CONSTRUCTION GUIDELINES FOR SINGLE AND DUAL DWELLINGS RESIDENTIAL CONSTRUCTION

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 republishing this handbook. Refer to the adopted Codes for full requirements.

Code Adoption: January 1st, 2014

2013 California Residential Code

Based on the 2012 International Residential Code

2013 California Building Code

Based on the 2012 International Building Code

2013 California Electrical Code

Based on the 2011 National Electrical Code

2013 California Plumbing Code

Based on the 2012 Uniform Plumbing Code

2013 California Mechanical Code

Based on the 2012 Uniform Mechanical Code

2013 California Energy Code

Published April 2014

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Part I
BUILDING REQUIREMENTS

Adopted Codes

2013 California Residential Code
Based on the 2012 International Residential Code

2013 California Building Code
Based on the 2012 International Building Code

FOUNDATION INSPECTION

(CRC Chapter 4 or CBC Chapter 18)

Setbacks

- □ Property lines are clearly marked or easily determined from existing references
- □ Setbacks conform to zoning
- □ Setbacks from slopes are OK (i.e. Refer to figure R403.1.7.1 or CBC 1808.7.1)

Grading & Pad Creation

- □ Collect compaction report (if building pad created)
- □ Review soils report if applicable (Verify City Policy regarding soils report for add/alt)
- □ Verify soils engineer inspection if applicable

Footings

- □ Footing depth & dimensions conform to plan and minimum code requirements (see Table R403.1)
- □ 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; check details
- □ Steel grade, size, laps, ties & clearances are ok
  - Vertical steel grade: (Grade 60 min. per R404.1.2.3.7.1)
  - Horizontal steel: 2-#4 min., 1 T & B (Per R403.1.3.1 & TableR404.1.2(1)) Grade 40 ok
  - Vertical steel laps: 30" for #4 splice or engineer's specification
  - Horizontal steel laps: 20" for #4 reinforcement unless engineered (Table R611.5.4(1))
  - Clearances: 3" min to earth, 1-1/2" min to forms, 3/4" min to air (R404.1.2.3.7.4)
- □ Foundation elevation
  - Top of exterior footing must be a min of 12" plus 2% above the street gutter per R403.1.7.3
  - 6" min fall per 10' away from building foundation (R401.3)

- □ 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 downs must be secured in position at the time of the foundation inspection) Refer to Simpson or similar manufacturers catalog for current installation info and sizing of required anchor bolts
- □ Min 1/2" diameter foundation anchor bolts with a min embedment of 7"; spaced at no more than 6' oc for up to 2 stories and 4' oc for over 2 stories (R403.1.6 & R403.1.6.1) These bolts may be "wet-set" at the time of concrete placement
- □ Plumbing is wrapped to accommodate expansion and contraction at footing and/or slab intersections
- □ Top of footings must be level, bottom of footing may be stepped where slope of bottom exceeds 1 in 10 (R403.1.5)

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

- □ 20" round, 16" square, 18" deep
- □ Piers larger than 30" x 30" require a bottom mat of 2-#4 EW

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

When in flood zone

Elevation Certificate and all associated documentation to be collected by Public Works (Contact Maria Angeles @ 408-535-6817)

SLAB INSPECTION

- □ Slab thickness
  - 3-1/2” min thickness (R506.1/CBC 1910)
- □ Check plan and soils report for required
  - Base rock requirements 4” (R506.2.2)
  - Vapor barrier requirements 6 mil min with min 6” lap at joints (R506.2.3)
- □ Reinforcement installed as per plan
- □ Perimeter dowels installed if applicable
- □ Perimeter insulation installed if applicable
- □ Plumbing wrapped
- □ Verify if Special Inspection report is required.

UNDERFLOOR/SUBFLOOR INSPECTION
(R502/CBC 2304)

Verify foundation has been approved

Mudsill Material
- □ Pressure treated & accredited agency label (R504.3/CBC 2304.11.2.4)
- □ 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 Mudsill Bolting (R403.1.6/CBC 2308.6 & City Policy)
- □ 6' oc max for 1 & 2 story
- □ 4' oc max for over 2 stories (R403.1.6 #4/CBC 2308.3.3)
- □ Min 2 bolts per each piece, 1/2" diameter min with 3"x3"x.229" plate washers (R602.11.1/CBC 2308.12.8)
  - Min 7 bolt diameters and max 12" from splices or ends (R403.1.6)
  - Min 4" & max 12" from ends of plates (CBC 2308.6)

Shear Connections
- □ Shear wall sill bolting as per shear table
- □ Shear transfer connections installed as per shear wall table
- □ Drag blocking and straps installed
- □ HD's extended to engage posts for full load capacity
- □ Identify shear walls and braced wall lines; check load path to foundation

Floor Joists
- □ Bearing (R502.6/CBC 2308.8.1)
  - 1-1/2" min on wood or metal
  - 3" min on masonry or concrete
- □ Joist laps (R502.6.1/CBC 2308.8.2)
  - 3" min laps with 3-10d's face nails
  - 1-1/2" min bearing and butts strapped with ST9 or equal

UNDERFLOOR INSPECTION (continued)

- □ Joist blocking (R502.7/CBC 2308.8.2)
  - At ends and all bearing points with 2x full depth blocking
- □ Joist nailing Table (Table R602.3(1),(2)/CBC 2304.9.1)
  - To sill or girder with 3-8d
  - Sole plate to joist or blocking 16d's @ 16" oc
  - 2" subfloor to joist or girder face nail with 2-16d's
- □ Joists doubled under all bearing walls (R502.4/CBC 2308.8.4)
- □ Manufactured floor joists and trusses per plan & manufacturer's details

Girders

- □ Girder bearing (R502.6/CBC 2308.7 & 2304.11.5)
  - 1-1/2" min on wood or metal
  - 3" min on masonry or concrete
  - 4x min post @ splices & ends tied with ST 12 or equal
  - 1/2" air spaces @ sides, ends & top with mudsill bearing in girder masonry pockets (R317.1 #4)
  - Girder connections to post with positive connection (R502.9/CBC 2308.7)
- □ Size supporting single floor min 4 x 6, with spans less than 6', spaced max 8' oc

Access Provided (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

Clearances and Protection of Wood

- □ 12" min to girders (18" if girders only), 18" min to bottom of joist or subfloor without joists (R317/CBC 2304.11.2.1)
- □ Piers elevated
  - 8" min above earth @ under floor or pressure treated post (R314.1.4/CBC 1809.8)

□ Concrete steps poured against wood
  - 26 ga galvanized flashing installed to protect wood, tight against wall caulked with mastic (Aluminum not allowed)

Under-floor Ventilation (R408/CBC 1203.3)
□ 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
□ Max. 14" non-corrosive wore mesh

Cripple Walls (R602.9/CBC 2308.9.4)
□ 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

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
□ Min 24" wide unless blocked and nailed (Table R503.2.1.1(1) c/CBC Table 2304.7(3))

FLOOR JOIST SPAN TABLES R502.3.1(2)/CBC2308.8(2) With 40 psf live load and 10 psf dead load Deflection = 1/360					
		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’-1”	8’-4”	7’-11”
2 x 8	12”	14’-5”	14’-2”	13’-10”	13’-2”
	16”	13’-1”	12’-7”	12’-7”	12’-0”
	24”	11’-0”	10’-3”	10’-9”	10’-2”
2 x 10	12”	18’-5”	17’-9”	17’-8”	16’-10”
	16”	16’-5”	15’-5”	16’-0”	15’-2”
	24”	13’-5”	12’-7”	13’-1”	12’-5”
2 x 12	12”	22’-0”	20’-7”	21’-6”	20’-4”
	16”	19’-1”	17’-10”	18’-7”	17’-7”
	24”	15’-7”	14’-7”	15’-2”	14’-4”

SHEAR INSPECTIONS

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

Hold-downs are Installed Properly

- □ Uplift and compression posts are properly sized
- □ HD's are installed per manufacturer's details
- □ Straps are extended on uplift posts for full nailing with specified nails
- □ Shear ply is nailed to uplift post with edge nailing per plans
- □ 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.

General Requirements (R403.1.6/CBC 2308.6)

- □ Sill bolting or nailing must be complete
- □ 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
- □ Blocked diaphragms must have all blocking installed and zone nailing completed
- □ Plywood grade/piles & thickness match plan
- □ Nail size and spacing matches plan
  - Nail heads should not penetrate face ply
  - 3/8" min edges distance must be maintained
- □ Chord splices are complete as per plan

  Note: Min splice in top plates is 24" with 8-16d's or as required by plan (Table R602.3(1) item 14)

  Min splice in top plates is 48" with 8-16d's or as required by plan (CBC 2308.9.2.1)
- □ If double plate system is utilized, bottom top plate is installed and nailed as per shear table

SHEAR INSPECTIONS (continued)

□ CBC Table 2306.3(1) Footnotes:
- (f) Where panels are applied on both faces of a wall and fastener spacing is less than 6" oc 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.
- (g) 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.

□ Verify glu-lams specified properties if used

ROOF FRAMING & ROOF NAIL

This inspection is required when shear extends to the roof.

□ Conventional roof framing must be checked to verify conformance with plan
- Rafter sizes & spacing ok Table R802.5.1(1) or (2)/CBC Table 2308.10.3(1) or (2)
- Purlin size is equal to or larger than rafter R802.5.1/CBC 2308.10.5
- 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'

□ If trusses are used, 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

- Hangers at header conditions match reaction loads listed on truss details
- Verify support at bearing points
- Uplift conditions greater than 500 lbs, require verification of connection for uplift forces
- Stud directly beneath truss with bearing more than 1300 lbs (See 2011 revised Field Note 20)

□ Rafter ties provided (R802.3.1/CBC 2308.10.4.1)
- Where joist are parallel to rafters, ceiling joist must be nailed to rafters at min 4' oc
- Where not parallel, rafter ties shall be min 2 x 4 installed at just above ceiling joist
- Install collar ties or ridge straps to resist uplift at the upper 1/3 of attic space with min 1 x 4 @ max 4' oc when ceiling joists or rafter ties are not provided

□ Verify radiant barrier requirement (R802.3.1)

□ Verify eave proximity to property line (Table R302.1(1) or (2))

TABLE R302.1(1) EXTERIOR WALLS-DWELLINGS AND ACCESSORY BUILDINGS WITHOUT AUTOMATIC RESIDENTIAL FIRE SPRINKLER PROTECTION			
EXTERIOR WALL ELEMENT		MIN FIRE-RESISTIVE RATING	MIN FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour-tested in accordance with ASTM E 119 or UL 263 with exposure form both sides	< 5’
	Not fire-resistance rated	0 hour	≥ 5’
Projections	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	< 5’
		None required	≥ 5’

TABLE R302.1(2) EXTERIOR WALLS-DWELLINGS AND ACCESSORY BUILDINGS WITH AUTOMATIC RESIDENTIAL FIRE SPRINKLER PROTECTION			
EXTERIOR WALL ELEMENT		MIN FIRE-RESISTANCE RATING	MIN FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour-tested in accordance with ASTM E 119 or UL 263 with exposure form outside	< 3’
	Not fire-resistance rated	0 hour	≥ 3’
Projections	Fire-resistance rated	1 hour on the underside	2’ - 3’
	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’

TABLE R802.5.1(9) RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS

RAFTER SLOPE	RAFTER SPACING (INCHES)	GROUND SNOW LOAD 20 (psf)			
		Roof span (feet)			
		12	20	28	36
		Required number of 16d common nails 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

PRESCRIPTIVE WALL BRACING
(R602.10.1.4/CBC 2308.9.3.1)

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 R602.10.1.3)
- □ 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. Distance between adjacent brace panel edges shall not be greater than 20' (R602.10.2.2)
- □ Braced walls must be one of the following materials per adopting ordinance (Table R602.10.3(3))
  - Wood structural panels (WSP), diagonal boards (DWB), particleboard (PBS), fiberboard (SFB), hardboard panels (HPS) etc.
  - Portland cement plaster (PCP) on studs spaced at 16" oc for single story buildings only (R-3 & U)
  - Nominal 1 x 4 let-in braces are <u>not</u> allowed
  - Gypsum board is <u>not</u> allowed
- □ Each panel min 4'-0" long, height per stud height of (City Ordinance, Table R602.10.3(3)/CBC Table 2308.9.1)
- □ Alternate Braced Wall Panel (Table R602.10.6.5 & Figure R602.10.6.1)
  - Min 2'-8" by max 8' height 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 into continuous foundation
  - First story of 2 stories: Requires 3000# tie downs

Buildings that are irregular in shape; or must have unusual element engineered

- □ Walls in plane vertically from the foundation to the uppermost story except: R301.2.2.2.5
  - Floors that are contilevered or setback not exceeding 4 times the depth of the joist and comply with the following
    - Joists are 2 x 10 or greater and not spaced more than 16" oc
    - 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
- □ 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)
- □ 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
- □ Openings in floor or roof diaphragms must not exceed the lesser of 12' or 50% of the least dimension of the diaphragm (Table R602.10.4.2)
- □ Floor levels can not 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
- □ Braced wall lines must be provided in two perpendicular directions

PRESCRIPTIVE WALL BRACING (continued)

- □ Walls may be supported by continuous footings at exterior and at 50’ intervals provided: (R602.10.9.1)
  - 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
- □ First floor girder shall not be less than 4 x 6 for 6’ spans not to exceed 8’ oc (Table R502.5(1) & (2)/CBC 2308.7)
- □ Exterior and interior brace walls shall extend to roof as per City Policy

Roof Decks (must be solid plywood sheathing)
Roof nail inspection is required (R905)

Cripple Walls (R602.9/CBC 2308.9.4)

- □ Stud heights 14” min or solid blocked or sheathed
- □ Stud heights exceeding 14” shall be braced per (Table R602.1.2(3)/CBC 2308.12.4)
  - 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

FRAME INSPECTION

Verify prior inspection record is complete & approved

Structural Bearing

- □ Studs
  - Check allowable heights - See Table
  - Check notching and boring - See Table
- □ Joist/rafter size and spacing is ok, (refer to Tables & plans)
- □ Beam sizes and trimmers are as per plan

STUD SIZE & SPACING (TABLE R602.3(5)/cbc 2308.9.1) Cripple walls over 4' high will be considered as an additional story						
	Bearing Walls				Non Bearing Walls	
	Stud Height	Max Stud Spacing Supporting			Stud 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"

TABLE R502.5(1)/CBC 2308.9.5 GIRDER SPANS AND HEADERSPANS FOR EXTERIOR REARING WALLS (Max spans for Douglas fir-larch, southern pine & spruce-pine-fir & required number of jack studs)							
GIRDERS & HEADERS SUPPORT-ING	**SIZE**	**GROUND SNOW LOAD 30 psf**					
		Building Width					
		20'		**28'**		**36'**	
		Span	**Jack Studs**	**Span**	**Jack Studs**	**Span**	**Jack Studs**
Roof & ceiling	2-2 X 4	3-6	1	3-2	1	2-10	1
	2-2 X 6	5-5	1	4-8	1	4-2	1
	2-2 X 8	6-10	1	5-11	2	5-4	2
	2-2 X 10	8-5	2	7-3	2	6-6	2
	2-2 X 12	9-9	2	8-5	2	7-6	2
Roof, ceiling & one center-bearing floor	2-2 X 4	3-1	1	2-9	1	2-5	1
	2-2 X 6	4-6	1	4-0	1	3-7	2
	2-2 X 8	5-9	2	5-0	2	4-6	2
	2-2 X 10	7-0	2	6-2	2	5-6	2
	2-2 X 12	8-1	2	7-1	2	6-5	2
Roof, ceiling & one clear span floor	2-2 X 4	2-8	1	2-4	1	2-1	1
	2-2 X 6	3-11	1	3-5	2	3-0	2
	2-2 X 8	5-0	2	4-4	2	3-10	2
	2-2 X 10	6-1	2	5-3	2	4-8	2
	2-2 X 12	7-1	2	6-1	3	5-5	3
Roof, ceiling & two center-bearing floors	2-2 X 4	2-7	1	2-3	1	2-0	1
	2-2 X 6	3-9	2	3-3	2	2-11	2
	2-2 X 8	4-9	2	4-2	2	3-9	2
	2-2 X 10	5-9	2	5-1	2	4-7	3
	2-2 X 12	6-8	2	5-10	3	5-3	3
Roof, Ceiling & two clear span floors	2-2 X 4	2-1	1	1-8	1	1-6	2
	2-2 X 6	3-1	2	2-8	2	2-4	2
	2-2 X 8	3-10	2	3-4	2	3-0	3
	2-2 X 10	4-9	2	4-1	3	3-8	3
	2-2 X 12	5-6	3	4-9	3	4-3	3

See actual Tables in Codes for other sizes.

TABLE R502.5(2)/CBC 2308.9.6 GIRDER SPANS AND HEADER SPANS FOR INTERIOR BEARING WALLS (Max spans for Douglas Fir-larch, southern pine & spruce-pine-fir & required number of jack studs)							
HEADERS & GIRDERS SUP-PORTING	**SIZE**	**Building Width**					
		20'		**28'**		**36'**	
		Span	**Jack Studs**	**Span**	**Jack Studs**	**Span**	**Jack Studs**
One floor only	2-2 X 4	3-1	1	2-8	1	2-5	1
	2-2 X 6	4-6	1	3-11	1	3-6	1
	2-2 X 8	5-9	1	5-0	2	4-5	2
	2-2 X 10	7-0	2	6-1	2	5-5	2
	2-2 X 12	8-1	2	7-0	2	6-3	2
	3-2 X 8	7-2	1	6-3	1	5-7	1
	3-2 X 10	8-9	1	7-7	2	6-9	2
	3-2 X 12	10-2	2	8-10	2	7-10	2
	4-2 X 8	9-0	1	7-8	1	6-9	1
	4-2 X 10	10-1	1	8-9	1	7-10	2
	4-2 X 12	11-9	1	10-2	2	9-1	2
Two floors	2-2 X 4	2-2	1	1-10	1	1-7	1
	2-2 X 6	3-2	2	2-9	2	2-5	2
	2-2 X 8	4-1	2	3-6	2	3-2	2
	2-2 X 10	4-11	2	4-3	2	3-10	3
	2-2 X 12	5-9	2	5-0	3	4-5	3
	3-2 X 8	5-1	2	4-5	2	3-11	2
	3-2 X 10	6-2	2	5-4	2	4-10	2
	3-2 X 12	7-2	2	6-3	2	5-7	3
	4-2 X 8	6-1	1	5-3	2	4-8	2
	4-2 X 10	7-2	2	6-2	2	5-6	2
	4-2 X 12	8-4	2	7-2	2	6-5	2

TABLE R802.4(1)/CBC 2308.10.2(1) CEILING JOIST SPANS FOR COMMOM LUMBER SPECIES (Uninhabitable attics without storage, live load = 10 psf)					
CEIL-ING 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-larch #1	12’-8”	19’-11”	> 26’-0”	> 26’-0”
	Douglas fir-larch #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-larch #1	11’-6”	18’-1”	23’-10”	> 26’-0”
	Douglas fir-larch #2	11’-3”	17’-8”	23’-0”	> 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-larch #1	10’-0”	15’-9”	20’-1”	24’-6”
	Douglas fir-larch #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”

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"
Non-Bearing Members	40% allowed		60% allowed
2 x 4	1-3/8"		2-3/16"
2 x 6	2-3/16"		3-1/4"

Note: 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.
Check shear notes for limits on notches and bores.
In no case shall the edge of the bored hole be nearer than 5/8" to the edge of the stud. (R602.6/CBC 2308.9.11)

RAFTERS SPAN TABLES					
Size	Spacing	Douglas fir		Hem Fir	
		#1	#2	#1	#2
RAFTERS (With 20 lb live load & 10 lb dead load) Table R802.5.1(1)/CBC Table 2308.10.3(1) Ceiling not attached to rafters					
2 x 4	12" oc	11'-1"	10'-10"	10'-7"	10'-1"
	16" oc	10'-10"	9'-10"	9'-8"	9'-2"
	24" oc	8'-7"	8'-0"	8'-4"	7'-11"
2 x 6	12" oc	17'-4"	16'-7"	16'-8"	15'-11"
	16" oc	15'-4"	14'-4"	14'-11"	14'-2"
	24" oc	12'-6"	11'-9"	12'-3"	11'-7"
2 x 8	12" oc	22'-5"	21'-0"	21'-10"	20'-8"
	16" oc	19'-5"	18'-2"	18'-11"	17'-11"
	24" oc	15'-10"	14'-10"	15'-6"	14'-8"
2 x 10	12" oc	> 26'	25'-8"	> 26'	25'-3"
	16" oc	23'-9"	22'-3"	23'-2"	21'-11"
	24" oc	19'-5"	18'-2"	18'-11"	17'-10"
2 x 12	12" oc	> 26'	> 26'	> 26'	> 26'
	16" oc	> 26'	25'-9"	> 26'	25'-5"
	24" oc	22'-6"	21'-0"	21'-11"	20'-9"
RAFTERS (With 20 lb live load & 10 lb dead load) Table R802.5.1(2)/CBC Table 2308.10.3(1) Ceiling attached to rafters					
2 x 4	12" oc	10'-0"	9'-10"	9'-8"	9'-2"
	16" oc	9'-1"	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'-9"	12'-0"	11'-5"
2 x 8	12" oc	20'-10"	20'-5"	19'-11"	19'-0"
	16" oc	18'-11"	18'-2"	18'-1"	17'-3"
	24" oc	15'-10"	14'-10"	15'-6"	14'-8"
2 x 10	12" oc	> 26'	25'-8"	25'-5"	24'-3"
	16" oc	23'-9"	22'-3"	23'-1"	21'-11"
	24" oc	19'-5"	18'-2"	18'-11"	17'-10"
2 x 12	12" oc	> 26'	> 26'	> 26'	> 26'
	16" oc	> 26'	25'-9"	> 26'	25'-5"
	24" oc	22'-6"	21'-0"	21'-11"	20'-9"

FRAME INSPECTION (continued)

Exterior weatherproof at time of Frame Inspection (R701.2/CBC 110.3.4)

- □ Siding is on or lath installed, and roof cover complete
- □ Exterior to be weather tight before electrical installation has begun

Sub Trades Must be Completes or Inspected at the Same Time as Frame Inspection

- □ Electrical, plumbing & mechanical must be completed, inspected and approved by the time of rough frame approval (R109.1.4/CBC 110.3.4)

Bedrooms Provided with Egress Window or Door to Exterior (R310/CBC 1029)

- □ 20" min width
- □ 24" min height
- □ 5.7 sq. ft. (821 sq. in.) min net clear opening except on 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/CBC 406.3.4)

Fall Protection (R312.2.1/CBC 1013.8)

- ❑ Required when the bottom of window is more than 72" above grade and lower than 24" from finished floor
  - Largest opening will not allow a 4" sphere to pass through
  - Or provide fall prevention devices that comply with ASTM F2090

Smoke Detectors (R314.3/CBC 907.2.11.2)

- □ Locations
  1. One every floor
  2. Rooms or hallways giving access to bedrooms
  3. Every bedroom
  4. Basements & habitable attics

FRAME INSPECTION (continued)

□ Power (R314.4/CBC 907.2.11.4)
- Interconnected direct power with battery backup for new construction, 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/CBC 907.2.12.1)

Carbon Monoxide Alarms (R315/CBC 420.6)
□ 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

□ Power & Alarm Audibility
- Same as smoke detectors

Stairs for R-3 occupancy (R311.7/CBC 1009.7 exception 5)
□ 3’ min width
□ 7-3/4” max risers
□ 10” min tread depth with min 3/4” & max 1-1/4” nosing/11” min without nosing
□ 3/8” max variation between all risers and between all treads Check finish schedules for top & bottom riser consistency
□ 6’-8” minimum headroom
□ Landings 36” min depth

Winder (R311.7.5.2.1/CBC 1009.7.3)
□ Min 6” tread depth at narrow end of walkline and 10” at wide end of walkline
□ 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/CBC 1009.12)
□ Min clear width 26” below handrail
□ Min 7-1/2” tread at 12” from narrower edge, max 9-1/2” rise
□ Headroom min 6’-6”

Room Dimensions (R304/CBC 1208)

- □ Hall widths 3’ min (R311.6/CBC 1018.2 exception 3)
- □ Min habitable room size: 7’ min dimension & 70 sq. ft. except kitchen (R304/CBC 1208.1)
- □ At least one habitable room is not less than 120 sq. ft. (R304.1/CBC 1208.3)
- □ Min ceiling heights—habitable room 7’ min in CRC, but 7’-6” min in CBC (R305.1/CBC 1208.3) Refer to (R305.1/CBC 1208.2) for sloped ceilings
- □ Kitchens, bathrooms, storage rooms, & laundry rooms min ceiling height 7’ in CBC & CRC, with exception of non-habitable portion in bathrooms and basement min 6’-8” in CRC (R305.1 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)

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/CBC 718.3)
  - 1/2” gypsum, 3/8” plywood, 3/8” particle board, 1 x lumber, cement board, glass fiber

FRAME INSPECTION (continued)

- 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

Light & Ventilation (R303/CBC 1203 & 1205)
See Energy Inspection for glazing requirements to be checked at Frame Inspection

□ 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 (CBC 1203.4.1.1 min 8% of the floor area or min 25 sq ft, whichever is greater)
- Exterior window open to yards or courts, min 3' wide yard or court spaces (CBC 1206)
- If a mechanical ventilation system is used in lieu of exterior openings it must provide a min 10 cfm for studio or one bedroom dwelling and additional 5 cfm per person for each additional bedroom (CMC Table 402.1)

□ Bathrooms & Laundry Rooms (R303.3/CBC 1203.4.2.1)
- 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 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

Attic Ventilation (R806/CBC 1203.2)

- □ 1 sq ft per 150 sq ft of attic area if only eave vents
- □ 1/300 of area when at least 40% and not more than 50% of the required ventilating area is provided by upper ventilators that located no more than 3' below the roof's highest point (R806.2)
- □ 1/300 of area is permitted if at least 50% and not more than 80% is located over 3' above eave and the remainder percentage at eaves (CBC 1203.2)
- □ Min 1/16" & max 1/4" corrosion resistant metal mesh screen required
- □ Check for isolated and un-vented attic spaces
- □ Must be vented top & bottom @ 1/150 if radiant barrier is required with 30% min at the tope (California Energy Code)

Exterior Finish & Elevations Must Match Planning Approved Plan

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 within a 24" radius of either vertical edge of the door in a closed position if less than 60" above the floor, except glazing in walls on the latch side of and perpendicular to the plane of the door in a closed position, decorative glazing, where an intervening wall or permanent barrier between door & glazing. Access door to closet or storage area ≤ 3' deep, and glazing adjacent to fixed panel of patio door
- □ Glazing adjacent to bottom landing of a stairway < 3' above the landing & within 5' horizontally of the bottom tread unless protected by a guard 18" from glazing
- □ 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 except glazing is > 60" measured horizontally from the water edges of these fixtures.

FRAME INSPECTION (continued)

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 1210.3)

□ 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 (R 307)

Lath Inspection (R703.6/CBC 2507)

□ Check plan for lateral bracing requirements, and shear inspection signed off on permit

□ 2 layers type D paper when over solid wood backing (R703.6.3/CBC 2510.6)

□ Windows flashed, counter flashed & caulked

□ Paper laps are 2" min horizontal & 6" 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 (703.6.1/CBC 2507.3)

- □ Corners reinforced per ASTM C1063-03
- □ 3-1/2" 26 gage galvanized weep screed installed 4" above earth & 2" above concrete (R703.6.2.1/CBC 2512.1.2)

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
- □ Effective date is 6/20/00 based on permit application date
  Exception: On going tract developments effective date is 7/20/01
- □ 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

Masonry Fireplace (CRC Chapter 10/CBC Chapter 21)

Foundations (R1001.2/CBC 2111.2)
- □ At least 12" thick and must extend 6" wider and longer than firebox

Firebox (R1001.5/CBC 2111.5)
- □ Min 8" solid masonry wall thickness with 2" firebrick lining, 10" min otherwise (R1001.5/CBC 2111.2)
- □ Max 1/4" joints in firebrick (R1001.5/CBC 2111.5)
- □ Min 20" depth (R1001.6/CBC 2111.6)
- □ Min 4 #4 bars, one each corner, solid grouted cavities (R1001.3.1/CBC 2111.3.1)

Smoke Chamber (R1001.8/CBC 2111.8)
- □ Min 8" wall thickness in front, back, and sides, see exception with lining

FRAME INSPECTION (continued)

Chimney (R1003/CBC 2113)

- □ Up to 40” wide, 4 #4 vertical bars
- □ More than 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/CBC 2111.4.1)
- □ See City Policy for existing masonry chimney repair
- □ Flue liner must be bedded in mortar & joints smoothed on the inside per ASTM C199 (R1003.12/CBC 2111.12)
- □ Chimney flue size see Table R1003.14(1) & (2)/CBC Table 2113.16(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/CBC 2113.9)
- □ An approved spark arrestor required at final inspection (R1003.9.2/CBC 2113.9.2)

Hearth (R1001.9/CBC 2111.9)

- □ Min 4” thickness of non combustible material & non-combustible support

Clearances to Combustible (R1001.11/CBC 2111.11)

- □ 2” from front and sides and 4” from back, and see manufacturer’s installation instruction

Exterior Air Supply (R1006/CBC 2111.13.3)

- □ Provide exterior combustion air per listing and manufacturer's instruction unless the room is mechanically ventilated and controlled so that the indoor pressure is neutral or positive

ROOFING (CRC CHAPTER 9/CBC 1507)

Roof Sheathing

- □ Spaced lumber sheathing is not allowed in Seismic Design Category D_2 (R803)

Composition (slopes 2:12 or greater) R905.2/CBC 1507.2 Read instructions on bundles.

- □ 1 overlay is allowed (R1510.3 & R1510.4)
- □ Solid sheathing required or over existing comp shingles
- □ 15 lb underlayment required unless overlaying existing comp per ASTM D226, Type I
- □ 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
- □ Slopes 2:12 to 4:12 are as above except 2 layers of 15 lb underlayment are required & shingles must be self sealing
- □ Check bundle for nailing location requirement
- □ Exposed edges of sheathing to be covered with L-metal or equal
- □ Counter flashing required when flashing meets vertical surface

Wood Shake (slopes 3:12 or greater R905.8, but 4:12 or greater for CBC 1507.9)

- □ Fire treated required for new or additions and reroofs more than 50% of the roof area
- □ Solid sheathing
- □ 18" wide of strips of not less than 30 lb interlayment is required
- □ Corrosion-resistant fasteners 2 per shake, 1/2" penetration into sheathing in CRC, but 3/4" penetration required per CBC
- □ Exposure per Table R905.8.6/CBC 1507.9.8, 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 15 lb underlayment in addition to all of the above in CRC only
- □ Open porches > 1-1/2:12 are OK with 90 lb underlayment

Tile R905.3/CBC 1507.3 (installed as per manufacturer’s installation instructions)

- □ 30 lb 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
- □ Slope 2-1/2:12 up to 4:12 with double 30 lb felt, 4:12 or greater with 30 lb felt
- □ Solid structural sheathing
- □ Underlayment:
  - Valley flashing at 3:12 slope-min 36” wide, 1 layer of 15 lb
  - Greater than 4:12 slope-1 layer of 30 lb
  - Low slopes up to 4:12-2 layers of 30 lb with 19” starter course and 36” overlapping
- □ If lightweight tile (< 9 psf), one nail on every tile
- □ Re-roofs to be lightweight tile unless supporting structure is approved for heavyweight tile
- □ If heavy weight tile (≥ 9 psf), see Table R905.3.7/CBC 1507.3.7
  - Slopes up to 5:12, nail perimeter for 3’ border
  - Slopes > 5:12, see manufacture’s instructions for additional nailing requirements or Table R905.3.7/CBC 1507.3.7
- □ Corrosion resistant nails not less than 11 gage, 5/16” head with 3/4” penetration, wire ties min 0.083”
- □ 26 gage galvanized flashing and see manufacturer’s instruction

ROOFING (continued)

Built Up/Modified Bitumen/Single-Ply/Sprayed Foam Roofings/ Liquid-applied coatings (R905.9/CBC 1507.10)

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

Metal Roof (R905.10/CBC 1507.5)

- □ Slope 3:12 or greater and see manufacturer's instruction
- □ Solid sheathing
- □ 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

Roof Inspection

- □ Only final inspection is required
- □ Permit required for skylights including reflective tubes
  - Non-structural alterations will not have drawings
  - Structural alterations include modifications of trusses or width > 4' will require plans

ENERGY CONSERVATION INSPECTION

Under floor, walls and batt ceiling insulation is inspected at one time. Blown-in insulation is done at final inspection. See Field Note 29.

R-Values of Insulation Match CF1 Form

□ Prescriptive package:
   1. Attic—R-30
   2. Walls—R-13
   3. Under floor—R-19
   4. Or per plan

□ Faced batts have facing toward conditioned area

□ U factor is conductance of energy flow, U=1/R

□ R value is resistance to energy flow, R=1/U
   - Styrofoam has R value of R-5/in
   - Urethane has R value of R-7.2/in

□ Secure insulation if not held in place by finishes

□ Check cripple walls and cathedral walls

□ 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)

□ If computer run used, check radian barrier and duct testing

U-Factor of Windows Match CF1 Form

□ Glazing to be inspected at frame inspection
   - Prescriptive is .32 U-factor/labeled/.25 SHGC
   - Reduced to .40 U-factor/.35 SHGC if ducts don't HERS tested (Table 150.2-B)
   - 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)

□ Sill plates are sealed at floor line on slab floors (California Energy Code 110.7)

ENERGY CONSERVATION INSPECTION (continued)

- □ Penetrations in plates are sealed between attic and under floor
- □ Exterior sheathing is sealed to prevent openings into wall cavities
- □ Max 1:12 slope ceiling for blown in insulation

Attic & Under Floor Vents Maintained Open

- □ 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

Documentation

- □ If computer package: CF-1R & C-2R
- □ If HERS: duct testing is required: CF-4R
- □ If shading device: worksheet 5A
- □ If required on plan: CF-6R

TABLE 150.1-A COMPONENT PACKAGE A-STANDARD BUILDING DESIGN					
BUILDING ENVELOPE	INSULATION[1]				**CLIMATE ZONE 4**
		ROOFS/CEILING			U 0.031 R-30
		Walls	Above grade	2 x 4 Framed[2]	U 0.065 R-15+4 or R-13+5
				Mass Wall Interior[3]	U 0.070 R-13
				Mass Wall Exterior[3]	U 0.125 R-8.0
			Below grade	Below Grade Interior[3]	U 0.070 R-13
				Below Grade Exterior[3]	U 0.200 R-5.0
		Floors	Slab perimeter		NR
			Raised		U 0.037 R-19
			Concrete raised		U 0.269 R-0
		RADIANT BARRIER			REQ
	ROOFING PRODUCTS	Low-sloped		Aged solar reflectance	NR
				Thermal emittance	NR
		Steep-sloped		Aged solar reflectance	NR
				Thermal emittance	NR
	FENESTRATION	Maximum U-factor[4]			0.32
		Maximum SHGC[5]			0.25
		Maximum total area			20%
		Maximum west facing area			5%
HVAC SYSTEM[8]		Space Heating	Electric-resistance allowed		No
			If gas, AFUE =		MIN
			If heat pump, HSPF[7,6] =		MIN
		Space Cooling	SEER =		MIN
			Refrigerant charge verification or charge indicator display		NR
			Whole house fan[7]		NR
		Central System Air Handlers[8]	Central fan integrated ventilation system fan efficacy		REQ
		Ducts	Duct insulation		R-6
WATER HEATING		All Buildings			Section 150.1(c)[8]

FOOTNOTE REQUIREMENTS TO TABLE 150.1-A

1. The U-factors/R-values shown for ceiling, wall and raised floor insulation are for wood-frame construction with insulation installed between the framing members. For alternative construction assemblies, see Section 150.1(c)1A, B and C.
2. U-factors can be met by cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in a U-factor equal to or less than the U-factor shown. "R-15+4" means R-15 cavity insulation plus R-4 continuous insulation sheathing. Any combination of cavity insulation and/or continuous insulation that results in a U-factor equal to or less than 0.065 is allowed, such as R-13+5.
3. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft2. Below grade "interior" denotes insulation installed on the inside surface of the wall. Below grade "exterior" denotes insulation installed on the outside surface of the wall.
4. The installed fenestration products shall meet the requirements of Section 150.1(c)3.
5. The installed fenestration products shall meet the requirements of Section 150.1(c)4.
6. HSPF means "heating seasonal performance factor."
7. 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 2 cfm/square foot of conditioned floor area per Section 150.1(c)12.
8. 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.

TABLE 150.2-B STANDARD DESIGN FOR AN ALTERED COMPONENT		
ALTERED COMPONENT	**STANDARD DESIGN WITHOUT THIRD PARTY VERIFICATION OF EISTING 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	The requirements of Sections 150.0(a), (c) and (d)	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 Tables 110.6-A and 110.6-B.
Space-heating and space-cooling equipment	The requirements of Table 150.1-A	The existing efficiency levels.
Air distribution system-duct sealing	The requirements of Table 150.1(b)1D.	
Air distribution system-duct insulation	The proposed efficiency levels.	The existing efficiency levels.
Water heating systems	The requirements of Section 150.1(b)1 without the solar water heating requirements.	The existing efficiency energy factor.
Roofing products	The requirements of Section 150.2(b)1H.	
All other measures	The proposed efficiency levels.	The existing efficiency levels.

FINAL INSPECTION

VERIFY all other Required Inspections are approved.

Garage Fire Wall is Complete (Table R302.6/CBC 406.3.4)

- □ Firewall extends to roof sheathing
- □ 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
- □ Firewalls extend through crickets above ceiling
- □ Support walls, beams & posts for second floor are 1-hr protected or heavy timber, i.e. 8 x 8 posts & 6 x 10 beams and girders (CBC 602.4.2)
- □ Doors are 20-minute rated or 1 3/8" solid core to be self closing and self latching (R302.5.1/CBC 406.3.4)

Plumbing Penetrations: (See 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 (donut may be required for pipes over 3" 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
- □ Furnace/water heater platforms are 1-hr protected if part of firewall, i.e. 1-1/8" thick plywood, two 3/4" layers of plywood or 2x material

Stairs, Landings, & Guardrails (R311.7.5/CBC 1009.7.2, 1012, 1013)

- □ Handrails to be installed at 34" to 38" above nosing of tread and to be continuous (R311.7.8/CBC 1012.2)
- □ Rise & run are still within 3/8" of least and greatest rise & run within the flight (R311.7.5/CBC 1009.7.4)
- □ Solid risers required unless opening between treads doesn't permit the passage of a 4" diameter sphere or spiral stairways (R311.7.5.1/CBC 1009.7.5.3)

- □ Guardrails are 42” high with exception if also serve as handrails on open sides of stairs between 34” & 38”; openings less than 4” (R312.1.2/CBC 1013.3)
- □ 36” deep landings are installed at exterior doors (R311.3/CBC 1008.1.6 exception)

Smoke Detectors are Installed (R314/CBC 907.2.8 see Frame Inspection for locations)

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, Egress & Fall Protection

Grading is Complete
- □ 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

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

Other Clearances to Verify
- □ Special inspection report, structural observation letter, and/or soil report collected (R109.2/CBC 1704)
- □ Public Works, CDD, Fire Department & Planning Department clearances verified

FINAL INSPECTION (continued)

- □ Flood Elevation Certificate clearance verified, if not have owner contact Public Works

Processing

- □ Verify that PG&E meter releases were done with sub-trade final
- □ Verify that all other trades are final
- □ Sign permit card and bring office copy of correction notice back to office for filing

Handrail (R311.7.8/CBC 1012)

- □ 34" - 38" high from the sloped plane adjoining the tread nosing
- □ To be continuous for the full length of the flight
- □ 1-1/2" min space between the wall & handrail except at terminations
- □ Grip size between 1-1/4" & 2"
- □ Terminate in newel posts, volute, or return to wall
- □ No vertical drop and no more than 45° shift in direction (City of San Jose policy)

Bulkhead Enclosure Stairways (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

Verify Street Address Installed at Front of House.

SWIMMING POOLS
(CRC APPENDIX G/CBC 3109.4.1-3109.4.3)

(Also see Plumbing/Mechanical/Electrical Checklist)

Inspections

□ Pre-gunite

- Pool placement:
  - Not allowed in easements.
  - Must be designed for retaining if within angle of repose of foundation.
  - Setbacks:
    1. Front = 30',
    2. Sides = 5',
    3. Corner Lots = 9',
    4. Rear = 5'.
    5. Max total rear yard coverage, including all accessory buildings = 60%
- Pool equipment setbacks:
  - Front = 25'
  - Sides = 5'
  - Rear = 5'
- Steel inspection (pre-gunite): Check plans, bond beam, spring line, steel schedule, check if pool configuration includes retaining wall or raised section, glass within 5' to be safety glazing, bond all metallic objects within 5' of pool
- Verify minimum of 4 points uniformly spaced bonding wires around pool perimeter for equipotential bonding except nonconductive pool shells (NEC 680.26(B)(2))
- Verify perimeter surface bonding with a 8 AWG bare solid copper conductor around the pool perimeter 3' from inside walls of the pool for unpaved or paved surfaces

□ Pre-plaster/Final:

- Verify fencing, overhead wire at 22'6" clearance to water and 14'6" to diving platform or observation

SWIMMING POOL (continued)

stand or tower; safety glass within 5'; pool cover if heated (See Field Note 29); anti-entrapment grates at suction outlets

- Manual or power safety pool cover meeting ASTM F1346 instead of enclosure (or locking device meets ASTM ES13-89 for spa), or
- Enclosure Requirements
  - ♦ Fence: min 4' from pool, min 5' high, within 2" of grade, contain 4" sphere, free of handholds usable to climb. CBC 3109.4.4.3 & CRC Appendix G.
  - ♦ Gates: open away from pool, self-closing and latching min 54" high at latch
  - ♦ Doors from house into enclosure: self-closing and latching at 54" high or be equipped with battery or powered exit alarms (with UL 2017 listing) that make audible continuous alarm sounds when doors are opened or left ajar

∗ **See Electrical portion for electrical requirements.**

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 require special inspection & final letter of compaction approval

Part II
PLUMBING REQUIREMENTS

Adopted Codes

2013 California Plumbing Code
Based on the 2012 Uniform Plumbing Code

UNDERGROUND INSPECTION

Building Sewer Chapter 7

- Approved Materials 701
  - ABS and PVC DWV limited to no more than two stories residences per HCD
  - DWV copper tube and cast-iron soil pipe
  - Vitrified Clay no closer than 2' of building and not allowed when pressurized by a pump or ejector.
- 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
  - Horizontal to horizontal = 45° wye, combo wye & 1/8 bend or equivalent
  - Vertical to horizontal = 45° wye, combo wye & 1/8 bend and 60° offset is permitted to achieve vertical or equivalent
  - Horizontal to vertical = 45° wye, 60° wye, combo wye & 1/8 bend, sanitary tee/sanitary tapped tee or equivalent
- Cleanout Requirements
  - Intervals exceeding 100'. 719.1
  - Each aggregate horizontal change of direction >135°
  - 2' inside or outside of building, near building drain connection to building sewer. 715.1
  - ≤ 2" cleanout requires min. 12" clearance in front. 707.9
  - > 2" cleanout requires min. 18" clearance in front. 707.9
  - Under floor cleanout shall be within 20' from access.
  - 4" cleanout within 5' of property line extended to grade. MO 17.56.160
- Protection of Piping
  - Min. 1' cover sewer pipes of ABS, PVC, Copper & Vitrified Clay. 718.3
- Backwater Valve Requirements 710
  - For fixtures where the flood level rim is not above the upstream manhole by 1'.

- Fixtures above the upstream manhole 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 as the building it serves.
- 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.
- Size of Building Sewer 717
  - On the basis of total fixture units per Table 717.1
  - Min. of 3" with a water closet connected to it. Table 703.2
  - Rule of thumb: min. 3" sewer with 3 or less water closets. And min. 4" sewer with 4 or more water closets.
  - Size shall be based on Tables 702.1 & 703.2.

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
- Firestop all fire resistive rated walls, floors, etc. per California Building Code. 312.7

Hangers and Supports 313

- Pipe shall be laid on a firm bed for its entire length. 313.3
- Upward movement shall be restricted. (Installation standards)
- Cast iron shall be supported within 18" of all bands.

Water Services Chapter 6

- Approved Materials 604
  - Brass, copper, CPVC, galvanized steel, polyethylene, PVC, stainless steel per Table 604.1
  - PVC shall be a min. of schedule 40 per installation standards

UNDERGROUND INSPECTION continued

- Copper shall be a min. of type "M" 604.2 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 services replaced with nonmetallic material shall have electrical grounding provided. 604.9 exception
- A fullway gate valve shall be on the discharge side of a water meter. 606.2
- PVC female adapters allowed only with plastic male fittings 605.13.3
- No portion of a water service is allowed under a footing or slab floor.

- Minimum and Maximum 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
- 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. 18 AWG tracer wire that is listed for direct burial with plastic building supply.

Gas Piping Inspection

- Underground gas piping must have a visual inspection before covering. 1203.2
- Connections and fittings
  - Unions are allowed at exposed fixture connections and exposed exterior locations on the discharge side of a shut

off valve only.
  - In other locations, left & right couplings may be used. 1210.3
  - No bushings are allowed in concealed locations. 1210.3
- No gas piping is allowed under a footing or slab floor. 1211.4
- No unwrapped gas piping is allowed closer than 6" to the ground within a building. 1211.4
- 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. 1208.5.2
  - 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 is restricted to short sections & fittings.
  - Coating protection shall extend a min. of 6" above grade.
  - Underground ferrous gas piping shall be electrically isolated from the rest of the gas system with listed or approved isolation fittings installed a min. of 6" above grade.
  - Shall have a min. 12" of cover. 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.
  - Use max. 15 lbs. gauges for pressure tests of 10 lbs. or less shall be calibrated with increments of 1/10 lb. or less. 318.2
- Polyethylene Gas Piping
  - Shall be of a type approved for natural gas, Table 1401.1
  - Shall have a min. 18" of cover. 1210.1.1
  - 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
  - Risers, including prefabricated protected metallic risers, shall extend a min. 6" above grade, with the horizontal

section being a min. 30" long. Listed one-piece 90° fittings or risers may have less than 30".

Drainage Systems Material & Testing

- Approved materials 701.1
  - 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
  - Vertical to horizontal = long sweep
  - Horizontal to vertical = long or short sweep
  - 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
  - Fixtures installed below the next upstream manhole cover shall install backwater valve.

Horizontal Piping Support

- Plastic horizontal piping Table 313.1
  - 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 313.1
  - Max. 5' interval where joints occur.
  - When over 4' pipe length support every joint.
  - Supports shall be within 18" of joints, not on couplings Table 313.1 Note 1

- Support must be adequate to prevent sag & maintain alignment. 313.2

- Copper tubing Table 313.1
  - 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
  - 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 other branch lines exceeding 5' in length.
  - Kitchen sinks & urinals regardless of branch length.
- Access & Working Clearance in Front of Cleanouts 707.9
  - Min. 12" in front of cleanouts for pipes 2" & smaller.
  - Min. 18" in front of cleanouts for pipes larger than 2".
  - Max. 20' from crawl hole access.
- Min. size of cleanouts as per Table 707.1

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

Sizing DWV Systems 703

- All DWV piping shall be sized from Tables 702.1 & 703.2.

UNDERFLOOR INSPECTION (continued)

- Min. size of a vent for a water closet is 2" per note #3 of Table 703.2

TABLE 703.2
MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING

	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12
Max Units Drainage Piping[1]											
Vertical	1	2[2]	16[3]	32[3]	48[4]	256	600	1380	3600	5600	8400
Horizontal	1	1	8[3]	14[3]	35[4]	216[5]	428[5]	720[5]	2640[5]	4680[5]	8200[5]
Max Length Drainage Piping											
Vertical	45'	65'	85'	148'	212'	300'	390'	510'	750'	-	-
Horizontal	Unlimited										
Vent Piping Horizontal & Vertical[6]											
Max Units	1	8[3]	24	48	84	256	600	1380	3600	-	-
Max Lengths	45	60	120	180	212	300	390	510	750	-	-

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 1/4" per foot slope. For 1/8" per foot slope, multiply horizontal fixture units by a factor of 0.8..
6. The diameter of an individual vent shall be not less than 1 1/4" 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(b). 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. The table is in accordance with the requirements of Section 901.2.

TABLE 702.1 DRAINAGE FIXTURE UNIT VALUES (DFU)				
PLUMBING APPLIANCES, APPURTENANCES, OR FIXTURES	**MIN SIZE TRAP & TRAP ARM[7] (INCHES)**	**PRIVATE**	**PUBLIC**	**ASSEMBLY[8]**
Bathtub or Combination Bath/Shower	1 1/2	2.0	2.0	-
Bidet	1 1/4	1.0	-	-
Bidet	1 1/2	2.0	-	-
Clothes Washer, domestic, standpipe[5]	2	3.0	3.0	3.0
Dental Unit, cuspidor	1 1/4	-	1.0	1.0
Dishwasher, domestic, with independent drain[2]	1 1/2	2.0	2.0	2.0
Drinking Fountain or Water Cooler	1 1/4	0.5	0.5	1.0
Food Waste Grinder, commercial	2	-	3.0	3.0
Floor Drain, emergency	2	-	0.0	0.0
Floor Drain (for additional sizes see Section 702.0)	2	2.0	2.0	2.0
Shower, single-head trap	2	2.0	2.0	2.0
Multi-head, each additional	2	1.0	1.0	1.0
Lavatory, single	1 1/4	1.0	1.0	1.0
Lavatory, in sets of two or three	1 1/2	2.0	2.0	2.0
Washfountain	1 1/2	-	2.0	2.0
Washfountain	2	-	3.0	3.0
Mobile Home, trap[9]	3	12.0	-	-
Receptor, indirect waste[1,3]	1 1/2	See footnote [1, 3]		
Receptor, indirect waste[1, 4]	2	See footnote[1, 4]		
Receptor, indirect waste[1]	3	See footnote[1]		
Sinks	-	-	-	-
Bar	1 1/2	1.0	-	-
Bar[2]	1 1/2	-	2.0	2.0
Clinical	3	-	6.0	6.0
Commercial with food waste[2]	1 1/2	-	3.0	3.0
Special Purpose[2]	1 1/2	2.0	3.0	3.0
Special Purpose	2	3.0	4.0	4.0
Special Purpose	3	-	6.0	6.0
Kitchen, domestic[2] (with or without food waste grinder, dishwasher, or both)	1 1/2	2.0	2.0	-

TABLE 702.1 DRAINAGE FIXTURE UNIT VALUES (DFU) continued				
PLUMBING APPLIANCES, APPURTENANCES, OR FIXTURES	**MIN SIZE TRAP & TRAP ARM[7] (INCHES)**	**PRIVATE**	**PUBLIC**	**ASSEMBLY[8]**
Sinks (continued)	-	-	-	-
Laundry[2] (with or without discharge from a clothes washer)	1 1/2	2.0	2.0	2.0
Service or Mop Basin	2	-	3.0	3.0
Service or Mop Basin	3	-	3.0	3.0
Service, flushing rim	3	-	6.0	6.0
Wash, each set of faucets	-	-	2.0	2.0
Urinal, integral trap 1.0 GPF[2]	2	2.0	2.0	5.0
Urinal, integral trap greater than 1.0 GPF	2	2.0	2.0	6.0
Urinal, exposed trap[2]	1 1/2	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank[6]	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank[6]	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve[6]	3	3.0	4.0	6.0
Water Closet, greater than 1.6 GPF Gravity Tank[6]	3	4.0	6.0	8.0
Water Closet, greater than1.6 GPF Flushometer Valve[6]	3	4.0	6.0	8.0

Notes:

1. Indirect waste receptors shall be sized based on the total drainage capacity of the fixtures that drain therein to, in accordance with Table 702.2(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. 7Trap sizes shall not be increased to the point where the fixture discharge is capable of being inadequate to maintain their self-scouring properties.
8. Assembly (Public Use (see Table 422.1)).
9. (**HDC2**) For drainage fixture unit values related to mobilehome parks in all parts of the State of California, see California Code of Regulations, Title 25, Division 1, Chapter 2, Article 5, Section 1268. For drainage fixture unit values related to special occupancy parks in all parts of the State of California, see California Code of Regulations, Title 25, Division 1, Chapter 2.2, Article 5, Section 2268.

UNDERFLOOR INSPECTION (continued)

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
HORIZONTAL LENGTHS OF TRAP ARMS
(EXCEPT FOR WATER CLOSETS & SIMILAR FIXTURES)[1,2]

TRAP ARM PIPE DIAMETER (inches)	DISTANCE TRAP TO VENT MINIMUM (inches)	LENGTH MAXIMUM (inches)
1 1/4	2 1/2	30
1 1/2	3	42
2	4	60
3	6	72
4	8	120
Exceeding 4	2 x Diameter	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 pipings and fittings.
- Only water piping supplies island sinks is allowed under a slab and short sections per 609.3(2) & CSJ.
- Support of horizontal water piping Table 313.1
  - Copper tubing
    - Every 6' for pipe 1 1/2" & smaller.
    - Every 10' for pipe 2" & larger.
  - Pex

UNDERFLOOR INSPECTION (continued)

- 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

Gas Piping

- Materials 1208.5
  - No copper & brass gas pipe allowed 1208.5.2.3
  - CSST with plan check approval only.
  - Black steel if protected from weather.
  - Galvanized steel or painted black steel if exposed to weather.
- Piping in Floors 1210.3.4
  - No gas piping allowed under a slab, footing, or closer than 6” to ground within a building.
- Horizontal support of gas piping Table 1210.2.4.1
  - Every 6’ for 1/2” pipe.
  - Every 8’ for 3/4” to 1” pipe.
  - Every 10’ for 1 1/4” & larger pipe.
- Inspection is visual only at this time.
- Sizing is as per Tables 1216.2(1), 1216.2(14), & 1216.2(20)

TABLE 1210.2.4.1
SUPPORT OF PIPING (NFPA 54: TABLE 7.2.6.2)

STEEL PIPE, NOMINAL SIZE OF PIPE (inches)	SPACING OF SUPPORTS (feet)	NOMINAL SIZE OF TUBING SMOOTH-WALL (inches O.D.)	SPACING OF SUPPORTS (feet)
1/2	6	1/2	4
3/4 or 1	8	5/8 or 3/4	6
1 1/4 or larger (horizontal)	10	7/8 or 1 (horizontal)	8
1 1/4 or larger (vertical)	Every floor level	1 or larger (vertical)	Every floor level

ROUGH INSPECTION

Same rules as underfloor for:

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

Support of vertical pipe Table 313.1

- Plastic pipe—Mid span between plates & within 18" of fixture tees.
- Cast Iron—Every story or 15' max. Table 313.1
- Copper—Every story or 10' max. Table 313.1

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

Exposed Piping: Installation Standard IAPMO IS 9-2003 Section 2.3.3

- 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.

Closet Flanges

- Shall be 15" from center to finish sidewall. 402.5
- Flanges shall be secured with brass or stainless steel screws, bolts or other listed equally non corrosive materials. 402.6.2

Vents

- Every fixture trap shall be vented. 901.1
- Grade & slope
  - Shall be level or graded to drain back to the drain served. 905
  - Shall be 6" above the flood rim of the fixture before offsetting horizontally. 905.3

Termination

- Shall extend above a roof a min. of 6" & 1' from vertical surfaces. 906.1

ROUGH INSPECTION (continued)

- Shall be 10’ away from or 3’ above any operable 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

Wet Vents 908

- Vertical Wet Venting 908.1
  - Limited to vertical drainage receiving the discharge from the trap arm of 1 & 2 fixture unit fixtures. (Note: laundry is a 3-fixture unit fixtures)
  - 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.

- Horizontal Wet Venting 908.2
  - Limited to water closets, bathtubs, showers, and floor drains within one or two bathroom groups located on the same floor level for private use.
  - Each wet-vented fixture drain or trap arm shall connect independently to the wet-vented horizontal branch drain.
  - Each individual fixture drain or trap arm shall connect horizontally to the wet-vented horizontal branch drain or dry vent.
  - Only the fixtures within the bathroom groups shall connect to the wet-vented horizontal branch drain.
    - Only one wet-vented fixture drain or trap arm shall discharge upstream of the dry-vented fixture drain connection.

- Min. 2” in diameter for 4 drainage fixture units or less.
- Min. 3” in diameter for 5 drainage fixture units or more.
- Use Tables 702.1 & 703.2 for dry vent size based on the total fixture units discharging into the wet vent.

Water, Waste & Gas Piping (same rules as underfloor)
Gas pressure test not at this time but after sheetrock is up.

Shower Receptacles 408

- Shower pans shall be inspected at the time of rough inspection.
- Shower Compartment Dimensions 408.6
  - Min. 1024 in^2 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” door with door swinging outward.
  - 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.

ROUGH INSPECTION (continued)

- ❑ Test for shower pans 408.7.1
  - 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.
- ❑ Shower & Tub/Shower combination valves 408.3
  - Verify listing
  - Verify pressure balance/thermostatic mixing valve type.

Tubs

- ❑ Inspection
  - Fill tub with water to bottom of overflow.
  - Tub & shower valves must be listed for anti-scald.
  - 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 Valves

- ❑ 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

Cleanouts 707

- ❑ No cleanouts are required above the first floor except those serving the building drain & its branches. 707.4 Exception 3.
- ❑ Adequate fire protection of rated walls penetrations.

FINAL INSPECTION

Gas

- Verify rough inspection approval.
- Pressure test
  - Air test—10 lb. for 15 minutes for piping 1 1/4" & smaller
  - 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. 1211.5
- Appliance connectors 1211.3
  - Max. 6' in length.
  - 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 Tables 1216.2(3), 1216.2(6), 1216.2 (14), 1216.2(20), 1216.2(23) or manufacturing listing.

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 cristy 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. 608.3

Vacuum Breakers

- Required on all hose bibs & on landscape piping. 603.3 thru 603.5.21

FINAL INSPECTION (continued)

Fixtures

- All fixtures shall be installed and complete.
- All fixtures shall be trapped. 1001.1
- 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. 807.4

Water Heater

- Garage Installation 510
  - Min. 18" elevation from flammable source to floor unless listed as flammable vapor ignition resistant. 507.13
  - Shall be elevated or have adequate barrier to guard against damage. 507.13.1
- Clearances & Access 504.3
  - Subject to manufacturer's installation instruction. 504.3.1
  - Access door shall be min. 22" x 24". 508.3.2
- 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.
- Earthquake straps are required as per 507.2.

- Strap at the vertical upper and lower third of 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.
  - Seal bottom of closet door with threshold or gasket.
  - Provide combustion air from the outdoors.
  - The closet shall be for the exclusive use of the water heater.
  - Otherwise direct vent type and non–fuel burning types may be installed in closet locations without the requirements above.
- Installations in Attics 507.4
  - Provide a corrosion resistant watertight pan beneath the water heater with min. 3/4" diameter drain to exterior.

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.
  - Where air chambers are installed, they shall be in an accessible place with provisions for restoring air.
  - Mechanical device s shall be installed according to the manufacturer and shall be listed.
  - Re-pipes require water hammer arrestors per City policy

TABLE 610.3 WATER SUPPLY FIXTURE UNIT (WSFU) & MINIMUM FIXTURE BRANCH PIPE SIZES[3]				
APPLIANCES, APPURTENANCES, OR FIXTURES[2]	**MIN FIXTURE BRANCH PIPE SIZE[1,4] (INCHES)**	**PRIVATE**	**PUBLIC**	**ASSEMBLY[6]**
Bathtub or Combination Bath/Shower (fill)	1/2	4.0	4.0	-
3/4" Bathtub Fill Valve	3/4	10.0	10.0	-
Bidet	1/2	1.0	-	-
Clothes Washer	1/2	4.0	4.0	-
Dental Unit, cuspidor	1/2	-	1.0	-
Dishwasher, domestic	1/2	1.5	1.5	-
Drinking Fountain or Water Cooler	1/2	0.5	0.5	0.75
Hose Bibb	1/2	2.5	2.5	-
Hose Bibb, each additional[8]	1/2	1.0	1.0	-
Lavatory	1/2	1.0	1.0	1.0
Lawn Sprinkler, each head[5]	-	1.0	1.0	-
Mobile Home, each (minimum)[9]	-	12.0	-	-
Sinks	-	-	-	-
Bar	1/2	1.0	2.0	-
Clinic Faucet	1/2	-	3.0	-
Clinic Flushometer Valve with or without faucet	1	-	8.0	-
Kitchen, domestic with or without dishwasher	1/2	1.5	1.5	-
Laundry	1/2	1.5	1.5	-
Service or Mop Basin	1/2	1.5	3.0	-
Washup, each set of faucets	1/2	-	2.0	-
Shower, per head	1/2	2.0	2.0	-
Urinal, 1.0 GPF Flushometer Valve	3/4	See Footnote[7]		
Urinal, greater than 1.0 GPF Flushometer Valve	3/4	See Footnote[7]		
Urinal, flush tank	1/2	2.0	2.0	3.0
Wash Fountain, circular spray	3/4	-	4.0	-
Water Closet, 1.6 GPF Gravity Tank	1/2	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Valve	1	See Footnote[7]		

TABLE 610.3 WATER SUPPLY FIXTURE UNIT (WSFU) & MINIMUM FIXTURE BRANCH PIPE SIZES[3] continued				
APPLIANCES, APPURTENANCES, OR FIXTURES[2]	**MIN FIXTURE BRANCH PIPE SIZE[1,4] (INCHES)**	**PRIVATE**	**PUBLIC**	**ASSEMBLY[6]**
Water Closet, greater than 1.6 GPF Gravity Tank	1/2	3.0	5.5	7.0
Water Closet, greater than 1.6 GPF Flushometer Valve	1	See Footnote[7]		

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 bibs 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.
9. (**HCD 2**) For water supply fixture unit values related to mobilehome parks in all parts of the State of California, see California Code of Regulations, Title 25, Division 1, Chapter 2, Article 5, Section 1278. For water supply fixture unit values related to special occupancy parks in all parts of the State of California, see California Code of Regulations, Title 25, Division 1, Chapter 2.2, article 5, Section 2278.

TABLE 610.4
FIXTURE UNIT TABLE FOR DETERMING WATER PIPE & METER SIZES

METER & STREET SERVICE (in)	BUILDING SUPPLY & BRANCHES (in)	MAXIMUM ALLOWABLE LENGTH (feet) 40	60	80	100	150	200	250	300	400	500	600	700	800	900	1000
PRESSURE RANGE—30 to 45 psi[1]																
3/4	1/2[2]	6	5	4	3	2	1	1	1	0	0	0	0	0	0	0
3/4	3/4	16	16	14	12	9	6	5	5	4	4	3	2	2	2	1
3/4	1	29	25	23	21	17	15	13	12	10	8	6	6	6	6	6
1	1	36	31	27	25	20	17	15	13	12	10	8	6	6	6	6
3/4	1 1/4	36	33	31	28	24	23	21	19	17	16	13	12	12	11	11
1	1 1/4	54	47	42	38	32	28	25	23	19	17	14	12	12	11	11
1 1/2	1 1/4	78	68	57	48	38	32	28	25	21	18	15	12	12	11	11
1	1 1/2	85	84	79	65	56	48	43	38	32	28	26	22	21	20	20
1 1/2	1 1/2	150	124	105	91	70	57	49	45	36	31	26	23	21	20	20
2	1 1/2	151	129	129	110	80	64	53	46	38	32	27	23	21	20	20
1	2	85	85	85	85	85	85	82	80	66	61	57	52	49	46	43
1 1/2	2	220	205	190	176	155	138	127	120	104	85	70	61	57	54	51
2	2	370	327	292	265	217	185	164	147	124	96	70	61	57	54	51
2	2 1/2	445	418	390	370	330	300	280	265	240	220	198	175	158	143	133
PRESSURE RANGE—46 to 60 psi[1]																
3/4	1/2[2]	7	7	6	5	4	3	2	2	1	1	1	0	0	0	0
3/4	3/4	20	20	19	17	14	11	9	8	6	5	4	4	3	3	3
3/4	1	39	39	36	33	28	23	21	19	17	14	12	10	9	8	8
1	1	39	39	39	36	30	25	23	20	18	15	12	10	9	8	8
3/4	1 1/4	39	39	39	39	39	39	34	32	27	25	22	19	19	17	16
1	1 1/4	78	78	76	67	52	44	39	36	30	27	24	20	19	17	16
1 1/2	1 1/4	78	78	78	78	66	52	44	39	33	29	24	20	19	17	16
1	1 1/2	85	85	85	85	85	85	80	67	55	49	41	37	34	32	30
1 1/2	1 1/2	151	151	151	151	128	105	90	78	62	52	42	38	35	32	30
2	1 1/2	151	151	151	151	150	117	98	84	67	55	42	38	35	32	30
1	2	85	85	85	85	85	85	85	85	85	85	85	85	85	83	80
2	2	370	370	340	318	272	240	220	198	170	150	135	123	110	102	94
2	2 1/2	654	640	610	580	535	500	470	440	400	365	335	315	285	267	250
PRESSURE RANGE—Over 60 psi[1]																
3/4	1/2[2]	7	7	7	6	5	4	3	3	2	1	1	1	1	1	0
3/4	3/4	20	20	20	20	17	13	11	10	8	7	6	6	5	4	4
3/4	1	39	39	39	39	35	30	27	24	21	17	14	13	12	12	11
1	1	39	39	39	39	38	32	29	26	22	18	14	13	12	12	11
3/4	1 1/4	39	39	39	39	39	39	39	39	34	28	26	25	23	22	21
1	1 1/4	78	78	78	78	74	62	53	47	39	31	26	25	23	22	21
1 1/2	1 1/4	78	78	78	78	78	74	65	54	43	34	26	25	23	22	21
1	1 1/2	85	85	85	85	85	85	85	85	81	64	51	48	46	43	40
1 1/2	1 1/2	151	151	151	151	151	151	130	113	88	73	51	51	46	43	40
2	1 1/2	151	151	151	151	151	151	142	122	98	82	64	51	46	43	40
1	2	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
1 1/2	2	370	370	370	370	360	335	305	282	244	212	187	172	153	141	129
2	2	370	370	370	370	370	370	370	340	288	245	204	172	153	141	129
2	2 1/2	654	654	654	654	654	650	610	570	510	460	430	404	380	356	329

Notes:
1. Available static pressure after head loss.
2. Building supply, not less than 3/4" nominal size.

TABLE 1208.4.1 APPROXIMATE GAS INPUT FOR TYPICAL APPLIANCES (NFPA 54: TABLE 5.4.2.1)		
APPLIANCE		INPUT (Btu/h approx.)
Space Heating Units		
Warm air furnace		
	Single family	100,000
	Multifamily, per unit	60,000
Hydronic boiler		
	Single family	100,000
	Multifamily, per unit	60,000
Space and Water Heating Units		
Hydronic boiler		
	Single family	120,000
	Multifamily, per unit	75,000
Water Heating Appliances		
Water heater, automatic storage		
	30 to 40 gallon tank	35,000
Water heater, automatic storage		
	50 gallon tank	50,000
Water heater, automatic instantaneous		
	Capacity at 2 gallons per minute	142,800
	Capacity at 4 gallons per minute	285,000
	Capacity at 6 gallons per minute	428,400
Water heater, domestic, circulating or side –arm		35,000
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		
Refrigerator		30,000
Clothes dryer, Type 1 (domestic)		35,000
Gas fireplace direct vent		40,000
Gas log		80,000
Barbecue		40,000
Gaslight		2500

TABLE 1216.2(1) SCHEDULE 40 METALLIC PIPE (NFPA 54: TABLE 6.2(B))[1, 2]								
			GAS			NATURAL		
			INLET PRESSURE:			LESS THAN 2 psi		
			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	3
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR							
10	172	360	678	1390	2090	4020	6400	11300
20	118	247	466	957	1430	2760	4400	7780
30	95	199	374	768	1150	2220	3530	6250
40	81	170	320	657	985	1900	3020	5350
50	72	151	284	583	873	1680	2680	4740
60	65	137	257	528	791	1520	2430	4290
70	60	126	237	486	728	1400	2230	3950
80	56	117	220	452	677	1300	2080	3670
90	52	110	207	424	635	1220	1950	3450
100	50	104	195	400	600	1160	1840	3260
125	44	92	173	355	532	1020	1630	2890
150	40	83	157	322	482	928	1480	2610
175	37	77	144	296	443	854	1360	2410
200	34	71	134	275	412	794	1270	2240
250	30	63	119	244	366	704	1120	1980

Notes:
1. Table entries are rounded to 3 significant digits.
2. NA means a flow of less than 10 ft^3/h.

When pipe size is over 3" and longer than 250', refer to the CPC Table.

TABLE 1216.2(14)
CORRUGATED STAINLESS STEEL TUBING (CSST) (NFPA 54-12: TABLE 6.2(o))[1, 2]

								GAS				**NATURAL**			
								INLET PRESSURE:				**LESS THAN 2 psi**			
								PRESSURE DROP:				**0.5 in. w.c.**			
								SPECIFIC GRAVITY:				**0.60**			
FLOW DESIGNATION:	**TUBE SIZE (EHD) Equivalent Hydraulic Diameter**														
	13 3/8"	15	18 1/2"	19	23 3/4"	25	30	31 1"	37 1 1/4"	39	46	48 1 1/2"	60 2"	62	
LENGTH (feet)	**CAPACITY IN CUBIC FEET OF GAS PER HOUR**														
5	46	63	115	134	225	270	471	546	895	1037	1790	2070	3660	4140	
10	32	44	82	95	161	192	330	383	639	746	1260	1470	2600	2930	
15	25	35	66	77	132	157	267	310	524	615	1030	1200	2140	2400	
20	22	31	58	67	116	137	231	269	456	536	888	1050	1850	2080	
25	19	27	52	60	104	122	206	240	409	482	793	936	1660	1860	
30	18	25	47	55	96	112	188	218	374	442	723	856	1520	1700	
40	15	21	41	47	83	97	162	188	325	386	625	742	1320	1470	
50	13	19	37	42	75	87	144	168	292	347	559	665	1180	1320	
60	12	17	34	38	68	80	131	153	267	318	509	608	1080	1200	
70	11	16	31	36	63	74	121	141	248	295	471	563	1000	1110	
80	10	15	29	33	60	69	113	132	232	277	440	527	940	1040	
90	10	14	28	32	57	65	107	125	219	262	415	498	887	983	
100	9	13	26	30	54	62	101	118	208	249	393	472	843	933	
150	7	10	20	23	42	48	78	91	171	205	320	387	691	762	
200	6	9	18	21	38	44	71	82	148	179	277	336	600	661	
250	5	8	16	19	34	39	63	74	133	161	247	301	538	591	
300	5	7	15	17	32	36	57	67	95	148	226	275	492	540	

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.

TABLE 1216.2(20) POLETHYLENE PLASTIC PIPE (NFPA 54-12: TABLE 6.2(u))							
				GAS:	**NATURAL**		
				INLET PRESSURE:	**LESS THAN 2 psi**		
				PRESSURE DROP:	**0.5 in. w.c.**		
				SPECIFIC GRAVITY:	**0.60**		
	PIPE SIZE (inch)						
NOMINAL OD:	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 (feet)	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

Part III
MECHANICAL REQUIREMENTS

Adopted Codes

2013 California Mechanical Code
Based on the 2012 Uniform Mechanical Code

GENERAL INFORMATION

HVAC DUCT MATERIALS AND INSTALLATION

- Joints & Seams of Ducts 602.4
  - Min. 1-1/2" contact lap for round ducts
  - Min. 3 screws equally spaced around the joint except dryer ducts 504.3
  - 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 603.5
  - Refer to manufacturer's installation instructions
  - SMACNA
    - Metal round duct—Min. 1" wide 22 ga strap at 12'-0" interval
    - Metal rectangular duct—Min. 1" wide 22 ga strap at 10'-0" interval
    - Flexible duct—Min. 1" wide 22 ga strap at 5'-0" interval
- Factory-Made Air Ducts 602.3
  - Shall be listed and labeled for class used
  - 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
  - Max. 1/2" sag per ft
  - Use minimum length of ducts
  - Avoid exposure to sunlight & sharp bends
  - Provide additional supports at bends up to 1 diameter

- Seal damaged vapor barriers with UL 181 listed tape

UNDERGROUND/UNDERSLAB INSPECTION

Gas Piping

- See Plumbing Section on page 50

HVAC metal ducts in or underslab

- Require 2" concrete encasement 603.2
- 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 504.2
  - Schedule 40 PVC is allowed to be installed under a concrete slab

UNDERFLOOR INSPECTION

Domestic Range Vents 504.2

- 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 & 602.4
- Equip with a back draft damper except when the exhaust must operate continuously.

Clothes Dryers Ducts 504.3

- Refer to manufacturer's installation instructions
- No screws or rivets at joints
- Equip with back-draft damper
- No screen at duct termination
- Shall not connect to a gas vent connector, gas vent, or chimney for clothes dryers
- Min. 4"diameter duct
- Smooth interior metal ducts except max. 6' of exposed flexible duct
- Min. 100 in^2 opening for makeup air when dryer is located in a closet. 504.3.1
- Max. length of 14' including 2-90° elbows and deduct 2' for every added elbow. 504.3.1.2 or max. 35' and each elbow used deduct 5' per CSJ Directive M-001
- Min. 3' from termination to property line and openings into the building. 504.5

Condensate Wastes 312 802.9, 1105.10 & CPC 814

- 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

UNDERFLOOR INSPECTION (continued)

- 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
- Primary drainline shall be terminated in a drywell with an air-gap 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

- Verify with manufacturer’s installation instructions
- Supported by min. 3” of concrete slab above ground, or
- Supported from above with min. 6” clearance from finished grade, and
- If excavation is needed provide clearances:
  - Min. 6” depth below 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 904.10
  - 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. 24” width unobstructed solid flooring
  - 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 at max. 50’ 903.7

- Furnace in flood zone shall be elevated at or above the flood elevation 308.2

Floor Furnace 912

- Installation 912.1
  - Listed floor furnaces refer to manufacturer’s installation instruction
  - Unlisted floor furnaces not allowed in combustible floors
  - Thermostats shall be located in the same room as register
- Placement 912.3
  - 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 912.5
  - Doubled joists and with headers not smaller than the joists
- Clearance 912.7
  - 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 912.8
  - Min. 18” x 24”

Hydronic Piping 1201

- Hydronic system piping, tubing & fittings see Table 1201.3.1 for ASTM listings
- Hydronic Panel Heating System 1202
  - Backflow protection may be required when connected to potable water

UNDERFLOOR INSPECTION (continued)

- 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
  - Copper tubing joined with brazing alloys having a melting point above 1000°F

- Testing 1207
  - 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 1201.3.1

ROUGH INSPECTION

Wall Furnace 928

- Installation
  - 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
    - Securing a solid header plate as a fire-stop to the furnace casing with base plate
    - 1st ceiling level top plates shall be cut flush with the adjacent studs with ceiling plate spacers
    - Subsequent ceiling or 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 and up to 2" below roof sheathing
    - ≤ 12" diameter gas vents needs 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 have air intake terminal in the outside
    - Verify wall thickness per furnace listing or manufacturer's instruction
  - Removable panels, grilles, and access doors for servicing operations shall not be attached to the building, also see Section 802
- Locations
  - 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

ROUGH INSPECTION (continued)

building

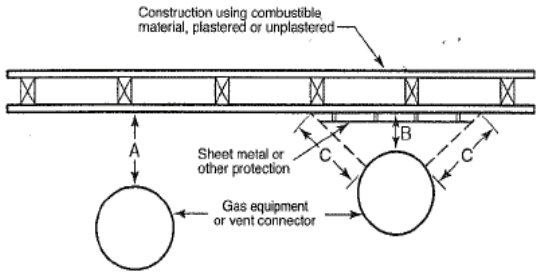
- Combustion & Circulating Air
  - Min. 50 cu ft per 1000 BTU per hour

TABLE 904.2
CLEARANCES TO COMBUSTIBLE MATERIAL FOR UNLISTED FURNACES, BOILERS, AND AIR CONDITIONERS*
[NFPA 54: TABLE 10.2.3(a)]

	MINIMUM CLEARANCE (inches)					
APPLIANCE	ABOVE AND SIDES OF FURNACE PLENUM	TOP OF BOILER	JACKET SIDES AND REAR	FRONT	DRAFT HOOD AND BAROMETRIC DRAFT REGULATOR	SINGLE-WALL VENT CONNECTOR
I 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
II Automatically fired heating boilers – steam boilers operating not exceeding 15 pounds-force per square inch (psi) and hot water boilers operating at 250°F or less	6	6	6	18	18	18
III Central heating boilers and furnaces, other than in I or II	18	18	18	18	18	18
IV Air-conditioning appliance	18	18	18	18	18	18

For SI units: 1 inch = 25.4 mm, °C = (°F-32)/1.8, 1 pound-force per square inch = 6.8947 kPa

* See Section 903.3 for additional requirements for air-conditioning appliances and Section 904.1 for additional requirements for central heating boilers and furnaces.



Notes:
A – Equals the clearance with no protection.
B – Equals the reduced clearance permitted. The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

FIGURE 904.2(1)
EXTENT OF PROTECTION NECESSARY TO REDUCE
CLEARANCES FROM GAS APPLIANCES OR VENT CONNECTORS
[NFPA 54: FIGURE 10.3.2.2(a)]

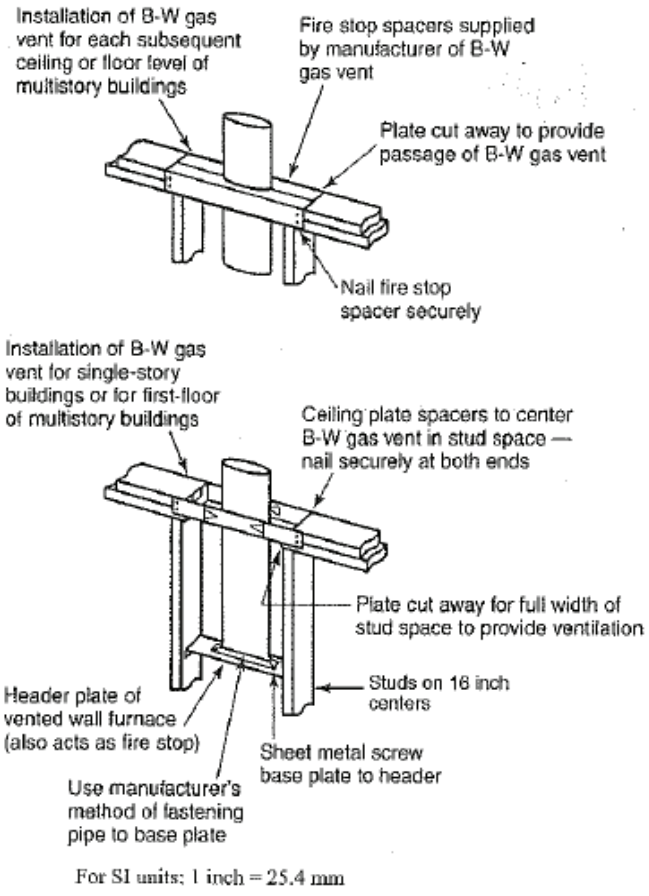


FIGURE 928.1
INSTALLATION OF TYPE B-W GAS VENTS FOR VENTED WALL FURNACES
[NFPA 54: FIGURE 10.27.1.3]

Central Heating Furnaces 904

- Locate in bedrooms or bathrooms 904.1
  - In a closet exclusive use for the furnace 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

ROUGH INSPECTION (continued)

- 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 802.7.3.4(2)
- 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 ≤ 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. clearance to combustibles of 6" 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 303.3

Attic Furnace 904.10

- Access Size
  - 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 service 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 locates at the access entrance
  - Disconnect locates 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 on Roofs 303.9

- 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
- Roof Support
  - Structure shall be capable of supporting the additional load
  - Or reinforced to support the additional load
- Corrosion Resistance
  - Access locks, screws, and bolts shall be corrosion-resistant material.
- Roof Drainage & Rails
  - Well-drained roof surface is required
  - Min. 6' between a part of the equipment and the edge of a roof or other similar hazard
  - When less than 6' to hazard, 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

ROUGH INSPECTION (continued)

- Provide a GFCI receptacle on the roof adjacent to the equipment on the supply side of the disconnect switch
- Access to equipment on roof 304.2
  - ♦ Buildings over 15' in height shall have an inside means of access to the roof
    1. Door or scuttle—Min. 22" x 24" opening
    2. Permanent ladders
       - ∗ Min. 30" extension of side railing above roof or parapet wall
       - ∗ Max. 18' landings apart measured from the finish grade
       - ∗ Min. 14" wide on center
       - ∗ Rungs are max. 14" oc.
       - ∗ Min. 6" required on top 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

Furnaces Located in Garages 308 & CPC 507.13

- ❑ 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 1106.2
  - Locate at or above flood elevation in flood zones 308.2
  - 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 907

- Prohibited locations
  - Bathrooms
  - Bedrooms
  - Unless listed for such locations with the required volume
- 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 908

- Prohibited locations
  - Bathrooms
  - Bedrooms
  - Unless listed for such locations with the required volume per 701.4
  - Except direct-vent gas fireplaces
- Installation
  - Listed vented gas fireplaces install per manufacturer's installation instructions

ROUGH INSPECTION (continued)

- 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 & Draft Hood Clearances Table 303.3(2) & Listing

- Clearances from combustibles and building insulation
  - Min. 6" for unlisted single wall vent connectors
  - Listed single wall connectors per manufacturer's listing (Dura-vent usually 1")
  - Min. 1" for most B and BW vents
  - Verify installation instructions and listings for other listed materials
- Draft hoods
  - Locate in the same room as the equipment 802.12.4

Vent Connectors 802.10

- Slope 802.10.6
  - Min. 1/4" per foot upward toward the vent or chimney without dips or sags except the vent connectors attached to a mechanical draft system per manufacturer
- Upsizing 803.1.14
  - Max. 2 sizes larger than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.

- Additional requirements for multiple appliance vent 803.2
  - Use Tables 803.1.3(7) through 803.1.3(15) except where obstructions are installed in the venting system
  - Vents serving listed appliances with vent dampers install per manufacturer's instructions or Tables cited above
  - Min. Type B vent required at tees & wyes
  - Maximum horizontal length shall be 18" per inch of connector diameter as per Table 803.2.1

TABLE 803.2.1 MAXIMUM HORIZONTAL LENGTHS OF VENT CONNECTOR				
Connector Diameter	3"	4"	5"	6"
Max. Horizontal length	4-1/2'	6'	7-1/2'	9'

TABLE 802.7.3.4(1) CLEARANCE FOR CONNECTORS				
APPLIANCE	LISTED TYPE B GAS VENT MATERIAL	LISTED TYPE L VENT MATERIAL	SIN-GLE-WALL METAL PIPE	FACTORY-BUILT CHIMNEY SECTIONS
Listed appliance with draft hoods and appliance listed for use with Type B gas vents	As listed	As listed	6	As listed
Residential boilers and furnaces with listed gas conversion burner and with draft hood	6	6	9	As listed
Residential appliances listed for use with Type L vents	Not permitted	As listed	9	As listed
Listed gas-fired toilets	Not permitted	As listed	As listed	As listed
Unlisted residential appli-ances with draft hood	Not permitted	6	9	As listed
Residential and low-heat appliance other than those above	Not permitted	9	18	As listed
Medium-heat appliance	Not permitted	Not permitted	36"	As listed

ROUGH INSPECTION (continued)

- Unlisted single wall vent connectors 802.10.7
  - Min. 6" clearance to combustibles
  - Min. 28 ga galvanized or 21 ga aluminum
  - Not allowed in attics, crawl spaces and concealed spaces 802.10.2.3
  - Not allowed through ceilings, floors, fire rated walls, interior walls 802.7.3.2
  - Not allowed through exterior walls unless thimble is used or required clearances to combustibles are provided 802.10.12.1

Length & Slope of Vents 802.6 & 802.10.7

- Min. 5' vertical height above the highest connected appliance draft hood or flue collar 802.6.2.1
- Max. horizontal length shall be 75% of height of the chimney or vent except for engineered systems except where the entire connector is B vent 100% of the height of the vent is allowed 802.10.7.2
- Max. 45° from vertical with one 60° offset is allowed

Sizing of Vents 802.6.3.3

- Vent for listed category I natural draft appliances per manufacturer's instruction, per Tables 803.1.3(1)-(4)
- For 2 appliances with draft hoods: 802.6.3.1(4)
  - The effective area of the vent shall be min. of the larger draft hood + 50% of the smaller draft hood outlet area
  - Max. 7x of the smaller draft hood outlet area

Vent Terminations 802.6.2

- Gravity vent systems—Min. 5' vertical above vent collar 802.6.2.1
- Fan assisted appliance & vents sized by Tables 803.1.3(1)-(15) or engineered methods
  - Min. 6' in height
- Direct vent appliance clearances 802.8.3
  - Min. 12" above grade at the bottom of vent terminal and

air intake
    - Min. 6” for appliances with ≤ 10,000 Btu/h input from vent terminal to opening into the building
    - Min. 9” when the input is > 10000 Btu/h to ≤ 50000 btu/h
    - Min.12” when the input is > 50000 Btu/h
- Vent termination clearances from the building 802.6.2
    - Vents ≤ 12” in diameter require min. 8’ clear from vertical wall or terminate above the roof
    - Vents > 12” in diameter or < 8’ from vertical wall shall terminate at min. 2’ above highest point of the roof and min. 2’ above a portion of a building within 10’ horizontally.
    - Min. 12” at the lowest discharge opening above roof for 6:12 roof pitch or less
- Vent termination clearances from openings into the buildings 802.6.2
    - Forced air inlets—min. 3’ above inlets within 10’ 802.6.2.5
    - Any air inlets—min. 10’ from operable ventilation openings ASHRAE 62.2-6.8
- Mechanical draft system vent termination clearances
    - Min. 7’ above public walkway 802.3.3.5
    - Min. 3’ above forced air inlets located within 10’ 802.8.1 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 802.8.2

Combustion Air Requirements 701

- Indoor opening size & location 701.5
    - Combining spaces on the same story
        - Min. 1 in^2 per 1000 Btu/h of total input rating for appliances in the spaces but not less than 100 in^2 for each opening

ROUGH INSPECTION (continued)

- ♦ Top opening to be within 12” of the top of enclosure
- ♦ Bottom opening to be within 12” of the bottom of the enclosure

- Combining spaces in different stories
  - ♦ Min. 2 in^2 per 1000 Btu/h of total input rating of appliances by openings in doors or floors
- Unconfined spaces
  - ♦ Rooms communicating directly through openings not furnished with doors 701.4
  - ♦ Space volume has 50 ft^3 or more per 1000 Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space.
- Confined spaces 205
  - ♦ Space volume is less than 50 ft^3 per 1000 Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space

❑ 2 permanent openings method for outdoor combustion air 701.6.1

- 1 within 12” of the top of the enclosure
- 1 within 12” of the bottom of the enclosure
  - ♦ Directly communicating with the outdoors or through vertical ducts that communicating with the outdoors, each opening shall have free area of min. 1in^2 per 4000 Btu/h of input for the appliances in the enclosure
  - ♦ Through horizontal ducts communicating with the outdoors and each opening shall have a free area of min. 1 in^2 per 2000 Btu/h of input for appliances in the enclosure

❑ 1 permanent opening method 701.6.2

- Within 12” of the top of the enclosure
- Clearances to the appliance
  - ♦ Min. 1” from the sides & back
  - ♦ Min. 6” from the front
- Opening shall be directly communicating with the outdoors with either a vertical or horizontal duct
  - ♦ 1 in^2 per 3000 Btu/h of total input rating of appliances

in the enclosure
    - ♦ Min. sum of the areas of vent connectors in the space
- ❑ Screen at openings 701.10
    - 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—701.11(5) & 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 for 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 62.2-6.6.2
    - Min. 4% of the room floor area and
    - Not less than 1.5 ft^2 openable 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
- ❑ Duct termination 504
    - Extend to exterior of the building 504.1
    - Min. 3' from the property line & openings into the building 504.5

ROUGH INSPECTION (continued)

Kitchen Ventilation ASHRAE 62.2-6.6.1

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

Whole-Building Ventilation ASHRAE 62.2-4.1

- Required in new constructions & when additions greater than 1000 ft^2 CSJ
  - Required cfm based on number of bedrooms and floor area ASHRAE 62.2-Tables 4.1a & b

Condensate Wastes

- Plastic condensate lines may only serve up to 2-story per CPC
- Secondary drain shall be piped to a readily observable location 312.2

FINAL INSPECTION

Review records to verify all u/g, u/f, rough inspections have been approved.

Gas Lines

- ❑ Verify listed gas shut off valves at each appliances on supply side of unions
- ❑ Verify length of gas flex connectors
  - Max. 6' for ranges and dryers
  - Max. 3' for all other appliances
- ❑ Gas Test
  - Verify all valves & connectors on site
  - Drywall complete
  - Verify gas gauge is set at min. 10 psi on a max. 15 pound gas gauge with 1/10th of a pound increments for 15 minutes
- ❑ Verify sediment trap at following locations of new construction
  - Water heaters
  - Furnaces

Ventilation per Rough

- ❑ Bathrooms
- ❑ Toilet and laundry rooms
- ❑ Kitchens

Domestic Ranges & Cooktops

- ❑ Verify exhaust and back-draft damper installed properly
- ❑ Verify clearance from top of range to combustibles
  - Min. 30" vertical clearance
  - Unless hoods are protected with sheet metal or listed microwave combo per code can be reduced to 24" 916.1.2
  - Verify manufacturer's instruction
  - Verify anti-tip device in place

FINAL INSPECTION (continued)

Microwave above Range

- ❑ Recirculation fan not compliant without local exhaust ASH-RAE 62.2

Domestic Clothes Dryers 504.3

- ❑ Vent
  - Min. 4" diameter duct
  - Max. 6' of exposed flex duct 504.3.1.1
  - Max. 35' of smooth rigid duct without screws and deduct 5' for every elbow in place CSJ
  - Verify back-draft damper without screen at termination 504.3
  - Min. 3' at termination to property line and house openings 504.5
- ❑ Make up air
  - Verify manufacturer's instruction
  - Min. 100 in^2 when enclosed in a closet or similar environment 701.5

Furnaces

- ❑ Single wall flue and unlisted vent connectors are not allowed in concealed spaces 802.10..1.2
- ❑ 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 312
- ❑ Verify protection against damage when it is installed in the garage 308
- ❑ Min. R-6 insulation for ducts in un-condition spaces
- ❑ Verify if unit had to be elevated when there is no guard or in a flood zone 308
- ❑ Verify combustion air for unit
- ❑ Verify penetration through fire wall or ceiling with hard duct and necessary fire caulking or fire stops

Whole-Building Ventilation

- ❑ Verify Title 24 if whole-building fan

Air Conditioning Compressors

- ❑ Verify setbacks, easements, and not allowed within 5' of property line CSJ
- ❑ Verify equipment is elevated per 1106.2
  - Min. 3" base
- ❑ Verify drywell and secondary drain

Terminations

- ❑ Verify exposed terminations to be protected from the elements, their heights and clearances
- ❑ Verify if it clear the flood line when they are located in the flood zone
- ❑ Verify fall protections when equipment is on roof

Part IV
ELECTRICAL REQUIREMENTS

Adopted Codes

2013 California Electrical Code
Based on the 2011 National Electrical Code

SERVICE INSPECTION

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

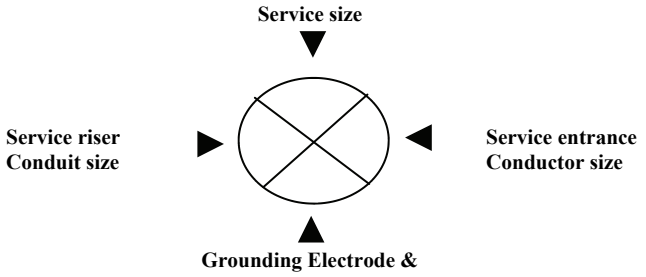
- Service Entrance Conductor Size—Tables 310.15(B)(16) & 310.15(B)(7) on page 103
- Service Riser Size—Chapter 9, Table 4
- Service Riser Bond—250.92(A)&(B)
  - Listed hub secured by threaded machine screws, or grounding bushing and jumper at concentric & eccentric knock-outs.
  - Grounding locknut, grounding wedge, or Meyers hub not allowed at partially punched concentric & eccentric knock-outs.
  - Self-tapping screws not allowed. 250.8
- Check Overhead Clearances—230.24
  - Min. 8’ above roofs <4:12 pitch
  - Min. 3’ above roofs ≥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. 18’ above roadways 230.24(B)(4)
- Grounding Electrode Conductor Size see 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 Grounding Electrode
  - Conductor raceway shall be bonded at both ends 250.64 (E)
  - Metal flex is not allowed.
- Cold Water Piping System
  - Bond within 5’ of entering building of metal water service. 250.68(C)(1)
- 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 bare 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

- 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.
- 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 ≤ 200 amp
- 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.
  - PG&E will normally install meter at 66” from standing surface 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 Breakers
  - Height—Max. 6’-7” above standing surface. 404.8(A)
- Conductor 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.
- Neutral (Grounded Conductor) Bonded 250.24(C) & 250.26
  - Sub-panel neutral shall not be bonded 250.24(5)
- Back-Fed Devices 408.36(D)
  - Secured in place.
- Two or More Buildings or Structures Supplied by a Common Service. 250.32
  - Grounding electrode is required unless equipment ground is provided at branch circuit. 250.32(A)

SERVICE INSPECTION (continued)

- Bond metallic piping systems to subpanel enclosure, equipment grounding conductor, or grounding electrode. 250.104(A)(3)



Residential 310-16 Note 3

Copper	Aluminum
100 / 1" / #4 / #8	100 / 1" / #2 / #8
125 / 1" / #2 / #8	125 / 1" / #1/0 / #8
150 / $1\frac{1}{4}$" / #1 / #6	150 / $1\frac{1}{2}$" / #2/0 / #6
200 / $1\frac{1}{2}$ / #2/0 / #4	200 / 2" / #4/0 / #4
400 / 3" / 40 / #1/0 KC	400 / $3\frac{1}{2}$ / 600 / #1/0 KC

Table 310.16 Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)

	Temperature Rating of Conductor (See Table 310.13.)						
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
Size AWG or kcmil	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Size AWG or kcmil
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	14	—	—	—	—
16	—	—	18	—	—	—	—
14*	20	20	25	—	—	—	—
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	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	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000
	CORRECTION FACTORS						
Ambient Temp. (°C)	For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.						Ambient Temp. (°F)
21–25	1.08	1.05	1.04	1.08	1.05	1.04	70–77
26–30	1.00	1.00	1.00	1.00	1.00	1.00	78–86
31–35	0.91	0.94	0.96	0.91	0.94	0.96	87–95
36–40	0.82	0.88	0.91	0.82	0.88	0.91	96–104
41–45	0.71	0.82	0.87	0.71	0.82	0.87	105–113
46–50	0.58	0.75	0.82	0.58	0.75	0.82	114–122
51–55	0.41	0.67	0.76	0.41	0.67	0.76	123–131
56–60	—	0.58	0.71	—	0.58	0.71	132–140
61–70	—	0.33	0.58	—	0.33	0.58	141–158
71–80	—	—	0.41	—	—	0.41	159–176

* See 240.4(D).

Table 310.15(B)(6) Conductor Types and Sizes for 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. Conductor Types RHH, RHW, RHW-2, THHN, THHW, THW, THW-2, THWN, THWN-2, XHHW, XHHW-2, SE, USE, USE-2

Conductor (AWG or kcmil)		
Copper	Aluminum or Copper-Clad Aluminum	Service or Feeder Rating (Amperes)
4	2	100
3	1	110
2	1/0	125
1	2/0	150
1/0	3/0	175
2/0	4/0	200
3/0	250	225
4/0	300	250
250	350	300
350	500	350
400	600	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[b]
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
Over 600 through 1100	Over 900 through 1750	2/0	4/0
Over 1100	Over 1750	3/0	250

Notes:

1. Where multiple sets of service-entrance conductors are used as permitted in 230.40, Exception No. 2, 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.

[a]This table also applies to the derived conductors of separately derived ac systems.

[b]See installation restrictions in 250.64(A).

Table 250.122 Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment

Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size (AWG or kcmil)	
	Copper	Aluminum or Copper-Clad 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

Note: Where necessary to comply with 250.4(A)(5) or (B)(4), the equipment grounding conductor shall be sized larger than given in this table.

*See installation restrictions in 250.120.

Minimum Cover Requirements Table 300.5

- Min. 24” for underground cables
- Min. 18” fro PVC (See Table 300.5 for exception)

Table 300.5 Minimum Cover Requirements, 0 to 600 Volts, Nominal, Burial in Millimeters (Inches)

Location of Wiring Method or Circuit	Type of Wiring Method or Circuit									
	Column 1 Direct Burial Cables or Conductors		Column 2 Rigid Metal Conduit or Intermediate Metal Conduit		Column 3 Nonmetallic Raceways Listed for Direct Burial Without Concrete Encasement or Other Approved Raceways		Column 4 Residential Branch Circuits Rated 120 Volts or Less with GFCI Protection and Maximum Overcurrent Protection of 20 Amperes		Column 5 Circuits for Control of Irrigation and Landscape Lighting Limited to Not More Than 30 Volts and Installed with Type UF or in Other Identified Cable or Raceway	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
All locations not specified below	600	24	150	6	450	18	300	12	150	6
In trench below 50-mm (2-in.) thick concrete or equivalent	450	18	150	6	300	12	150	6	150	6
Under a building	0	0 (in raceway or Type MC or Type MI cable identified for direct burial)	0	0	0	0	0	0 (in raceway or Type MC or Type MI cable identified for direct burial)	0	0 (in raceway or Type MC or Type MI cable identified for direct burial)
Under minimum of 102-mm (4-in.) thick concrete exterior slab with no vehicular traffic and the slab extending not less than 152 mm (6 in.) beyond the underground installation	450	18	100	4	100	4	150 (direct burial) 100 (in raceway)	6 4	150 (direct burial) 100 (in raceway)	6 4
Under streets, highways, roads, alleys, driveways, and parking lots	600	24	600	24	600	24	600	24	600	24
One- and two-family dwelling driveways and outdoor parking areas, and used only for dwelling-related purposes	450	18	450	18	450	18	300	12	450	18
In or under airport runways, including adjacent areas where trespassing prohibited	450	18	450	18	450	18	450	18	450	18

Notes:

1. Cover is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.

2. Raceways approved for burial only where concrete encased shall require concrete envelope not less than 50 mm (2 in.) thick.

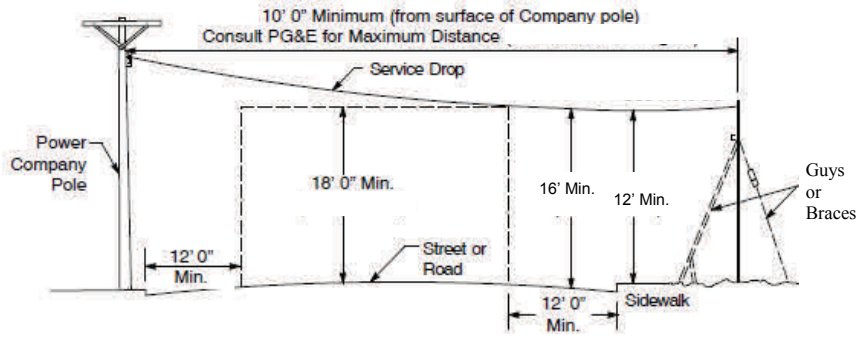
3. Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.

4. Where one of the wiring method types listed in Columns 1–3 is used for one of the circuit types in Columns 4 and 5, the shallowest depth of burial shall be permitted.

5. Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) of concrete extending down to rock.

Temporary Power Poles

- Locate permit and inspection record
- Verify address permanently marked on service
- Verify support and bracing of pole (Min. 2 x 4 wood braces)
- Verify overhead clearances (See below)
- Verify grounding and bonding of pole
- Verify grounding and bonding of grounding electrode race-ways
- 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(B)(7) & Table 310.15(B)(16)
- Verify weatherproof equipment 406.9(B) & 408.37 (i.e.: re-ceptacles & panelboards in wet locations)
- Issue temporary power meter release upon approval



ROUGH INSPECTION

Receptacle Requirements

- General Receptacle Locations & Spacing 210-52(A)(1)-(4)
  - Measure max. 6' horizontally of any wall surface to a receptacle.
  - ≥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 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.
- 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 ft^2 a receptacle is required in each wall space ≥3' wide.

- Attics and Crawl Spaces
  - Min. 1 receptacle is required in addition to dedicated furnace circuit if located in these areas. 210.63

GFCI Protected Receptacle Requirement 210.8(A)

- Min. 15 Amp GFCI Receptacles
  - Garages and accessory buildings
  - Outdoors except not readily accessible and dedicated circuits for equipments.
  - Crawl spaces
  - Unfinished basements except for supply to a permanent fire alarm or burglar alarm system.
  - Within 6' of sinks other than kitchen and laundry sinks.
  - Screenrooms
- Min. 20 Amp GFCI Receptacles 210.11(C)
  - Bathrooms
  - Kitchens—Small appliance circuits
  - Laundry rooms

AFCI Protected Receptacle Requirement 210.12(A)

- Combination-type
  - Family rooms
  - Dining rooms
  - Living rooms
  - Parlors
  - Libraries
  - Dens
  - Bedrooms
  - Sunrooms
  - Recreation rooms
  - Closets
  - Hallways
  - Similar rooms or areas
    - ♦ Except individual circuit to a fire alarm system

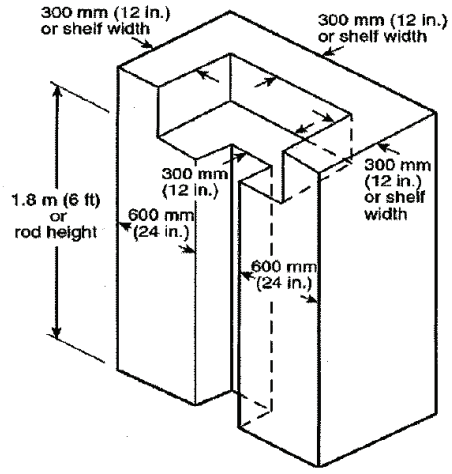
ROUGH INSPECTION (continued)

Switched Lighting Outlets Requirement 210.70(A)

- Habitable rooms
  - Min. 1 wall switch-controlled lighting outlet in every habitable room and bathroom.
  - Can be switched receptacle except bathrooms & kitchens.
- 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.
- Storage or Equipment Spaces 210.70(3)
  - 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) & 250.110

Closet Light Clearance to Storage/Clothes Closets 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 luminaires.
  - 6" for surface-mounted fluorescent luminaires.
  - 6" for enclosed recessed incandescent or LED luminaries.
  - 6" for recessed fluorescent luminaires.
  - Surface-mounted fluorescent or LED luminaires identified to be installed within the closet storage space is allowed.



Closet Storage Space

Mandatory Energy Features and Devices

- Kitchen lighting-California Energy Code 150.0(k)3
  - Min. 50% of the total rated wattage shall be high efficacy.
- Bathroom lighting-California Energy Code 150.0(k)5
  - Min. 1 high efficacy luminaire in each bathroom; and
  - All other lighting installed in each bathroom shall be high efficacy or controlled by vacancy sensors.
  - Manual on/auto off vacancy sensor for low efficacy fixtures. California Energy Code 100.1
  - Separate switches for high and low efficacy fixtures. California Energy Code 150.0(k)2
  - Exhaust fans shall be switched separately from lighting system. California Energy Code 150.0(k)2
- Garages, laundry & utility rooms lighting-California Energy Code 150.0(k)6
  - High efficacy luminaires and controlled by vacancy sensors.
- All other lighting-California Energy Code 150.0(k)7
  - High efficacy or controlled by either dimmers or vacancy sensors.

ROUGH INSPECTION (continued)

- Recessed luminaires in ceilings-California Energy Code 150.0 (k)8
  - Listed for IC for zero clearance insulation contact.
  - Certified for air-tight.
  - Where non-IC fixture is allowed, min. 1/2" from combustible materials and 3" from insulations. CEC 410.116

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) see below
- Unused opening must be closed 314.17(A)
- Paddle fan support-listed fan box required for fans that 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

	Free Space Within Box for Each Conductor
Size of Conductor (AWG)	in^3
14	2.00
12	2.25
10	2.50
8	3.00
6	5.00

NM Cable 334

- 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 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 raceway 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.
  - #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.

Required Circuits

- Min. 2-20 amp small appliance circuits serving the kitchen, pantry, breakfast room, dining room, or similar area 210.52 (B)

ROUGH INSPECTION (continued)

- 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)

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
- ❑ Verify switches/sensors, and light fixtures meet the energy code requirement. (See rough inspection for requirements)
- ❑ Verify appliance cord length:
  - Dishwashers & trash compactors—Min.3' & max. 4' 422.16(B)(2)
  - Garbage disposals & range hoods—Min. 18" & max. 36" 422.16(B)(1) & (4)
- ❑ Verify closet light clearance 410.16(C)
- ❑ Verify circuit breakers in panels are identified. 408.4
- ❑ Verify appliance disconnects 422.30

• Hydromassage tub	• Dishwasher
• Air conditioning unit	• Tankless water heater
• Furnace	• Attic fan
• Garbage disposal	

- ❑ Verify ceiling paddle fan support 422.18 (See rough correction notice if fan boxes were installed at the time of rough.)
- ❑ Verify GFCI receptacles 210.8 (See rough for locations)
- ❑ Verify AFCI receptacles 210.12 (See rough for locations)
- ❑ Verify temper resistant receptacles 406.12
- ❑ Verify weather resistant receptacles and weatherproof covers for wet locations 406.9(B)
- ❑ Verify listed splice devices used at AL-CU connection 110.14
- ❑ Verify 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.
- ❑ Verify central vacuum outlet assemblies and ground all metal parts. 422.15

FINAL INSPECTION (continued)

- Verify correct receptacle installation
  - Polarity
  - 15 amp versus 20 amp GFCI receptacle at their required location
- Verify service and sub panels
  - Size of over-current device for conductor
  - 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)
  - Working clearances
  - Overhead clearances
  - Meter & breaker heights
  - Bonding & grounding
  - Service conductor & riser size
  - See Service Inspection for details

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 625.29(B)
- Outdoor locations coupling height 24”-48” AFF 625.30(B)
- Verify ventilation requirements if needed per manufacturer instructions 625.15
- Verity branch circuit conductors sized 125% of max. Load as noted by manufacturer 625.21
- Verify disconnect required for EV Charger rated more than 60 amps or over 150 volts to ground. 625.23
- Verify disconnect required to be readily accessible and capable of being locked in the open position. 625.23

SWIMMING POOL

- Equipotential bonding 680.26
  - Min. #8 cu solid bonding conductor
  - Pool shells
  - Perimeter surfaces 680.26(B)(2)
    - Walking surfaces within 3' of inside walls of the pool, paved or unpaved, shall be bonded to the pool shell at a min. of 4 points uniformly spaced around the perimeter of the pool except non-conductive pool shells.
    - The required conductor shall be 18" to 24" from the inside walls of the pool.
    - Secured between 4" & 6" below the subgrade.
  - Metallic components of the pool structure.
  - Underwater lighting
  - Metal fittings
  - Electrical pool equipment
  - Fixed metal parts less than 5' horizontally of the inside walls of the pool and within 12' vertically from the max. water level of the pool. (including metal pipes, window frames, foundation vents, gutters, etc.)
  - Pool water
  - Diving board, ladders, pool covers, drain, etc.

Receptacles 680.22(A)(3)&(4)
- Locate between 6' and 20' from the inside wall of pool
- GFCI protected

Lights 680.22(B)
- GFCI protected
- Pool/spa light potting 680.23(B)(4)

Panels
- Verify properly identified circuits for pool in panels.
- Verify breakers and panel compatibility
- Verify conductor size for the breaker

* **See Building portion for building requirements.**

SWIMMING POOLS, OUTDOOR SPAS, & HOT TUBS				
Equipment Location	**Wiring Method**	**Equipment Grounding Required**	**Equipotential Bonding Required**	**GFCI Required**
Feeders (from service to subpanel) 680.25	●RMC/IMC ●RNMC/LFNMC ●On/in buildings: EMT ●In building: ENT	**Yes** ●Insulated CU/AL ●Min. #12 ●Table 250.122	**No** ●Not allowed within 5' of pool or spa	**No**
Existing Feeders & Panelboards 680.25 (A) exception	●Same as feeders ●MC cable, LFMC/ other approved cable	**Yes** ●Same as feeders ●Insulated/covered		
Wet-niche 680.23(B) & no niche 680.23(D) fixtures from forming shell to J-Box & 680.23(F) branch circuit supply	●Brass ●Approved corrosive-resistant RMC/IMC ●RNMC/LFNMC w/ #8 encapsulated, insulated copper bonding jumper	Yes ●Insulated copper ●Min. #12 @ ≤ 20 mps ●Min. #10 @ ≤ 60amps ●Size per Table 250.122 Equipment Grounding ●Insulated, encapsulated, solid or stranded #8 CU bonding jumper at RNMC/LFNMC	Yes ●#8 solid copper to grid ●680.23(B)(1) ●680.26	Yes ●680.23(A)(3) ●Limitations on locations 680.24
Dry-niche fixtures 680.23(C)	●Brass ●Approved corrosion-resistant RMC/IMC ●RNMC ●On/in buildings: EMT		Yes ●All metal forming shells	Yes ●680.23(A)(3) ●Limitations on locations 680.24
Area lighting fixtures, lighting outlets & ceiling fans 680.22(B)	Chapter 3 method ●Clearances 680.22 (B) ●Outdoors: 12' above within 5' ●Indoors: same as outdoors except enclosed fixtures or damp location fans on GFCI circuit: 7'-6" above ●Existing: 5' above water within 5', rigidly attached and GFCI protected	Yes ●250.110	Yes ●When within 5' ●680.22(B)(4)	Yes ●Unless 10' and rigidly attached 5' above water ●680.22(B)(4)
Pool-associated motors, pool pump motors 680.21 & pool cover motors 680.27 (B)	●5' from pool ●RMC, IMC, RNMC/ MC cable listed for the application ●On/in buildings: EMT ●In buildings: any Chapter 3 method with min. #12 insulated /covered equipment ground 680.21(A)(4) ●Where flexibility required: MC cable, LFMC/LFNMC permitted ●Cord & plug: Max. 3' 680.21(A)(5)	Yes ●680.21(A)(1) ●680.27(B) ●Min. #12 insulated CU ●Table 250.122	Yes ●680.26(B)(6) ●#8 solid CU ●Grid to motor ●Non-grounded systems: motor to equipment ground ●Double insulated motors: bond tail for future use required	Yes ●680.27(B)(2)

TABLE 680.8
Overhead Conductor Clearances

Clearance Parameters		Insulated Cables, 0-750 Volts to Ground, Supported On and Cabled Together With a Solidly Grounded Bare Messenger or Solidly Grounded Neutral Conductor	All Other Conductors Voltage to Ground	
			0-15 kV	Over 15-50 kV
		ft	ft	ft
A.	Clearance in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft	22.5	25	27
B.	Clearance in any direction to the observation stand, tower, or diving platform	14.5	17	18
C.	Horizontal limit of clearance measured from inside wall of the pool	This limit shall extend to the outer edge of the structures listed in A and B of this table but not to less than 10'.		

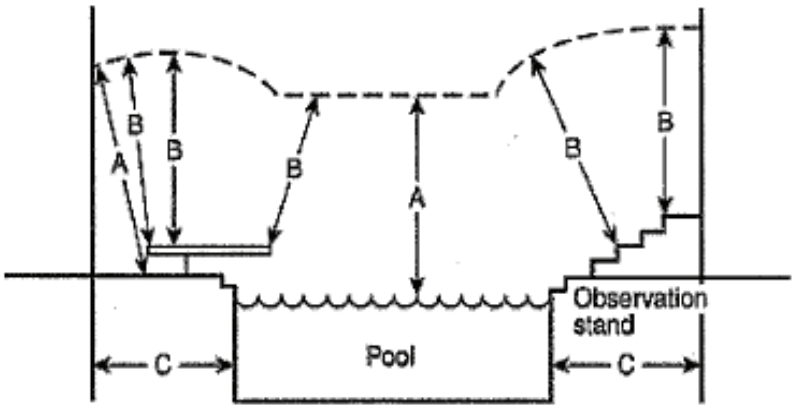
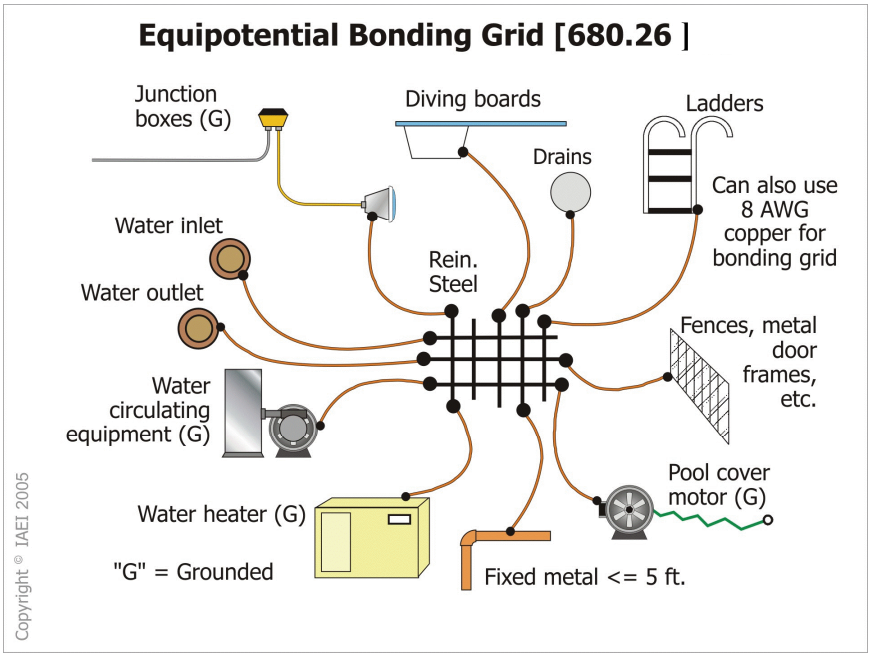


Figure 680.8 Clearances from Pool Structures.


Equipotential Bonding Grid [680.26]
Junction boxes (G)
Diving boards
Ladders
Drains
Can also use 8 AWG copper for bonding grid
Water inlet
Rein. Steel
Water outlet
Fences, metal door frames, etc.
Water circulating equipment (G)
Pool cover motor (G)
Water heater (G)
"G" = Grounded
Fixed metal <= 5 ft.
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