



# **City of East Palo Alto**

## **Community & Economic Development Department**

### **Building Division**

## **Inspections Checklist for 1 & 2 Family Dwellings**

December 2018

## **TABLE OF CONTENTS**

### **BUILDING INSPECTIONS** **Pages 3-55**

Foundation	4-6
Slab	6
Underfloor / Subfloor	7-10
Shear	11-12
Roof Framing and Roof Nailing	12-15
Prescriptive Wall Bracing	16-18
Frame Inspection	19-35
Roofing	35-38
Energy Conservation Inspection	39-49
Final Inspection	50-53
Swimming Pool	54-55
Demolition	55

### **PLUMBING INSPECTIONS** **Pages 56-87**

Underground	57-61
Underfloor	62-69
Rough	70-73
Final	74-80
Tables	81-87

### **MECHANICAL INSPECTIONS** **Pages 88-112**

General Information	89
Underground / Underslab	90
Underfloor	91-95
Rough	96-109
Final	110-112

### **ELECTRICAL INSPECTIONS** **Pages 113-137**

Service	114-122
Temporary Power Poles	122
Rough	123-130
Final	131-132
Swimming Pool	133-137

## **Part I**

### **BUILDING REQUIREMENTS**

#### **Adopted Codes**

##### **2016 California Residential Code**

Based on the 2015 International Residential Code

##### **2016 California Building Code**

Based on the 2015 International Building Code

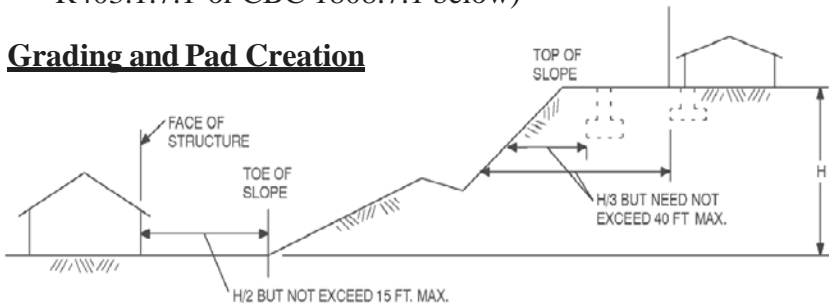
# **FOUNDATION INSPECTION**

(CRC Chapter 4 or CBC Chapter 18)

## **Setbacks**

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

## **Grading and Pad Creation**

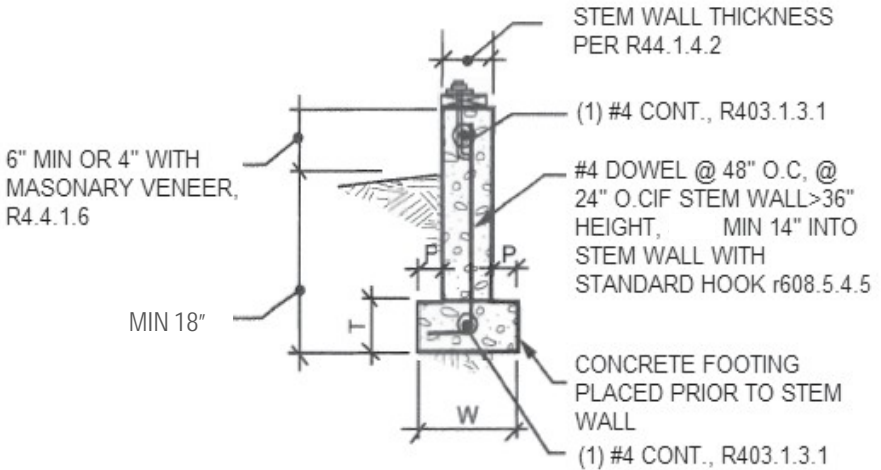


- ❑ Collect compaction report (if building pad created)
- ❑ Review soils report if applicable (verify City Policy regarding soils report for add/alt)
- ❑ Verify soils engineer inspection if applicable

## **Footings**

- ❑ Footing depth and dimensions conform to plan and minimum code requirements (see Table R403.1(1))
- ❑ 6" Stem wall thickness ok if stem wall height is less than 4' - 6" (R404.1.4.2). Manufactured shear walls may require 8" min. stem wall; check details.
- ❑ Steel grade, size, laps, ties and clearances are ok
  - Horizontal Steel: 2 - #4 min., 1 T & B (per R403.1.3.1 & Table R404.1.2(1)) Grade 40 min.
  - Additional horizontal #4 18"oc if stem wall height exceeds 24"
  - Steel Rebar Laps: 20" for #4 splice unless engineered (Table R608.5.4(1))
  - Clearances: 3" Min. to earth, 1-1/2" min. to forms, 3/4" min. to air (R404.1.2.3.7.4)
  - When horizontal construction joints exist, vertical steel, #4 at 48"oc with standard hooks and extends min. 14" into stem wall (Grade 60 min. per R403.1.3.1)

## **FOUNDATION INSPECTION (Continued)**



- ❑ Construction Requirements
  - Construction and Demolition recycle requirements
  - Storm water plan
- ❑ Foundation Elevation
  - Top of exterior footing must be a min. of 12" plus 2% above the street gutter (R403.1.7.3)
  - 6" Min. fall within 10' to slope away from building foundation (R401.3)
- ❑ Trenches are clean, free of debris and no soil cracking
- ❑ HD placements ok, i.e. diameter of bolts, embedment depth, edge distances conform to plan and manufacturer's recommendations. (Hold-downs must be secured in position at the time of the foundation inspection.) Refer to Simpson or similar manufacturer's catalog for current installation info and sizing of required anchor bolts. HD's for manufactured shear walls may require embedment into footing or grade beam, not stem wall.
- ❑ 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)
- ❑ 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)

## **FOUNDATION INSPECTION (Continued)**

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

- ❑ 20" Round, 16" square, 18" deep or per soil report/engineer's design
- ❑ 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

### **If Located in Flood Zone**

- ❑ If top of stem wall >12" above finish grade, verify flood vents in stem walls matching flood vent calculation.
- ❑ Elevation Certificate and all associated documentation to be collected by Engineering.

## **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 between slab and base course (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

**BUILDING UNDERFLOOR / SUBFLOOR**  
**INSPECTION**  
(R502/CBC 2304)

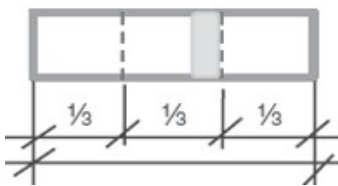
**Note:** Verify foundation has been approved

**Mudsill Material**

- ❑ Pressure treated and accredited agency label (R504.3/CBC 2304.12.1)
- ❑ 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 2308.3.1)

- ❑ 6'oc Max. for 1st and 2nd story
- ❑ 4'oc Max. for over 2 stories (R403.1.6 #4/CBC 2308.3.1, exception 2)
- ❑ Min. 2 bolts per each piece, 1/2" diameter min. with 3"x3"x.229" plate washers (R602.11.1/CBC 2308.3.2)
  - Min. 7 bolt diameters and max. 12" from splices or ends (R403.1.6)
  - Min. 4" and max. 12" from ends of plates (CBC 308.3.1)
  - Within middle 1/3 of plate width



Edge Distance: Min. 1-1/8" for 2x4 plate or 1-3/4" for 2x6 plate

**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, 18" max. from top of stem wall/slab to bottom of HD
- ❑ Identify shear walls and braced wall lines; check load path to foundation

## **BUILDING UNDERFLOOR / SUBFLOOR**

### **INSPECTION (Continued)**

#### **Floor Joists**

- ❑ Bearing (R502.6/CBC 2308.4.2.2)
  - 1-1/2" Min. on wood or metal
  - 3" Min. on masonry or concrete
- ❑ Joist Laps (R502.6.1/CBC 2308.4.2.3)
  - 3" Min. lap with 3-10d's face nails
  - 1-1/2" Min. bearing and butts strapped with ST9 or equal
- ❑ Joist Blocking (R502.7/CBC 2308.4.2.3)
  - At ends and all bearing points with 2x full depth blocking, 2x12 joists with solid blockings at max. 8'oc
- ❑ Joist Nailing (Table R602.3(1),(2)/CBC 2304.10.1)
  - To sill or girder with 4-8d box or 3-8d common
  - Sole plate to joist or blocking 2-16d common at 16"oc
  - 2x Subfloor to joist or girder face nail with 2-16d common
- ❑ Joists doubled under all bearing walls (R502.4/CBC 2308.4.5)
- ❑ Manufactured floor joists and trusses per plan and manufacturer's details

#### **Girders**

- ❑ Girder Bearing (R502.6/CBC 2308.4.1 & 2304.11.2)
  - 1-1/2" Min. on wood or metal
  - 3" Min. on masonry or concrete
  - 4x Min. post at splices and ends tied with ST 12 or equal
  - 1/2" Air spaces at sides, ends and top with mudsill bearing in girder masonry pockets (R317.1 #4)
  - Girder connections to post with positive connection (R502.9/CBC 2304.11.2)
- ❑ Size supporting single floor min. 4x6, with spans less than 6', spaced max. 8'oc (CBC 2308.4.1)

#### **Access Provided** (R408.4/CBC 1209.1)

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



## **BUILDING UNDERFLOOR / SUBFLOOR** **INSPECTION (Continued)**

### **Clearances and Protection of Wood**

- ❑ 12" Min. to girders (18" if girders only), 18" min. to bottom of joist or subfloor without joists (R317.1/CBC 2304.12.1.1)
- ❑ Piers Elevated
  - 8" Min. above earth at underfloor and earth is covered by moisture barrier, or pressure treated post (R317.1.4 / CBC 1809.8)
- ❑ Concrete Steps Poured Against Wood
  - 26ga Galvanized flashing installed to protect wood, tight against wall caulked with mastic (Aluminum not allowed)

### **Underfloor Ventilation** (R408/CBC 1203.4.1)

- ❑ Cross flow provided on at least two opposite sides, equally distributed, and within 3' to corners to remove dead air
- ❑ At additions, maintain and extend existing vents and add required ventilation of new addition
- ❑ 1sqft per 150sqft of new floor area
- ❑ Max. 1/4" non-corrosive wire mesh

### **Cripple Walls** (R602.9/CBC 2308.6.6.2)

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

### **Subfloor Nail**

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

- ❑ Check floor framing to verify conformance with plan
- ❑ Min. 24" wide unless blocked and edge nailed

# **BUILDING UNDERFLOOR / SUBFLOOR INSPECTION (Continued)**

## **Fire Protection of Floor** (R302.13)

- If crawlspace or basement with fuel burning appliance or intended storage space, it will be protected with 1/2" drywall or 5/8" structural panel or equivalent, from underside

### Exceptions:

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

<b>FLOOR JOIST SPAN TABLES R502.3.1(2)/CBC2308.4.2.1(2)</b>					
<b>With 40psf live load and 10psf dead load deflection = 1/360</b>					
		<b>Douglas Fir</b>		<b>Hem Fir</b>	
<b>Size</b>	<b>Spacing</b>	<b>#1</b>	<b>#2</b>	<b>#1</b>	<b>#2</b>
2 x 6	12"	10'-11"	10'-9"	10'-6"	10'-0"
	16"	9'-11"	9'-9"	9'-6"	9'-1"
	24"	8'-8"	8'-3"	8'-4"	7'-11"
2 x 8	12"	14'-5"	14'-2"	13'-10"	13'-2"
	16"	13'-1"	12'-9"	12'-7"	12'-0"
	24"	11'-0"	10'-5"	10'-10"	10'-2"
2 x 10	12"	18'-5"	18'-0"	17'-8"	16'-10"
	16"	16'-5"	15'-7"	16'-0"	15'-2"
	24"	13'-5"	12'-9"	13'-3"	12'-5"
2 x 12	12"	22'-0"	20'-11"	21'-6"	20'-4"
	16"	19'-1"	18'-1"	18'-10"	17'-7"
	24"	15'-7"	14'-9"	15'-5"	14'-4"

## **SHEAR INSPECTION**

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. Epoxy installation can be inspected by City Building Inspector for conventional braced walls.

### **General Requirements** (R403.1.6/CBC 2308.6)

- ❑ Sill bolting or nailing must be complete
- ❑ All transfer connections to roof and 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/plies and 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
  - Min. splice in top plates is 24" with 8-16d common or 12-16d box nails or as required by plan (Table R602.3 (1) item 13)
  - Min. splice in top plates is 48" with 8-16d's or as required by plan (CBC 2308.5.3.2)

## **SHEAR INSPECTION (Continued)**

### **General Requirements (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 350plf, 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.
- Verify glu-lams specified properties if used

## **ROOF FRAMING AND ROOF NAILING INSPECTION**

This inspection is required when shear extends to the roof.

- Conventional roof framing must be checked to verify conformance with plan
  - Rafter sizes and spacing ok Table R802.5.1(1) or (2)/ CBC Table 2308.7.2(1) or (2)
  - Purlin size is equal to or larger than rafter R802.5.1/ CBC 2308.7.7
  - Purlin struts go to bearing walls, are 45° min. from horizontal at max. 4'oc with 2x4 braces and are laterally braced if greater than 8'
- If trusses are used, review approved truss plans and details
  - Compressive webs are laterally supported as per truss details if required
  - Trusses designed for lateral loads are connected to shear walls and match truss details

## **ROOF FRAMING AND ROOF NAILING**

### **INSPECTION (Continued)**

- ❑ If trusses are used, review approved truss plans and details (Continued)
  - Hangers at header conditions match reaction loads listed on truss details
  - Verify support at bearing points
  - Uplift conditions greater than 500lbs require verification of connection for uplift forces
  - Verify hurricane ties where trusses/rafters spaced more than 24”oc
  - Truss Bearing (See 2015 revised Field Note 303)
    - Stud directly beneath truss with bearing 1500-2500lbs in 2x4 wall, 2,000–4,000lbs in 2x6 walls
    - Two studs or 4x directly beneath truss with bearing 2,501-4,000lbs in 2x4 wall, 4,001–6,000lbs in 2x6 walls
    - For reaction loads exceed 4,000lbs and 6,000lbs in 2x4 and 2x6 walls respectively, engineer design required
- ❑ Rafter Ties Provided (R802.3.1/CBC 2308.7.3.1)
  - Where joist are parallel to rafters, ceiling joist must be nailed to (Table R802.5.1(9))
  - Where not parallel, rafter ties shall be min. 2x4 installed at just above ceiling joists nailed to rafters (Table R802.5.1(9))
  - Verify radiant barrier requirement on T-24
  - Install collar ties or ridge straps to resist uplift at the upper 1/3 of attic space with min. 1x4 at max. 4’
- ❑ Verify eave proximity to property line (Table R302.1(1) or (2)). No eave projection in 2’ side setbacks, rear 15’ setback, front porch overhang (using 5’ setback exception), front overhang into front building setback (for lots with front building setbacks)

<b>TABLE R302.1(1)</b> <b>EXTERIOR WALLS, DWELLINGS AND ACCESSORY BUILDINGS</b> <b>WITHOUT AUTOMATIC FIRE SPRINKLER PROTECTION</b>			
<b>EXTERIOR WALL ELEMENT</b>		<b>MIN. FIRE- RESISTANCE RATING</b>	<b>MIN. FIRE SEPARATION DISTANCE</b>
Walls	Fire-Resistance Rated	1 Hour-tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	< 5'
	Not Fire-Resistance Rated	0 Hour	≥ 5'
Projections	Not Allowed	N/A	< 2'
	Fire-Resistance Rated	1 Hour on the Underside	2' - 5'
	Not Fire-Resistance Rated	0 Hour	≥ 5'
Openings in Walls	Not Allowed	N/A	< 3'
	25% Max. of Wall Area	0 Hour	3' - 5'
	Unlimited	0 Hour	≥ 5'
Penetrations	All	Comply with Section R302.4	< 3'
		None Required	≥ 3'

<b>TABLE R302.1(2)</b> <b>EXTERIOR WALLS, DWELLINGS AND ACCESSORY BUILDINGS</b> <b>WITH AUTOMATIC FIRE SPRINKLER PROTECTION</b>			
<b>EXTERIOR WALL ELEMENT</b>		<b>MIN. FIRE- RESISTANCE RATING</b>	<b>MIN. FIRE SEPARATION DISTANCE</b>
Walls	Fire-Resistance Rated	1 Hour-tested in accordance with ASTM E 119 or UL 263 with exposure from outside	0'
	Not Fire-Resistance Rated	0 Hour	≥ 3'
Projections	Not Allowed	N/A	< 2'
	Fire-Resistance Rated	1 Hour on the underside	2'
	Not Fire-Resistance Rated	0 Hour	≥ 3'
Openings in Walls	Not Allowed	N/A	< 3'
	Unlimited	0 Hour	≥ 3'
Penetrations	All	Comply with Section R302.4	< 3'
		None Required	≥ 3'

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

RAFTER SLOPE	RAFTER SPACING (Inches)	GROUND SNOW LOAD 20psf			
		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**

### **INSPECTION**

(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 1 and 2 story buildings, one room or equal not exceeding 900sqft 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 1x4 let-in braces are not allowed
  - Gypsum board is not allowed
- ❑ Each panel (Table R602.10.3(3)/CBC Table 2308.5.1)
- ❑ Alternate braced wall panel (Table R602.10.6.1 & Figure R602.10.6.1)
  - Min. 2'8" by max. 8' height with hold-downs at each end (Table R602.10.5)

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



## **PRESCRIPTIVE WALL BRACING**

### **INSPECTION (Continued)**

#### **Braced Wall Lines (Continued)**

- ❑ Walls in plane vertically from the foundation to the upper-most story except: R301.2.2.2.5
  - Floors that are cantilevered or setback not exceeding 4 times the depth of the joist and comply with the following:
    - Joists are 2x10 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 16ga 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 2-2x12 and opening not more than 8' wide
- ❑ 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)**

#### **Braced Wall Lines (Continued)**

- ❑ Walls may be supported by continuous footings at exterior and at 50' intervals provided: (R602.10.9.1/R403.1.2)
  - Cripple walls do not exceed 4' high
  - First 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 4x6 for 6' spans not to exceed 8' oc (Table R602.7(1) & (2)/CBC 2308.4.1)
- ❑ Exterior and interior brace walls shall extend to roof
  - Roof decks (must be solid plywood sheathing)
  - Roof nail inspection is required (R905)

#### **Cripple Walls** (R602.9/CBC 2308.6.6.2)

- ❑ Stud heights 14" min. or solid blocked or sheathed
- ❑ Stud heights exceeding 14" shall be braced (Table R602.3(1) #30 / CBC Table 2308.6.1)
  - One (1) Story: 3/8" wood structural panel nailed with 8d at 6"/12" for 48% of wall length

## **FRAME INSPECTION**

**Note:** Verify prior inspection record is complete and 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

<b>STUD SIZE AND SPACING (TABLE R602.3(5)/CBC 2308.9.1)</b> <b>Cripple walls over 4' high will be considered as an additional story</b>						
	<b>Bearing Walls</b>				<b>Non-Bearing Walls</b>	
	<b>Stud Height</b>	<b>Max. Stud Spacing Supporting</b>			<b>Stud Height</b>	<b>Spacing</b>
		<b>Roof</b>	<b>1-Floor</b>	<b>2-Floor</b>		
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 R602.7(1)/CBC 2308.9.5**  
**GIRDER SPANS AND HEADER SPANS FOR EXTERIOR BEARING WALLS**  
(Max. spans for Douglas Fir-Larch, Southern Pine and Spruce-Pine-Fir and required number of jack studs)

GIRDERS & HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD 30psf					
		BUILDING WIDTH					
		20'		28'		36'	
		Span	Jack Studs	Span	Jack Studs	Span	Jack Stud
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 and 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 and 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 and 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 and 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 R602.7(2)/CBC 2308.9.6**  
**GIRDER SPANS AND HEADER SPANS FOR INTERIOR BEARING WALLS**  
(Max. spans for Douglas Fir-Larch, Southern Pine and Spruce-Pine-Fir and required number of jack studs)

GIRDERS & HEADERS SUPPORTING	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	2
	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 = 10psf)

CEILING JOIST SPACING	SPECIES & GRADE	DEAD LOAD = 5psf			
		2 x 4	2 x 6	2 x 8	2 x 10
		Max Ceiling Joist Spans			
<b>12"</b>	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"
<b>16"</b>	Douglas Fir-Larch #1	11'-6"	18'-1"	23'-10"	> 26'-0"
	Douglas Fir-Larch #2	11'-3"	17'-8"	23'-4"	> 26'-0"
	Hem- Fir #1	11'-0"	17'-4"	22'-10"	> 26'-0"
	Hem-Fir #2	10'-6"	16'-6"	21'-9"	> 26'-0"
<b>24"</b>	Douglas Fir-Larch #1	10'-0"	15'-9"	20'-1"	24'-6"
	Douglas Fir-Larch #2	9'-10"	15'-0"	19'-1"	23'-3"
	Hem-Fir #1	9'-8"	15'-2"	19'-10"	24'-3"
	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"

### **Notes:**

- Strap top plate if less than 50% width remaining with 16ga 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)
- Engineered wood products: Cuts, notches and bores are prohibited except where permitted per manufacturer's recommendations or such alteration specifically designed by EOR (R502.8.2)

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



## **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 Completed or Inspected at the Same Time as Frame Inspection**

(R109.1.4/CBC 110.3.4)

- ❑ Electrical, plumbing and mechanical must be completed, inspected and approved by the time of rough frame approval

### **Egress Window or Door to Exterior**

(R310/CBC 1030)

- ❑ Required for bedrooms, habitable attics and basements
- ❑ 20" Min. width and 24" min. height
- ❑ 5.7sqft (821sq.in.) Min. net clear opening except on or below grade floor openings can be 5sqft 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)
- ❑ Egress door with opening below grade shall be provided with bulkhead enclosure of the same or larger net opening (R310.3.2)

### **Exceptions:**

- Basement houses mechanical equipment, less than 200sqft
- Basement alteration or repair, no new bedroom created
- New basement addition with egress from new bedroom
- New basement addition connecting to existing basement with egress

## **FRAME INSPECTION (Continued)**

### **Smoke Alarms** (R314.3/CBC 907.2.11.2)

- ❑ Locations
  - One every floor
  - Rooms or hallways giving access to bedrooms
  - Every bedroom
  - Habitable basements and attics
- ❑ Power (R314.4/CBC 907.2.11.4)
  - Interconnected direct power with battery backup for new construction, built-in 10 yr. battery power or direct power for remodels and 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)
- ❑ Specific Requirements
  - Min. 3' from bathroom opening, return/supply heat register, tip of ceiling fan blade
  - Min. 20' from permanently installed cooking surface, permitted to reduce to 10' min. with ionization alarm with silence switch, and 6' min. with photoelectric smoke alarm
  - Max. 12" vertically down from the highest point of the ceiling

### **Carbon Monoxide Alarms** (R315/CBC 420.6)

- ❑ Required for dwelling units and sleeping units with fuel-burning appliances and/or with attached garage
- ❑ Locations
  - Rooms or hallways giving access to bedrooms
  - One every level including basement and habitable attic
  - In bedroom if gas burning appliance installed within bedroom or its attached bathroom
- ❑ Power and Alarm Audibility
  - Same as smoke detectors

## **FRAME INSPECTION (Continued)**

### **Stairs for R-3 Occupancy** (R311.7/CBC 1011.5.2 exception 3)

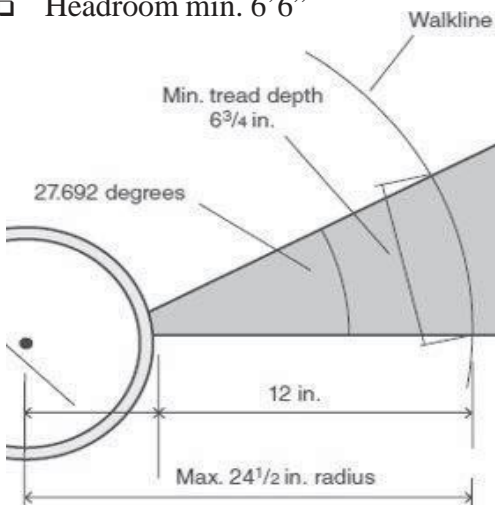
- ❑ 3' Min. width, max. 147" rise between floor levels or landing
- ❑ 7-3/4" Max. risers
- ❑ 10" Min. tread depth with min. 3/4" and max. 1-1/4" nosing/  
11" min. without nosing
- ❑ 3/8" Max. variation between all risers and between all treads
- ❑ Check finish schedules for top and bottom riser consistency
- ❑ 6'8" Min. headroom
- ❑ Landings 36" min. depth

### **Winder** (R311.7.5.2.1/CBC 1011.4)

- ❑ Min. 6" tread depth at narrow end of walk line and 10" at wide end of walk line: located 12" from the narrower side of winders.
- ❑ Nosing min. 3/4" and max. 1-1/4" with solid risers
- ❑ 3/8" Tolerance allowed on rise and run

### **Spiral Stair** (R311.7.10.1/CBC 1011.10)

- ❑ Min. clear width 26" below handrail
- ❑ Min. 6-3/4" tread at walk line, treads shall be identical
- ❑ Max. 9-1/2" rise, open risers permitted
- ❑ Headroom min. 6'6"

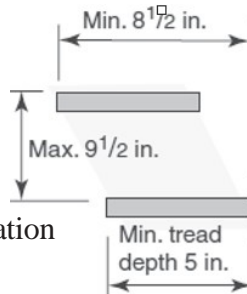


Tip: The typical spiral layout has 13 treads per revolution

## **FRAME INSPECTION (Continued)**

### **Alternating Tread Devices** (R311.7.11/CBC 1011.14)

- ❑ Shall not be used as element of egress to a space/level
- ❑ Between 50° to 70° from horizontal
- ❑ Min. clear width 20" at and below handrail
- ❑ Min. 5" tread depth and min. 8-1/2" projected tread depth, min. 7" tread width
- ❑ The initial tread shall begin at the same elevation as the landing or floor surface
- ❑ Max. 9-1/2" riser
- ❑ Handrails on both sides between 30" to 34"



### **Ships Ladders** (R311.7.12/CBC 1011.15)

- ❑ Shall not be used as element of egress to a space/level
- ❑ Min. clear width 20" at and below handrail
- ❑ Min. 5" tread depth and min. 8-1/2" projected tread depth
- ❑ Max. 9-1/2" riser
- ❑ Handrails on both sides between 30" to 34"

### **Room Dimensions** (R304/CBC 1208)

- ❑ Hall widths 3' min. (R311.6/CBC 1018.2 exception 3)
- ❑ Min. habitable room size: 7' min. dimension and 70sqft except kitchen (R304/CBC 1208.1)
- ❑ Min. ceiling heights—habitable room 7' min. in CRC, but 7'6" min. in CBC (R305.1/CBC 1208.2) Refer to (R305.1/CBC 1208.2 exception 2) for sloped ceilings
- ❑ Bathrooms, storage rooms, and laundry rooms min. ceiling height 6'8" in CBC & CRC
- ❑ Habitable basement: min. 6'8" ceiling height, 6'4" under beams, girders, ductworks (R305.1 exceptions)
- ❑ Bathrooms
  - 24" Min. depth in front and 30" min. width at water closet and min. 15" from center line of water closet to wall or obstruction (CPC 402.5)
  - Shower 30" min. dimension and 1024sq in min. per (CPC 408.6)

## **FRAME INSPECTION (Continued)**

### **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 at 10' spacing max.
  - Between vertical and horizontal spaces at soffits, drop or cove ceilings and furred spaces
  - Concealed stair stringer spaces at top and 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
  - At 1,000sqft max. in floors where there is usable space above and 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 is a duplex

## **FRAME INSPECTION (Continued)**

### **Light and 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 and ventilation purposes, any room may be considered as part of an adjoining room when 1/2 of the common wall area is open and unobstructed. The opening shall also be a min. of 1/10 of the floor area of the interior room or min. 25sqft, whichever is greater (CBC 1203.5.1.1 min. 8% of the floor area or min. 25sqft, whichever is greater)
- Exterior window open to yards or courts, min. 3' wide yard or court spaces (CBC 1206.2)
- Must meet ASHREA 62.2 standards

#### **□ Bathrooms and Laundry Rooms, Water Closet Compartment** (R303.3/ASHREA62.2)

- 1-1/2sqft Min. opening of a 3sqft window to exterior or mechanical ventilation capable of 50cuft per minute for intermittent ventilation or 20cuft 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

## **FRAME INSPECTION (Continued)**

### **Attic Ventilation** (R806/CBC 1203.2)

- ❑ 1sqft Per 150sqft 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" and max. 1/4" corrosion resistant metal mesh screen required
- ❑ Check for isolated and un-vented attic spaces
- ❑ Must be vented top and bottom at 1/150 if radiant barrier is required with 30% min. at the top (California Energy Code)

**Note:** Exterior finish and elevations MUST match planning approved plan

### **Electric Vehicle Charging Infrastructure in New Single and Two-Family Dwellings and Townhouses with Attached Private Garages** (CRC309.8)

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

## **FRAME INSPECTION (Continued)**

### **Safety Glazing** (R308.4/CBC 2406)

- ❑ All glazing in doors, see Exceptions below for decorative glazing and opening size limits a 3" diameter sphere to pass
- ❑ All glazing less than 60" above the floor and meet any of the following:
  - Within a 24" radius of either vertical edge of the door, in plane with the door in a closed position
  - Where glazing is in perpendicular wall to the plane of an in-swing door

### **Exceptions:**

- Decorative glazing, where an intervening wall or permanent barrier between door and glazing
- Access door to closet or storage area  $\leq 3'$  deep
- Glazing adjacent to fixed panel of patio door
- ❑ Glazing adjacent to bottom landing of a stairway  $< 3'$  above the landing of the bottom tread unless protected by a guard 18" from glazing and within 5' horizontal arc less than 180° from the bottom tread nosing
- ❑ Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and 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

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

- ❑ All glazing in guards and railings
- ❑ Glazing adjacent stairs and ramps where the bottom exposed edge of glazing is  $< 36''$  above walking surface of stairways and intermediate landings, unless a rail installed between 34" and 38" above walking surface
- ❑ All glazing that is within 36" of a walking surface if it conforms to the following:
  - Greater than 9sqft 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"



## **FRAME INSPECTION (Continued)**

### **Protection from Water Damage** (R307/CBC 1210)

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

### **Lath Inspection** (R703.7/CBC 2507)

- ❑ Check plan for lateral bracing requirements, and shear inspection signed off on permit
- ❑ When installed over solid wood backing, 2 layers type D paper installed independently with separate continuous plane and any flashing is directed between the layers (R703.7.3/ CBC 2510.6)
- ❑ Windows flashed, counter flashed and caulked
- ❑ Paper laps are 2" min. horizontal and 6" min. vertical (R703.2)
- ❑ Wire laps are one diamond min. ASTM C1063
- ❑ Break-backs and tie-ins did not damage existing paper
- ❑ Lath fastened at 6"oc to studs, plates or blocking with 11ga 1-1/2" long 7/16" head nails or 16ga 7/8" head staples must penetrate 3/4" into framing members (703.6.1/CBC 2507.3)
- ❑ Expanded rib lath attached to horizontal wood framing member with nails or staples with not less than 1-3/4" penetration into horizontal wood framing member (ASTM 1063-03)
- ❑ Corners reinforced per ASTM C1063-03
- ❑ 3-1/2" 26ga Galvanized weep screed installed 4" above earth and 2" above concrete (R703.7.2.1/CBC 2512.1.2)

### **Hearth** (R1001.9/CBC 2111.10)

- ❑ Min. 4" thickness of non-combustible material and non-combustible support

### **Clearances to Combustible** (R1001.11/CBC 2111.12)

- ❑ 2" From front and sides and 4" from back, and see manufacturer's installation instructions

## **FRAME INSPECTION (Continued)**

### **Exterior Air Supply** (R1006.1/CBC 2111.4)

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

### **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 and 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. 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)
- ❑ Flue liner must be bedded in mortar and 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)
- ❑ A cricket or saddle required for 30" or wider chimney (R903.2.2/CBC1503.6)

### **Mechanical Fireplaces**

- ❑ Installed as per manufacturers' installation instructions

## **FRAME INSPECTION (Continued)**

### **Wood Burning Appliances**

- ❑ Wood burning appliances must be listed

### **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

## **ROOFING**

(CRC CHAPTER 9/CBC 1507)

### **Roof Sheathing**

- ❑ Spaced lumber sheathing is not allowed in Seismic Design Category D<sub>2</sub> (R803)

### **Composition** (Slopes 2:12 or greater - R905.2/CBC 1507.2)

Read instructions on bundles

- ❑ 1 Overlay is allowed (R908.3.1.11 & CBC1511.3.1)
- ❑ Solid sheathing required or over existing comp shingles R905.2.1/CBC1507.2.1
- ❑ 15lb Underlayment required unless overlaying existing comp per Table R905.1.1(1)

## **ROOFING (Continued)**

(CRC CHAPTER 9/CBC 1507)

### **Composition (Continued)**

(Slopes 2:12 or greater - R905.2/CBC 1507.2)

- ❑ Nails 12ga 3/8" heads or meets ASTM F1667
- ❑ Fasteners must penetrate 3/4" into or through sheathing, or reduced to sheathing thickness at overhangs
- ❑ Number of fasteners and exposure as per manufacturer's instructions, but not less than 4 fasteners per strip shingle or 2 fasteners per individual shingle (R905.2.6/CBC1507.2.7)
- ❑ Slopes 2:12 to 4:12 are as above except where 2 layers of 15lb underlayment are required and shingles must be self-sealing (R905.1.1/CBC1507.2.4)
- ❑ Check bundle for nailing location requirement
- ❑ Exposed edges of sheathing to be covered with L-metal or equal (R905.2.8.5/CBC1507.2.9.3)
  - ❑ Counter flashing required when flashing meets vertical surface (R905.2.8.3)

**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 or reroofs (R902.2)
- ❑ Solid sheathing
- ❑ 18" Wide of strips of not less than 30lb underlayment is required (R905.8.7)
- ❑ Corrosion-resistant fasteners, 2 per shake, 3/4" penetration into sheathing (R905.8.6/CBC1507.9.7)
- ❑ Exposure per Table R905.8.6/CBC Table 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 and 2" above exposure
- ❑ Slopes of 3:12 are ok with 15lb underlayment in addition to all of the above in CRC only. CBC (1507.9.2) requires 4:12 min. slope.
- ❑ Open porches > 1-1/2:12 are ok with 90lb underlayment

## **ROOFING (Continued)**

(CRC CHAPTER 9/CBC 1507)

### **Tile**(R905.3/CBC 1507.3)

- ❑ Installed as per manufacturer's installation instructions
- ❑ 30lb Felt must be installed with all flashings and roof jacks integrated in a weatherboard fashion and sealed to the felt to provide a weather tight temporary roof cover
- ❑ Slope 2:12 up to 4:12 with double 30lb felt, 4:12 or greater with 30lb felt
- ❑ Solid structural sheathing
- ❑ Underlayment
  - Valley flashing at 3:12 slope min. 36" wide, 1 layer of 15lb
  - Greater than 4:12 slope, 1 layer of 30lb
  - Low slopes up to 4:12, 2 layers of 30lb with 19" starter course and 36" overlapping
- ❑ If lightweight tile (< 9psf), one nail on every tile
- ❑ Re-roofs to be lightweight tile unless supporting structure is approved for heavyweight tile
- ❑ If heavy weight tile (> 9psf), see Table R905.3.7/CBC 1507.3.7
  - Slopes up to 5:12, nail perimeter for 3' border
  - Slopes > 5:12, see manufacturer's instructions for additional nailing requirements or Table R905.3.7/CBC 1507.3.7
- ❑ Corrosion resistant nails not less than 11 ga, 5/16" head with 3/4" penetration, wire ties min. 0.083"
- ❑ 26ga Galvanized flashing and see manufacturer's instructions

### **Built Up/Modified Bitumen/Single-Plv/Sprayed Foam Roofings or Liquid-Applied Coatings**(R905.9/CBC 1507.10-1507.14)

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

**ROOFING (Continued)**  
(CRC CHAPTER 9/CBC 1507)

**Metal Roof** (R905.10/CBC 1507.4)

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

**Reroof Inspection**

- ❑ In progress and final inspection is required
- ❑ Permits required for skylights if framing alterations are done
  - Structural alterations include modifications of trusses or spacing
  - Non-structural alterations will not have drawings or width > 4' will require plans

## **ENERGY CONSERVATION INSPECTION** (USE CLIMATE ZONE 4 FOR EAST PALO ALTO)

**Note:** Under floor, walls and batt ceiling insulation inspected at one time. Blown-in insulation done at final inspection.

### **Building Envelope** (CA Energy Code T150.1-A)

- 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
- Check cripple walls and cathedral walls (walls to have same insulation as underfloor or attic enclosed)
- 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)

### **R-values of insulation match CF1 Form for performance package or prescriptive package as follows:**

**Attic:** There are Three (3) attic options that may be used to comply

Option A: Ducts and air handler may be located in the attic

- Install attic radiant barrier
- Install continuous roof deck insulation

Option B: Ducts and air handler may be located in the attic

- Install R-38 insulation at ceiling
- Install below roof deck insulation (at rafter) R-13 with air space above insulation / R-18 with no space

Option C: Ducts and air handler must be located in conditioned space

- Install attic radiant barrier
- Install R-30 insulation at ceiling

### **Walls:** New Dwellings

- 2x6 at 16"oc framing—R-19 cavity + R-5 continuous
- 2x4 at 16"oc framing—R-15 cavity + R-8 continuous

### **Additions**

- Install R-15 in 2x4 framing
- Install R-19 in 2x6 framing

# **ENERGY CONSERVATION INSPECTION**

## **(Continued)**

(USE CLIMATE ZONE 4 FOR EAST PALO ALTO)

### **Building Envelope (Continued)** (CA Energy Code T150.1-A)

#### **Under-Floor R-19**

- ❑ Faced batts have facing toward conditioned area, paper face is required to be in substantial contact with drywall.
- ❑ A Class I or II vapor retarder is required on unvented attic space side with air permeable insulation (R806.5)
- ❑ Secure insulation if not held in place by finishes

#### **U-Factor of Windows Match CE1 Form**

- ❑ U factor is conductance of energy flow,  $U=1/R$
- ❑ Glazing to be inspected at frame inspection
  - Prescriptive is .32 U-factor/labeled/.25 SHGC

#### **Exterior Openings Sealed to Prevent Infiltration**

- ❑ Exterior openings around doors, windows and exterior penetrations are sealed (California Energy Code 110.6(b))
- ❑ Sill plates are sealed at floor line on slab floors (California Energy Code 110.7)
- ❑ Penetrations in plates are sealed between attic and under floor
- ❑ Exterior sheathing is sealed to prevent openings into wall cavities
- ❑ Max. 1:12 slope ceiling for blown-in insulation

#### **Attic and 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



**TABLE 150.1-A COMPONENT PACKAGE A  
STANDARD BUILDING DESIGN FOR CLIMATE ZONE 4**

Building Envelope Insulation									
Roofs / Ceilings									
Option C (Meets §150.1(c) 9B)		Option B (Meets §150.1(c) 9A)				Option A (Meets §150.1(c) 9A)			
Radiant Barrier	Ceiling Insulation	Radiant Barrier	Ceiling Insulation	Below Roof Deck Insulation <sup>3</sup>		Radiant Barrier	Ceiling Insulation	Continuous Insulation Above Roof Rafter	
				Roofing Type				Roofing Type	
				With Air Space	No Air Space			With Air Space <sup>2</sup>	No Air Space <sup>1</sup>
REQ	R-30	NR	R-38	R-13	R-18	REQ	R-38	R-6	R-8

Building Envelope				Building Envelope				Building Envelope Insulation							
Fenestration				Roofing Products				Floors			Walls				
Maximum West Facing Area	Maximum Total Area	Maximum SHGC	Maximum U-factor	Steep Slope		Low-Sloped									
				Thermal Emittanc	Aged Solar Thermal Emittanc	Concrete Raised	Raised	Slab Perimeter	Below Grade		Above Grade				
									Below Grade Exterior <sup>8</sup>	Below Grade Interior <sup>7</sup>	Mass Wall Exterior <sup>6</sup>	Mass Wall Exterior <sup>5</sup>	Framed <sup>4</sup>		
5%	20%	0.25	0.32	NR	NR	NR	NR	U0.269 R0	U0.037 R-19	NR	U0.200 R-5	U0.070 R-13	U0.125 R-8	U0.070 R-13	U0.051

HVAC System				
	Space Heating <sup>11</sup>	Electric-Resistance Allowed		NO
		If Gas, AFUE		MIN
		If Heat Pump, HSPF <sup>9</sup>		MIN
	Space Cooling	SEER		MIN
		Refrigerant Charge Verification or Fault Indicator Display		NR
		Whole House Fan <sup>10</sup>		NR
	Central System Air Handlers	Central Fan Integrated Ventilation System Fan Efficacy		REQ
	Ducts <sup>12</sup>	Roof/Ceiling Options: A & B	Duct Insulation	R-8
			§150.1 (c) 9A	NA
		Roof/Ceiling Option C	Duct Insulation	R-6
			§150.1 (c) 9B	REQ

## FOOTNOTE REQUIREMENTS TO TABLE 150.1-A

1. Install the specified R-value with no air space present between the roofing and the roof deck.
2. Install the specified R-value with an air space present between the roofing and the roof deck. Such as standard installation of concrete or clay tile.
3. R-values shown for below roof deck insulation are for wood-frame construction with insulation installed between the framing members.
4. Assembly U-factors can be met with cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in an assembly U-factor equal to or less than the U-factor shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to meet the required maximum U-factor.
5. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft<sup>2</sup>. "Interior" denotes insulation installed on the inside surface of the wall.
6. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft<sup>2</sup>. "Exterior" denotes insulation installed on the exterior surface of the wall.
7. Below-grade "Interior" denotes insulation installed on the inside surface of the wall.
8. Below-grade "Exterior" denotes insulation installed on the outside surface of the wall.
9. HSPF means "Heating Seasonal Performance Factor."
10. When whole house fans are required (REQ), only those whole house fans that are listed in the Appliance Efficiency Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow CFM is capable of meeting or exceeding a minimum 1.5cfm/sf of conditioned floor area as specified by Sect. 150.1(c)12.
11. 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 7,000Btu/hr and is controlled by a time limiting device not exceeding 30 minutes.
12. For duct and air handler location: REQ denotes location in conditioned space. When the table indicates ducts and air handlers are in conditioned space, a HERS verification is required as specified by Reference Residential Appendix RA3.1.4.3.8.

**TABLE 150.2-C STANDARD DESIGN FOR  
AN ALTERED COMPONENT**

<b>Altered Component</b>	<b>Standard Design Without Third-Party Verification of Existing Conditions Shall Be Based On</b>	<b>Standard Design With Third-Party Verification of Existing Conditions Shall Be Based On</b>
<b>Ceiling Insulation, Wall Insulation, and Raised Floor Insulation</b>	The requirements of Sections 150.0(a), (c) and (d)	The existing insulation R-value
<b>Fenestration</b>	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 $\leq 0.40$ and SHGC value is $\leq 0.35$ , 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.
<b>Window Film</b>	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
<b>Space-Heating and Space-Cooling Equipment</b>	The requirements of Table 150.1-A	The existing efficiency levels
<b>Air Distribution System-Duct Sealing</b>	The requirements of Table 150.1(b)1D	
<b>Air Distribution System-Duct Insulation</b>	The proposed efficiency levels	The existing efficiency levels
<b>Water Heating Systems</b>	The requirements of Section 150.1(b)1 without the solar water heating requirements	The existing efficiency energy factor
<b>Roofing Products</b>	The requirements of Section 150.2(b)1H	
<b>All Other Measures</b>	The proposed efficiency levels	The existing efficiency levels

# **ENERGY CONSERVATION INSPECTION**

## **(Continued)**

### **Indoor Lighting (150.0(k)) - Part 1**

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

### **Recessed Luminaires**

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

### **Night Lights**

- ❑ Permanently installed night lights and night lights integral to installed luminaires or exhaust fans shall be rated <5W per luminaire

**Note:** Light sources that are not marked “JA8-2016-E” shall not be installed in enclosed luminaires

### **Indoor Light Switching Devices and Controls (150.0(k)) - Part 2**

- ❑ Exhaust fans shall be switched separately from lighting systems  
Exception to Section 150.0(k)2B: Lighting integral to an exhaust fan may be on the same switch as the fan provided the lighting can be switched OFF while allowing the fan to continue to operate for an extended period of time
- ❑ No bypass option on a dimmer or vacancy sensor function
- ❑ An Energy Management Control System (EMCS) may be used to comply with dimmer requirements in Section 150.0(k)
- ❑ In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces shall be controlled by a vacancy sensor

# **ENERGY CONSERVATION INSPECTION**

## **(Continued)**

### **Indoor Light Switching Devices and Controls (150.0(k)) - Part 2 (Continued)**

- Dimmers or vacancy sensors shall control all luminaires required to have light sources compliant with Reference Joint Appendix JA8

#### **Exception:**

- Luminaires in closets < 70sqft and in hallways
- Under-cabinet lighting shall be switched separately from other lighting systems

### **Residential Outdoor Lighting**

- All luminaires shall be high efficacy or JA8-2016 listed and meet one of the following:
  - Controlled by photocell and motion sensor with manual ON/OFF switch that does not override to ON unless the override automatically reactivates the motion sensor within 6 hours
  - Controlled by photocell and time switch control with manual ON/OFF switch that does not override to ON unless the override automatically reactivates the photo-control and time switch within 6 hours
  - Controlled by Astronomical timer with manual ON/OFF switch that does not override to ON unless programmed to automatically turn the outdoor lighting OFF during daylight hours
  - Energy management control system per 150.0(k)

# **ENERGY CONSERVATION INSPECTION**

## **(Continued)**

### **Water Heaters: 3 Prescriptive Options** 150.1(c)8

1. Tankless (gas or propane): Minimum energy factor of 0.82. Insulation required first 5' from water heater and to kitchen fixtures.
2. Tank  $\leq$  55 gal (gas or propane): Minimum energy factor of 0.60. Additional HERS verification: HERS verified Quality Insulation Installation (QII) and either HERS verified compact hot water distribution system or HERS verified. All hot water pipes to have 1" thick insulation.
3. Tank  $>$  55 gal (gas or propane): Minimum energy factor of 1.76. Additional HERS verification: HERS verified compact hot water distribution system or HERS verified. All hot water pipes to have 1" thick insulation.

### **Mandatory Measures** (150.0(n))

- ❑ Accessible 120V electrical receptacle within 3' from the water heater
- ❑ A Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed
- ❑ A condensate drain that is no more than 2" higher than the base of the installed water heater, sloped 1/4" per foot
- ❑ A gas supply line with a capacity of at least 200,000Btu/hr
- ❑ Pipe Insulation: 150 (j) 2
  - All piping associated with a hot water circulation system
  - All hot water piping buried below grade in a water-proof and non-crushable casing or sleeve

#### **Exceptions:**

- Installed in attics encased in min. of 4" attic insulation
- Installed in walls with insulation compliance with Quality Insulation Installation per Reference Residential Appendix RA3.5, HERS verified

### **Insulation Thickness** (Energy Code T120.3-A)

- ❑ 1" For pipes less than 1" in diameter, 1.5" for 1" - 1.5" pipes



**Return Duct Sizing**  
**Single Duct Systems 1.5 to 2.5 Tons (CEC Table150.0-B)**

Return duct length max. 30 feet and with no more than 180° of bend. If exceeds 90° one bend shall be a metal elbow. Return grille devices shall be labeled to disclose the grille's design air flow rate and a max. allowable clean-filter pressure drop of 12.5pa for the air filter media.		
System Nominal Cooling Capacity (Ton)*	Min. Return Duct Diameter (Inches)	Min. Total Return Filter Grille Gross Area (Inches <sup>2</sup> )
1.5	16	500
2	18	600
2.5	20	800
*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 tons		

**Multiple Return Duct Systems 1.5 to 2.5 Tons (CEC Table150.0-C)**

Return duct length max. 30 feet and with no more than 180° of bend. If exceeds 90° one bend shall be a metal elbow. Return grille devices shall be labeled to disclose the grille's design air flow rate and a max. allowable clean-filter pressure drop of 12.5pa for the air filter media.			
System Nominal Cooling Capacity (Ton)*	Min. Return Duct 1 Diameter (Inches)	Min. Return Duct 2 Diameter (Inches)	Min. Total Return Filter Grille Gross Area (Inches <sup>2</sup> )
1.5	12	10	500
2	14	12	600
2.5	14	14	800
3	16	14	900
3.5	16	16	1000
4	18	18	1200
5	20	20	1500
*Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 tons			

## **BUILDING FINAL INSPECTION**

**Note:** Verify all other required inspections are approved

### **Garage Fire Wall/Ceiling 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
- ❑ Supporting walls, beams and posts for second floor are protected with 1/2" gypsum or heavy timber, i.e. 8" x 8" posts and 6" x 10" beams and girders (CBC 602.4.3 & 602.4.4)
- ❑ 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)
- ❑ Where attic access openings and pull-down ladders located in a garage-rated ceiling

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

Attic Access Ladders: Three (3) Options

1. 20 Minute min. fire-rated ladder, installed per manufacturer's instructions
2. Standard ladder with 5/8" Type X drywall attached, overlapping the framing at least 1/2" on the three non-hinged sides, a double spring kit (must close easily), and a latch to hold the ladder up and tightly shut

### **Smoke Detectors**

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

## **BUILDING FINAL INSPECTION (Continued)**

### **Plumbing Penetrations**

(See 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 26ga 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 protected with min. 1/2" gypsum if part of rated wall

### **Stairs, Landings and Guardrails** (R311.7.5/CBC 1011)

- ❑ Handrails to be installed at 34" to 38" above nosing of tread and to be continuous (R311.7.8/CBC 1014.2)
- ❑ Rise and run are still within 3/8" of least and greatest rise and run within the flight (R311.7.5/CBC 1011.5.4)
- ❑ 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 1011.5.5.3)
- ❑ Guardrails are 42" high with exception if also serve as handrails on open sides of stairs between 34" and 38"; openings less than 4" (R312.1.2/CBC 1015.3)
- ❑ 36" Deep landings are installed at exterior doors (R311.3/CBC exception)

### **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)

## **BUILDING FINAL INSPECTION (Continued)**

### **Grading is Complete**

- ❑ Check soils report for grading and 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 and 2" from concrete to stucco

### **Energy Conservation**

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

### **Other Clearances to Verify**

- ❑ Special inspection report, structural observation letter, and/or soil report collected (R109.2/CBC 1704)
- ❑ Engineering, Fire Department, Planning Department or Other clearances listed on permit card clearances
- ❑ Flood Elevation Certificate clearance verified if required

### **Processing**

- ❑ Verify that PG&E meter releases
- ❑ Verify that all other trades are final
- ❑ Sign permit card and take a photo

## **BUILDING FINAL INSPECTION (Continued)**

### **Handrail** (R311.7.8/CBC 1014)

- ❑ 34" to 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 and handrail except at terminations
- ❑ Grip size between 1-1/4" and 2"
- ❑ Terminate in newel posts, volute, or return to wall

### **Bulkhead Enclosure Stairways** (R311.7.10.2)

- ❑ Exterior access to basement is exempt from requirements of Sections R311.3 and R311.7

### **Additional Notes:**

- ❑ Verify required safety glazing
- ❑ Verify street address installed at front of house

## **SWIMMING POOL**

(CRC APPENDIX V & R326/CBC 3109.4-3109.5)

### **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:
    1. Front = 25'
    2. Sides = 5'
    3. 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 min. of 4 points uniformly spaced bonding wires around pool perimeter for equipotential bonding except nonconductive pool shells with copper conductor grid (CEC 680.26(B)(1))
  - 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 stand or tower; safety glass within 5'; pool cover if heated (See Field Note 29); anti-entrapment grates at suction outlets

## **SWIMMING POOL (Continued)**

### **Inspections (Continued)**

- ❑ Pre-Plaster/Final (Continued)
  - 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 hand-holds usable to climb
    - Gates: Open away from pool, self-closing and latching min 60" 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

### **Swimming Pool Electrical Requirements** - See page 134

### **Plumbing**

- ❑ To meet applicable plumbing code provisions

## **DEMOLITION INSPECTION** ( CBC 3303) (Also see Plumbing/Mechanical/Electrical Checklist)

### **Building Demolition**

- ❑ Utilities discontinued, capped-off, safe-off (CBC 303.6)
- ❑ "Non-build" areas match plan
- ❑ Buildable areas require special inspection and final letter of compaction approval

### **Pool Demolition**

- ❑ Plumbing, mechanical and electrical abated
- ❑ "Non-build" areas match plan
- ❑ Buildable area requires special inspection and final letter of compaction approval

## **Part II**

### **PLUMBING REQUIREMENTS**

#### **Adopted Codes**

##### **2016 California Plumbing Code**

Based on the 2015 Uniform Plumbing Code



# **PLUMBING 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 and 1/8 bend or equivalent
  - Vertical to horizontal = 45° wye, combo wye and 1/8 bend. 60° Offset is permitted to be used only when installed in true vertical position.
  - Horizontal to vertical = 45° wye, 60° wye, combo wye and 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. 18" clearance in front 707.9
  - > 2" Cleanout requires min. 24" clearance in front 707.9
  - Under-floor cleanout shall be within 5' from access
- ❑ Backwater Valve Requirements 710
  - For fixtures on a floor level that is not above the upstream manhole by 1'
  - Fixtures above the upstream manhole cannot discharge through the backwater valve (Check for split system requirement)

# **PLUMBING UNDERGROUND INSPECTION**

## **(Continued)**

### **Building Sewer Chapter 7 (Continued)**

- ❑ Protection of Piping
  - Min. 1' cover sewer pipes of ABS, PVC, copper and vitrified clay 718.3
- ❑ 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**

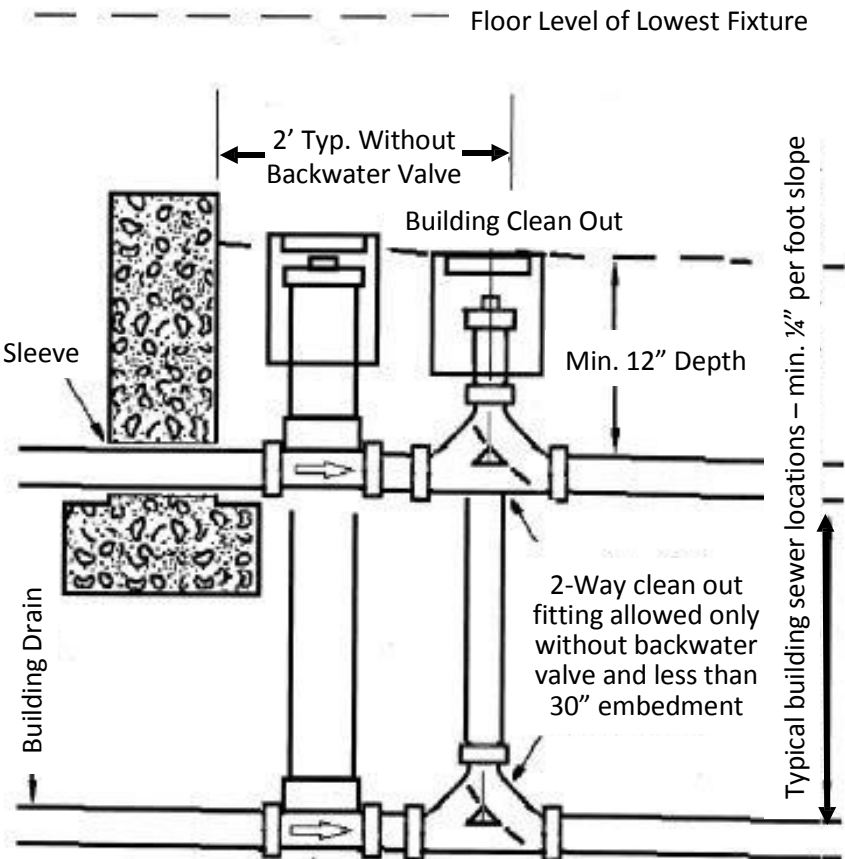
- ❑ All pipes passing through concrete shall be protected from breakage and corrosion 312.1
- ❑ Trenches deeper than the footing shall be at a 45° angle there from 314.1 (Angle of repose)
- ❑ No direct embedment in concrete 312.2
- ❑ Exposed ABS and PVC pipes, only allowed above roof jack, to be protected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

### **Hangers and Supports 313**

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

### **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



# **PLUMBING UNDERGROUND INSPECTION**

## **(Continued)**

### **Water Services Chapter 6 (Continued)**

- Approved Materials 604 (Continued)
  - Copper shall be a min. of type “M” - 604.3 Exception
    - DWV is marked in yellow (usually not in single family dwellings)
    - Type M is marked in red
    - Type L is marked in blue
    - Type K is marked in green
  - Metallic water services replaced with non-metallic material shall have electrical grounding provided 604.10 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 605.12.3
  - 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 15psi
  - Max. pressure is 80psi
  - Pressure regulators are required at more than 80psi
- Testing
  - Shall be tested with either working pressure or a 50lb 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 604.10.1

# **PLUMBING UNDERGROUND INSPECTION**

## **(Continued)**

### **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 315.1 & 1212.5
  - In other locations, left and right couplings may be used 1210.3
  - No bushings are allowed in concealed locations 1210.3
- ❑ 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
- ❑ 1,000Btu per cubic foot to be used to calculate CFH

### **Gas Piping Materials and 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 and primer is restricted to short sections and fittings
  - Coating protection shall extend a min. of 6" above grade
  - Shall have a min. of 12" cover, where external damage to pipe from external forces is likely, the cover shall be not less than 18" 1210.1.1
  - Shall be tested with a min. of 10lbs of air pressure for 15 minutes for pipe pressure at 14" water column or less
  - Use max. 15lb gauges for pressure tests of 10lbs or less shall be calibrated with increments of 1/10lb or less 318.2
- ❑ Polyethylene Gas Piping
  - Shall be marked "gas" and "ASTM D2513"
  - Shall have a min. 18" IS12-2006
  - Shall be laid in a firm bed for its entire length 1210.1.2
  - Shall have a min. 14ga electrically continuous corrosion-resistant tracer wire attached to the entire length and extend above grade on one end 1210.1.7.2

# **PLUMBING UNDERFLOOR INSPECTION**

## **Drainage Systems Material and 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. 5psi 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 313.3
  - Max. 4' oc
  - 18ga Band iron or approved plastic hangers to restrict upward movement
  - Shall be supported at ends of branches, at each change of direction and elevation
- ❑ Cast Iron Horizontal Piping Table 313.3
  - When over 4' pipe length support every joint
  - Supports shall be within 18" of joints, not on couplings Table 313.3 Note 1
  - Support must be adequate to prevent sagging and maintain alignment 313.4

# **PLUMBING UNDERFLOOR INSPECTION**

## **(Continued)**

### **Horizontal Piping Support (Continued)**

- Copper Tubing Table 313.3
  - Shall be supported at 6' intervals for 1 1/2" and smaller
  - Shall be supported at 10' intervals for 2" and 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 and urinals regardless of branch length
- Access and Working Clearance in Front of Cleanouts 707.9
  - Min. 18" in front of cleanouts for pipes 2" and smaller
  - Min. 24" in front of cleanouts for pipes larger than 2"
  - Max. 5' 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 Inch)
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

**PLUMBING UNDERFLOOR INSPECTION (Continued)**

**Sizing DWV Systems 703**

- All DWV piping shall be sized from Tables 702.1 & 703.2
- 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 <sup>1</sup>											
Vertical	1	2 <sup>2</sup>	16 <sup>3</sup>	32 <sup>3</sup>	48 <sup>4</sup>	256	600	1380	3600	5600	8400
Horizontal	1	1	8 <sup>3</sup>	14 <sup>3</sup>	35 <sup>4</sup>	216 <sup>5</sup>	428 <sup>5</sup>	720 <sup>5</sup>	2640 <sup>5</sup>	4680 <sup>5</sup>	8200 <sup>5</sup>
Max Length Drainage Piping											
Vertical	45'	65'	85'	148'	212'	300'	390'	510'	750'	-	-
Horizontal	Unlimited										
Vent Piping Horizontal & Vertical <sup>6</sup>											
Max Units	1	8 <sup>3</sup>	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.



<b>TABLE 702.1 DRAINAGE FIXTURE UNIT VALUES (DFU)</b>				
<b>PLUMBING APPLIANCES, APPURTENANCES OR FIXTURES</b>	<b>MIN. SIZE TRAP &amp; TRAP ARM<sup>7</sup> (Inches)</b>	<b>PRIVATE</b>	<b>PUBLIC</b>	<b>ASSEMBLY<sup>8</sup></b>
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 <sup>5</sup>	2	3.0	3.0	3.0
Dental Unit, cuspidor	1-1/4	-	1.0	1.0
Dishwasher, domestic with independent drain <sup>2</sup>	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
Wash Fountain	1-1/2	-	2.0	2.0
Wash Fountain	2	-	3.0	3.0
Mobile Home, trap <sup>9</sup>	3	12.0	-	-
Receptor, indirect waste <sup>1,3</sup>	1-1/2	See footnote <sup>1,3</sup>		
Receptor, indirect waste <sup>1,4</sup>	2	See footnote <sup>1,4</sup>		
Receptor, indirect waste <sup>1</sup>	3	See footnote <sup>1</sup>		
Sinks	-	-	-	-
Bar	1-1/2	1.0	-	-
Bar <sup>2</sup>	1-1/2	-	2.0	2.0
Clinical	3	-	6.0	6.0
Commercial with Food Waste <sup>2</sup>	1-1/2	-	3.0	3.0
Special Purpose <sup>2</sup>	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 <sup>2</sup> (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)**

<b>PLUMBING APPLIANCES, APPURTENANCES OR FIXTURES</b>	<b>MIN SIZE TRAP &amp; TRAP ARM<sup>7</sup> (Inches)</b>	<b>PRIVATE</b>	<b>PUBLIC</b>	<b>ASSEMBLY<sup>8</sup></b>
Sinks (Continued)				
Laundry <sup>2</sup> (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 <sup>2</sup>	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 <sup>2</sup>	1-1/2	2.0	2.0	5.0
Water Closet, 1.6 GPF Gravity Tank <sup>6</sup>	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Tank <sup>6</sup>	3	3.0	4.0	6.0
Water Closet, 1.6 GPF Flushometer Valve <sup>6</sup>	3	3.0	4.0	6.0
Water Closet, greater than 1.6 GPF Gravity Tank <sup>6</sup>	3	4.0	6.0	8.0
Water Closet, greater than 1.6 GPF Flushometer Valve <sup>6</sup>	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. Trap 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 mobile home 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.

**PLUMBING UNDERFLOOR INSPECTION (Continued)**

**Trap Arms**

- ❑ Change in Direction Allowed Without Cleanout 1002.3
  - Max. 90° on pipe 2-1/2” and smaller
  - Max. 135° on pipe 3” and larger
- ❑ Size of Trap Arms Table 1002.2

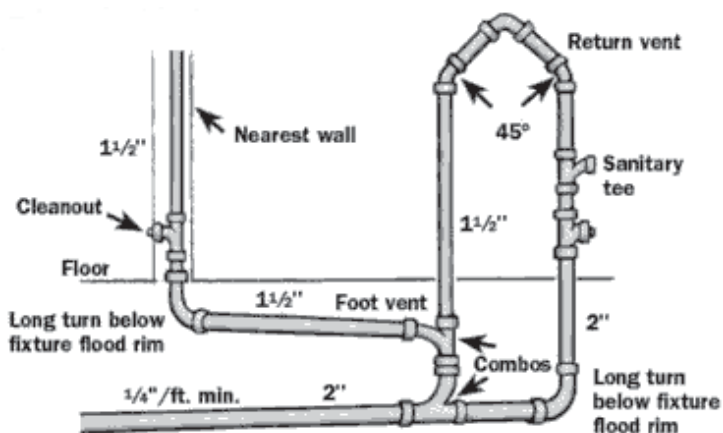
<b>TABLE 1002.2 HORIZONTAL LENGTHS OF TRAP ARMS (EXCEPT FOR WATER CLOSETS AND SIMILAR FIXTURES)<sup>1,2</sup></b>		
<b>TRAP ARM PIPE DIAMETER (Inches)</b>	<b>DISTANCE TRAP TO VENT MINIMUM (Inches)</b>	<b>LENGTH MAXIMUM (Inches)</b>
1-1/4	2-1/2	30
1-1/2	3	42
2	4	60
3	6	72
4	8	120
Exceeding 4	2 x Diameter	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’

### **PLUMBING UNDERFLOOR INSPECTION (Continued)**

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



# **PLUMBING UNDERFLOOR INSPECTION**

## **(Continued)**

### **Underfloor Water Piping 604**

- ❑ Materials Table 604.1
- ❑ PVC is not allowed to be used in water distribution piping and fittings
- ❑ Only water piping supplies island sinks is allowed under a slab and short sections per 609.3(2)
- ❑ Support of Horizontal Water Piping Table 313.3
  - Copper Tubing
    - Every 6' for pipe 1-1/2" and smaller
    - Every 10' for pipe 2" and larger
  - Pex
    - Every 32" for pipe 1" and smaller
    - Every 4' for pipe 1-1/4" and larger
  - Steel and Brass
    - Every 10' for pipe 3/4" and smaller
    - Every 12' for pipe 1" and larger
- ❑ All water pipe shall be reamed to the full bore of the pipe or tube
- ❑ Sizing water pipe use Tables 610.3 & 610.4
- ❑ Pipe Insulation see page 48

### **Gas Piping**

- ❑ Materials 1208.5
  - No copper, brass and aluminum alloy pipe/tube to be used with gases corrosive to such material or hydrogen sulfide content exceeds .7mg/100L 1208.5.2.2
  - CSST with plan check approval only
  - Black steel if protected from weather
- ❑ Galvanized steel or painted black steel if exposed to weather. Inspection is visual only at this time.
- ❑ Sizing is as per Tables 1216.2(1), 1216.2(14), & 1216.2(20)

# **PLUMBING ROUGH INSPECTION**

## **Same Rules as Underfloor for:**

- Materials
- Change of Direction
- Grade of Pipe
- Support of Pipe
- Trap Arms
- Wet Vents

## **Support of Vertical Pipe Table 313.3**

- ❑ Plastic Pipe—Mid span between plates
- ❑ Cast Iron—Every story or 15' max. Table 313.3
- ❑ Copper—Every story or 10' max. Table 313.3

## **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 UPC IS 5-2006 & IS Section 2.2.3
- ❑ ABS and 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 (Shall require 30"W by 24"D in front of bowl at final)
- ❑ Flanges shall be secured with brass or stainless steel screws, bolts or other listed equally non-corrosive materials 402.6.2

## **Vents**

- ❑ Every fixture trap shall be vented 901.2
- ❑ Grade and Slope
  - Shall be level or graded to drain back to the drain served 905.1
  - Shall be 6" above the flood rim of the fixture before offsetting horizontally 905.3

## **PLUMBING ROUGH INSPECTION (Continued)**

### **Termination**

- ❑ Shall extend above a roof a min. of 6" and 1' from vertical surfaces 906.1
- ❑ Shall be 10' away from or 3' above any openable openings including skylights, air intake, or vent shaft 906.2
- ❑ Shall terminate min. 3' from property line 906.2

### **Sizing**

- ❑ The aggregate cross-sectional area shall not be less than that of the largest required building sewer per Table 703.2. 904.1

### **Wet Vents 908**

- ❑ Vertical Wet Venting 908.1
  - Limited to vertical drainage receiving the discharge from the trap arm of 1 and 2 fixture unit fixtures (Note: Clothes washer is 3 fixture unit fixture, laundry sink is 2)
  - Max. 4 fixtures
  - Fixtures within the same story
  - Max. 6' in developed length
  - Min. 1 pipe size larger than the required minimum waste pipe size of the upper fixture or 1 pipe size larger than the sum of the fixture units served, whichever is larger
  - Min. 2" pipe size for the wet vented section
  - Min. 2" in diameter for 4 drainage fixture units or less
  - Min. 3" in diameter for 5 drainage fixture units or more
  - For dry vent size based on the total fixture units discharging into the wet vent use Tables 702.1 & 703.2

### **Water, Waste and Gas Piping**

- ❑ Same rules as underfloor

### **Gas Pressure Test**

- ❑ Not at this time, but after sheetrock is up

## **PLUMBING ROUGH INSPECTION (Continued)**

### **Shower Receptors 408**

- ❑ Shower pans shall be inspected at the time of rough inspection
- ❑ Shower Compartment Dimensions 408.6
  - Min. 1024in<sup>2</sup> 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" and 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
  - 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
- ❑ Test for Shower Pans 408.7.5
  - Min. 2" drain 408.4
  - Drain plugged below weep holes
  - Pull plug and check complete drainage with subfloor slope to drain
  - Verify weep holes are functional
  - Check for leaks
- ❑ Shower and Tub/Shower Combination Valves 408.3
  - Verify Listing:
    - Shower valves ASSE 1016
    - Tub/Shower combo valves ASME A112.18.1/CSA B125.1
  - Verify pressure balance/thermostatic mixing valve type



## **PLUMBING ROUGH INSPECTION (Continued)**

### **Tubs**

- ❑ Inspection
  - Fill tub with water to bottom of overflow
  - Tub and shower valves must be listed for anti-scald
  - Valve and shower riser must be secured to structure
  - When slip joints are used on trap or waste and 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
- ❑ Tub Filler Valves: Hot water temperature limited to 120° by device conforming to ASSE1070 or CSA B125.3

### **Cleanouts 707**

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

# **PLUMBING FINAL INSPECTION**

## **Gas**

- ❑ Verify rough inspection approval
- ❑ Pressure Test
  - Air test - 10lb for 15 minutes
  - Must use appropriate gauge—max. 15lb and 1/10lb increments
- ❑ Shut-Off Valves
  - Shall be listed for use with gas
  - Shall be within 6' of gas appliances 1212.5
- ❑ 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(1) for Sch40, 1216.2(14) for CSST, 1216.2(20) for PE, or manufacturing listing

## **Vents**

- ❑ Must be painted and 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 cristry box 710.6

## **Pressure Reducing Valves (PRV)**

- ❑ Shall be installed if pressure is greater than 80psi 608.2
- ❑ A listed expansion tank is required when PRV is installed 608.2
- ❑ A “closed” water system (presence of check valve, backflow preventer) requires expansion tanks 608.3

## **Backflow Protection 603.3 Through 603.5.20**

- ❑ Required on all hose bibbs (603.5.7) and on landscape piping (603.5.6), and plumbing fixtures (603.5.19). Plumbing fixture fittings with integral backflow protection shall comply with ASME A112.18.1/CSA B125.1.

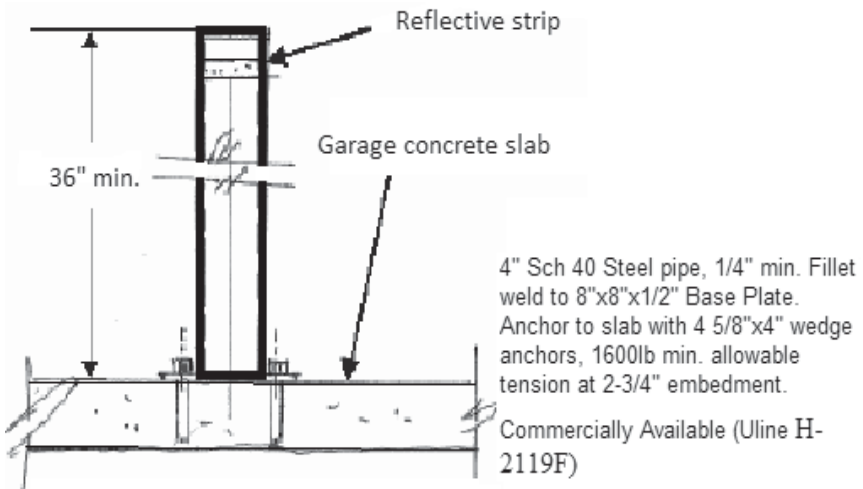
## **PLUMBING FINAL INSPECTION (Continued)**

### **Fixtures**

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

### **Water Heater** (No electric water heaters allowed per T24)

- ❑ Garage Installation 507.13
  - Shall be elevated or have adequate barrier to guard against damage (507.13)
  - Min. 18" elevation from flammable source to floor unless listed as flammable vapor ignition resistant 507.13



## **PLUMBING FINAL INSPECTION (Continued)**

### **Water Heater (Continued)**

- Earthquake straps are required as per 507.2
  - Strap at the vertical upper and lower third, at least 4" above control of water heater, a 75-gallon unit requires 3 straps and a 100-gallon unit requires 4 straps

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

Conduit Method - Use a round thinwall conduit along with 24ga min. plumber's tape, bolts, and lag screws

- Closet Locations 504.1
  - Closet located in the bedroom or bathroom with a listed, gasket door assembly and a listed self-closing device
  - Exception: Direct vent water heater
  - Seal bottom of closet door with threshold or gasket
  - Provide outdoor combustion air (506.4)

#### One Opening Method (506.4.2)

- Within 12" of the top of enclosure, min. 1 square inch per 3,000Btu/h and not less than the sum of the areas of connectors in the space AND appliance shall have min. clearance of 1" from sides and back, and 6" from front

#### Two Openings Method (506.4.1)

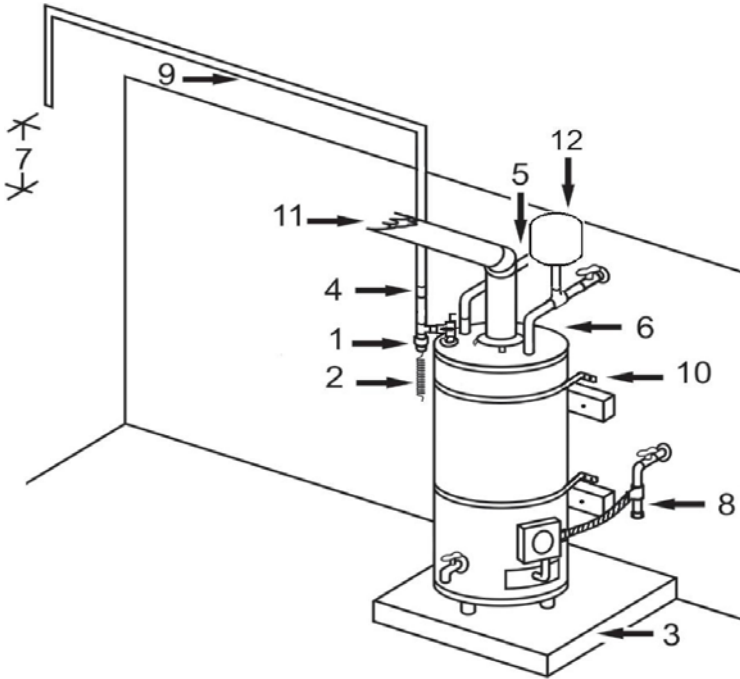
- Directly vent to outdoor or through vertical duct EACH opening will be based on 1 square inch min. per 4,000Btu/h. 2,000Btu/h where venting through horizontal ducts. Openings shall be within 12" from top and bottom of the enclosure.
- Wood louvers shall be assumed yielding 25% free area, 75% for metal louvers for required venting calculation
- The closet shall be for the exclusive use of the water heater and/or FAU (not storage space)
- Otherwise direct vent type and non-fuel burning types may be installed in closet locations without the requirements above

## **PLUMBING FINAL INSPECTION (Continued)**

- Installations in Attics 508.4
  - Provide a corrosion resistant watertight pan, min. 1-1/2" depth, beneath the water heater with min. 3/4" diameter drain to exterior
  - Provide access, clearances to combustibles, switched lighting, and adjacent receptacle. Access to the attic may not be from a bedroom or bathroom; however, access from a walk-in closet is permissible.
- Clearances and Access 504.3
  - Subject to manufacturer's installation instruction 504.3.1
  - Access door shall be min. 22" x 30" 508.4
- Temperature and Pressure Relief Valve 504.6
  - Shall be provided with a temperature and 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.

## **PLUMBING FINAL INSPECTION (Continued)**

### □ Installation in Basement



1. 3/4" Tee with 1/8" reducer
2. 1/8" Tubing, "drip coil" with slightly crimped end
3. 3" Min. slab or base
4. 3/4" Union within 12"
5. Hot water line (insulated first 5')
6. Cold water line with shut-off valve (insulated first 5')
7. Terminate not less than 6" and not more than 24" at exterior
8. Gas supply line with sediment trap, downstream of shutoff valve
9. 3/4" CPVC or copper tubing, 1/4 per foot slope toward termination
10. Seismic straps, listed for size or use 24ga straps  
(50gal: 2 straps, 75gal: 3 straps, 100gal: 4 straps)
11. Vent Connector: Single-appliance vent with max. horizontal  
length 75% of vertical for single wall, 100% for b-vent
12. Expansion tank if required per CPC 608.3

## **PLUMBING FINAL INSPECTION (Continued)**

### **Tankless Water Heater**

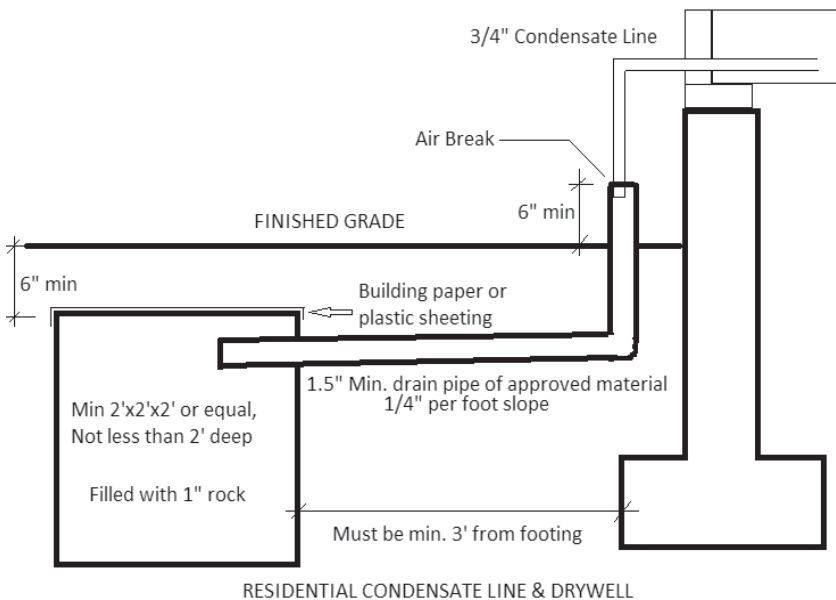
- ❑ Can also be installed on exterior side/back wall: allowed *if* listed for exterior use, and if not restricted by any planned development requirements
- ❑ Sizing - See Table 5-1 of California Plumbing Code
- ❑ Vents: Positive pressure (forced) vents. Installation of these vents must comply with the vent manufacturer's instructions. Most vents are stainless steel due to the slightly acidic content of the condensate. Type B venting material is not acceptable for positive pressure vents. Termination shall be min. 4' from property lines.

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating - Gallons	42	54	54	54	67	67	80	67	80	80	80

## **PLUMBING FINAL INSPECTION (Continued)**

### **Tankless Water Heater (Continued)**

- ❑ Condensate: Discharge to trapped and vented receptors, drywells, leach pits or at the tailpiece of plumbing fixtures
- ❑ Drywell specifications are as follows:



### **Water Hammer Table 609.10**

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



**TABLE 610.3 WATER SUPPLY FIXTURE UNIT (WSFU) AND  
MINIMUM FIXTURE BRANCH PIPE SIZES<sup>3</sup>**

<b>APPLIANCES, APPURTENANCES OR FIXTURES<sup>2</sup></b>	<b>MIN. FIXTURE BRANCH PIPE SIZE<sup>1,4</sup> (Inches)</b>	<b>PRIVATE</b>	<b>PUBLIC</b>	<b>ASSEMBLY<sup>6</sup></b>
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 <sup>8</sup>	1/2	1.0	1.0	-
Lavatory	1/2	1.0	1.0	1.0
Lawn Sprinkler, each head <sup>5</sup>	-	1.0	1.0	-
Mobile Home, each (minimum) <sup>9</sup>	-	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	-
Wash, 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 <sup>7</sup>		
Urinal, greater than 1.0 GPF Flushometer Valve	3/4	See Footnote <sup>7</sup>		
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 <sup>7</sup>		

<b>TABLE 610.3 WATER SUPPLY FIXTURE UNIT (WSFU) AND MINIMUM FIXTURE BRANCH PIPE SIZES<sup>3</sup> (Continued)</b>				
<b>APPLIANCES, APPURTENANCES OR FIXTURES<sup>2</sup></b>	<b>MIN FIXTURE BRANCH PIPE SIZE<sup>1,4</sup> (Inches)</b>	<b>PRIVATE</b>	<b>PUBLIC</b>	<b>ASSEMBLY<sup>6</sup></b>
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 <sup>7</sup>		

**Notes:**

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

METER & STREET  
SERVICE (Inches)  
BUILDING SUPPLY  
& BRANCHES (Inches)

**TABLE 610.4**  
**FIXTURE UNIT TABLE FOR DETERMINING WATER PIPE AND**  
**METER SIZES MAXIMUM ALLOWABLE LENGTH (Feet)**

		60	80	100	150	200	250	300	400	500	600	700	800	900	1000
PRESSURE RANGE—30 to 45 psi <sup>1</sup>															
3/4	1/2 <sup>2</sup>	6	5	4	3	2	1	1	1	0	0	0	0	0	0
3/4	3/4	16	16	14	12	9	6	5	5	4	4	3	2	2	1
3/4	1	29	25	23	21	17	15	13	12	10	8	6	6	6	6
1	1	36	31	27	25	20	17	15	13	12	10	8	6	6	6
3/4	1-1/4	36	33	31	28	24	23	21	19	17	16	13	12	12	11
1	1-1/4	54	47	42	38	32	28	25	23	19	17	14	12	12	11
1-1/2	1-1/4	78	68	57	48	38	32	28	25	21	18	15	12	12	11
1	1-1/2	85	84	79	65	56	48	43	38	32	28	26	22	21	20
1-1/2	1-1/2	150	124	105	91	70	57	49	45	36	31	26	23	21	20
2	1-1/2	151	129	129	110	80	64	53	46	38	32	27	23	21	20
1	2	85	85	85	85	85	85	82	80	66	61	57	52	49	46
1-1/2	2	220	205	190	176	155	138	127	120	104	85	70	61	57	54
2	2	370	327	292	265	217	185	164	147	124	96	70	61	57	54
2	2-1/2	445	418	390	370	330	300	280	265	240	220	198	175	158	143
PRESSURE RANGE—46 to 60 psi <sup>1</sup>															
3/4	1/2 <sup>2</sup>	7	7	6	5	4	3	2	2	1	1	1	0	0	0
3/4	3/4	20	20	19	17	14	11	9	8	6	5	4	4	3	3
3/4	1	39	39	36	33	28	23	21	19	17	14	12	10	9	8
1	1	39	39	39	36	30	25	23	20	18	15	12	10	9	8
3/4	1-1/4	39	39	39	39	39	39	39	34	32	27	25	22	19	17
1	1-1/4	78	78	76	67	52	44	39	36	30	27	24	20	19	17
1-1/2	1-1/4	78	78	78	78	66	52	44	39	33	29	24	20	19	17
1	1-1/2	85	85	85	85	85	85	80	67	55	49	41	37	34	32
1-1/2	1-1/2	151	151	151	151	128	105	90	78	62	52	42	38	35	32
2	1-1/2	151	151	151	151	150	117	98	84	67	55	42	38	35	32
1	2	85	85	85	85	85	85	85	85	85	85	85	85	85	83
2	2	370	370	340	318	272	240	220	198	170	150	135	123	110	102
2	2-1/2	654	640	610	580	535	500	470	440	400	365	335	315	285	250
PRESSURE RANGE—Over 60 psi <sup>1</sup>															
3/4	1/2 <sup>2</sup>	7	7	7	6	5	4	3	3	2	1	1	1	1	0
3/4	3/4	20	20	20	20	17	13	11	10	8	7	6	6	5	4
3/4	1	39	39	39	39	35	30	27	24	21	17	14	13	12	11
1	1	39	39	39	39	38	32	29	26	22	18	14	13	12	11
3/4	1-1/4	39	39	39	39	39	39	39	39	34	28	26	25	23	21
1	1-1/4	78	78	78	78	74	62	53	47	39	31	26	25	23	22
1-1/2	1-1/4	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
1-1/2	1-1/2	151	151	151	151	151	130	113	88	73	51	51	46	43	40
2	1-1/2	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
1-1/2	2	370	370	370	370	360	335	305	282	244	212	187	172	153	141
2	2	370	370	370	370	370	370	370	340	288	245	204	172	153	141
2	2-1/2	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.)
<b>SPACE HEATING UNITS</b>		
Warm Air Furnace		
	Single Family	100,000
	Multifamily, per unit	60,000
Hydronic Boiler		
	Single Family	100,000
	Multifamily, per unit	60,000
<b>SPACE AND WATER HEATING UNITS</b>		
Hydronic Boiler		
	Single Family	120,000
	Multifamily, per unit	75,000
<b>WATER HEATING APPLIANCES</b>		
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
<b>COOKING APPLIANCES</b>		
Range, freestanding, domestic		
		65,000
Built-in Oven or Broiler Unit, domestic		
		25,000
Built-in Top Unit, domestic		
		40,000
<b>OTHER APPLIANCES</b>		
Refrigerator		
		30,000
Clothes Dryer, Type 1, domestic		
		35,000
Gas Fireplace, direct vent		
		40,000
Gas Log		
		80,000
Barbecue		
		40,000
Gaslight		
		2,500

**TABLE 1216.2(1)**  
**SCHEDULE 40 METALLIC PIPE (NFPA 54: TABLE 6.2(B))<sup>1, 2</sup>**

			GAS			NATURAL		
			INLET PRESSURE:			LESS THAN 2psi		
			PRESSURE DROP:			0.5 in. WATER CLOSET		
			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 10ft/hr

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))<sup>1,2</sup>**

						GAS					NATURAL				
						INLET PRESSURE:					LESS THAN 2psi				
FLOW DESIGNATION:						PRESSURE DROP:					0.5 In. WATER CLOSET				
						SPECIFIC GRAVITY:					0.60				
	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° 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. WATER CLOSET	
			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**

##### **2016 California Mechanical Code**

Based on the 2015 Uniform Mechanical Code



## **MECHANICAL GENERAL INFORMATION**

### **HVAC Duct Materials and Installation**

- Joints and Seams of Ducts 603.10
  - Min. 1-1/2" contact lap for round ducts
  - Min. 3 screws equally spaced around the joint except dryer ducts 504.4
  - Shall be airtight
- Installation of Ducts 603
  - At Underfloor or Crawl Space
    - Do not block or reduce underfloor access
    - Min. 18" vertical clearance between underside of ducts and grade at the passage to equipment
    - Min. 4" clearance to earth
    - Secure heat boots on all sides
    - Install ducts above the flood elevation
- Support 603.8
  - Refer to manufacturer's installation instructions
  - SMACNA
    - Metal round duct - Min. 1" wide 22ga strap at 12'-0" interval
    - Metal rectangular duct - Min. 1" wide 22ga strap at 10'-0" interval
    - Flexible duct - Min. 1" wide 22ga strap at 5'-0" interval
- Factory-Made Air Ducts and Connector 603.4
  - Shall be listed and labeled UL181
  - Vertical risers up to 2 stories with straps at max. 6'-0" oc CMC Standard
  - Joint secured per manufacturer's specifications
  - Supports per manufacturer's field fabrication and installation instructions or SMACNA
  - 26ga 1-1/2" Galvanized straps at max. 4' oc horizontally and max. 6' oc vertically
  - Max. 1/2" sag per ft
  - Use minimum length of ducts
  - Avoid exposure to sunlight and sharp bends
  - Provide additional supports at bends up to 12" diameter
  - Seal damaged vapor barriers with UL 181 listed tape

## **MECHANICAL UNDERGROUND / UNDERSLAB INSPECTION**

### **HVAC Metal Ducts In or Under Slab**

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

### **Domestic Range Vents 504.3**

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

## **MECHANICAL UNDERFLOOR INSPECTION**

### **Clothes Dryers Ducts 504.4**

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

**When conditions prohibit compliance with CMC 504.4.2.1, use the dryer's manufacturer's installation instructions and the following:**

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

**MECHANICAL UNDERFLOOR INSPECTION**  
**(Continued)**

**DRYER EXHAUST DUCT FITTING EQUIVALENT LENGTH**

Fitting Type	Dryer Exhaust Duct Equivalent
4" Radius Mitered 45° Elbow	2'6"
4" Radius Mitered 90° Elbow	5'
6" Radius Mitered 45° Elbow	1'
6" Radius Mitered 90° Elbow	1'9"
8" Radius Mitered 45° Elbow	1'
8" Radius Mitered 90° Elbow	1'7"
10" Radius Mitered 45° Elbow	9"
10" Radius Mitered 90° Elbow	1'6"

A durable placard at least 4” vertically and 5” horizontally, shall be affixed on a wall visible from and close to the dryer location. The placard shall provide the actual length of the installed dryer exhaust vent. The following is an example of such placard:

**WARNING** CHECK THE MANUFACTURER'S  
INSTALLATION INSTRUCTIONS FOR ANY DOMESTIC  
DRYER THAT WILL BE INSTALLED AT THIS LOCATION.  
THE INSTALLATION INSTRUCTIONS SHOULD ALLOW  
THE DRYER TO BE CONNECTED TO AN EXHAUST DUCT  
(VENT) THAT IS \_\_\_\_\_ FEET.

## **MECHANICAL UNDERFLOOR INSPECTION**

### **(Continued)**

#### **Condensate Wastes 310.1-310.7, 802.9**

- ❑ Required at air conditioning coils and Category II & IV equipment (high efficiency appliances)
- ❑ Min. 1/8" per foot slope to drain 312.1 except pump discharge is allowed where gravity drainage is impractical to where the required slope can be resumed
- ❑ Min. 3/4" pipe up to 20 tons of refrigeration Table 312.3
- ❑ Max. 4'oc for PVC support; listed primer and glue are required CPC Table 313.1
- ❑ Max. 3'oc for CPVC support; listed primerless glue required CPC Table 313.1
- ❑ Exposed plastic pipes shall be protected with water based synthetic latex paint. Metallic only for above roof installation.
- ❑ Primary drain line shall be terminated in a drywell with an air-gap, air-break 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 instructions for vent and trap requirement on condensate drain line

See Page 81 for Drywell

# **MECHANICAL UNDERFLOOR INSPECTION**

## **(Continued)**

### **Underfloor Furnace 904.3.1**

- ❑ Verify with manufacturer's installation instructions
- ❑ Need to meet floor fire protection requirement (CRC3.2.13)
- ❑ Supported by min. 3" of concrete slab above ground, or
- ❑ 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 904.4
  - Min. 22" x 30" access opening or the largest piece of component of the appliance, whichever is greater
  - Max. 20' in length between access and appliance when headroom is less than 6'
  - Min. 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 301.4
- ❑ Furnace in flood zone shall be elevated at or above the flood elevation 308.2

### **Hydronic Piping 1201**

- ❑ Hydronic System Piping, Tubing and Fittings see Table for ASTM listings
- ❑ Hydronic Panel Heating System 1202
  - Backflow protection may be required when connected to potable water
  - Steel pipe, Type L copper, plastic pipe or tubing rated for 100psi at 180° can be used to pipe for heating panel

# **MECHANICAL UNDERFLOOR INSPECTION**

## **(Continued)**

### **Hydronic Piping 1201 (Continued)**

- Embedded Joints
  - Steel pipe welded with electrical arc or oxygen/acetylene method 1211.2
  - Copper tubing joined with brazing alloys having a melting point above 1000°F, 1221.2.2
- Testing 1221.3
  - Hydrostatic test method required
  - Min. 100psi 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 and installation practices see Table 1201.1

### **Floor Furnace 906**

- Installation 906.1
  - Listed floor furnaces refer to manufacturer's installation instructions
  - Unlisted floor furnaces not allowed in combustible floors
  - Thermostats shall be located in the same room as register
- Placement 906.4
  - Floor furnaces not allowed at doorways, stairway landing, aisle, or passageway of an enclosure, or in an exitway
  - Min. 6" from wall to register
  - Min. 18" from two adjoining sides of the floor furnace register to walls
  - Min. 6" from a wall register to a corner
  - Min. 12" from register to door, drapery, or similar objects
- Bracing 906.5
  - Doubled joists and with headers not lighter than the joists
- Clearance 906.7
  - Min. 6" from bottom of furnace to grade except manufactured sealed units can be 2"
  - When excavation is needed, provide min. 12" on sides and min. 18" on the control side
- Access 906.8
  - Min. 18" x 24" in foundation, 24"x24" in trap door

## **MECHANICAL ROUGH INSPECTION**

### **Wall Furnace 907**

#### **□ Installation 907.1**

- Listed wall furnaces shall be installed per manufacturer's installation instructions. 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, 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
  - $\leq 12"$  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 be installed in accordance of manufacturer's installation instructions and vent terminated min. 12" above ground, 6" from to opening for 10K Btu or less, 9" for  $> 10K$  up  $< 50 K$  Btu, and 12" for more than 50K Btu
- Removable panels, grilles, and access doors for servicing operations shall not be attached to the building, also see Section 802 for venting



## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Wall Furnace 907 (Continued)**

#### ❑ 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 building

#### ❑ Combustion and Circulating Air

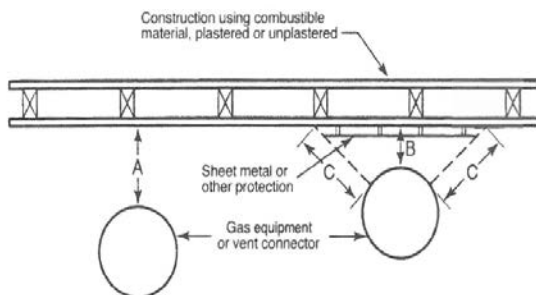
- Min. 50cuft per 1,000Btu per hour

**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:

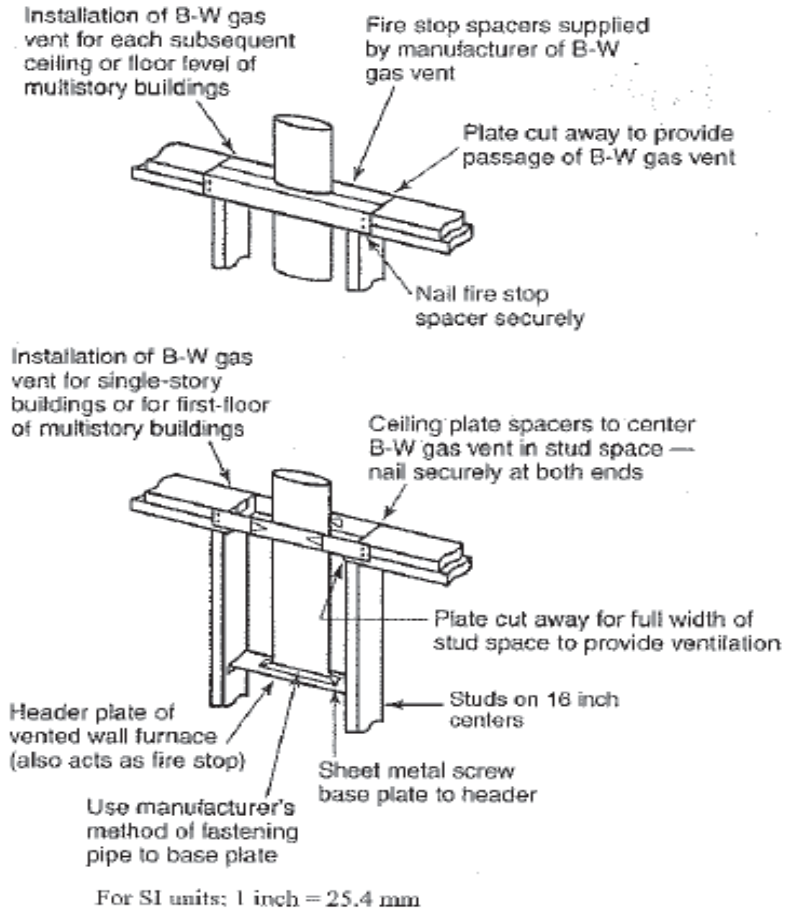
<sup>1</sup> A – Equals the clearance with no protection specified in Table 802.7.3.4 and Table 904.2 and in the sections applying to various types of appliances

<sup>2</sup> B – Equals the reduced clearance permitted in accordance with Table 303.10.1.

<sup>3</sup> The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

**FIGURE 303.10.1(1)<sup>1,2,3</sup>**  
**EXTENT OF PROTECTION NECESSARY TO REDUCE**  
**CLEARANCES FROM GAS APPLIANCES OR VENT CONNECTORS**  
[NFPA 54: FIGURE 10.3.2.3(a)]

## **MECHANICAL ROUGH INSPECTION (Continued)**



**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**

- When located in bedrooms or bathrooms 904.1
  - In a closet located in the bedroom or bathroom with a listed self-closing and gasketed door assembly and combustion air obtained from the outdoors
  - Or direct-vented type
- Clearance 904.2
  - Listed central heating furnaces per manufacturer's instructions

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Central Heating Furnaces 904 (Continued)**

- Clearance 904.2 (Continued)
  - Unlisted central heating furnaces from combustible materials per Table 904.2 unless manufacturer's instructions allow reduction
  - Listed and 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  $\leq 2''$
  - The clearance to these appliances shall not interfere with combustion air, draft hood clearance and relief, and accessibility for servicing
  - Supply air ducts connecting to listed central heating furnaces shall have the same minimum clearance to combustibles as required for the furnace supply plenum for a distance of min. 3' from the supply plenum
  - Supply air ducts connecting to unlisted central heating furnaces equipped with temperature limit controls with a max. setting of 250°F shall have a min. 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 an 8' ceiling height, where ceiling height  $> 8'$ , the volume shall be calculated on the basis of an 8' ceiling 303.2

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **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 serviced from the access within 12" of the appliance
  - Provide a permanent receptacle outlet within 25' of furnace and a lighting fixture near the appliance with switch controlling the light fixture located at the access entrance
  - Disconnect locates adjacent to and within sight of furnace
  - Verify manufacturer's instructions for spark shield in front of fire box on horizontal installation
  - Vertical installation requires min. 5' headroom in attic

### **Equipment and Appliances on Roofs 303.8**

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

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Equipment and Appliances on Roofs 303.8 (Continued)**

#### **□ Electrical Power**

- Provide a readily accessible disconnect within sight
- Provide a GFCI receptacle on the roof adjacent to the equipment on the supply side of the disconnect switch
- Access to Equipment on Roof 304.3
  - Buildings over 15' in height shall have an inside means of access to the roof
    - a. Door or Scuttle - Min. 22" x 24" opening
    - b. 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
    - a. A permanent lighting at roof access
    - b. Switch for such lighting shall be located inside the building near the access
  - Standing Water
    - a. Water sealed walkway, platform or both shall be elevated above waterline located adjacent to the equipment and control panels

### **Furnaces Located in Garages 305.1**

#### **□ Protect Against Damages**

- Burners and 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

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Furnaces Located in Garages 305.1 (Continued)**

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

### **Decorative Appliances in Vented Fireplaces 911.0**

- ❑ Prohibited Locations 911.1
  - Bathrooms
  - 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 instructions
    - Unlisted appliance installed in a vented fireplace requires permanent free opening based on appliance input rating and chimney height per Table 907.2
- ❑ Fireplace screen is required

### **Vented Gas Fireplaces 912.0**

- ❑ Any newly installed gas fireplace shall be direct-vent, sealed combustion type (HCD1, HCD2)
- ❑ Installation
  - Listed vented gas fireplaces install per manufacturer's installation instructions

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Vented Gas Fireplaces 912.0 (Continued)**

- Installation (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 and Draft Hood Clearances**

Table 802.7.3.4 & 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 802.10.2.4
  - Max. 2 sizes larger than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Vent Connectors 802.10 (Continued)**

- Additional Requirements for Multiple Appliance Vent 803.2
  - Use Tables 803.2(1) through 803.2(9) 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 and wyes
  - Maximum horizontal length shall be 18" per inch of connector diameter as per Table 803.2.1

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

<b>TABLE 802.7.3.4(1) CLEARANCE FOR CONNECTORS</b>				
<b>APPLIANCE</b>	<b>LISTED TYPE B GAS VENT MATERIAL</b>	<b>LISTED TYPE L VENT MATERIAL</b>	<b>SINGLE WALL METAL PIPE</b>	<b>FACTORY- BUILT CHIMNEY SECTIONS</b>
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 Appliances 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



## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Vent Connectors 802.10 (Continued)**

- ❑ Unlisted Single Wall Vent Connectors 802.10.7
  - Min. 6" clearance to combustibles
  - Min. 26ga galvanized or min. 0.027" thick 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

### **Length and Slope of Vents 802.6.2.1 & 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 where 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 Gas Vents 802.6.3.3**

- ❑ Vent for listed Category I - natural draft appliances per manufacturer's instructions 802.6.3.1 1-5
- ❑ 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 and vents sized by Tables 803.1.2(1)-(15) or engineered methods
  - Min. 6' in height
- ❑ Direct Vent Appliance Clearances 802.8.2
  - Min. 12" above grade at the bottom of vent terminal and air intake

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Vent Terminations 802.6.2 (Continued)**

- Direct Vent Appliance Clearances 802.8.2 (Continued)
    - Min. 6" for appliances with  $\leq 10,000\text{Btu/h}$  input from vent terminal to opening into the building
    - Min. 9" when the input is  $> 10,000\text{Btu/h}$  to  $\leq 50,000\text{Btu/h}$
    - Min. 12" when the input is  $> 50,000\text{Btu/h}$
  - Vent Termination Clearances from the Building 802.6.2
    - Vents  $\leq 12"$  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' 802.6.2.6
    - 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
- Exceptions:
- Combustion air intake of a direct-vent appliance
  - Separate outdoor air inlet and flue gas discharge of listed outdoor appliance
  - Min. 4' below, 4' horizontally from, or 1' above a door, operable window, or gravity air inlet into a building and min. 1' above grade for other than direct-vent appliance 802.8.1

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Combustion Air Requirements 701.1**

- Indoor Opening Size and Location 701.5
  - Combining Spaces on the Same Story
    - Min.  $1 \text{ in}^2$  per 1,000Btu/h of total input rating for appliances in the spaces but not less than  $100 \text{ in}^2$  for each opening
    - Top opening to commence 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.  $2 \text{ in}^2$  per 1,000Btu/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  $50 \text{ ft}^3$  or more per 1,000Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space
  - Confined spaces 205
    - Space volume is less than  $50 \text{ ft}^3$  per 1,000Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space
- Two (2) Permanent Openings Method for Outdoor Combustion Air: 701.6.1
  1. Commencing within 12" of the top of the enclosure
  2. Commencing 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.  $1 \text{ in}^2$  per 4,000Btu/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.  $1 \text{ in}^2$  per 2,000Btu/h of input for appliances in the enclosure

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Combustion Air Requirements 701.1 (Continued)**

- ❑ One (1) Permanent Opening Method 701.6.2
  - Commencing within 12" of the top of the enclosure
  - Clearances to the Appliance
    - Min. 1" from the sides and back
    - Min. 6" from the front
  - Opening shall be directly communicating with the outdoors with either a vertical or horizontal duct
    - 1 in<sup>2</sup> Per 3,000 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 701.10.1
  - Min. 1/4" mesh
- ❑ 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 and Laundry Room Ventilation**

- ❑ Bathrooms with showers, spas and/or tubs require mechanical ventilation at min. 50cfm intermittent ventilation exhaust air-flow ASHRAE 62.2 Section 5, CMC 402.5, CRC R303.3
- ❑ Toilet rooms other than part of bathrooms and laundry rooms without dryer duct ASHRAE 62.2-6.7
  - Min. 4% of the room floor area and
  - Not less than 1.5ft<sup>2</sup> openable ventilation area
  - Or mechanical ventilation at min. 50cfm intermittent ventilation exhaust air flow or min. 20cfm continuous ventilation exhaust air flow

## **MECHANICAL ROUGH INSPECTION (Continued)**

### **Bathroom, Toilet Room and Laundry Room Ventilation (Cont.)**

- ❑ Back-draft dampers are required except when it must operate continuously 504.1.1
- ❑ Duct Termination 502.2.2
  - Extend to exterior of the building 504.1
  - Min. 3' from the property line and openings into the building 502.2.2

### **Kitchen Ventilation ASHRAE 62.2-6.6.1**

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

### **Whole-Building Ventilation ASHRAE 62.2-4.1**

- Required cfm based on number of bedrooms and floor area ASHRAE 62.2-Tables 4.1(A) & (B)

### **Condensate Waste**

- ❑ Plastic condensate lines may only serve up to 2-story per CPC
- ❑ Secondary drain shall be piped to a readily observable location, or a water detecting device that will shut off the equipment or appliance in the event the primary drain is blocked 312.2

## **MECHANICAL 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 and connectors on site
  - Drywall complete
  - Verify gas gauge is set at min. 10psi on a max. 15lb gas gauge with 1/10th of a pound increments for 15 minutes
- ☐ Verify sediment trap at following locations
  - Water heaters
  - Central forced air furnaces (not wall furnaces)

### **Ventilation per Rough**

- ☐ Bathrooms
- ☐ Toilet and laundry rooms
- ☐ Kitchens

### **Domestic Ranges and 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"  
921.3, 921.4
  - Verify manufacturer's instructions
  - Verify anti-tip device in place, installed per manufacturer's specifications

## **MECHANICAL FINAL INSPECTION (Continued)**

### **Microwave above Range**

- ❑ Recirculation fan not compliant

### **Domestic Clothes Dryers 504.3**

- ❑ Vent
  - Min. 4" diameter duct
  - Max. 6' of exposed flex duct 504.4.2.2
  - Max. 35' of smooth rigid duct without screws
  - Verify back-draft damper without screen at termination 504.4
  - Min. 3' at termination to property line and house openings 502.2.1
- ❑ Make Up Air
  - Verify manufacturer's instructions
  - Min. 100in<sup>2</sup> when enclosed in a closet or similar environment 701.5

### **Furnaces**

- ❑ Single wall flue and unlisted vent connectors are not allowed in concealed spaces 802.7.3.2
- ❑ Verify manufacturer's instructions for clearances and type of flues and sheet metal in front of the fire box
- ❑ Verify condensate trap, vent drain and drywell or other approved indirect waste method 310
- ❑ Verify protection against damage when it is installed in the garage 305.1
- ❑ Min. R-8 insulation for ducts in un-condition spaces
- ❑ Verify if unit had to be elevated when there is no guard or in a flood zone
- ❑ 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

## **MECHANICAL FINAL INSPECTION (Continued)**

### **Air Conditioning Compressors**

- ❑ Verify setbacks, easements, and not allowed within 5' of property line
- ❑ Verify equipment is elevated per 1105.2
  - Min. 3" base
- ❑ Verify drywell and secondary drain/moisture switch

### **Terminations**

- ❑ Verify exposed terminations to be protected from the elements, their heights and clearances
- ❑ Verify if it clears 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**

##### **2016 California Electrical Code**

Based on the 2014 National Electrical Code

## **SERVICE INSPECTION**

### **For Service Sizes of 100, 125, 150, 200, and 400 Amp**

- ❑ Service Entrance Conductor Size - Tables 310.15(B)(16) & 310.15(B)(7)
- ❑ 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 and eccentric knock-outs
  - Grounding locknut, grounding wedge, or Meyers hub not allowed at partially punched concentric and 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  $\geq$ 4:12 pitch 230.24(A) exception 2
  - Min. 18" at eaves 230.24(A) exception 3
  - Min. 10' above walkways 230.24(B)(1)
  - Min. 12' above driveways 230.24(B)(2)
  - Min. 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 250.6(E)
  - Metal flex is not allowed
- ❑ Cold Water Piping System
  - Bond within 5' of entering building of metal water service 250.68(C)(1)

## **SERVICE INSPECTION (Continued)**

### **For Service Sizes of 100, 125, 150, 200, and 400 Amp (Continued)**

- ❑ Main Service Grounding Electrode 250.52
  - Concrete Encased Electrode 250.52(A)(3)(1) & (2)
    - Min. 20' long 1/2" (#4) continuous rebar
    - Min. 20' long #4 AWG copper conductor
  - Rod and 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

NEC250.66: Where ground rod is the sole electrode or supplement a metallic water main (electrode), verification letter stating the resistance to earth max. 25ohms, or another ground rod required min. 6' apart
- ❑ 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" W x 36" D x 78" H in front of service Table 110.26(A)(1) & 110.26(A)(2) & (3)
  - Height exception when service is  $\leq 200\text{amp}$
- ❑ Meter Height (PG&E Requirements)
  - Exterior non-pole-mounted—Min. 48" and max. 75" from standing surface to center of meter
  - Enclosed or indoor installation—Min. 36" and 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

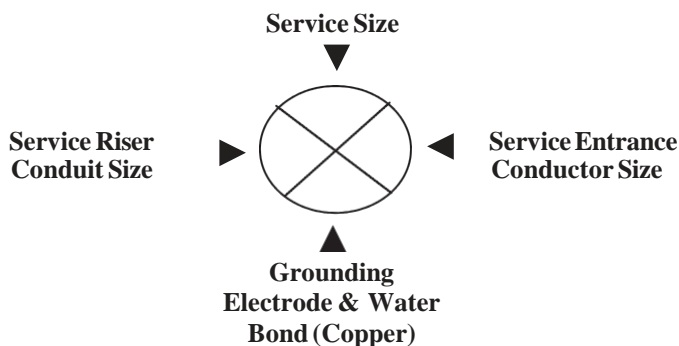
## **SERVICE INSPECTION (Continued)**

### **For Service Sizes of 100, 125, 150, 200, and 400 Amp (Continued)**

- ❑ Circuit Breaker
  - Height - Max. 6'-7" above standing surface 404.8(A)
  - AFCI protection required if branch circuit wiring extended more than 6' or modified to include any additional outlets or devices (210.12 (B))
- ❑ 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 250.2(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)
  - Bond metallic piping systems to subpanel enclosure, equipment grounding conductor, or grounding electrode 250.104(A)(3)

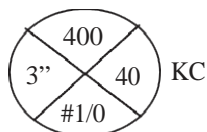
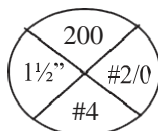
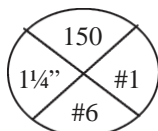
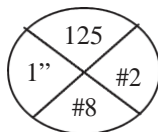
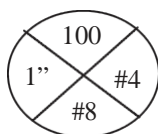
## **SERVICE INSPECTION (Continued)**

**For Service Sizes of 100, 125, 150, 200, and 400 Amp  
(Continued)**

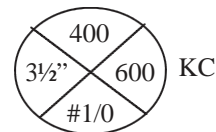
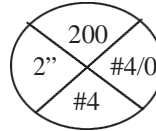
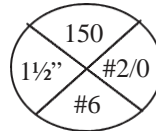
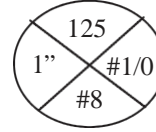
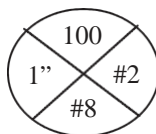


### **Residential 310-16 - Note 3**

#### **Copper**



#### **Aluminum**



**TABLE 310.15(B)(16) – (Formerly 310.16) ALLOWABLE AMPACITIES OF INSULATED RATED UP AND INCLUDING 2,000 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)\***

Size AWG or kcmil	TEMPERATURE RATING OF CONDUCTOR (See Table 310.104(A))						Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
	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	
18**	-	-	14	-	-	-	-
16**	-	-	18	-	-	-	-
14**	15	20	25	-	-	-	-
12**	20	25	30	15	20	25	12**
10**	30	35	40	25	30	35	10**
8	40	50	55	35	40	45	8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	350	420	475	285	340	385	600
700	385	460	520	315	375	425	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	445	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	525	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	555	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

\* Refer to 310.15(B)(2) for the ampacity correction factors where the ambient temperature is other than 30°C (86°F)

\*\* Refer to 240.4(D) for conductor overcurrent protection limitations

<b>TABLE 250.66 GROUNDING ELECTRODE CONDUCTOR FOR ALTERNATING-CURRENT SYSTEMS</b>			
<b>Size of Largest Underground Service-Entrance Conductor or Equivalent Area for Parallel Conductors<sup>1</sup> (AWG/kcmil)</b>		<b>Size of Grounding Electrode Conductor (AWG/kcmil)</b>	
<b>Copper</b>	<b>Aluminum or Copper-Clad Aluminum</b>	<b>Copper</b>	<b>Aluminum or Copper-Clad Aluminum<sup>2</sup></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:**

- Where multiples 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.
  - 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.
- 1 This table also applies to the derived conductors of separately derived AC systems
  - 2 See installation restrictions in 250.64(A)

**TABLE 250.122 MINIMUM SIZE EQUIPMENT GROUNDING  
CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT**

<b>Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)</b>	<b><u>Size (AWG or kcmil)</u></b>	
	<b>Copper</b>	<b>Aluminum or Copper-Clad Aluminum<sup>1</sup></b>
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	800
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

- 1 See installation restrictions in 250.120



## Minimum Cover Requirements Table 300.5

- Min. 24" for underground cables
- Min. 18" from 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	0	0	0	0	0	0	0	0
	(in raceway only)						(in raceway only)		(in raceway only)	
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	6	150	6
							(direct burial)		(direct burial)	
							100	4	100	4
							(in raceway)		(in raceway)	
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

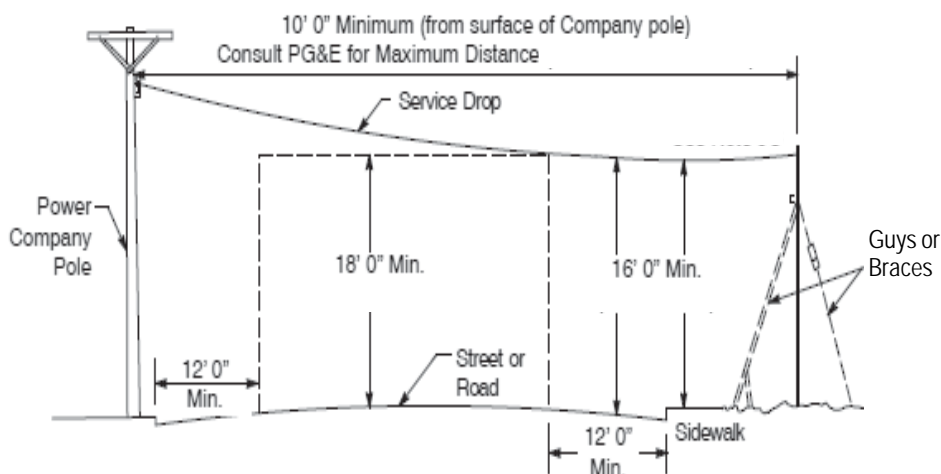
### Notes:

- 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.
- Raceways approved for burial only where concrete encased shall require concrete envelope not less than 50 mm (2 in.) thick.
- Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
- 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.
- 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.

## **SERVICE INSPECTION (Continued)**

### **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
- ❑ Verify grounding and bonding of pole
- ❑ Verify grounding and bonding of grounding electrode raceways
- ❑ Verify main disconnect at service and remote panel boards 225.33 & 230.71
- ❑ Verify GFCI protection of all receptacles 590.6(A) & (B)
- ❑ Verify size of service entrance conductors 310.15 & Table 310.16
- ❑ Verify weatherproof equipment 406.8(B) & 408.37 (i.e., receptacles and panel boards in wet locations)
- ❑ Issue temporary power meter release upon approval



## **ELECTRICAL ROUGH INSPECTION**

### **Receptacle Requirements**

- ❑ General Receptacle Locations and Spacing 210-52 (A)
  - Measure max. 6' horizontally of any wall surface to a receptacle
  - $\geq 2'$  Wide wall requires min. 1 receptacle
  - Max. 18" of wall for floor receptacles to be counted as part of the required receptacles
- ❑ Kitchen Receptacles 210.52 (C)
  - Counter with 12" or more wide, max. 24" to a receptacle and max. 20" above the counter surface
  - Min. 1 receptacle for island counter that is 12" x 24" and larger
  - Min. 1 receptacle for peninsula counter that is 12" x 24" and larger
  - Max. 12" below countertop and max. 6" overhang
- ❑ Bath Receptacles 210.52 (D)
  - Max. 3' from the outside edge of each basin
  - Max. 12" below countertop
- ❑ Outdoor Receptacles 210.52 (E)
  - Min. 1 receptacle at the front and back of the dwelling
  - Max. 6'6" above grade
  - Requirement applies to each unit for a duplex
  - Min. 1 receptacle at balcony, deck, and porch when accessible from inside the dwelling
- ❑ Laundry Area 210.52 (F)
  - Min. 1 receptacle for the laundry
- ❑ Basements, Garages and Accessory Buildings 210.52 (G)
  - Min. 1 receptacle in addition to dedicated circuits for equipment in each basement, attached or detached garage, and accessory building with electric power
  - Min. 1 receptacle in each unfinished portion of a partially finished basement
  - Min. 1 EV Branch Circuit in garage per CA Energy code, shall be dedicated (210.17)

## **ELECTRICAL ROUGH INSPECTION (Continued)**

### **Receptacle Requirements (Continued)**

- Hallways 210.52 (H)
  - Min. 1 receptacle when hallways are more than 10' long
  - Foyer is not part of a hallway, when it is greater than 60ft<sup>2</sup> a receptacle is required in each wall space  $\leq 3'$  wide
- Attics and Crawl Spaces
  - Min. 1 receptacle is required in addition to dedicated furnace circuit if located in these areas

### **GFCI Protected Receptacle Requirement 210.8(A)**

- 15Amp GFCI Receptacles (Interruption shall be in readily accessible locations)
  - Garages and accessory buildings
  - Outdoors except not readily accessible and dedicated circuits for equipment
  - Crawl spaces
  - Unfinished basements except for supply to a permanent fire alarm or burglar alarm system
  - Within 6' of sinks other than kitchen sinks
  - Dishwasher circuit (210.8(D))
  - Screen rooms
  - Laundry rooms/areas
- 20Amp GFCI Receptacles 210.11(C)
  - Bathrooms
  - Kitchens - Small appliance circuits
  - Laundry rooms/areas
- AFCI Protected Receptacle Requirement 210.12(A)
  - All 120V, 15A and 20A circuits
    - Kitchens
    - Family rooms
    - Dining rooms
    - Living rooms
    - Parlors
    - Libraries
    - Dens
    - Bedrooms
    - Sunrooms
    - Recreation rooms
    - Closets, Hallways
    - Laundry areas/rooms
    - Or similar rooms or areas
- Combination-Type
  - Except individual circuit to a fire alarm system

## **AFCI Protection Methods**

<b>AFCI PROTECTION METHOD</b>	<b>ADDITIONAL INSTALLATION REQUIREMENTS</b>
210.12(A)(1) Combination type AFCI circuit breaker installed at the origin of branch circuit	No additional requirements
210.12(A)(2) Branch/feeder type AFCI circuit breaker installed at origin of branch circuit, <u>PLUS</u> , outlet branch circuit type AFCI device installed at first outlet in branch circuit	Marking of first outlet box in branch circuit
210.12.(A)(3) Supplemental arc protection type circuit breaker installed at origin of branch circuit, <u>PLUS</u> , outlet branch circuit type AFCI device installed at first outlet in branch circuit	<ol style="list-style-type: none"> <li>1. Continuous branch circuit wiring</li> <li>2. Home run conductor length to the first AFCI outlet restricted (14 AWG- 50ft, 12 AWG-70ft)</li> <li>3. Marking of the first outlet box in branch circuit</li> </ol>
<p>210.12.(A)(4) Branch circuit over-current protective device, <u>PLUS</u>, outlet branch circuit type AFCI device installed at first outlet in branch circuit.</p> <p>The combination of devices must be listed and identified to provide <i>system combination type arc-fault protection for the "home run" conductors</i>.</p>	<ol style="list-style-type: none"> <li>1. Continuous branch circuit wiring</li> <li>2. Home run conductor length to the first AFCI outlet restricted (14 AWG-50ft, 12 AWG-70ft)</li> <li>3. Marking of the first outlet box in branch circuit</li> </ol>
210.12.(A)(5) Outlet branch circuit type AFCI device installed at first outlet in branch circuit	Branch circuit conductors installed in RMC, IMC, EMT, Type MC, or steel-armored type AC cables and metal outlet and junction boxes to the first AFCI outlet
210.12.(A)(6) Outlet branch circuit type AFCI device installed at first outlet in branch circuit	Branch circuit conduit, tubing or cable encased in min. 2" of concrete from origin to the branch circuit to the first outlet

## **ELECTRICAL 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
- ❑ 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
  - 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)

### **Closet Light Clearance to Storage Area 410.16(C)**

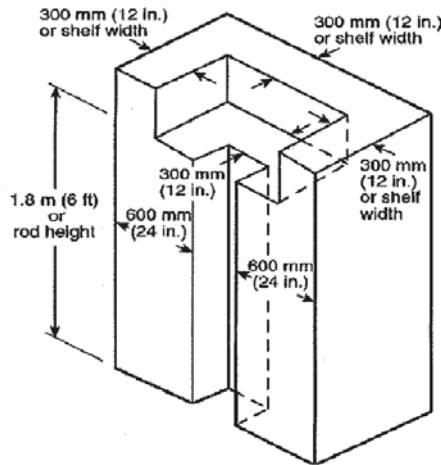
- ❑ Closet Storage Space 410.2

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

  - 12" For surface-mounted enclosed incandescent or LED 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

## **ELECTRICAL ROUGH INSPECTION (Continued)**

### **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
  - 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
- ❑ Garage, Laundry and Utility Room 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

## **ELECTRICAL ROUGH INSPECTION (Continued)**

### **Mandatory Energy Features and Devices (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
- ❑ Box Fill - light junction box fill Table 314.16(B)
- ❑ Unused opening must be closed 314.17(A)
- ❑ Paddle fan support-listed fan box required for fan weigh more than 35lbs and not more than 70lbs 314.27(C) (Note on correction notice for number of fan boxes installed and their locations)

<b>Table 314.16(B) Volume Allowance Required per Conductor</b>	
	<b>Free Space Within Box for Each Conductor</b>
<b>Size of Conductor (AWG)</b>	<b>In<sup>3</sup></b>
14	2.00
12	2.25
10	2.50
8	3.00
6	5.00



## **ELECTRICAL ROUGH INSPECTION (Continued)**

### **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 and notches, otherwise provide a nail plate 330.4(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 330.14

### **Hydro-Massage Bathtubs 680.70**

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

## **ELECTRICAL ROUGH INSPECTION (Continued)**

### **Required Circuits**

- ❑ Min. 2-20amp small appliance circuits serving the kitchen, pantry, breakfast room, dining room, or similar area 210.52(B)
  - Equally divide kitchen counter receptacles into each of the 2 circuits
  - No other outlets allowed to be served by these small appliance circuits
- ❑ Min. 1-20amp 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. 1-20amp 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

## **ELECTRICAL 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 and trash compactors - Min.3' and max. 4' 422.16(B)(1)
  - Garbage disposals and range hoods - Min. 18" and max. 36" 422.16(B)(2) & (4)
- ❑ Verify closet light clearance 410.16
- ❑ Verify circuit breakers in panels are identified 408.4
- ❑ Verify motor disconnects 422.30

• Hydro-Massage 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 410.4(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

## **ELECTRICAL FINAL INSPECTION (Continued)**

- ❑ Verify Correct Receptacle Installation
  - Polarity
  - 15Amp versus 20amp GFCI receptacle at their required location
  - In-use box hoods for 15amp /20amp receptacle shall be listed and identified as “extra duty” (406.9(B))
- ❑ 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). Grounded and ungrounded of a circuit to be grouped by wire markers, or cable ties 200.4 (B).
  - Working clearances
  - Overhead clearances
  - Meter and breaker heights
  - Bonding and grounding
  - Service conductor and riser size
  - See Service Inspection for details

### **Electrical Vehicle Chargers**

- ❑ Verify calculations for services rated 125amps or less
- ❑ Verify manufacturer’s installation instructions
- ❑ Indoor locations coupling height 18”-48” AFF 625.29
- ❑ Outdoor locations coupling height 24”-48” AFF 625.30
- ❑ Verify ventilation requirements if needed per manufacturer’s instructions 625.15
- ❑ Verify branch circuit conductors sized 125% of max. load as noted by manufacturer 625.21
- ❑ Verify disconnect required for EV Charger rated more than 60amps 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. #8cu 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" and 6" below the subgrade
- Exceptions: All Conditions Apply
  - a. Listed self-contained, above ground hot tub/spa
  - b. Not identified as suitable for indoor use only
  - c. Installed per manufacturer's instructions and locate on above grade
  - d. 28" Min. from tub/spa's top rim to all surface within 30", measured horizontally, only non-conductive steps for entry and exit permitted
- 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, min. 9 square inches of corrosion-resistant conductive surface
- Diving board, ladders, pool covers, drain, etc.

### **Receptacles 680.22**

- ❑ Locate between 6' and 20' from the inside wall of pool
- ❑ GFCI protected

## **SWIMMING POOL (Continued)**

### **Lights 680.22**

- ☐ GFCI protected
- ☐ Pool/spa light potting 680.23(B)(4)
- ☐ Low-voltage landscape lighting, without grounding, not permitted within 5' from the inside wall of pool

### **Panels**

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

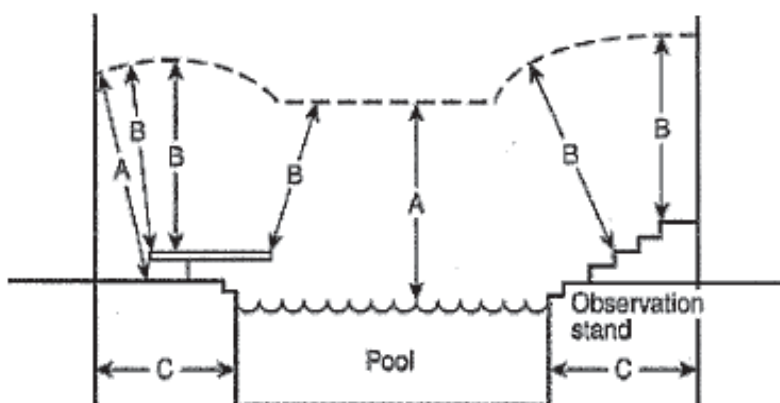
**Note: See Building portion for building requirements**

SWIMMING POOLS, OUTDOOR SPAS, AND HOT TUBS				
Equipment Location	Wiring Method	Equipment Grounding Required	Equipment Bonding Required	GFCI Required
Feeders (from Service to Subpanel) 680.25	<ul style="list-style-type: none"> <li>RMC/IMC</li> <li>RNMC/LFNCMC</li> <li>On/in buildings: EMT</li> <li>In buildings: ENT</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Insulated CU/AL</li> <li>Min. #12</li> <li>Table 250.122</li> </ul>	<b>No</b> <ul style="list-style-type: none"> <li>Not allowed within 5' of pool or spa</li> </ul>	<b>No</b>
Existing Feeders & Panel Boards 680.25 (A) Exception	<ul style="list-style-type: none"> <li>Same as feeders</li> <li>MC cable, LFMC/ other approved cable</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Same as feeders</li> <li>Insulated/covered</li> </ul>		
Wet-Niche 680.23(B) & No Niche 680.23(D) Fixtures from Forming Shell to J-Box & 680.23(F) Branch Circuit Supply	<ul style="list-style-type: none"> <li>Brass</li> <li>Approved corrosion-resistant RMC/IMC</li> <li>RNMC/LFNCMC w/ #8 encapsulated, insulated copper bonding jumper</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Insulated copper</li> <li>Min. #12 @ ≤20mps</li> <li>Min. #10 @ ≤60amps</li> <li>Size per Table 250.122 Equipment Grounding</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>#8 Solid copper to grid</li> <li>680.23(B)(1)</li> <li>680.26</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>680.23(A)(3)</li> <li>Limitations on locations</li> <li>680.24</li> </ul>
Dry-Niche Fixtures 680.23(C)	<ul style="list-style-type: none"> <li>Brass</li> <li>Approved corrosion-resistant RMC/IMC</li> <li>RNMC</li> <li>On/in buildings: EMT</li> </ul>	<ul style="list-style-type: none"> <li>Insulated, encapsulated, solid or stranded #8 CU bonding jumper at RNMC/LFNCMC</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>All metal forming shells</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>680.23</li> <li>Limitations on locations</li> <li>680.24</li> </ul>
Area Lighting Fixtures, Lighting Outlets & Ceiling Fans 680.22(B)	<ul style="list-style-type: none"> <li>Chapter 3 Method</li> <li>Clearances 680.22(B)</li> <li>Outdoors: 12' above within 5'</li> <li>Indoors: same as outdoors except enclosed fixtures or damp location fans on GFCI circuit: 7', 6" above</li> <li>Existing: 5' above water within 5', rigidly attached and GFCI protected</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Table 250.110</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>When within 5'</li> <li>680.22(B)(4)</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Unless 10' and rigidly attached 5' above water</li> <li>680.22(B)(4)</li> </ul>
Pool-Associated Motors, Pool Pump Motors 680.21 & Pool Cover Motors 680.27 (B)	<ul style="list-style-type: none"> <li>5' From pool</li> <li>RMC, IMC, RNMC/ MC cable listed for the application</li> <li>On/in buildings: EMT</li> <li>In buildings: Any Chapter 3 method with min. #12 insulated/covered equipment ground</li> <li>680.21(A)(4)</li> <li>Where flexibility required: MC cable, LFMC/LFNCMC permitted</li> <li>Cord &amp; plug: Max. 3' 680.21(A)(5)</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>680.21(A)(1)</li> <li>680.27(B)</li> <li>Min. #12 insulated CU</li> <li>Table 250.122</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>680.26(B)(4)</li> <li>#8 solid CU</li> <li>Grid to motor</li> <li>Non-grounded systems: motor to equipment ground</li> <li>Double insulated motors: Bond tail for future use required</li> </ul>	<b>Yes</b> <ul style="list-style-type: none"> <li>Table 680.27(B)(2)</li> </ul>

## **SWIMMING POOL (Continued)**

**TABLE 680.8  
OVERHEAD CONDUCTOR CLEARANCES**

	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 <u>Voltage to Ground</u>	
CLEARANCE PARAMETERS	FEET	FEET	FEET
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'		

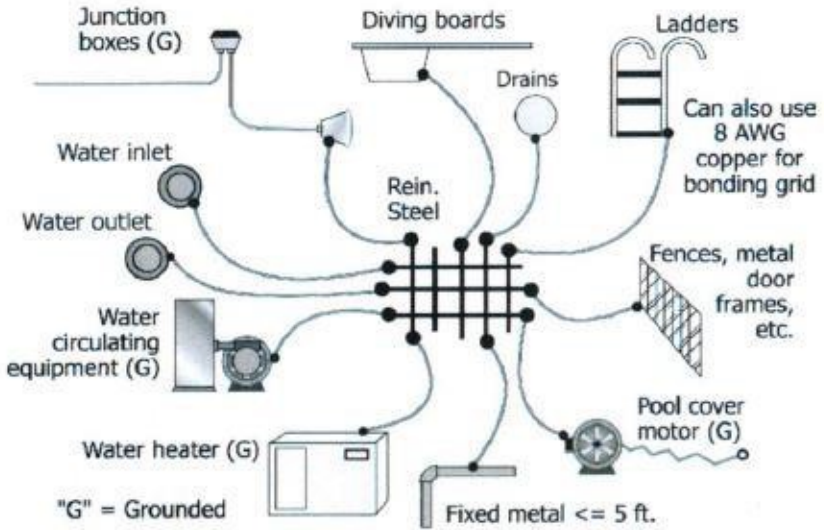


**Figure 680.8 Clearances from Pool Structures.**



## **SWIMMING POOL (Continued)**

### **EQUIPOTENTIAL BONDING GRID (680.26(C))**



Copyright © JAEI 2005

## **Building Inspector Final Inspection and work has been completed, but other items need to be completed, Paper work or Department clearances.**

If the only items left to final a permit are one or all of the following items listed below, put your results as a **Pending final compliance** under the 5060 code final inspection results. Results will have comments listed below that are required to final project. This means you will not return to the site for any inspections and Building is complete with project. The permit holder can final the permit by providing compliance with the comments listed for final building.

Plan Check and other staff can final the permit once documents or other departments have signed off based on the partial building compliance results.

- Pending Fire
- Pending Planning
- Pending Engineering
- Pending Code Enforcement
- Pending Health Department
- Pending Final Soils and Compaction letter
- Pending C&D Compliance
- Pending Cal Green Compliance
- Pending Smoke/Carbon Affidavit
- Pending Air balance report approval
- Pending ST&I Final compliance letter

