface of the wall.
7. HSPF means "heating seasonal performance factor."
8. When whole house fans are required (REQ), only those whole house fans that are listed in the Appliance Efficiency Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow CFM is capable of meeting or exceeding a minimum 1.5 cfm/square foot of conditioned floor area as specified by Section 150.1(c)12.
9. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.
10. For duct and air handler location: REQ denotes location in conditioned space. When the table indicates ducts and air handlers are in conditioned space, a HERS verification is required.

Exterior wall: U-factor to Insulation conversion JA4.3

Spacing	Cavity Insulation	Framing size	R-0	R-2	R-4	R-5	R-6
			Continuous Insulation R Value				
16 in. OC	None	Any	0.356	0.209	0.146	0.127	0.113
	R-11	2x4	0.11	0.088	0.074	0.068	0.064
	R-13	2x4	0.102	0.082	0.069	0.064	0.06
	R-15 1	2x4	0.095	0.077	0.065	0.06	0.056
	R-19	2x6	0.074	0.063	0.055	0.051	0.049
	R-211	2x6	0.069	0.059	0.051	0.048	0.046
	R-22	2x6	0.072	0.062	0.054	0.051	0.048
	R-23	2x6	0.067	0.057	0.049	0.047	0.044
	R-25	2x6	0.065	0.055	0.048	0.045	0.043
	R-19	2x8	0.065	0.057	0.051	0.048	0.045
	R-22	2x8	0.061	0.053	0.047	0.045	0.043
	R-25	2x8	0.057	0.05	0.044	0.042	0.04
	R-301	2x8	0.056	0.049	0.044	0.041	0.04
24 in. OC	None	Any	0.362	0.211	0.148	0.128	0.114
	R-11	2x4	0.106	0.086	0.072	0.067	0.062
	R-13	2x4	0.098	0.079	0.067	0.062	0.058
	R-15	2x4	0.091	0.074	0.063	0.059	0.055
	R-19	2x6	0.071	0.061	0.053	0.05	0.048
	R-211	2x6	0.066	0.057	0.05	0.047	0.045
	R-22	2x6	0.069	0.06	0.052	0.049	0.047
	R-23	2x6	0.064	0.054	0.048	0.045	0.043
	R-25	2x6	0.061	0.052	0.046	0.043	0.041
	R-19	2x8	0.063	0.055	0.049	0.047	0.045
	R-22	2x8	0.058	0.051	0.046	0.044	0.042
	R-25	2x8	0.055	0.048	0.043	0.041	0.039
	R-301	2x8	0.054	0.047	0.042	0.04	0.038

Spacing	Cavity Insulation	Framing size	R-7	R-8	R-10	R-12	R-15
			F	G	H	I	J
16 in. OC	None	Any	0.101	0.092	0.078	0.067	0.056
	R-11	2x4	0.06	0.056	0.05	0.045	0.04
	R-13	2x4	0.056	0.053	0.047	0.043	0.038
	R-15 1	2x4	0.053	0.05	0.045	0.041	0.036
	R-19	2x6	0.046	0.044	0.04	0.037	0.033
	R-211	2x6	0.043	0.041	0.038	0.035	0.031
	R-22	2x6	0.045	0.043	0.037	0.036	0.033
	R-23	2x6	0.042	0.04	0.037	0.034	0.03
	R-25	2x6	0.04	0.039	0.035	0.036	0.032
	R-19	2x8	0.043	0.041	0.038	0.035	0.032
	R-22	2x8	0.041	0.039	0.036	0.033	0.03
	R-25	2x8	0.038	0.037	0.034	0.032	0.029
	R-301	2x8	0.038	0.036	0.033	0.031	0.028
24 in. OC	None	Any	0.102	0.092	0.078	0.067	0.056
	R-11	2x4	0.059	0.055	0.05	0.045	0.039
	R-13	2x4	0.055	0.052	0.047	0.043	0.038
	R-15	2x4	0.052	0.049	0.044	0.04	0.036
	R-19	2x6	0.045	0.043	0.04	0.036	0.033
	R-211	2x6	0.042	0.04	0.037	0.034	0.031
	R-22	2x6	0.044	0.042	0.036	0.036	0.033
	R-23	2x6	0.041	0.039	0.036	0.033	0.03
	R-25	2x6	0.039	0.037	0.034	0.035	0.031
	R-19	2x8	0.043	0.041	0.037	0.035	0.031
	R-22	2x8	0.04	0.038	0.035	0.033	0.03
	R-25	2x8	0.037	0.036	0.033	0.031	0.028
	R-301	2x8	0.037	0.035	0.033	0.03	0.028

Notes

1. Higher density fiberglass batt is required in these cases.
2. Continuous insulation may be installed on either the inside or the exterior of the wall, or both.

ENERGY COMPLIANCE STANDARD FOR ALTERATION

TABLE 150.2-C

Altered Component	Standard Design Without Third Party Verification of Existing Conditions Shall be Based On	Standard Design With Third Party Verification of Existing Conditions Shall be Based On
Ceiling Insulation, Wall Insulation, and Raised-floor Insulation	<u>The requirements of Sections 150.0(a), (c), and (d)</u>	The existing insulation R-value
Fenestration	The U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.	If the proposed U-factor is ≤ 0.40 and SHGC value is ≤ 0.35 , the standard design shall be based on the existing U-factor and SHGC values as verified. Otherwise, the standard design shall be based on the U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.
Window Film	The U-factor of 0.40 and SHGC value of 0.35.	The existing fenestration in the alteration shall be based on TABLE 110.6-A and TABLE 110.6-B.
Doors	The U-factor of 0.20. The door area shall be the door area of the existing building.	If the proposed U-factor is < 0.20 , the standard design shall be based on the existing U-factor value as verified. Otherwise, the standard design shall be based on the U-factor of 0.20. The door area shall be the door area of the existing building.

Space-Heating and Space-Cooling Equipment	TABLE 150.1-A or B for equipment efficiency requirements; Section 150.2(b)1C for entirely new or complete replacement systems; Section 150.2(b)1F for refrigerant charge verification requirements	The existing efficiency levels.
Air Distribution System – Duct Sealing	<u>The requirements of Sections 150.2(b)1D and 150.2(b)1E</u>	
Air Distribution System – Duct Insulation	The proposed efficiency levels.	The existing efficiency levels.
Water Heating Systems	<u>The requirements of Section 150.2(b)1Gii.</u>	The existing efficiency level.
Roofing Products	<u>The requirements of Section 150.2(b)1H.</u>	
All Other Measures	The proposed efficiency levels.	The existing efficiency levels.

Pipe Insulation 150(j)2 & CPC 609.11

- All domestic hot water piping shall be insulated. Insulation shall have thickness of not less than diameter of pipe, and not less than 2” thick for 2” pipe or larger.
- Insulation thickness shall be min 1” for the followings
 - i. The first 5 feet (1.5 meters) of cold-water pipes from the storage tank.
 - ii. All hot water piping with a nominal diameter equal to or greater than 3/4 inch and less than 1 inch.
 - iii. All hot water piping with a nominal diameter less than 3/4 inch that is:
 - a. Associated with a domestic hot water recirculation system;
 - b. From the heating source to the kitchen fixtures;
 - c. From the heating source to a storage tank or between storage tanks; or

d. Buried below grade, must be in water proof and non-crushable casing or sleeve (Energy Code 120.3(b))

Exception:

Installed in attics encased in min. of 4” attic insulation.

Installed in walls with insulation compliance with Quality

Insulation Installation (QII)

Surrounded with a minimum of 1” of wall insulation, 2” of crawlspace insulation, or 4” of attic insulation.

Indoor Lighting (150.0(k)) part 1

- All installed luminaries shall be high efficacy
- Blank electrical boxes that are more than 5 feet above the finished floor shall be no greater than the number of bedrooms and must be served by a dimmer, vacancy sensor control, or fan speed control.

Recessed Luminaires

- shall be IC rated and labeled that certifies the luminaire is airtight with air leakage less than 2.0 CFM at 75 Pascals. Sealed with a gasket or caulk between the luminaire housing and ceiling,
- Shall not contain screw base sockets; and shall contain light sources that are marked “JA8-2016-E” as specified in Reference Joint Appendix JA8.

Night Lights. Permanently installed night lights and night lights integral to installed luminaries or exhaust fans shall be rated

<5W per luminaire

Screw based luminaries.

- The installed lamps shall be marked with “JA8-2016” or “JA8 -2016-E” as specified in

NOTE: Light sources that are not marked “JA8-2016-E” shall not be installed in enclosed luminaries.

Indoor Light switching devices and controls (150.0(k)) part 2

- Exhaust fans shall be switched separately from lighting systems.

EXCEPTION to Section 150.0(k)2B: Lighting integral to an exhaust fan may be on the same switch as the fan provided the lighting can

be switched OFF while allowing the fan to continue to operate for an extended period of time.

- No bypass option on a dimmer or vacancy sensor function
- An Energy Management Control System (EMCS) may be used to comply with dimmer requirements in Section 150.0(k)
- In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces shall be controlled by a vacancy sensor.
- Dimmers or vacancy sensors shall control all luminaries required to have light sources compliant with Reference Joint Appendix-JA8.
Exception: Luminaries in closets < 70 sf. and in hallways.
- Under-cabinet lighting shall be switched separately from other lighting systems.

Residential Outdoor Lighting.

- All luminaries shall be high efficacy or JA8 listed, and meet one of the followings:
- Controlled by photocell and motion sensor. With manual ON/ OFF switch that does not override to ON unless the override automatically reactivates the motion sensor within 6 hours
- Controlled by photocell and time switch control with manual ON/OFF switch that does not override to ON unless the override automatically reactivates the photo control and timer switch within 6 hours
- Controlled by Astronomical timer. With manual ON/OFF switch that does not override to ON unless programmed to automatically turn the outdoor lighting OFF during daylight hours
- Energy management control system per 150.0(k)

Mechanical Compliance

- Air Filter (min MERV 13) shall be provided, except evaporative coolers are exempt, filter shall not exceed system's allowable pressure drop stated on a permanent table affixed at filter location.
- Return Duct sizing
 - Return duct length max. 30 ft and with max. 180 degrees total bend. If exceeds 90 degrees, one bend shall be a metal elbow.

- Return grille devices shall be labeled to disclose the grille's design airflow rate and a max allowable clean-filter pressure drop of 12.5Pa for the air filter media

Single Duct Systems 1.5 to 2.5 tons (CEC Table150.0-B)		
System Cooling Capacity (Ton)*	Min. Return Duct Diameter (inch)	Min. Total Return Filter Grille Gross Area (inches ²)
1.5	16	500
2	18	600
2.5	20	800
*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 ton		

Multiple Return Air Duct Systems (CEC Table150.0-C)			
System Cooling Capacity (Ton)	Duct 1 Diameter	Duct 2 Diameter	Min. Return Grille Gross Area (inches ²)
1.5	12	10	500
2	14	12	600
2.5	14	14	800
3	16	14	900
3.5	16	16	1000
4	18	18	1200
5	20	20	1500

*Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 ton

Water Heaters (no gas for new buildings, SJC. Prescriptive methods) shall meet the requirement of either i, ii, iii, iv or v:

- i.** instantaneous water heater with an input of 200,000 Btu per hour or less and no storage tank.
- ii.** A single gas or propane storage type, max 55-gallon, water heater, 75,000 Btu per hour or less. The dwelling unit shall have installed fenestration products with a weighted average U factor no greater than 0.24, and in addition one of the following shall be installed:
 - a. A compact hot water distribution system; or
 - b. A drain water heat recovery system
- iii.** A single gas or propane storage type water heater with an input of 75,000 Btu per hour or less, rated volume of more than 55 gallons.
- iv.** A single heat pump water heater. The storage tank shall be located in the garage or conditioned space. In addition, one of the following:
 - a. A compact hot water distribution system and a drain water heat recovery system that is field verified; or
 - b. A photovoltaic system capacity of 0.3 kWdc larger than the requirement specified in Section 150.1-c; or
 - c. For Climate Zones 1 and 16, a photovoltaic system capacity of 1.1 kWdc larger than the requirement specified in Section 150.1-c.
- v.** A single heat pump water heater that meets the requirements of NEEA Advanced Water Heater Specification Tier 3 or higher. The storage tank shall be located in the garage or conditioned space. In addition, for Climate Zones 1 and 16, a photovoltaic system capacity of 0.3 kWdc larger than the requirement specified in Section 150.1-c or a compact hot water distribution system

Photovoltaic System Sizing

EQUATION 150.1-C annual PV electrical output for CZ4

$$kW_{PV} = (CFA \times 0.586)/1000 + (NDwell \times 1.21)$$

WHERE:

kW_{PV} = kWdc size of the PV system

CFA = Conditioned floor area

NDwell = Number of dwelling units (= 1 for single family)

Mandatory measures (150.0(n))

- Accessible 120V electrical receptacle within 3' from the water heater, with a 120/240V 3 conductor, 10AWG copper branch circuit. Both end of the unused conductor shall be labeled "spare" and capped. Space reserved in panel for Future 240V conversion.
- A Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed
- A condensate drain that is no more than 2 inches higher than the base of the installed water heater, sloped 1/4" per foot
- A gas supply line with a capacity of at least 200,000 Btu/hr.

RATED WALL/CEILING INSPECTION

Rated Wall/Ceiling (Table R302.6/CBC 406.)

- Firewall extends to roof sheathing, through crickets above ceiling
- Ceiling rocked with 5/8" type X if living area above. Lid must extend to end of garage or 6' beyond second story wall and to roof sheathing
- Supporting walls, beams & posts for second floor are protected with 1/2" gyp or heavy timber, i.e. 8 x 8 posts & 6 x 10 beams and girders (CBC 602.4.3 & 602.4.4)

Access in garage *rated* ceiling/wall (CRC 302.6/Field Note 45)

- Doors are 20-minute rated or 1 3/8" solid core to be self-closing and self-latching or automatic closing device (R302.5.1/CBC 406.3.4)
- Ceiling access

Attic Access cover: 5/8" Type X drywall attached to a 3/4" plywood with (2) hinges, minimum, to prevent loss, self-closing (spring hinges or by gravity). Non-combustible support for the cover (dry wall rip or metal L-bracket; not just wood trim)

Attic Access Ladders: 20-minute (minimum) Fire-Rated ladder, installed per manufacturer's instructions OR

Standard ladder with 5/8" Type X drywall attached, overlapping the framing at least 1/2" on the three non-hinged sides, a double spring kit (must close easily), and a latch to hold the ladder up and tightly shut. OR, Non-Rated Attic Ladder *AND* Standard Access Cover installed *ABOVE* the ladder

Plumbing Penetrations (Field Note 30 or R302.11 item 4/CBC 714)

- Seal annular space on all metallic piping
- Install listed penetration protection on all ABS piping (Listed Fire-stop collar required for nonmetallic pipes over 2" in diameter)
- Duct penetrations are 26 gage galvanized sheet metal. No duct openings in garage
- All holes are fire caulked or mudded tight, no flat taping allowed
- Protect Furnace/water heater platforms with min 1/2 gyp if part of rated wall.

FINAL INSPECTION

BUILDING REQUIREMENTS

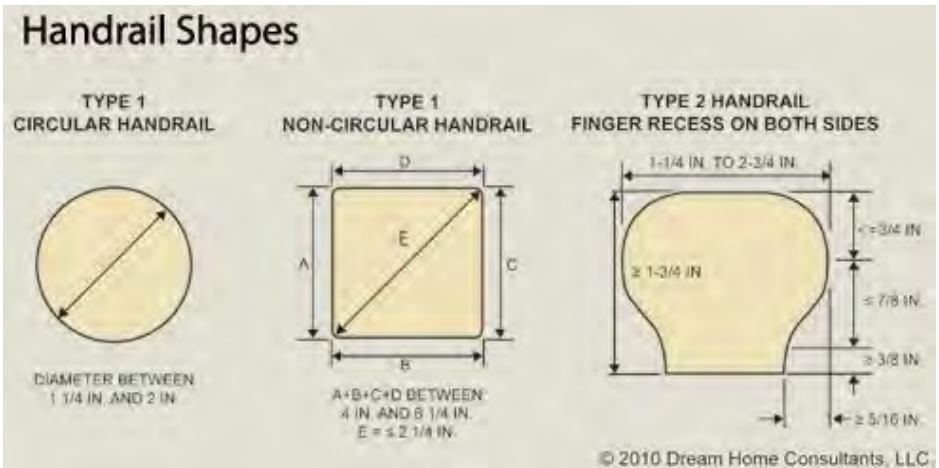
All applicable inspections below must be complete prior (or concurrent) to Final Inspection

- Insulation, QII, HERS report
- Gas pressure test
- Rated wall
- PG&E meter releases were done with sub-trade final
- Fire Sprinklers, Public Works, CDDD final
- Special inspection report, structural observation letter, and/or soil report collected (R109.2)

Stairs, Landings, & Guardrails (R311.7.5)

See Stairs in Rough Frame Inspection

Handrail(R311.7.8)



- 34" - 38" high from the sloped plane adjoining the tread nosing and continuous for the full length of the flight
- 1-1/2" min space between the wall & handrail except at terminations

- Terminate in newel posts, volute, or return to wall
- Type I: Grip size between 1-1/4" & 2" and cross section not more than 2^{1/4}"
- Type II: width of the handrail above the recess shall be not less than 1^{1/4}" and not more than 2^{3/4}". Where handrail perimeter greater than 6^{1/4}", a graspable finger recess area on both sides to be provided, begin within ^{3/4}" vertically from the tallest portion, of the profile, min depth of ^{5/16}". This required depth shall continue for not less than ^{3/8}" to a level that is not less than 1^{3/4}" below the tallest portion of the profile.
- No vertical drop and no more than 45° shift in direction, no 90-degree bend. (City of San Jose policy)

Guardrail(R312.1)

- 42" high min unless serving as handrail on open side of stair
- Openings to be 4" max, except:
 - 4^{3/8}" max at side of stairs,
 - 6" max at the triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a guard

Window Fall Protection(R312.2)

Operable window with sill height less than 24" above floor and greater than 72" above grade must comply with the following:

- Window will not open more than 4"
- A fall-protection device in compliant with ASTM F2090 is installed.
- Window is provided with opening control device complying with section R312.2.2

Bulkhead Enclosure (R311.7.10.2)

- Not part of required egress
- Exterior access to basement is exempt from requirements of Sections R311.3 and R311.7
- Covered with hinged doors

Smoke Detectors are Installed (R314/CBC 907.2.11.2 see Frame Inspection for locations)

Egress (see requirements in Frame Inspection)

Fireplace (R1001/CBC 2111)

- Hearth, mantle, and doors are installed—check manufacturer’s specifications
 - Glass doors are installed (California Energy Code 150.0(e) 1A)
- Verify Required Safety Glazing

Grading

- Check soils report for grading & drainage requirements
- Rain water leaders discharge as per plan and soils report
- Grade slopes 2% away from structure and toward street or drainage easement
- Verify clearance: 8” from earth to wood, 4” from earth to stucco & 2” from concrete to stucco from finish grade.

Energy Conservation

- All exterior doors and windows weather stripped
- Insulation certificate is posted
- Fireplace has doors installed
- Fluorescent or LED lighting is installed throughout or alternative lighting permitted by Energy code

Building Identification

Verify Street Address Installed at Front of House.

See also Final Inspection sections in Plumbing, Mechanical, and Electrical.

**DEMOLITION INSPECTION
(CSJ POLICY & CBC 3303)**

(Also see Plumbing/Mechanical/Electrical Checklist)

□ Building Demolition

- Utilities discontinued, capped-off, safe-off (CBC 3303.6)
- “non-build” areas match plan
- Buildable areas require special inspection & final letter of compaction approval

□ Pool Demolition

- Plumbing, mechanical & electrical abated
- “non-build” areas match plan
- Buildable area requires special inspection & final letter of compaction approval

Part II

PLUMBING REQUIREMENTS

2019 California Plumbing Code

Based on the 2018 Uniform Plumbing Code

UNDERGROUND SEWER - CHAPTER 7

Approved Materials 701

- ABS and PVC DWV limited to no more than two stories residences per HCD (SJC P-004)
- DWV copper tube and cast-iron soil pipe
- Polyethylene (Trenchless pipe replacement) and Vitrified Clay pipes can't be installed within 2' of building and Clay pipes are not to be pressurized by a pump or ejector. (Table 701.2)

Protection of Piping

- Material other those approved for use under or within building will be min 1' below ground surface and 2' away from structures. 718.3

Grade and Support 718

- Slope shall not be less than 2% or 1/4" per ft. 718.1
- 4" through 6" pipe may slope at 1% or 1/8" per ft, if structural conditions dictate and approved 718.1 (Exception)
- Shall be laid on a firm bed for its entire length. 718.2
- Change of direction (type of sweep) 706
 - a. Horizontal to horizontal = 45° wye, combo wye & 1/8 bend or equivalent
 - b. Vertical to horizontal = 45° wye, combo wye & 1/8 bend. 60° offset is permitted to be used only when installed in true vertical position.
 - c. Horizontal to vertical = 45° wye, 60° wye, combo wye & 1/8 bend, sanitary tee/sanitary tapped tee or equivalent

Cleanout

- Intervals exceeding 100'. 719.1
- Each aggregate horizontal change of direction $>135^\circ$
- 2' inside or outside of building, near building drain connection to building sewer. 715.1
- $\leq 2''$ cleanout requires min. 18"x18" clearance in front. 707.9
- $> 2''$ cleanout requires min. 24"x24" clearance in front. 707.9
- Under floor cleanout shall be within 5' from access.
- 4" cleanout within 5' of property line extended to grade. MO 17.56.160

Backwater Valve Requirements 710

- For fixtures on a floor level that is not above the upstream manhole by 1'. (SJC P-002)

Fixtures above the upstream manhole more than 1' cannot discharge through the backwater valve. (Check for split system requirement.)

Location of Building Sewer 307.1

- Sewer shall be located on the same lot, or in easement, as the building it serves.

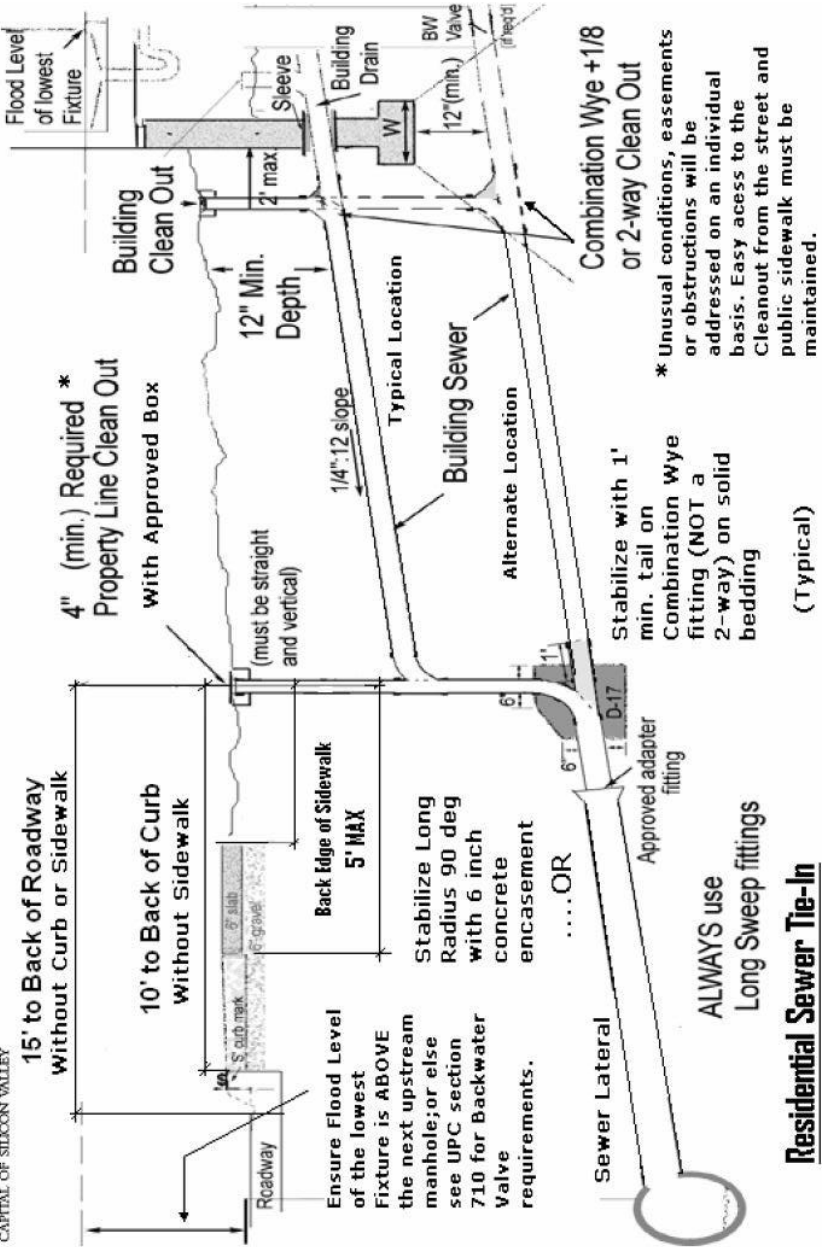
Size of Building Sewer 717

- On the basis of total fixture units per Table 703.2
- Min. of 3" with a water closet connected to it. Table 703.2
- Min. 3" sewer with 3 or less water closets. And min. 4" sewer with 4 or more water closets. (Table 703.2, note 4)
- Size shall be based on Tables 702.1 & 703.2

Backfill Requirements for Property line Cleanout Installations

Property line cleanout/piping shall be laid on a firm bed of $\frac{3}{4}''$ base rock (before inspection)

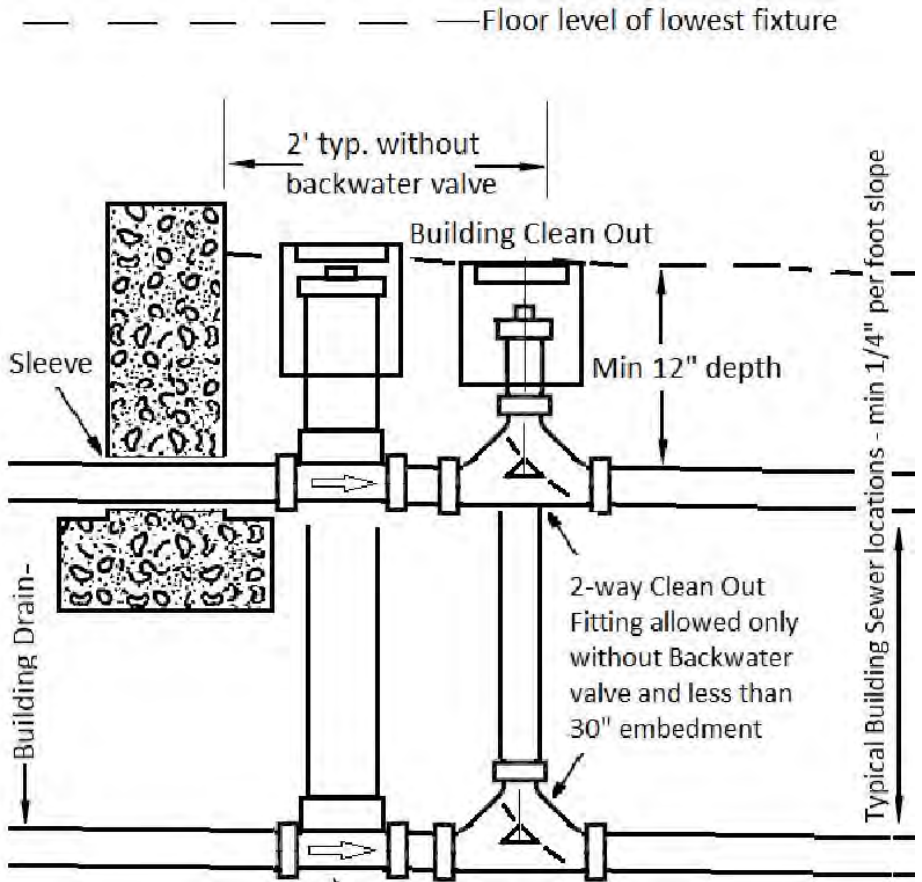
- Property line cleanout/piping shall have a minimum cover of 4" of $\frac{3}{4}''$ base-rock, then native dirt. The $\frac{3}{4}$ inch base-rock shall be at jobsite and shall be installed after final inspection.



* Unusual conditions, easements or obstructions will be addressed on an individual basis. Easy access to the Cleanout from the street and public sidewalk must be maintained.

(Typical)

Building Cleanout/Backwater valve



UNDERGROUND WATER - CHAPTER 6

Approved Materials 604

- Brass, copper, CPVC, galvanized steel, polyethylene, PP, schedule 40 PVC, stainless steel, Ductile-Iron, Malleable Iron, PE, PE-AL-PE, PE-AL-PEX, PE-RT per Table 604.1
- Copper shall be a min. of type “M” 604.3 exception
 - “ DWV is marked in yellow (usually not in single family dwellings)
 - “ Type M is marked in red
 - “ Type L is marked in blue
 - “ Type K is marked in green
- Metallic water pipe replaced nonmetallic material shall have electrical grounding provided. 604.10 exception
- A full-way gate valve shall be on the discharge side of a water meter. 606.2
- PVC female adapters allowed only with plastic male fittings 605.12.3

Service Pressure 608.1 & 608.2

- Min. pressure is 15 psi.
- Max. pressure 80 psi
- Pressure regulators are required at more than 80 psi.

Testing

- Shall be tested with either working pressure or a 50 lb. air test. 609.4
- No air test on plastic pipe is allowed. 609.4, 712.1, 723.1, exception: PEX, PP or PE-RT where permitted by manufacture.

Sizing 610

- Min. size of water service is 3/4”. Table 610.4
- Water piping shall be sized from Tables 610.3 & 610.4.

Building Supply Protection 609

- Min. cover shall be 1' below grade. 609.1
- Min. 14 AWG, blue insulated copper tracer wire that is listed for direct burial with plastic building supply. 604.10.1

APPLIANCES, APPURTENANCES, OR FIXTURES²	MIN FIXTURE BRANCH PIPE SIZE^{1,4} (INCHES)	PRIVATE
Bathtub or Combination Bath/Shower (fill)	1/2	4.0
3/4" Bathtub Fill Valve	3/4	10.0
Bidet	1/2	1.0
Clothes Washer	1/2	4.0
Dishwasher, domestic	1/2	1.5
Drinking Fountain or Water Cooler	1/2	0.5
Hose Bibb	1/2	2.5
Hose Bibb, each additional ⁸	1/2	1.0
Lavatory	1/2	1.0
Lawn Sprinkler, each head ⁵	-	1.0
Sinks	-	-
Bar	1/2	1.0
Kitchen, domestic with or without dishwasher	1/2	1.5
Laundry	1/2	1.5
Service or Mop Basin	1/2	1.5
Shower, per head	1/2	2.0
Water Closet, 1.6 GPF Gravity Tank	1/2	2.5
Water Closet, greater than 1.6 GPF Gravity Tank	1/2	3.0
TABLE 610.3 WATER SUPPLY FIXTURE UNIT (WSFU) & MINIMUM FIXTURE BRANCH PIPE SIZES³		

Notes:

1. Size of the cold branch pipe, or both the hot and cold branch pipes.
2. Appliances, appurtenances, or fixtures not referenced in this table shall be permitted to be sized by reference to fixtures having a similar flow rate and frequency of use.
3. The listed fixture unit values represent their load on the cold-water building supply. The separate cold water and hot water fixture unit value for fixtures having both hot and cold-water connections shall be permitted to be each taken as three-quarter of the listed total value of the fixture.
4. The listed minimum supply branch pipe sizes for individual fixtures are the nominal (I.D.) pipe size.
5. For fixtures or supply connections likely to impose continuous flow demands, determine the required flow in gallons per minute (gpm) (L/s), and add it separately to the demand in gpm (L/s) for the distribution system or portions thereof.
6. Assembly (Public Use (See Table 422.1))
7. Where sizing flushometer systems, see Section 610.10.
8. Reduced fixture unit loading for additional hose bibbs is to be used where sizing total building demand and for pipe sizing where more than one hose bibb is supplied by a segment of water distribution pipe. The fixture branch to each hose bibb shall be sized on the basis of 2.5 fixture units.

UNDERGROUND GAS

NO GAS TO NEW RESIDENTIAL BUILDINGS (SJ REACH)

General requirement

- Underground gas piping must have a visual inspection before covering. 1203.2
- Min 12” of cover from top of pipe, min 18” if external forces likely to result (ex. pipe buried under driveway) 1210.1.1
- Connections and fittings
 - Unions are allowed at exposed fixture connections and exposed exterior locations on the discharge side of a shut off valve only. 315.1 & 1212.6
 - In other locations, left & right couplings may be used. 1210.3
 - No bushings are allowed in concealed locations. 1210.3
- Gas piping is sized from tables in Chapter 12 of CPC.
- 1000 BTU per cubic foot to be used to calculate CFH.

Gas Piping Materials & Installation

- Schedule 40 factory wrapped or galvanized steel pipe 1208.6.3.1
 - Galvanized pipe not allowed closer than 6” above ground.
 - Pipe within 6” of ground or in ground shall be a machine applied coating.
 - Field wrap & primer are restricted to short sections & fittings.
 - Coating protection shall extend a min. of 6” above grade.
 - Shall have a min. or 12” cover, where external damage to pipe from external forces is likely, the cover shall be not less than 18” 1210.1.1
 - Shall be tested with a min. of 10 lbs. of air pressure for 15 minutes for pipe pressure at 14” water column or less. 1213.3
 - Use max. 15 lbs. gauges for pressure tests of 10 lbs. or less shall be calibrated with increments of 1/10 lb. or less. 318.5
- Polyethylene Gas Piping 1208.6.5
 - Shall be marked “gas” and “ASTM D2513”
 - Shall have a min. 18” IS12-2006

- Shall be laid in a firm bed for its entire length 1210.1.2
 - Shall have a min. 14 gauge electrically continuous corrosion-resistant tracer wire attached to the entire length & extend above grade on one end. 1210.1.7.2
- Gas Pipe Sizing
See Underfloor inspection section

UNDERFLOOR DRAINAGE INSPECTION

Drainage Systems Material & Testing

- Approved materials (Table 701.2)
 - DWV copper, ABS, PVC, Cast Iron or Galvanized steel (Galvanized steel must be kept a min. 6" above ground, and is not allowed for burial as DWV.)
- Testing system
 - Water test with a min. 10 'head. 712.2
 - Air test with a min. 5 psi for 15 minutes for metallic pipe only. 712.1 & 712.3
- Change of direction (Fittings) 706
 - Horizontal to horizontal = long sweep or equivalent
 - Vertical to horizontal = long sweep or equivalent
 - Horizontal to vertical = long sweep, sanitary tee or equivalent
 - Inlets at the same level shall be constructed so that the discharge from one cannot readily enter the other.
- Horizontal Grade of Pipe
 - Min. 2% or 1/4" per foot 708.1
- Verify backwater valve requirements 710.1
 - Only required where plumbing fixtures installed on floor level that is less than one foot above the next upstream manhole cover. SJC P002

Protection of Piping 312

- All pipes passing through concrete shall be protected from breakage and corrosion. 312.1
- Trenches deeper than the footing shall be at a 45° angle there from. 314.1 (angle of repose)
- No direct embedment in concrete. 312.2
- Exposed ABS and PVC pipes only allowed above roof jack, to be protected with water based synthetic latex paints. IAPMO IS 5-2006 and IS9-2006
- Firestop all fire rated wall, floor penetrations. CBC 312.7

Testing 723

- No air test on plastic pipes 712.1 & 723.1
- Filled with water from its lowest point to its highest.

- The building sewer shall be watertight.

Hangers and Supports 313

- Pipe shall be laid on a firm bed for its entire length. 313.5
- Upward movement shall be restricted. (Installation standards) Cast iron shall be supported within 18" of all bands.

Horizontal Piping Support

Support must be adequate to prevent sagging & maintain alignment. 313.4

- Plastic horizontal piping Table 313.3 · Max. 4 'o.c.
 - 18-gauge band iron or approved plastic hangers to restrict upward movement.
 - Shall be supported at ends of branches, at each change of direction & elevation.
- Cast Iron horizontal piping Table 313.3 · When over 4 'pipe length, support every joint.
 - Supports shall be within 18" of joints, not on couplings Table 313.3 Note 1
- Copper tubing Table 313.3
 - Shall be supported at 6 'intervals for 1 1/2" & smaller
 - Shall be supported at 10 'intervals for 2" & larger.

Note: Plumber's tape is not approved for sole support at any horizontal plumbing pipe. Plumber's tape may be used to strap cast iron down to blocking, or to keep vertical risers in stud bays in alignment only.

Cleanout Requirements 707

- Required Locations (707.4)
 - At all upper terminals, (a 2-way cleanout at the connection of the building drain to the building sewer may be substituted for the upper terminal cleanout.)
 - Each aggregate change of direction exceeding 135°.
 - Pipe runs exceeding 100'.
 - All branch lines exceeding 5 'in length.
 - Sinks & urinals regardless of branch length.
- Access & Working Clearance in Front of Cleanouts 707.9

- Min. 18”x18” in front of cleanouts for pipes 2” & smaller.
- Min. 24”x24” in front of cleanouts for pipes larger than 2”.
- Max. 5’ from crawl hole access.

Sizing DWV Systems 703

- All DWV piping shall be sized from Tables 702.1 & 703.2.
- Min. size of cleanouts as per Table 707.1
- Min. size of a vent for a water closet is 2” per note #3 of T703.2

TABLE 707.1 CLEANOUTS		
SIZE OF PIPE (inches)	SIZE OF CLEANOUT (inches)	THREADS (per inches)
1 1/2	1 1/2	11 1/2
2	1 1/2	11 1/2
2 1/2	2 1/2	8
3	2 1/2	8
4 & larger	3 1/2	8

TABLE 703.2

SIZE OF PIPE (inches)	1-1/4	1-1/2	2	3	4
Maximum Units-Drainage Piping ¹					
Vertical	1	2 ²	16 ³	48 ⁴	256
Horizontal	1	1	8 ³	35 ⁴	216 ⁵
Maximum Length-Drainage Piping					
Vertical, (feet)					
Horizontal (unlimited)	45	65	85	212	300
Vent Piping-Horizontal and Vertical ⁶					
Maximum Units	1	8 ³	24	84	256
Maximum Lengths, (feet)	45	60	120	212	300

MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING

Notes:

- ¹ Excluding trap arm.
- ² Except sinks, urinals, and dishwashers - exceeding 1 fixture unit.
- ³ Except six-unit traps or water closets.
- ⁴ Only four water closets or six-unit traps allowed on a vertical pipe or stack; and not to exceed three water closets or six-unit traps on a horizontal branch or drain.
- ⁵ Based on $\frac{1}{4}$ inch per foot (20.8 mm/m) slope. For $\frac{1}{8}$ of an inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.
- ⁶ The diameter of an individual vent shall be not less than $1\frac{1}{4}$ inches (32 mm) nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(2). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply.

TABLE 702.1 DRAINAGE FIXTURE UNIT VALUES (DFU)

PLUMBING APPLIANCES, APPURTENANCES, OR FIXTURES	MIN SIZE TRAP & TRAP ARM⁷ (INCHES)	PRIVATE
Bathtub or Combination Bath/Shower	1 1/2	2.0
Bidet	1 1/4	1.0
Bidet	1 1/2	2.0
Clothes Washer, domestic, standpipe ⁵	2	3.0
Dishwasher, domestic, with independent drain ²	1 1/2	2.0
Floor Drain (for additional sizes see Section 702.0)	2	2.0
Shower, single-head trap	2	2.0
Multi-head, each additional	2	1.0
Lavatory, single	1 1/4	1.0
Lavatory, in sets of two or three	1 1/2	2.0
Sinks	-	-
Bar	1 1/2	1.0
Kitchen, domestic ² (with or without food waste grinder, dishwasher, or both)	1 1/2	2.0
Laundry ² (with or without discharge from a clothes washer)	1 1/2	2.0
Water Closet, 1.6 GPF Gravity Tank ⁶	3	3.0
Water Closet, 1.6 GPF Flushometer Tank ⁶	3	3.0
Water Closet, 1.6 GPF Flushometer Valve ⁶	3	4.0

Notes:

1. Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain therein to, in accordance with T702.2(b).
2. Provide a 2” minimum drain.
3. For refrigerators, coffee urns, water stations, and similar low demands.
4. For commercial sinks, dishwashers, and similar moderate or heavy demands.
5. Buildings having a clothes-washing area with clothes washers in a battery of three or more clothes washers shall be rated at 6 fixture units each for purposes of sizing common horizontal and vertical drainage piping.
6. Water closets shall be computed as 6 fixture units where determining septic tank sizes based on Appendix H of this code.
7. Trap sizes shall not be increased to the point where the fixture discharge is capable of being inadequate to maintain their self-scouring properties.

Trap Arms

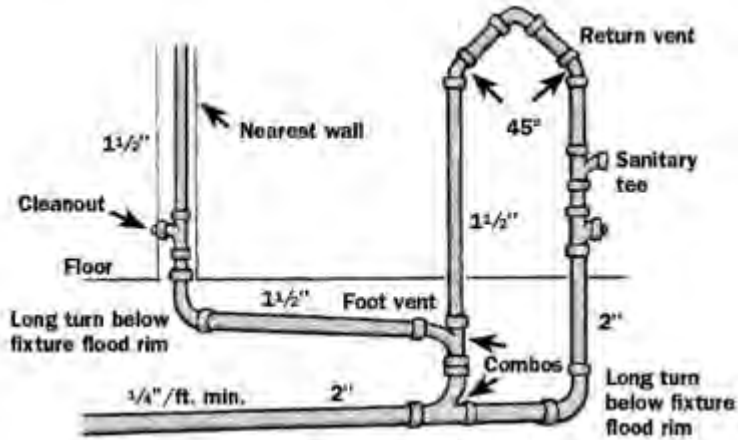
- Change in direction allowed without cleanout 1002.3 · Max. 90° on pipe 2 1/2” & smaller.
· Max. 135° on pipe 3” & larger.
- Size of trap arms Table 1002.2

Table 1002.2: LENGTHS OF TRAP ARMS (EXCEPT FOR WATER CLOSETS & SIM. FIXTURES)^{1,2}		
TRAP ARM PIPE DIAME- TER (inches)	DISTANCE TRAP TO VENT MINIMUM (inches)	LENGTH MAX- IMUM (inches)
1 1/4	2 1/2	30
1 1/2	3	42
2	4	60
3	6	72
4	8	120

Notes:

1. Maintain 1/4" per foot slope.
2. The developed length between the trap of a water closet or similar fixture (measured from the top of the closet flange to the inner edge of the vent) and its vent shall not exceed 6'.

Island Sinks 909 — Limited to sinks truly installed in an island.



Underfloor Water Piping 604

- Materials Table 604.1
- PVC is not allowed to be used in water distribution piping and fittings.
- Only water piping supplying island sinks are allowed under a slab and short sections per 609.3(2) & CSJ.
- Support of horizontal water piping Table 313.3
 - Copper tubing
 - “ Every 6' for pipe 1 1/2" & smaller.
 - “ Every 10' for pipe 2" & larger.
 - Pex
 - “ Every 32" for pipe 1" & smaller.
 - “ Every 4' for pipe 1 1/4" & larger.
 - Steel & Brass
 - “ Every 10' for pipe 3/4" & smaller.
 - “ Every 12' for pipe 1" & larger.

- ❑ All water pipe shall be reamed to the full bore of the pipe or tube.
- ❑ Sizing water pipe use Tables 610.3 & 610.4
- ❑ Pipe Insulation. See Energy Code section

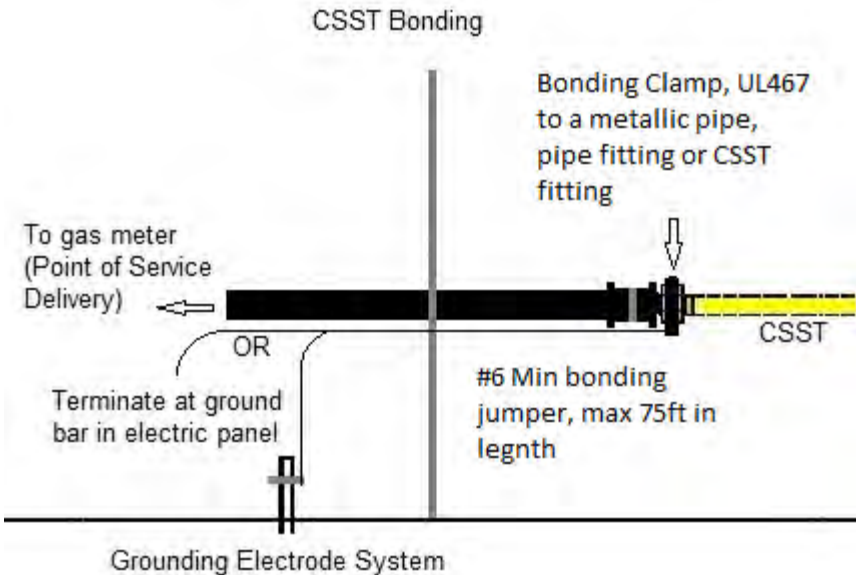
Gas Piping

- ❑ Materials 1208.6
 - No copper & brass & Aluminum alloy pipe/tube to be used with gases corrosive to such material or hydrogen sulfide content exceeds .7mg/100L 1208.5.2.2 · CSST with plan check approval only. SJC P001
 - Schedule 40 Black steel if protected from weather.
 - Schedule 40 Galvanized steel or painted black steel if exposed to weather.
- ❑ Inspection is visual only at this time.

Bonding and Grounding (1211.0)

Gas piping, other than CSST, shall be considered bonded with appliance connection.

Bonding of CSST piping:



Gas pipe sizing (2 methods)

Method 1: Longest Length Method (1215.1.1)

The pipe size of each section of gas piping shall be determined using the longest length of piping from the point of delivery to the most remote outlet and the load of the section

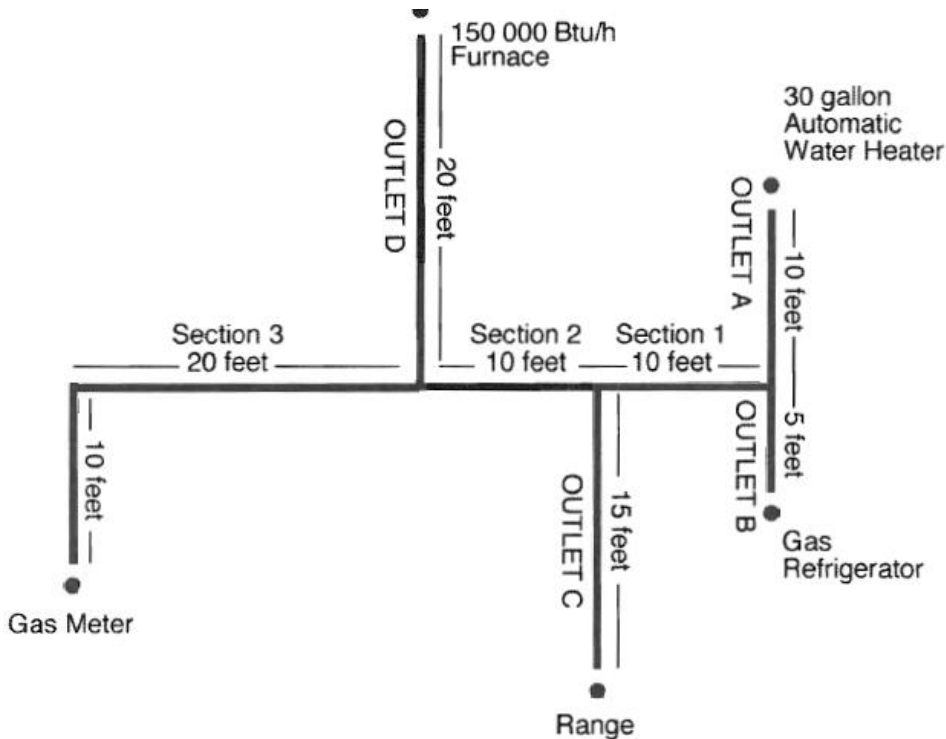
Method 2: Branch Length Method (1215.1.2)

Pipe shall be sized as follows:

1. The pipe size of each section of the longest pipe run from the point of delivery to the most remote outlet shall be determined using the longest run of piping and the load of the section.
2. The pipe size of each section of branch piping not previously sized shall be determined using the length of piping from the point of delivery to the most remote outlet in each branch and the load of the section. [NFPA 54:6.1.2]

EXAMPLE (Method 1): Determine the required pipe size of each section and outlet of the piping system shown in Figure 1215.1.1. Gas to be used has a specific gravity of 0.60 and 1000 British thermal units (Btu) per cubic foot (0.0114 kW•h/L), delivered at 8-inch water column (1.9 kPa) pressure.

For SI units: 1 foot = 304.8 mm, 1 gallon = 3.785 L, **1000** British thermal units per hour = 0.293 kW (Example in Code Book uses 1100 Btu per hour, local gas supplied rated at 1000 Btu per cfh), 1 cubic foot per hour = 0.0283 m³/h



Solution:

Maximum gas demand of

Outlet A: 35 cubic feet per hour ($0.91 \text{ m}^3/\text{h}$)

Outlet B: 3 cf/h ($0.08 \text{ m}^3/\text{h}$)

Outlet C: 65 cubic feet per hour ($1.67 \text{ m}^3/\text{h}$)

Outlet D: 150 cf/h ($3.85 \text{ m}^3/\text{h}$) [150 k Btu/hr (44 kW) divided by 1000 Btu per cf ($0.0114 \text{ kW}\cdot\text{h/L}$)].

The length of pipe from the gas meter to the most remote outlet (Outlet A) is 60 ft. Using column row marked 60 ft in Table 1215.2(1):

Outlet A, supplying 35 cf/h, requires $\frac{1}{2}$ -inch pipe.

Outlets A and B, or 38 cf/h, requires $\frac{1}{2}$ -inch pipe.

Section 2, supplying Outlets A, B, and C, or 103 cf/h requires $\frac{3}{4}$ -inch pipe.

Section 3, supplying Outlets A, B, C, and D, or 253 cf/h, requires 1-inch pipe.

Using the column marked 60 ft in Table 1215.2(1) [no column for actual length of 55 ft]:

Outlet B supplying 3 cf/h, requires $\frac{1}{2}$ -inch pipe.

Outlet C, supplying 65 cf/h, requires $\frac{1}{2}$ -inch pipe.

Outlet D, supplying 150 cf/h, requires $\frac{3}{4}$ -inch pipe.

**TABLE 1208.4.1 (NFPA 54: TABLE 5.4.2.1)
APPROXIMATE GAS INPUT FOR TYPICAL APPLIANCES**

APPLIANCE		INPUT (Btu/h)
Space Heating Units		
Warm air furnace, Single family		100,000
Hydronic boiler, Single family		100,000
Space and Water Heating Units		
Hydronic boiler, Single family		120,000
Water Heating Appliances		
Water heater, automatic stor- age	30 to 40-gallon tank	35,000
	50-gallon tank	50,000
Water heater, automatic in- stantaneous	Capacity at 2 gallons per minute	142,800
	Capacity at 4 gallons per minute	285,000
	Capacity at 6 gallons per minute	428,400
Cooking Appliances		
Range, freestanding, domestic		65,000
Built-in oven or broiler unit, domestic		25,000
Built-in top unit, domestic		40,000
Other Appliances		
Clothes dryer, Type 1 (domestic)		35,000
Gas fireplace direct vent		40,000
Gas log		80,000
Barbecue		40,000
Gaslight		2500

TABLE 1215.2(1)
SCHEDULE 40 METALLIC PIPE (NFPA 54: TABLE 6.2(B))^{1,2}

NATURAL GAS WITH INLET PRESSURE: LESS THAN 2psi
 PRESSURE DROP: 0.5 in. w.c., SPECIFIC GRAVITY: 0.60

PIPE SIZE (inch)							
NOMINAL:	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
LENGTH(ft)	CAPACITY IN CUBIC FEET OF GAS/HOUR						
10	172	360	678	1390	2090	4020	6400
20	118	247	466	957	1430	2760	4400
30	95	199	374	768	1150	2220	3530
40	81	170	320	657	985	1900	3020
50	72	151	284	583	873	1680	2680
60	65	137	257	528	791	1520	2430
70	60	126	237	486	728	1400	2230
80	56	117	220	452	677	1300	2080
90	52	110	207	424	635	1220	1950
100	50	104	195	400	600	1160	1840
125	44	92	173	355	532	1020	1630
150	40	83	157	322	482	928	1480
175	37	77	144	296	443	854	1360
200	34	71	134	275	412	794	1270
250	30	63	119	244	366	704	1120

Notes:

1. Table entries are rounded to 3 significant digits.
 2. NA means a flow of less than 10 ft³/h.
- For pipe size 3" and longer than 250', refer to the CPC Table 1215.2(1).

TABLE 1216.2(20) POLYETHYLENE PLASTIC PIPE				Gas: natural, Inlet pressure: less than 2psi Pressure drop: 0.5 in. w.c., Specific gravity: 0.60			
PIPE SIZE	1/2	3/4	1	1 1/4	1 1/2	2	3
DESIGNATION:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11
ACTUAL ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864
LENGTH (ft)	CAPACITY IN CUBIC FEET OF GAS PER HOUR						
10	201	403	726	1260	1900	3410	9450
20	138	277	499	865	1310	2350	6490
30	111	222	401	695	1050	1880	5210
40	95	190	343	594	898	1610	4460
50	84	169	304	527	796	1430	3950
60	76	153	276	477	721	1300	3580
70	70	140	254	439	663	1190	3300
80	65	131	236	409	617	1110	3070
90	61	123	221	383	579	1040	2880
100	58	116	209	362	547	983	2720
125	51	103	185	321	485	871	2410
150	46	93	168	291	439	789	2180
175	43	86	154	268	404	726	2010
200	40	80	144	249	376	675	1870
250	35	71	127	221	333	598	1660
300	32	64	115	200	302	542	1500
350	29	59	106	184	278	499	1380
400	27	55	99	171	258	464	1280
450	26	51	93	160	242	435	1200
500	24	48	88	152	229	411	1140

Notes:

1. Table entries are rounded to 3 significant digits.
2. Table includes losses for four 90-degree bends and two end fittings. Tubing runs with larger numbers of bends, fittings, or both shall be increased by an equivalent length of tubing to the following equation:
 $L=1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings, bends or both.

ROUGH PLUMBING INSPECTION

Same rules as underfloor for:

- ❑ Materials, Grade of pipe, Trap arms, Change of direction, Support of pipe, & Wet vents

Protection of Piping

- ❑ Nail plates required when plastic or copper is less the 1” from face of plate or stud, and min. 1 1/2” beyond the pipe or tubing. 312.9
- ❑ ABS & PVC piping shall not be exposed to direct sunlight with the exception of plumbing vents through roof protected by water base synthetic latex paints. (Installation Standard UPC IS 5-2006 & IS Section 2.2.3)

Closet Flanges

- ❑ Shall be 15” from center to finish sidewall. 402.5
(Shall require 30” W by 24” D in front of bowl at final)
- ❑ Flanges shall be secured with brass or stainless-steel screws, bolts or other listed equally non corrosive materials. 402.6.2

Support of vertical pipe - Table 313.3

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Cast	Lead and Oakum	5 feet, except 10 feet where 10-foot lengths are installed ^{1, 2, 3}	Base and each floor, not to exceed 15 feet
	Compression Gasket	Every other joint, unless over 4 feet then support each joint ^{1, 2, 3}	Base and each floor, not to exceed 15 feet
Cast-Iron Hubless	Shielded Coupling	Every other joint, unless over 4 feet then support each joint ^{1, 2, 3, 4}	Base and each floor, not to exceed 15 feet
Copper & Copper Alloys	Soldered, Brazed, Threaded, or Mechanical	1 ^{1/2} inches and smaller, 6 feet; 2 inches and larger, 10 feet	Each floor, not to exceed 10 feet ⁵
Steel Pipe for Water, DWV	Threaded or Welded	3/4 inch and smaller, 10 feet; 1 inch and larger, 12 feet	Every other floor, not to exceed 25 feet ⁵
Steel Pipe for Gas	Threaded or Welded	1/2 inch, 6 feet; 3/4 inch and 1 inch, 8 feet; 1 ^{1/4} inches and larger, 10 feet	1/2 inch, 6 feet; 3/4 inch and 1 inch, 8 feet; 1 ^{1/4} inches every floor level
Schedule 40 PVC and ABS DWV	Solvent Cemented	All sizes, 4 feet; allow for expansion every 30 feet ³	Base and each floor; provide mid-story guides; provide for expansion every 30'
CPVC	Solvent Cemented	1 inch and smaller, 3 feet; 1 ^{1/4} inches and larger, 4 feet	Base and each floor; provide mid-story guides
PEX	Cold expansion, Insert and Compression	1 inch and smaller, 32 inches; 1 ^{1/4} inches and larger, 4 feet	Base and each floor; provide mid-story guides
PEX-AL-PEX	Metal Insert and Metal Compression		Base and each floor; provide mid-story guides

Vents

- Every fixture trap shall be vented. 901.2
 - Shall be level or graded to drain back to the drain served. 905.1
 - Shall be 6" above the flood rim of the fixture before offsetting horizontally. 905.3
 - Shall extend above a roof a min. of 6" & 1' from vertical surfaces. 906.1
 - Shall be 10' away from or 3' above any openable openings including skylights, air intake, or vent shaft. 906.2
 - Shall terminate min. 3' from property line. 906.2
- Sizing
 - The aggregate cross-sectional area shall not be less than that of the largest required building sewer per Table 703.2. 904.1
- Vertical Wet Venting 908.1
 - Limited to vertical drainage receiving the discharge from the trap arm of 1 & 2 fixture unit fixtures. (Note: Clothes washer is 3 fixture unit fixture, laundry sink is 2)
 - Max. 4 fixtures
 - Fixtures within the same story
 - Max. 6' in developed length.
 - Min. 1 pipe size larger than the required minimum waste pipe size of the upper fixture or 1 pipe size larger than the sum of the fixture units served, whichever is larger.
 - Min. 2" pipe size for the wet vented section.

Water, Waste & Gas Piping (same rules as underfloor) Gas pressure test inspection only after sheetrock installed.

Shower Receptors 408

- Shower pans shall be inspected at the time of rough inspection.
- Shower Compartment Dimensions 408.6
 - Min. 1024 in² of finished interior
 - Capable of compassing a 30" circle

- Min. 70” above the shower drain outlet with no protrusions other than the fixture valve or valves, shower head, soap dishes, shelves, and safety grab bars or rails.
- Dam, Curb or Threshold 408.5
 - Min. 1” lower than the sides and back of receptor.
 - Min. 2” & max. 9” in depth where measured from the top of the dam or threshold to the top of the drain.
 - Threshold shall be wide enough to accommodate a min. 22”
 - Min. 1/4” per foot or max. 1/2” per foot for the slope of shower floor.
- Shower Pan 408.6
 - Hot Mopped—3 layers of grade 15 pound felt 408.7 · UPC listed 40-mil liners may be used.
 - Lining materials shall extend upward with min. 3” above horizontal surfaces and top of finished dam or threshold.
 - Must be tested with water filled up to top of rough threshold.
- Shower pan test 408.7.5
 - Min. 2” drain 408.4
 - Drain plugged below weep holes.
 - Pull plug and check complete drainage with subfloor slope to drain.
 - Verify weep holes are functional.
 - Check for leaks.

Tubs

- Fill tub with water to bottom of overflow.
- Tub & shower valves must be listed for anti-scald and thermal shock protection.
- Valve & shower riser must be secured to structure.
- When slip joints are used on trap or waste & overflow a min. 12” x 12” access panel is required. 402.11 · Tub spout shall be min. 1” above flood rim.

Pressure Balancing or Thermostatic Mixing Tub/Shower Valves

- Verify listing valves ASSE 1016/ASME a112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1
- Verify pressure balance/thermostatic mixing valve type.
- Shower and tub/shower combinations shall be provided with pressure balancing or thermostatic mixing valves. 408.3
- Valve and shower head shall be arranged to allow the bather to use the valves prior to stepping into the spray. 408.9
- Tub filler valves: hot water temp. limited to 120 degrees by device conforming to ASSE1070 or CSA B125.3 (409.4)

Cleanouts 707

- No cleanouts are required above the first floor except those serving the building drain & its branches. 707.4 Exception 3.

PLUMBING FINAL INSPECTION

Gas

- ❑ Verify rough inspection approval.
- ❑ Pressure test
 - Air test—10 lb. for 15 minutes.
 - Must use appropriate gauge—max. 15 lb. and 1/10 lb increments
- ❑ Shut off valves
 - Shall be listed for use with gas.
 - Shall be within 6 ' of gas appliances. 1212.5
- ❑ Appliance connectors 1211.3
 - Shall not be concealed and shall not be extend from one room to another or pass through wall partitions, ceilings, or floors.
 - Shall be sized per manufacturing listing.
 - Max. 6 'in length

Vents

- ❑ Must be painted & terminate into an approved flashing.

Cleanouts

- ❑ Cleanout within 5 ' of property line must be brought to grade in an approved box.

Back Water Valves

- ❑ Shall be installed in an accessible Crispy box. 710.6

Pressure Reducing valves (PRV)

- ❑ Shall be installed if pressure is greater than 80 psi. 608.2
- ❑ A listed expansion tank is required when PRV is installed. 608.2
- ❑ A “closed” water system (presence of check valve, backflow preventer) requires Expansion tanks. 608.3
- ❑ Required on all hose bibs (603.5.7) & on landscape piping (603.5.6), and Plumbing fixtures (603.5.19). Plumbing fixture fittings with integral backflow protection shall comply with ASME A112.18.1/CSA B125.1

Fixtures

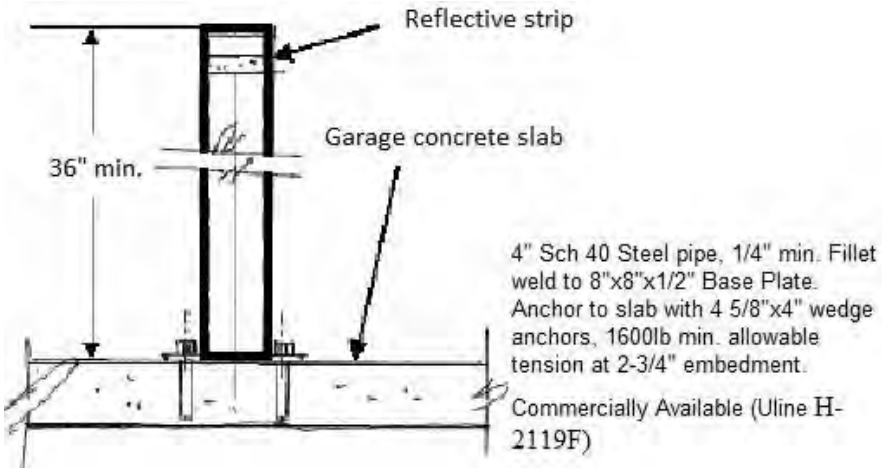
- ❑ All fixtures shall be installed and complete.

- ❑ All fixtures shall be trapped. 1001.2
- ❑ Water supplies must be UPC or IAPMO listed.
- ❑ Water Closets
 - Shall be secured to floor with corrosion resistant fasteners. 402.6.2
 - Requires 15” from center of fixture to finished wall clearance . 402.5
 - Requires 24” clearance in front. CPC 402.5 & CBC 11B-604.5.1
- ❑ Air gaps—Min. 1” from filler to flood rim of fixture. Table 603.3.1
- ❑ Dishwasher—Shall drain through an approved airgap fitting. 807.3

Water Heater

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating, gallons	38	49	49	49	62	62	74	62	74	74	74

- ❑ Storage water heater sizing (Table 5011(2)) of California Plumbing Code)
- ❑ Garage Installation 507.13
 - Shall be elevated or have adequate barrier to guard against damage. (507.13, SJ Bulletin #293) Min. 18” elevation from flammable source to floor unless listed as flammable vapor ignition resistant. 507.13
 - Earthquake straps are required as per 507.2. Strap at the vertical upper and lower third, at least 4” above control, of water heater, a 75-gallon unit requires 3 straps and a 100-gallon unit requires 4 straps



Tape Method - Use 24-gauge (minimum) plumber's tape to encircle the water heater and use lag screws to bolt it to a 2x4-inch ledger that is bolted to the wall framing. The 2x4-inch ledger is required at each strap location.

Conduit Method - Use round thin wall conduit along with 24gauge (minimum) plumber's tape, bolts, and lag screws. (SJ Bulletin #293)

□ Water Heater Closet Locations 504.1

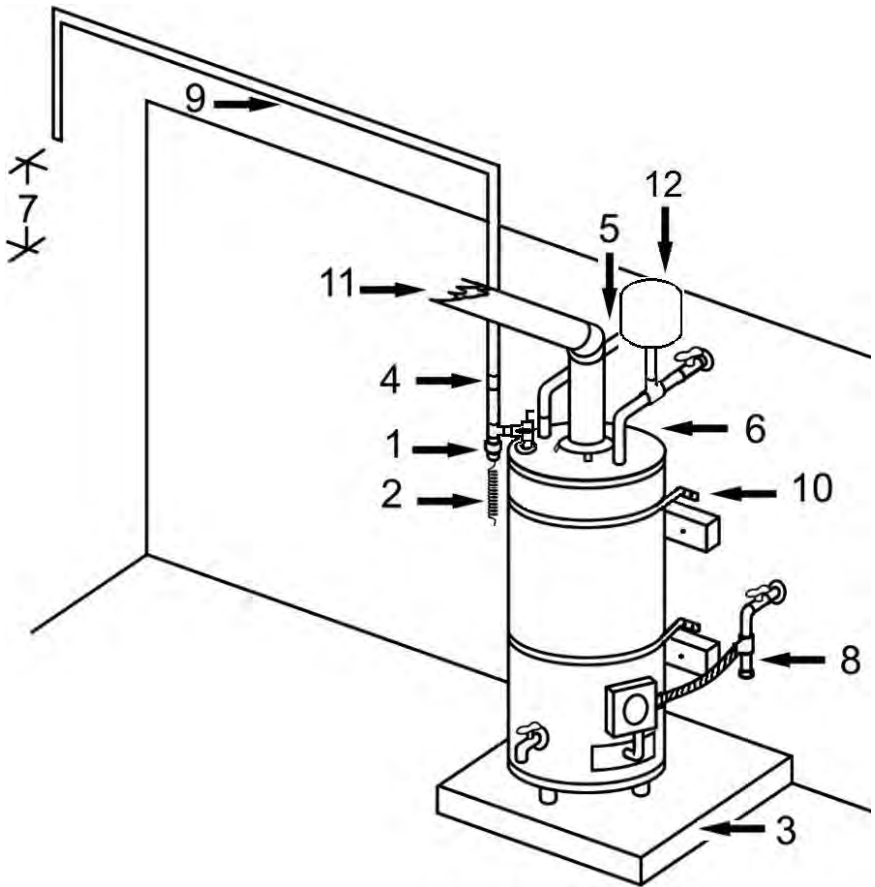
- Closet located in the bedroom or bathroom with a listed, gasket door assembly and a listed self-closing device, exception: direct vent water heater
- Seal bottom of closet door with threshold or gasket.
- Provide outdoor combustion air (506.4)

Two Openings method (506.4.1): Directly vent to outdoor or through vertical duct EACH opening will be based on 1 square inch min. per 4000 Btu/h. 2000Btu/h where venting through horizontal ducts, Openings shall be within 12" from top and bottom of the enclosure.

One Opening Method (506.4.2) within 12" of the top of enclosure, min 1 square inch per 3000 Btu/h and not less than the sum of the areas of connectors in the space. AND appliance shall have min clearance of 1" from sides and back, and 6" from front.

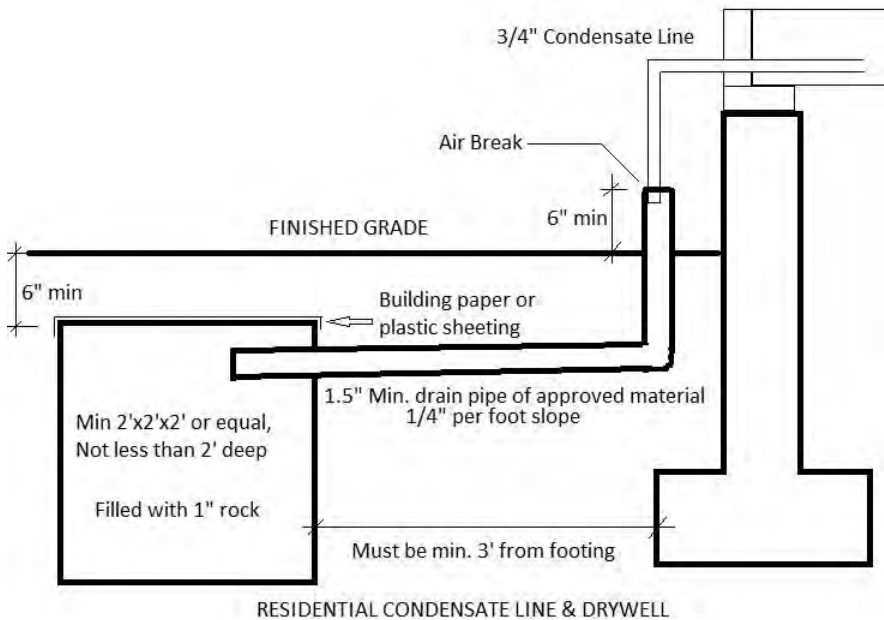
Wood louvers shall be assumed yielding 25% free area, 75% for metal louvers for required venting calculation.

- The closet shall be for the exclusive use of the water heater and/or FAU (not storage space)
- Otherwise direct vent type and non-fuel burning types may be installed in closet locations without the requirements above.
- Installations in Attics 508.4
 - Provide a corrosion resistant watertight pan (in attic, attic-ceiling assembly, floor-subfloor assembly), min 1-1/2" depth, beneath the water heater with min. 3/4" dia. drain to exterior.
 - Provide access, clearances to combustibles, switched lighting, and adjacent receptacle, Access to the attic may not be from a bedroom or bathroom; however, access from a walk-in closet is permissible.
- Clearances & Access 504.3
 - Subject to manufacturer's installation instruction. 504.3.1
 - Access door shall be min. 22" x 30". 508.4
- Installation in Basement



1. 3/4" Tee with 1/8" Reducer
2. 1/8" Tubing, "drip coil" with slightly crimped end
3. 3" min. slab or base
4. 3/4" Union within 12"
5. Hot water line (insulated first 5')
6. Cold water line with shut-off valve (insulated first 5')
7. Terminate not less than 6" and not more than 24" at exterior
8. Gas supply line with sediment trap, downstream of shutoff valve
9. 3/4" CPVC or Copper tubing, 1/4 per foot slope toward termination
10. Seismic straps, listed for size or use 24g straps (50gal: 2 straps, 75gal: 3 straps, 100gal: 4 straps)

11. Vent connector: Single appliance vent with Max. horizontal length 75% of vertical for single wall, 100% for b-vent
 12. Expansion tank if required per CPC 608.3
- Tankless Water Heater
 - Can also be Installed on exterior side/back wall: allowed *if* listed for exterior use, and if not restricted by any planned development requirements
 - Per Manufacture Installation Instructions
 - Vents: positive pressure (forced) vents. Installation of these vents must comply with the vent manufacturer's instructions. Most vents are stainless steel due to the slightly acidic content of the condensate. Type B venting material is not acceptable for positive pressure vents.
 - Condensate:
 - Discharge to trapped and vented receptors, dry-wells, leach pits or a tailpiece of plumbing fixtures. Drywell specifications are as follows:



Temperature & Pressure Relief Valve 504.6

- Shall be provided with a temperature & pressure relief valve.
- T & P valve drain line shall be within 6" to 24" from the floor. 608.5
- T& P drain line shall extend full size to the outside of the building. 608.5 (If T & P originates in garage, then it may terminate in the garage per City Policy.) It is not allowed to terminate in a building's crawl space.

Water Hammer 609.10

- ☐☐ Water pressure shock arrestors shall be installed as close as possible to quick-acting valves at the end of long pipe or near batteries of fixtures or both.
 - Mechanical devices shall be installed according to the manufacturer and shall be listed.
 - Re-pipes require water hammer arrestors per City policy

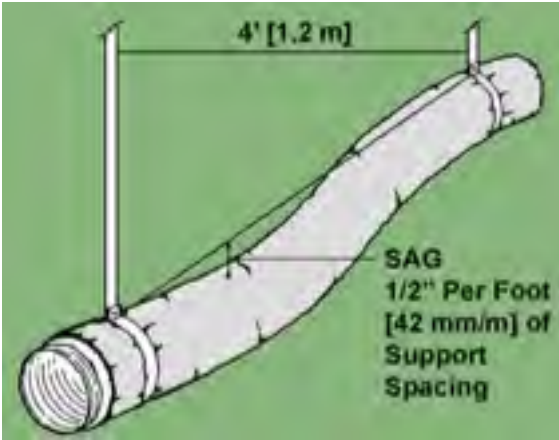
Part III
MECHANICAL REQUIREMENTS
Adopted Codes
2019 California Mechanical Code

GENERAL INFORMATION

HVAC DUCT MATERIALS AND INSTALLATION

- Joints & Seams of Ducts 603.10
 - Min. 1-1/2” contact lap for round ducts
 - Min. 3 screws equally spaced around the joint except dryer ducts 504.4
 - Shall be airtight
- Installation of Ducts 603
 - At underfloor or crawl space
 - “ Do not block or reduce underfloor access
 - “ Min. 18” vertical clearance between underside of ducts and grade at the passage to equipment
 - “ Min. 4” clearance to earth
 - “ Secure heat boots on all sides
 - “ Install ducts above the flood elevation □□Support 603.8
 - Refer to manufacturer’s installation instructions
 - SMACNA
 - “ Metal round duct—Min. 1” wide 22g strap at 12’-0” o.c
 - “ Metal rectangular duct—Min. 1” wide 22g strap at 10’-0” o.c
 - “ Aluminum Flexible duct—Min. 1” wide 22g strap at 4’-0” o.c
- Factory-Made Air Ducts and Connector 603.4
 - Shall be listed and labeled UL181
 - Vertical risers up to 2 stories with straps at max. 6’-0” o.c. CMC Standard
 - Joint secured per manufacturer’s specifications
 - Supports per manufacturer’s field fabrication and installation instructions or SMACNA

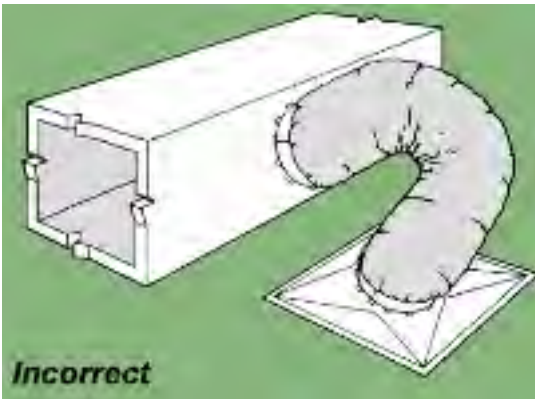
- 26 ga, 1-1/2” galvanized straps at max. 4 ’o.c. horizontally &



max. 6 ’o.c. vertically

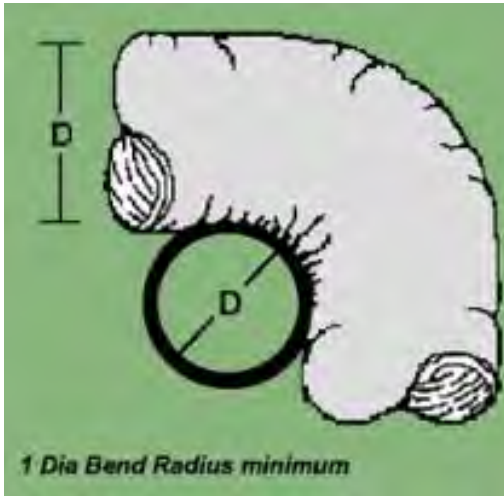
From Flexible Duct Performance and Installation Standard, 5th Ed.

- Max. 1/2” sag per ft
- Use minimum length of ducts, do not install duct in compressed state



- Avoid exposure to sunlight & sharp bends

From Flexible Duct Performance and Installation Standard, 5th Ed.



- Provide additional supports at bends up to 1 diameter
- Seal damaged vapor barriers with UL 181 listed tape

From Flexible Duct Performance and Installation Standard, 5th Ed.

UNDERGROUND/UNDERSLAB MECHANICAL INSPECTION

Gas Piping

- See Plumbing Section

HVAC metal ducts in or underslab

- Require 2" concrete engagement 603.12 □ Insulation
 - Protect against moisture
 - Package A: Min. R-6 (Energy Code Table 151.1-A)
 - Other unconditioned areas: Min. R-8
- Down-draft domestic range ducts exception 504.3
 - Schedule 40 PVC is allowed to be installed under a concrete slab

UNDERFLOOR INSPECTION

Clothes Dryers Ducts 504.4

- ❑ Refer to manufacturer's installation instructions
- ❑ Booster fans in dryer vent is not permitted
- ❑ No screws or rivets at joints, joints assembled in direction of air flow.
- ❑ Equipped with back-draft damper
- ❑ No screen at duct termination
- ❑ Shall not connect to a gas vent connector, gas vent, or chimney
- ❑ Min. 4" diameter duct
- ❑ Smooth interior metal ducts except max. 6' of exposed flexible duct
- ❑ Min. 100 in² opening for makeup air when dryer is located in a closet. 504.3.1
- ❑ Min. 3' from termination to property line and openings into the building. 502.2.1
- ❑ Min 5' from AC condenser (Energy code)
- ❑ Max. length of 14' including 2-90° elbows and deduct 2' for every added elbow. 504.4.2.1 or max. 35' and each elbow used deduct 5' per CSJ Directive M-001

When conditions prohibit compliance with CMC 504.4.2.1, use the dryer's manufacture's installation Instructions and the following

- a. The make and the model of the clothes dryer and the corresponding manufacture's installation instructions shall be provided to the Building Division for prior approval
- b. Regardless of the manufacture's installation instructions, the max. allowable equivalent length of the vent shall not exceed 35'
- c. The length of the vent shall be measured from the transition duct connected to the dryer up to the outlet terminal.
- d. The equivalent length of the vent shall be the total combined vertical and horizontal fittings shall be determined using the table below

DRYER EXHAUST DUCT FITTING EQUIVALENT LENGTH
(SJC Bulletin #258)

Fitting Type	Dryer Exhaust Duct Equi. length
4"radius mitered 45 degree elbow	30"
4"radius mitered 90 degree elbow	60"
6"radius smooth 45 degree elbow	12"
6"radius smooth 90 degree elbow	21"
8"radius smooth 45 degree elbow	12"
8"radius smooth 90 degree elbow	19"
10"radius smooth 45 degree elbow	9"
10"radius smooth 90 degree elbow	18"

e. A durable placard, min 3"x5" shall be affixed on a wall visible from and close to the dryer location. The Placard shall provide the actual length of the installed dryer exhaust vent. The following is an example of such placard.

WARNING

CHECK THE MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR ANY DOMESTIC DRYER THAT WILL BE INSTALLED AT THIS LOCATION. THE INSTALLATION INSTRUCTION SHOULD ALLOW THE DRYER TO BE CONNECTED TO AN EXHAUST DUCT (VENT) THAT IS A MAXIMUM ____ FEET LONG.

DO NOT REMOVE THIS PLACARD

Condensate Wastes 310.1-310.7, 802.9

- ❑ Required at air conditioning coils and category II & IV equipment (high efficiency appliances)
- ❑ Min. 1/8" per foot slope to drain 312.1 except pump discharge is allowed where gravity drainage is impractical to where the required slope can be resumed
- ❑ Min. 3/4" pipe up to 20 tons of refrigeration Table 312.3

- Max. 4 'o.c. for PVC support; listed primer and glue are required CPC Table 313.1
- Max. 3 'o.c. for CPVC support; listed primerless glue required, CPC Table 313.1
- Exposed plastic pipes shall be protected with water based synthetic latex paint. Metallic only for above roof installation.
- Primary condensate drain shall discharge in a drywell with an airgap or airbreak or tailpiece of plumbing fixtures 312.6
 - Min. size of a drywell is 2 ' x 2 ' x 2 ' filled with 1" clean drain rocks
 - Min. 3 ' away from building foundation
 - Cover with protective slit barrier
 - 3/4" primary drain pipe into 1-1/2" underground riser with an air break 6" above grade
 - Verify manufacturer's instruction for vent and trap requirement on condensate drain line.

Underfloor Furnace 904.3.1

- Verify with manufacturer's installation instructions
- Need to meet floor fire protection requirement (CRC3.2.13) □ □ Supported by min. 3" of concrete slab above ground, or
- Clearance from finished grade:
 - Min. 6" above grade
 - Min. 12" on sides and back
 - Min. 30" on service front
 - Min. 4" of concrete or masonry wall liners above the adjoining ground when either the excavation or passageway exceeds 12" deep
- Passageway to appliance 904.4
 - Min. 22" x 30" access opening or the largest piece of component of the appliance, whichever is greater
 - Max. 20 ' in length between access and appliance when headroom is less than 6'
 - Min. 30" x 30" work platform in front of the service side unless furnace can be serviced at the access opening within 12"

- GFCI protected service receptacle within 25 ' of equipment and light fixture are required near the appliance with lighting switch at passage entrance
- HVAC disconnect shall be within sight 301.4
- Furnace in flood zone shall be elevated at or above the flood elevation 308.2

Hydronic Piping 1201

- Hydronic system piping, tubing & fittings see Table 1201.1 for ASTM listings
- Hydronic Panel Heating System 1202
 - Backflow protection may be required when connected to potable water
 - Steel pipe, type L copper, plastic pipe or tubing rated for 100 psi at 180° can be used to pipe for heating panel
 - Embedded joints
 - “ Steel pipe welded with electrical arc or oxygen/ acetylene method 1211.2
 - “ Copper tubing joined with brazing alloys having a melting point above 1000°F, 1221.2.2
- Testing 1221.3
 - Hydrostatic test method required
 - Min. 100 psi water pressure or 1-1/2 times the operating pressure, whichever is greater for 30 minutes
Flexible plastic piping requires makeup water for stretching and visual inspection for tightness
 - Materials & installation practices see Table 1201.1

Floor Furnace 906

- Installation 906.1
 - Listed floor furnaces refer to manufacturer's installation instruction
 - Unlisted floor furnaces not allowed in combustible floors
 - Thermostats shall not be located in a room or space that is capable of being separated from the room or space in which the register of the floor furnace is located.

□ Placement 906.4

- Floor furnaces not allowed at doorways, stairway landing, aisle, or passageway of an enclosure, or in an exitway
- Min. 6” from wall to register
- Min. 18” from two adjoining sides of the floor furnace register to walls
- Min. 6” from a wall register to a corner
- Min. 12” from register to door, drapery, or similar objects

□ Bracing 906.5

- Doubled joists and with headers not lighter than the joists

□ Clearance 906.7

- Min. 6” from bottom of furnace to grade except manufacture sealed units can be 2”
- When excavation is needed, provide min. 12” on sides and min. 18” on the control side

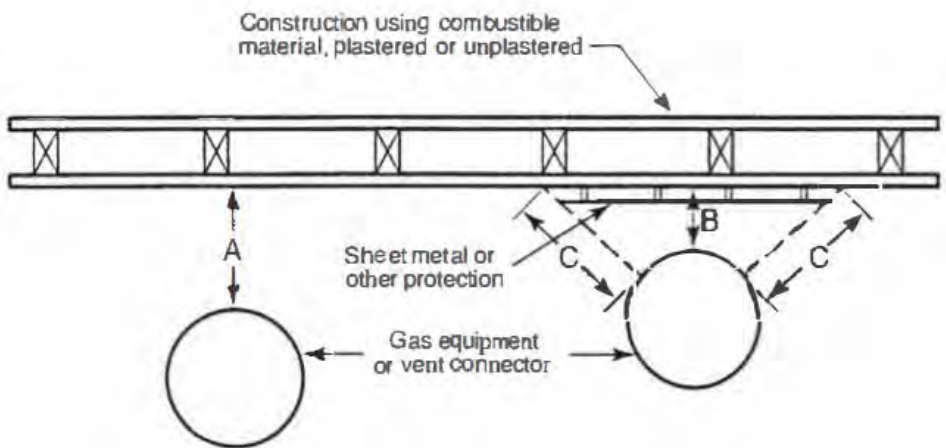
□ Access 906.8

- Min. 18” x 24” in foundation, 24”x24” in trap door.

ROUGH MECHANICAL INSPECTION

❑ **Required Clearance for Unlisted Equipment (T 904.2.2) - in inches**

APPLIANCE	ABOVE, SIDES OF FURNACE PLENUM	TOP OF BOILER	JACKET SIDES AND REAR	FRONT	DRAFT HOOD AND BAROMETRIC DRAFT REGULATOR	SINGLE-WALL VENT CONNECTOR
1. Automatically fired, forced air or gravity system, equipped with temperature limit control that is not capable of being set to exceed 250°F.	6	-	6	18	6	18
2. Automatically fired heating boilers - steam boilers operating at not over 15 pounds-force per square inch (psi) and hot water boilers operating at 250°F or less.	6	6	6	18	18	18
3. Central heating boilers and furnaces, other than in 1 or 2.	18	18	18	18	18	18



Reduced clearance, CMC 303.10, TABLE 303.10.1 (1)

Wall Furnace 907

- Installation 907.1
 - Listed wall furnaces shall be installed per manufacturer's installation instruction. Unlisted wall furnaces are not allowed to be in or attached to combustible materials
 - Vented wall furnaces require Type B-W gas vents and listed for multistory installation
 - 1st ceiling level top plates shall be cut flush with the adjacent studs with ceiling plate spacers
 - Subsequent ceiling, floor level shall use firestop spacers
 - Min. 12' from bottom of furnace to vent termination
- 802.6.2.2
 - Vent in attic shall be protected from insulations by a metal sleeve 12" above ceiling or 2" below roof sheathing
 - ≤ 12" diameter gas vents need min. 8' from a vertical wall, when > 12" and < 8' from vertical obstruction requires to terminate min. 2' above the highest point where they pass through the roof and min. 2' above a portion of a building within 10' horizontally
 - Direct-Vent wall furnaces shall be installed in accordance of manufacture installation instruction and Vent terminated min 12" above ground, 6" from to opening for 10K BTU or less, 9" for >10K up <50 K BTU, and 12" for more than 50K BTU.
- Removable panels, grilles, and access doors for servicing operations shall not be attached to the building, also see Section 802 for venting
- Locations
 - Per Manufactures Listing AND
 - Avoid causing a hazard to walls, floors, curtains, furniture, or doors.
 - When located between bathrooms and adjoining rooms, do not circulate air from bathrooms to other parts of the building
- Combustion & Circulating Air
 - Min. 50 cu ft per 1000 BTU per hour
 -

Installation of B-W gas vent for each subsequent ceiling or floor level of multistory buildings

Fire stop spacers supplied by manufacturer of B-W gas vent

Plate cut away to provide passage of B-W gas vent

Nail fire stop spacer securely

Installation of B-W gas vent for single-story buildings or for first-floor of multistory buildings

Ceiling plate spacers to center B-W gas vent in stud space — nail securely at both ends

Plate cut away for full width of stud space to provide ventilation

Studs on 16 inch centers

Header plate of vented wall furnace (also acts as fire stop)

Sheet metal screw base plate to header

Use manufacturer's method of fastening pipe to base plate

For SI units: 1 inch = 25.4 mm

FIGURE 907.1.2

INSTALLATION OF TYPE B-W GAS VENTS FOR VENTED WALL FURNACES

[NFPA 54: FIGURE 10.26.1.3]

Central Forced Air Furnace 904

Locate in bedrooms or bathrooms 904.1

- In a closet located in the bedroom or bathroom with a listed self-closing and gasketed door assembly and combustion air obtained from the outdoors, or
- Direct-vented type □□ Clearance 904.2
- Listed central heating furnaces per manufacturer's instruction
- Unlisted central-heating furnaces from combustible materials per Table 904.2 unless manufacturer's instruction allows reduction
- Listed & unlisted heating furnaces are permitted to reduce clearances to combustible material provide that the combustible material or appliance is protected per Table 303.10.1
- Where the furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is $\leq 2''$.
- The clearance to these appliances shall not interfere with combustion air, draft hood clearance and relief, and accessibility for servicing
- Supply air ducts connecting to listed central heating furnaces shall have the same minimum clearance to combustibles as required for the furnace supply plenum for a distance of min. 3' from the supply plenum.
- Supply air ducts connecting to unlisted central heating furnaces equipped with temperature limit controls with a max. setting of 250°F shall have a min. 6" clearance to combustibles for a distance of min. 6' from the furnace supply plenum.
- Central heating furnaces other than those listed in Section 904.2(7) or Section 904.2(8) shall have clearances from the supply ducts of min. 18" from the furnace plenum for the first 3', then 6" for the next 3' and 1" beyond 6'.
- Central heating furnaces not listed for closet or alcove require a room or space with min. 12x the total volume of the furnace and a 8' ceiling height, where ceiling height $> 8'$, the volume shall be calculated on the basis of an 8' ceiling. 303.2

Locate in Attic

- ❑ Opening allowing the largest component of the appliance and not less than 22" x 30"
- ❑ Passageway
 - When passage height is < 6', the access to appliance at max. 20' in length
 - Min. 24" wide unobstructed solid flooring from access to the appliance
 - Min. 30" x 30" level working platform or grade surface in front of the service side of the appliance unless it can be serviced from the access within 12" of the appliance
 - Provide a permanent receptacle outlet within 25' of furnace and a lighting fixture near the appliance with switch controlling the light fixture located at the access entrance
 - Disconnect located adjacent to and within sight of furnace
 - Verify manufacturer's instruction for spark shield in front of fire box on horizontal installation
 - Vertical installation requires min. 5' headroom in attic

Equipment and appliances on Roofs 303.8

- ❑ Listed or protected with enclosure that withstand climatic conditions
- ❑ Min. 30" clearance between the entire service access panel of the equipment and the enclosure walls
- ❑ Min 30"x30" level area at the service side of equipment where roof slope 4:12 or more. (304.2)
- ❑ Load Capacity (Roof Support) 303.8.1
 - Structure shall be capable to support the additional load
 - Or reinforced to support the additional load ❑❑Fasteners 303.8.2
 - Access locks, screws, and bolts shall be corrosion-resistant material.
- ❑ Clearance 303.8.4
 - Well-drained roof surface is required
 - Min. 6' between apart of the equipment and the edge of a roof or other similar hazard or provide a min. 42" high rail, guard, parapets, or other building structures on the exposed side.
- ❑ Electrical Power

- Provide a readily accessible disconnect within sight
- Provide a GFCI receptacle on the roof adjacent to the equipment on the supply side of the disconnect switch
- Access to equipment on roof 304.3
 - Buildings over 15 'in height shall have an inside means of access to the roof 304.3.1
 1. Door or scuttle—Min. 22" x 24" opening
 2. Permanent ladders
 - Min. 30" extension of side railing above roof or parapet wall
 - Landings: max. 18 'apart measured from the finish grade
 - Min. 14" wide on center
 - Rungs are max. 12" oc.
 - Min. 6" toe space
 - Permanent lighting
 1. A permanent lighting at roof access
 2. Switch for such lighting shall be located inside the building near the access
 - Standing water
 1. Water sealed walkway, platform or both shall be elevated above waterline located adjacent to the equipment and control panels

Appliances Located in Garages 305.1

- Protect against damages
 - Burners & burner-ignition devices shall be min. 18" above floor unless the equipment is listed as flammable vapor ignition resistant
 - Install protective barriers or elevate or locate equipment out of the vehicle path against physical damage
 - When the equipment is compartmented with an outside access, the equipment is permitted to be installed at floor level as long as adequate combustion air is provided and exhaust to the exterior

Air Conditioning Compressors

- Location & Supports
 - Not allowed in required side-yard setback or front-yard setbacks or easements, and not within 5 ' of rear-yard property line (Zoning Ordinance 20.30.400)
 - Supported from ground shall rest on a 3" concrete or approved base 1105.2
 - Locate at or above flood elevation in flood zones 305.2
 - Secure piping and tubing for permanent installation. 1111.2
 - Within 6 ' following the first bend from the compressor
 - Within 2 ' of each subsequent bend or angle
 - Max. 15 ' between supports

Decorative Appliances in Vented Fireplaces 911.0

- Prohibited locations 911.1
 - Bathrooms or bedrooms unless listed for such locations with the required volume of combustion air
- Installation
 - Required a working noncombustible chimney flue
 - Shall not be thermostatically controlled
 - Install per manufacturer's installation instruction
 - Unlisted appliance installed in a vented fireplace requires permanent free opening based on appliance input rating and chimney height per Table 907.2
- Fireplace screen is required

Vented Gas Fireplaces 912.0

Any newly installed gas fireplace shall be direct-vent, sealed combustion type. (HCD1, HCD2)

- Installation
 - Listed vented gas fireplaces install per manufacturer's installation instructions
 - Unlisted vented gas fireplaces shall be installed min. 18" from combustible material on sides and rear. Protect combustible floor under unlisted appliances. Draft hood and venting accordance with Section 802 are required. Metal, asbestos, or ceramic material to direct radiation to the front of the appliance shall

have 36” in front and, where constructed with a clearance of min. 18” at the sides and 12” at the rear.

- Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building.
- Direct-vent gas fireplaces shall be installed with the vent air intake terminal in the outdoors and per manufacturer’s instructions.

Vent connector

Category 1 Equipment (CMC 802.10)

- Minimum 26g (CMC Table 802.10.1.3) and located in same room as appliance 802.10.12
- Vent Connector clearances 802.10.4 & Table 802.7.3.3
 - 6” for single wall connector. B-vent, as listed, 1”
- Min ¼ per foot slope upward
- Length of Vent connector:
 - Horizontal run not to exceed 75% of vertical height of chimney or vent for single wall (802.10.7.1) NOR 100% of vertical height of a type B, double wall vent connector. But not to exceed 18” per inch of connector diameter in total length. (803.2.1)
- Size of vent connector- single appliance: 802.10.2.2
 - Not less than area of the draft hood of the appliance to which it is connected.
- Size of vent connector- multiple appliances: 802.10.2.2
 - Common vent connector for 2 appliances shall not be less than area of the larger vent connector + 50% of the area of the smaller flue collar outlet.

Vent connectors for Category II, III, and IV

- Shall comply with 802.4 and 802.4.3 and manufacturer of listed appliances

Vent

- Type B vents shall terminate not less than 5’ above the highest connected draft hood or connector (802.6.1.1)

- Vent offsets 802.6.2.2 shall extend vertically with offset not exceeding 45 degrees from vertical except that a vent system having not more than one 60 degrees offset shall be permitted, any angle greater than 45 degree from vertical is considered horizontal.
- Maximum vent size, not larger than 7x the area of the smallest draft hood outlet area.
- Gas vents shall be sized in accordance with 803.0
Use tables 803.1.2(1)-803.1.2(6) for single appliance
Use tables 803.2(1)-803.2(9) for multiple appliances

Vent terminations: 802.6.1

- Vent termination clearances from openings into the buildings 802.6.2
 - Forced air inlets—min. 3 ' above inlets within 10 ' 802.6.1.6
 - Any air inlets—min. 10 ' from operable ventilation openings ASHRAE 62.2-6.8
 - Min 10' from opening(s) of adjacent building
- Mechanical draft system vent termination clearances
 - Min. 7 ' above public walkway 802.3.3.5
 - Min. 3 ' above forced air inlets located within 10 ' 802.8

Exceptions:

 - Combustion-air intake of a direct-vent appliance
 - Separate outdoor-air inlet and flue gas discharge of listed outdoor appliance
 - Min. 4 ' below, 4 ' horizontally from, or 1 ' above a door, operable window, or gravity air inlet into a building and min. 1 ' above grade for other than direct-vent appliance 802.8.1

Combustion Air Requirements 701.1

- Indoor opening size & location 701.5
 - Combining spaces on the same story
 - Min. 1 in² per 1000 Btu/h of total input rating for appliances in the spaces but not less than 100 in² for each opening
 - Top opening to commence within 12" of the top of enclosure

- Screen at openings 701.10.1
 - Min. 1/4" mesh
 - Except in attics where screen is not permitted a duct termination, instead provide a sheet metal insulation barrier extends min. 6" above the attic insulation - CSJ
- Combustion air ducts 701.11
 - Min. 3" cross-sectional dimension 701.6
 - Ducts shall be corrosion resistant rigid material
 - Duct openings to be unobstructed
 - Serve a single space
 - Separate ducts for upper and lower combustion air openings
 - Horizontal upper combustion-air ducts shall not slope downward toward the source of combustion air
- Clothes dryers with required make up air is not required to provide combustion air 701.1 exception (2)

Bathroom, Toilet Room & Laundry Room Ventilation

- Bathrooms with showers, spas and/or tubs require mechanical ventilation at min. 50 cfm intermittent ventilation exhaust airflow ASHRAE 62.2 Section 5, CMC 402.5, CRC R303.3
- Toilet rooms other than part of bathrooms and laundry rooms without dryer duct ASHRAE 62.2-6.7
- Min. 4% of the room floor area and
 - Not less than 1.5 ft² operable ventilation area
 - Or mechanical ventilation at min. 50 cfm intermittent ventilation exhaust air flow or min. 20 cfm continuous ventilation exhaust air flow
- Back-draft dampers are required except when it must operate continuously 504.1.1
- Duct termination 502.2.2
 - Extend to exterior of the building 504.1
 - Min. 3' from the property line & openings into the building 502.2.1 and 10' from forced air inlet

Kitchen Ventilation ASHRAE 62.2-6.6.1

- Natural ventilation
 - Min. 4% of floor area and not less than 5 ft²
 - Min. 10% of the floor area of the interior room and not less than 25 ft² CRC R303.2
- Mechanical ventilation
 - 100 cfm with intermittent local exhaust or
 - 50 cfm with continuous exhaust

Domestic Range Vents 504.3

- Refer to manufacturer's installation instructions
- Verify duct size per listing
- Smooth interior metal ducts with exception of a down-draft system where PVC is allowed
- Screw and seal joints 504.1 & 603.10
- Equip with a back-draft damper except when the exhaust must operate continuously.

Whole-Building Ventilation ASHRAE 62.2-4.1

- Required in new constructions & when additions greater than 1000 ft² CSJ
 - Required cfm based on number of bedrooms and floor area ASHRAE 62.2-Tables 4.1a & b

Condensate Wastes 310.0

- Plastic condensate lines may only serve up to 2-story per CPC
- Secondary drain shall be piped to a readily observable location, or a water detecting device that will shut off the equipment or appliance in the event the primary drain is blocked.

FINAL INSPECTION

Review records to verify all U/G, U/F rough inspections have been approved.

Gas Lines

- ❑ Listed gas shut off valve at each appliance on supply side of union
- ❑ Length of gas flex connectors
 - Max. 6' for ranges and dryers
 - Max. 3' for all other appliances
- ❑ Gas Test
 - All valves & connectors on site
 - Gas gauge is set at min. 10 psi on a max. 15-pound gas gauge with 1/10th of a pound increment for 15 minutes
- ❑ Sediment trap
 - Installed between shut-off valve and downstream of flex connector at water heaters and Central Forced Air Furnaces (not wall furnaces)

Ventilation

- Bathrooms
- Toilet and laundry rooms
- Kitchens

Domestic Ranges & Cooktops

- ❑ Exhaust and back-draft damper installed, with smooth wall ducting, min 3 screws evenly spaced at each joint.
- ❑ Exhaust to be ducted to exterior, recirculation shall not be permitted
- ❑ Clearance from top of range to combustibles
 - Min. 30" vertical clearance, unless hood is protected with sheet metal or listed microwave combo per code can be reduced to 24" 921.3, 921.4
 - Size of gas connector to meet appliance BTU demand, or per manufacture. Flex gas connector shall not go through cabinet walls

- Verify anti-tip device in place, installed per manufacture specifications.

Domestic Clothes Dryers 504.3

- Vent
 - Min. 4” diameter duct max. 6 ’of exposed flex duct 504.4.2.2
 - Max. 35 ’of smooth rigid duct without screws and deduct 5 ’for every elbow in place CSJ - placard required.
 - Back-draft damper without screen at termination 504.4
 - Min. 3 ’at termination to property line and house openings 502.2.1
- Make up air
 - Min. 100 in² when enclosed in a closet or similar environment 701.5

Furnaces

- Single wall flue and unlisted vent connectors are not allowed in concealed spaces 802.7.3.2
- Verify manufacturer’s instruction for clearances and type of flues and sheet metal in front of the fire box
- Verify condensate trap, vent drain and drywell or other approved indirect waste method 310
- Protection against damage when unit installed in garage 305.1
- Min. R-8 insulation for ducts in un-condition spaces
- Unit to be elevated when there is no guard or in a flood zone
- Verify combustion air for unit
- Penetration through fire wall or ceiling with hard duct and necessary fire caulking or fire stops

Whole-Building Ventilation

- Continuous running fan sized Per T-24 Title 24’s IAQ requirement
- Manual switches for IAQ ventilation systems to have a label clearly displaying the following (or equivalent) text: **"This switch controls the indoor air quality ventilation for the home. Leave it on unless the outdoor air quality is very poor."** ASHRAE 62.2 Sect. 4.4

- For required whole house fans, only those listed in the Appliance Efficiency Directory may be installed. Footnote 8, Table 150.1A Energy Code.

Air Conditioning Compressors

- Shall not locate within 5 ' of property line CSJ
- Equipment is elevated on a min 3" base per 1105.2
- Verify fall protections when equipment is on roof
- Line-set insulation shall be protected from damage due to sunlight, moisture, equipment maintenance and wind. (Energy code 120.3)
- Air conditioning refrigerant circuit access ports located outdoors shall be protected from unauthorized access with locking-type tamper-resistant caps (CMC 1105.11)

Part IV - ELECTRICAL REQUIREMENTS

2019 California Electrical Code

Based on the 2017 National Electrical Code

SERVICE INSPECTION

For Service sizes of 100, 125, 150, 200, & 400 amp

- Service Entrance Conductor Overhead Clearances—230.24
 - Min. 8' above roofs <4:12 pitch
 - Min. 3' above roofs \geq 4:12 pitch 230.24(A) exception 2
 - Min. 18" at eaves 230.24(A) exception 3
 - Min. 10' above walkways 230.24(B)(1)
 - Min. 12' above driveways 230.24(B)(2)
 - Min. 24.5' over railway track
 - Min. 22.5' over swimming pool
 - Min. 18' above roadways 230.24(B)(4)
- Clearances on Buildings 230.9
 - Min. 3' from operable windows, doors, porches, balconies, ladders, stairs, fire escapes or similar locations unless conductors run above the top level of a window.
- Meter Height (PG&E Requirements)
 - Exterior non-pole-mounted—Min. 48" & max. 75" from standing surface to center of meter.
 - Enclosed or indoor installation—Min. 36" & max. 75" from standing surface to center of meter.
 - Typical meter height 66" to center of meter.
 - Min. 9" clear from obstruction above the meter or enclosure measuring at center of meter to bottom of obstruction or enclosure.
- Circuit Breaker Height 404.8(A)
 - Max. 6'-7" above standing surface.
- Working Clearance
 - Min. 30" wide x 36" D x 78" H in front of service Table 110.26(A)(1) & 110.26(A)(2) & (3)
 - Height exception: when service is \leq 200 amp

□ Service Load Calculation:

Optional Method CEC Section: 220:82

General light, power _____ SF x 3 volt-amperes	= _____ VA
Two kitchen appliance circuits @ 1,500 VA	= 3,000 VA
Laundry circuits	= 1,500 VA
Electric range (NP rating)	= _____ VA
Wall mounted oven (NP rating)	= _____ VA
Dishwasher (NP rating)	= _____ VA
Disposal (NP rating)	= _____ VA
Dryer (NP rating)	= _____ VA
Other _____	= _____ VA
Subtotal _____ VA	
New SFR (First 10 kVA @ 100%)	
Or Existing SFR (First 8 kVA @ 100%)	= _____ VA
Remaining VA @ 40%	= _____ VA

Heating and Air-Conditioning (The Largest of the following shall be included):

1. Air conditioning and cooling (100% NP rating) = _____ VA
2. Heat pump without supplemental heating
(100% NP rating) = _____ VA
3. Heat pump with supplemental electric heating
(100% NP rating plus 65%) = _____ VA
4. Electrical space heating < 4 separate units
(65% NP rating) = _____ VA
5. Electrical space heating ≥ 4 separate units
(40% NP rating) = _____ VA
6. Electrical thermal storage and other
(100% NP rating) = _____ VA

San Jose Reach Code – Electrification Readiness

Water heater (NP rating) or 30Amp, 240V @ 100%	= _____ VA
EV Chargers (NP rating) or 40Amp, 240V @ 125%	= _____ VA

Total VA _____ ÷ 240 volts = _____
(amps size for service entrance conductors and panel)

- Service Entrance Conductor Size—Tables 310.15(B)(16) & 310.15(B)(7). *200Amp min services for subdivision with 10 or more SFR's. 710.10(a)1 & 110.10(e)*
 - For 100 to 400 amp. service, the service conductors supplying the entire load associated with a one-family dwelling, or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the service rating.

- Service Riser Size—Chapter 9, Table 4
Min. 1 1/4" diameter steel RMC or IMC or 2" aluminum mast is required per PG&E, when the service riser is used as attachment point for service drop conductors. No coupler allowed at riser after last support.

- Service Riser Bond—250.92(A)&(B)
 - Listed hub secured by threaded machine screws, or grounding bushing and jumper at concentric & eccentric knock-outs.
 - Grounding locknut, grounding wedge, or Meyers hub not allowed at partially punched concentric & eccentric knock -outs.
 - Self-tapping screws not allowed. 250.8

- Grounding Electrode Conductor Size. 250.66 & Table 250.66
 - Grounding electrode conductor smaller than No. 6 shall be in RMC, IMC, EMT, RNC, Cable Armor 250.64(B) & 250.68(A) & (B) - **Metal flex conduit not to be used.**
 - Ferrous metal raceway shall be bonded at each end to GEC 250.64(E)

- Main service grounding electrode 250.52
 - Concrete encased electrode 250.52(A)(3)(1) & (2)
 - Min. 20 'long 1/2" (#4) continuous rebar
 - Min. 20 'long #4 AWG copper conductor
 - Rod & Pipe Electrodes 250.52(A)(5)
 - Min. 8 'long 3/4" steel, galvanized or metal-coated for corrosion protected pipe or conduit

- Min. 8 'long 5/8" steel, copper or zinc coated steel ground rod
- Metallic Underground Water Service 250.68(C)(1).
 - Bond within 5' of entering building of metal water service.

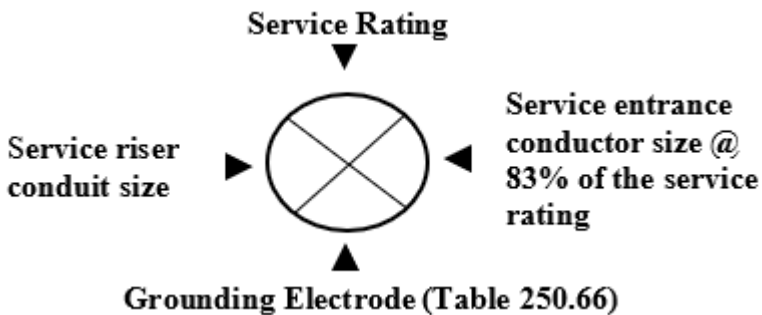
SJC #260 and NEC250.66: Where ground rod is the sole electrode or supplement a metallic water main (electrode), verification letter stating the resistance to earth max. 25 ohms, or another ground rod required min 6 ' apart.

- Separate Structures Supplied by a Common Service. 250.32
 - Grounding electrode is required, unless fed with a single branch circuit and equipment ground is provided. 250.32(A)

Sizing chart for Service/Feeder Conductor 310.10(B)(7),

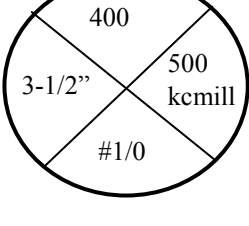
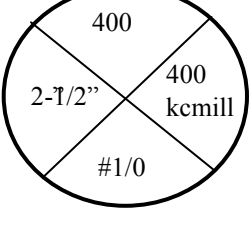
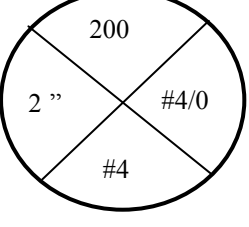
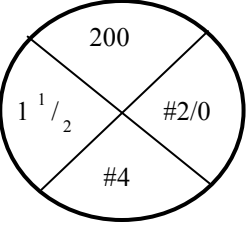
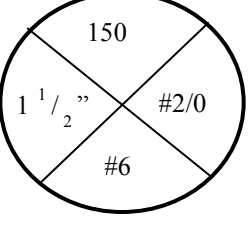
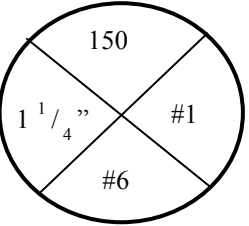
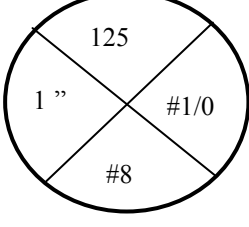
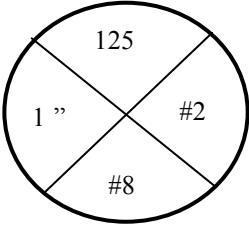
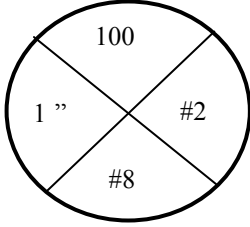
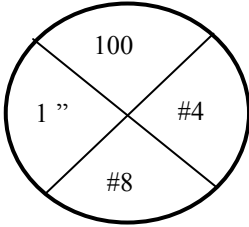
Service riser conduit

Grounding Electrode Conductor



Copper

Aluminum



- Bonding
 - Bond metallic piping systems to sub-panel enclosure, equipment grounding conductor, or grounding electrode. 250.104(A)(3)
 - Neutral (Grounded Conductor) Bonded at Main Service Equipment 250.24(C) & 250.26. Wire jumper to be sized per Table 250.102(C)
 - Sub-panel neutral bar shall not be bonded 250.24(5)

- Available Fault Current
 - When new meter installed has rating 225Amp or greater, a letter from PG&E stating Available Fault Current (AFC) will be required and system shall be configured to provide Interruption Current rating not less than stated AFC prior to being released and energized.

TABLE 310.15(B)(16) Ampacities of Insulated Conductors Rated Up to and Including 2000 Volts, 60°C - 90°C (140°F-194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried)

Temp. Rating of Conductor Based on Ambient Temperature of 30°C (86°F)							
Size AWG or kcmil	60°C	75°C	90°C	60°C	75°C	90°C	Size AWG or kcmil
	(140°F)	(167°F)	(194°F)	(140°F)	(167°F)	(194°F)	
	Types	Types	Types	Types	Types	Types	
	TW UF	RHW THHW THW XHHW	RHH THHN XHH XHHW	TW UF	RHW THHW THW XHHW	RHH THHN XHH XHHW	
	Copper			Aluminum			
18	----	----	14	----	----	----	----
16	----	----	18	----	----	----	----
14	15	20	25	----	----	----	----
12	20	25	30	15	20	25	12
10	30	35	40	25	30	35	10
8	40	50	55	35	40	45	8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400

TABLE 250.66 Grounding Electrode Conductor for Alternating-Current Systems

Size of Largest Ungrounded Service-Entrance Conductor or Equivalent Area for Parallel Conductors ^a (AWG/kcmil)		Size of Grounding Electrode Conductor (AWG/kcmil)	
Copper	Aluminum or Copper-Clad Aluminum	Copper	Aluminum or Copper-Clad Aluminum
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250	4	2
Over 3/0 through 350	over 250 through 500	2	1/0
Over 350 through 600	Over 500 through 900	1/0	3/0

Notes:

1. If multiple sets of service-entrance conductors connect directly to a service drop, set of overhead service conductors, set of underground service conductors, or service lateral, the equivalent size of the largest service-entrance conductor shall be determined by the largest sum of the areas of the corresponding conductors of each set.

2. Where there are no service-entrance conductors, the grounding electrode conductor size shall be determined by the equivalent size of the largest service-entrance conductor required for the load to be served.

^aThis table also applies to the derived conductors of separately derived ac systems.

TABLE 250.122: Min. Equipment grounding conductor size

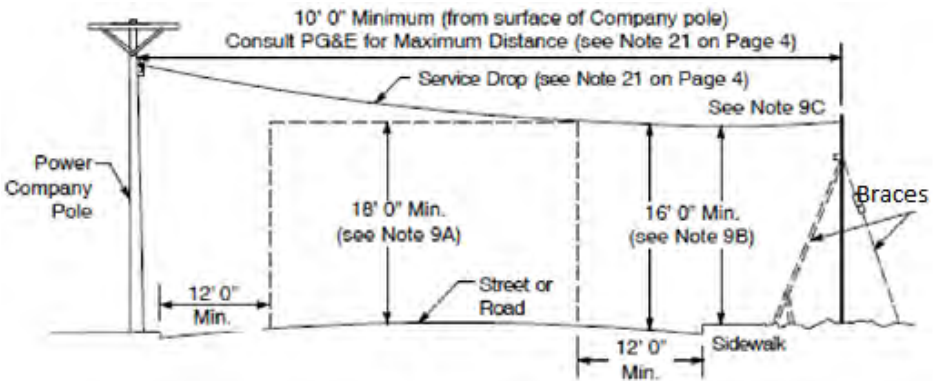
Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equip, Conduit, etc., Not Exceeding (Amps)	Size (AWG or kcmil)	
	Copper	Aluminum
15	14	12
20	12	10
30	10	8
40	10	8
60	10	8
100	8	6
200	6	4
300	4	2
400	3	1
500	2	1/0
600	1	2/0
800	1/0	3/0
1000	2/0	4/0
1200	3/0	250
1600	4/0	350
2000	250	400
2500	350	600
3000	400	600
4000	500	750
5000	700	1200
6000	800	1200

Minimum Cover Requirements Table 300.5

LOCATION OF WIRING METHOD OR CIRCUIT	TYPE OF WIRING METHOD OR CIRCUIT			
	Direct burial cables	RMC or IMC	Nonmetallic direct burial raceways	Max 20A-120v with GFCI
All locations not specified	24	6	18	12
In trench below 2" Of concrete or equivalent	18	6	12	6
Under a building	0 (In raceway only or Type direct burial MC)	0	0	0 (In raceway or Direct burial MC)
Under min. of 4" of concrete exterior slab with no vehicular traffic and the slab extending not less than 6" beyond the underground installation	18	4	4	6 (Direct burial) 4 (In raceway)
Under streets, highways, roads, alleys, driveways and parking lots	24	24	24	24
One/two-family dwelling driveways and outdoor parking areas, and used only for dwelling-related purposes	18	18	18	12

Temporary Power Poles

- ❑ Locate permit and inspection record, permit shall be independent of construction permit.
- ❑ Verify address permanently marked on service
- ❑ Verify support and bracing of pole (Min. 2 x 4 wood braces)
- ❑ Verify overhead clearances
- ❑ Verify grounding and bonding of pole
- ❑ Verify grounding and bonding of grounding electrode raceways
- ❑ Verify main disconnect at service and remote panelboards 225.33 & 230.71
- ❑ Verify GFCI protection of all receptacles 590.6(A) & (B)
- ❑ Verify size of service entrance conductors 310.15 & Table 310.16
- ❑ Verify weatherproof equipment 406.8(B) & 408.37 (i.e.: receptacles & panelboards in wet locations)
- ❑ Issue temporary power meter release upon approval



ROUGH INSPECTION

Receptacle Requirements

- ❑ General Receptacle Locations & Spacing 210.52 (A)
 - Measure max. 6' horizontally of any wall surface to a receptacle.
 - $\geq 2'$ wide wall requires min. 1 receptacle.
 - Max. 18" of wall for floor receptacles to be counted as part of the required receptacles.
- ❑ Kitchen Receptacles 210.52 (C)
 - Counter with 12" or more wide, max. 24" to a receptacle and max. 20" above the counter surface.
 - Min. 1 receptacle for island counter that is 12" x 24" and larger.
 - Min. 1 receptacle for peninsula counter that is 12" x 24" and larger.
 - Max. 12" below countertop and max. 6" overhang.
- ❑ Bath Receptacles 210.52 (D)
 - Max. 3' from the outside edge of each basin.
 - Max. 12" below top of basin or basin countertop
- ❑ Outdoor Receptacles 210.52 (E)
 - Min. 1 receptacle at the front and back of the dwelling
 - Max. 6'6" above grade
 - Requirement applies to each unit for a duplex.
 - Min. 1 receptacle at balcony, deck, and porch when accessible from inside the dwelling.
- ❑ Laundry Area 210.52 (F)
 - Min. 1 receptacle for the laundry.
- ❑ Basements, Garages and Accessory Buildings 210.52 (G)
 - Min. 1 receptacle in addition to dedicated circuits for equipment in each basement, attached or detached garage, and accessory building with electric power.
 - Min. 1 receptacle in each unfinished portion of a partially finished basement.
 - Min 1 EV Branch Circuit each Vehicle bay in garage, 5.5' max above finished floor, per CA California Green Building Standards 4.106.9.1
 - Min. 1 dedicated 120v, 20 Amp circuit for garage. 210.11(c)(4)
- ❑ Hallways 210.52 (H)

- Min. 1 receptacle when hallways are more than 10 ' long.
- Foyer is not part of a hallway, when it's greater than 60 ft² a receptacle is required in each wall space ≤ 3 ' wide.
- HVAC Equipment
 - Min. 1 receptacle is required in addition to dedicated furnace or condenser circuit.

Switched Lighting Outlets Requirement 210.70(A)

- Habitable rooms
 - Min. 1 wall switch-controlled lighting outlet in every habitable room, kitchen, and bathroom.
 - Can be switched receptacle except kitchen and bathrooms.
- Hallways, Stairways, Garages with Power
 - Min. 1 wall switch-controlled lighting outlet.
 - Outdoor entrances or exits with grade level access shall have min. 1 wall switch-controlled lighting outlet.
 - Stairway with 6 risers or more shall have a wall switch at each floor level. Dimming control must be full range, if installed.
- Storage or Equipment Spaces
 - Min. 1 lighting outlet containing a switch or controlled by a wall switch for attics, underfloor spaces, utility rooms, and basements where these spaces are used for storage or contain equipment requiring servicing.
 - Switches and metal plates must be grounded. 314.28(C)

GFCI Protected Receptacle Requirement 210.8(A)

- 15 & 20 Amp GFCI Receptacles (Interruptioners shall be in readily accessible locations)
 - Bathrooms
 - Kitchens—Small appliance circuits
 - Garages and accessory buildings
 - Outdoors except not readily accessible and dedicated circuits for equipments.
 - Crawl space receptacle and lighting outlets, 120V or less. 210.8(E)
 - Unfinished basements except for supply to a permanent fire alarm or burglar alarm system.
 - Within 6' of sinks other than kitchen sinks, and within 6' of bathtub or shower stall
 - Dishwasher circuit (210.8(D))
 - Boathouse
 - Laundry rooms/areas

Combination AFCI Protected outlet Requirement 210.12(A) All 120V, 15A and 20A circuits

- | | |
|----------------|-----------------------|
| • Kitchens | • Bedrooms |
| • Family rooms | • Sunrooms |
| • Dining rooms | • Recreation rooms |
| • Living rooms | • Closets, Hallways |
| • Parlors | • Laundry areas/rooms |
| • Libraries | • Or similar rooms |
| • Dens | or areas |

ˆExcept individual circuit to a fire alarm system installed RMC, IMC, EMT, MC or Steel Armored Cable.

□ AFCI Protection Methods

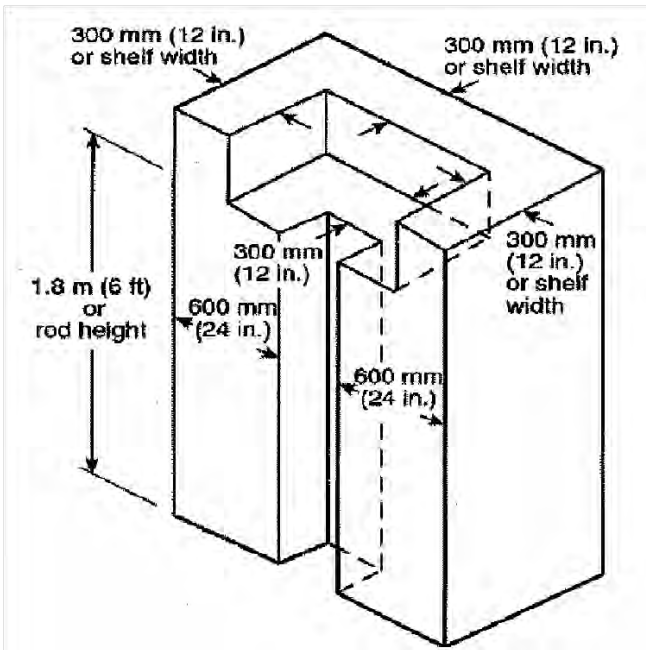
AFCI Protection Method	Additional Requirements
210.12(A)(1) Combination type AFCI Circuit Breaker installed at the origin of branch circuit.	No additional requirements
210.12(A)(2) Branch/feeder type AFCI circuit breaker installed at origin of branch circuit, AND, Outlet branch circuit type AFCI device installed at first outlet in branch circuit	Marking of first outlet box in branch circuit
210.12.(A)(3) Supplemental arc protection type circuit breaker installed at origin of branch circuit. PLUS, Outlet branch circuit type AFCI device installed at first outlet in branch circuit	<ol style="list-style-type: none"> 1. Continuous branch circuit wiring; 2. Home run conductor length to the first AFCI outlet restricted (14 AWG-50 ft, 12 AWG-70ft) 3. Marking of the first outlet box in branch circuit.
210.12.(A)(4) Branch Circuit Overcurrent Protective device, plus, Outlet branch circuit type AFCI device installed at first outlet in branch circuit The combination of devices must be listed and identified to provide <i>system combination type arc-fault protection for the "home run" conductors.</i>	<ol style="list-style-type: none"> 1. Continuous branch circuit wiring; 2. Home run conductor length to the first AFCI outlet restricted (14 AWG-50 ft, 12 AWG-70ft) 3. Marking of the first outlet box in branch circuit.
210.12.(A)(5) Outlet branch circuit type AFCI device installed at first outlet in branch circuit	Branch circuit conductors installed in RMC, IMC, EMT, Type MC, or steelarmored type AC cables and metal outlet and junction boxes to the first AFCI outlet
210.12.(A)(6) Outlet branch circuit type AFCI device installed at first outlet in branch circuit	Branch circuit conduit, tubing or cable encased in min 2" of concrete from origin to the branch circuit to the first outlet

Closet Light Clearance to Storage Area 410.16(C)

□ Closet Storage Space 410.2

Vertically 6' from floor or to the highest clothes-hanging rod and parallel to the walls at horizontal distance of 24" from the sides and back of the closet walls, and continuing vertically to the closet ceiling parallel to the walls at the horizontal distance of 12" or the width of the shelf.

- 12" for surface-mounted enclosed incandescent or LED luminaries.
- 6" for surface-mounted fluorescent luminaries.
- 6" for enclosed recessed incandescent or LED luminaries.
- 6" for recessed fluorescent luminaries.
- Surface-mounted fluorescent or LED luminaries identified to be installed within the closet storage space is allowed.



Closet Storage Space

Mandatory Energy Features and Devices

- See Energy Code Section.

Outlet Boxes

- ❑ Boxes must be flush with combustible finishes or max. 1/4" from non-combustible finishes. 314.20
- ❑ Metal boxes and non-metal light boxes shall be grounded. 250.148 (C) & (D) & 314.4
- ❑ Boxes must be made up for rough inspection per City Policy.
- ❑ Box fill—light junction box fill Table 314.16(B)
- ❑ Unused opening must be closed 314.17(A)
- ❑ Paddle fan support-listed fan box required for fan weigh more than 35 lbs. and not more than 70 lbs. 314.27(C) (Note on correction notice for number of fan boxes installed and their locations.)

Table 314.16(B) Volume Allowance Required per Conductor	
Size of Conductor (AWG)	Free Space Within Box for Each Conductor - in ³
14	2.00
12	2.25
10	2.50
8	3.00
6	5.00

NM Cable 334 - Max 60 degree C rated conductors

- ❑ Prohibited Use 334.12(A) & (B)
 - As service-entrance cable
 - Embedded in cement, concrete, or aggregate, masonry, adobe, fill, or plaster.
 - Exposed to corrosive fumes or vapors.
 - Wet or damp locations.
- ❑ Support 334.30
 - Staples, cable ties, straps, hangers, or similar listed fittings
 - 4-1/2' intervals

- Max. 12” of every outlet box
- Protection from damage
 - Min. 1-1/4” from edge of wood member at bored holes & notches, otherwise provide a nail plate. 300.4(A)(1)
- Length of free conductor at box
 - Min. 6” from the point in the box where it emerges from its race-way or cable sheath. 300.14

Hydro-massage Bathtubs 680.70

- Protection 680.71-680.74
 - Individual circuit
 - Max. 30 amp. & located within 6’ of inside walls of a hydro-massage tub.
 - GFCI
 - Equipment to be accessible with the supply receptacle accessible only through a service opening, receptacle shall face within direct view and not more than 1’ of the opening.
 - Min. 8 AWG bonding wire from metallic pipe to terminal on motor. (not required to terminate in panelboard, main panel or electrode.)
 - #8 AWG bonding wire is still required when double insulated pump motor is installed at time of inspection to ensure future equipment change out to a non-double insulated pump motor unless no metallic water pipe present.
 - All metallic surfaces within 5 less towel bars, glass mirror frames, or similar. 680.74

Required Circuits

- Min. 2-20 amp small appliance circuits serving the kitchen, pantry, breakfast room, dining room, or similar area 210.52 (B)
 - Equally divide kitchen counter receptacles into each of the 2 circuits.
 - No other outlets allowed to be served by these small appliance circuits.
- Min. 1-20 amp laundry circuit 210.52(F)
- Dedicated circuits for fastened-in-place appliances 422.16(B)

& 210.23

- Garbage disposals
- Dishwashers
- Microwave
- Electric wall-mounted Ovens
- Electric cook-tops
- Range hood with microwave units
- Furnaces
 - Note: Service receptacle and light are not allowed on this circuit

- Min. 1-20 amp bathroom circuit 210.52(D)
- Min. 1-20 amp garage circuit 210.11(C)(4)

Detached Buildings

- Requires main disconnect switch 225.31
- Back-fed breaker requires retainer. 408.36(D)
- Requires separate grounding electrode 250.32

FINAL INSPECTION

Verify previous inspections approval.

- ❑ All receptacles, switches, plates, light fixtures installed with correct trims.
- ❑ Boxes flush with combustible finishes, or max. 1/4" back from non-combustible finishes. 314.20
- ❑ Switches/sensors, and light fixtures meet the energy code requirement. (See rough inspection for requirements)
- ❑ Verify appliance cord length:
 - Trash compactors—Min. 3' & max. 4' 422.16(B)(1)
 - Dishwasher —Min. 3' & Max. 6.5'
 - Garbage disposals—Min. 18" & max. 36" 422.16(B)(2) & (4)
 - Range Hood —Min. 18" & Max. 4.0'
- ❑ Closet light clearance. NEC 410.16, see rough Elect.
- ❑ Circuit breakers in panels are identified. 408.4
- ❑ Motor disconnects 422.30
- ❑ Ceiling paddle fan support 422.18 (See rough correction notice if fan boxes were installed at the time of rough.)
- ❑ GFCI protection - test at receptacles. 210.8 (See rough for locations)
- ❑ Combination AFCI protection for circuit outlets 210.12 (See rough for locations)
- ❑ Verify tamper-resistant receptacles 406.12
- ❑ Verify weather resistant receptacles and weather-proof "extra-duty" covers for wet locations 406.9(B)
- ❑ Listed splice devices shall be used at AL-CU connection 110.14
- ❑ Lighting tracks are not installed in prohibited locations 410.10(D)
 - Min. 3' horizontally and 8' vertically from the top of threshold of bathtub rim or shower stall.
- ❑ Central vacuum outlet assemblies and all metal parts shall be grounded. 422.15

Receptacles

Verify correct receptacle installation

- Polarity, grounding
- 15 amp versus 20 amp GFCI receptacle at their required location
- In-use box hoods for 15A /20A receptacle shall be listed and identified as “extra duty” (406.9(B))
- Receptacles with USB Charger must have integrated class 2 circuitry. (406.3(F))

Verify service and sub panels

Circuit Breaker

- Height—Max. 6’-7” above standing surface. 404.8(A)
- AFCI protection required if branch circuit wiring extended more than 6’ or modified to include any additional outlets or devices. (210.12 (B))
- Back-Fed Devices 408.36(D) to be secured in place.
- Neutral and ground conductor terminations
- Proper phasing of three wire circuits
- Proper identification of circuits
- Handle tie/grouping for multi-wire circuits 210.4(B) & (D). Grounded and ungrounded of a circuit to be grouped by wire markers, or cable ties 200.4 (B).
- Bonding & grounding
- Size of over-current device. The standard ampere ratings for fuses and inverse time circuit breakers shall be considered 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350 and 400 amperes. (240.6)

REACH Code Compliance

Electrical Vehicle Chargers

- ❑ Verify calculations for services rated 125 amps or less **CSJ**
- ❑ Verify manufactures installation instructions **CSJ**
- ❑ Indoor locations coupling height 18”-48” AFF. 625.50
- ❑ Outdoor locations coupling height 24”-48” AFF. 625.50
- ❑ Ventilation requirements per manufacturer instructions. 625.15
- ❑ Branch circuit conductors sized 125% of max. Load as noted by manufacturer. 625.41
- ❑ Disconnect required for EV Charger rated more than 60 amps or over 150 volts to ground. 625.43
- ❑ Disconnect required to be readily accessible and capable of being locked in the open position. 625.43
- ❑ Dedicated EV circuit. 625.40

Water Heater

- ❑ Dedicated 120v 20A receptacle within 3’ fed by 10-3 AWG copper conductors, unused conductor to be capped off.
- ❑ Reserve breaker space for 2 pole 240 circuit conversion, labeled for Electric Water Heater

Photovoltaic - Reserved

See REACH code section for general requirements.