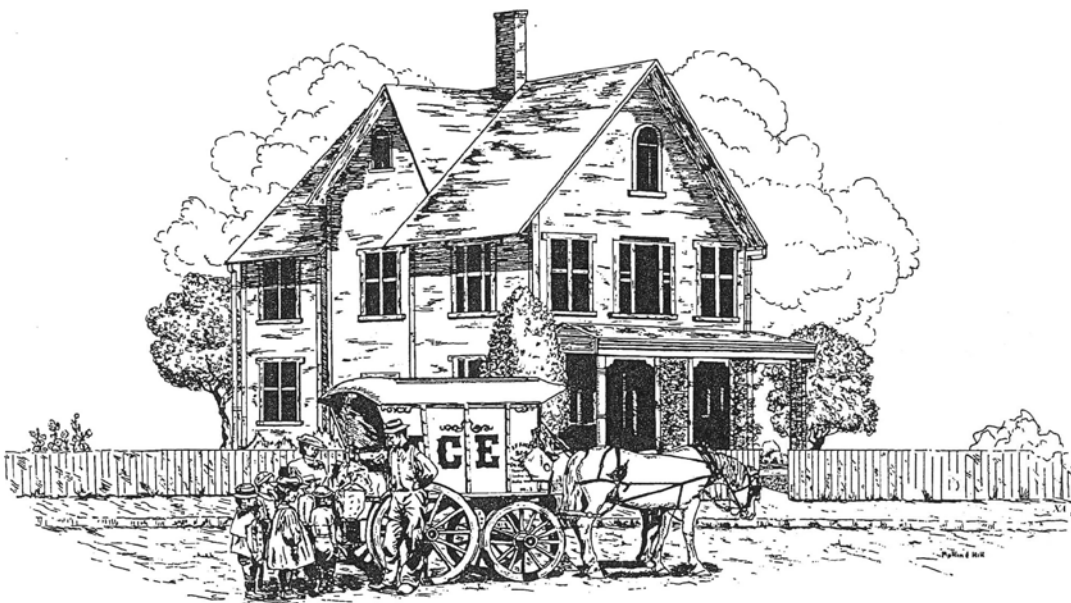


Guidelines

for Single-Family Residential
Construction in San Bernardino County



Building and Safety Division
Over 50 Years of Service



August, 2012

San Bernardino County Web Site: cms.sbcounty.gov

NOTE:

Please be advised sections in this Guidelines booklet are subject to change without notification. Contact the Building and Safety Division if you have questions.

NOTICE TO MOUNTAIN AREA RESIDENTS

AN EROSION AND SEDIMENT CONTROL ORDINANCE WHICH APPLIES TO YOUR AREA, REQUIRES THE SUBMISSION OF AN EROSION CONTROL PLAN FOR ANY CONSTRUCTION WHICH INVOLVES A LAND DISTURBING ACTIVITY. ALSO, SPECIAL SNOWLOADS APPLY TO MOUNTAIN CONSTRUCTION. CONTACT YOUR LOCAL BUILDING AND SAFETY OFFICE FOR A COPY OF THE SNOWLOAD RAFTERS/JOIST FRAMING TABLE FOR YOUR SPECIFIC AREA.

**COUNTY OF SAN BERNARDINO
BUILDING AND SAFETY DIVISION**

This booklet provides general information necessary to build or alter a dwelling in compliance with the San Bernardino County Codes. Please contact any of our offices for specific questions or additional information.

PERMITS: Permits are required to build, alter, repair, move or demolish any building and to do electrical, plumbing, heating, solar, and air conditioning work. Earthwork grading and driveway approaches also require permits. Permits may be obtained at your local Building and Safety Office (listed on the inside of the back cover). Be sure you have all the necessary permits before you start work.

Prior to any construction and/or land disturbing activity, obtain a Preconstruction Inspection or Erosion Control Permit and request an on-site inspection of your lot in order to obtain approval or clearance for subsequent building permits. Some areas are within zones where special studies may be needed. The specific requirements for your project can be obtained from your local Building and Safety office.

After the preconstruction or erosion control inspection is approved and the building permit is issued, any excavation that is less than two feet (2') in depth or does not create a cut slope greater than five feet (5') in height is exempt from a grading permit. Fills less than one foot (1') in depth or that do not exceed 50 cubic yards when less than three feet (3') in depth, not intended to support structures and do not obstruct a drainage course are also exempt from grading permits. Other grading projects not exempt will require permits. To obtain a grading permit, bring your grading plan into one of our offices for review.

You'll need plans prepared by a civil engineer if your job is over 5,000 cubic yards. Stop by for an information sheet describing when grading plans are required and the features needed on them.

PERMIT FEES: Permit fees for residential buildings and accessory buildings are based on the size of the building being built. We will be happy to provide more detailed fee information. There may be other fees, such as school fees, traffic fees or drainage fees due in your area. We can provide you with that information also.

ALTERATIONS AND ADDITIONS: If you intend to add to or otherwise remodel a building, contact your local Building and Safety office for a Prealteration Inspection before you apply for the permit. There is no charge for the prealteration inspection and it can help avoid problems that might occur during construction.

MOVING PERMITS: When a building is moved, there are a few additional steps in the application process. We need two photos (one of the front) and a termite certificate showing the building is free of termites. Be sure to bring them in when you apply for the relocation inspection. The permits for the location work can be obtained anytime before the building is moved. Ask your local office for a relocation application package.

PLANS: A set of plans includes a plot plan, foundation, floor, framing and roof plans; elevations, sections, details, specifications and energy information which consists of an energy compliance package, heating and cooling calculations and a list of mandatory features and devices. More detailed requirements for a set of plans can be obtained from any of our offices.

LEGAL DESCRIPTION: The legal description of your lot or parcel is a part of the application to build and can be found on your deed, title policy, escrow instructions or contract of sale. Lot surveys are recommended and often required. Your Assessor's Parcel Number is required in addition to the legal description and needs to be written on the application.

LOCATION ON PROPERTY: Yards are required around all dwellings. The front yard and other yards fronting on streets are determined by the width of the right of way. Side yards vary with the zone, fire hazard area and lot width. This information may be obtained at one of our offices.

PARKING AND GARAGES: All dwellings need to have two parking spaces. In most areas, those spaces and the driveway to them are paved. A parking space is 9 feet x 19 feet and at least one is required to be covered, (a minimum of 10 feet x 20 feet) except in the mountain areas. There are some exceptions that you may want to check on.

The private garage shall be separated from the dwelling unit and its attic area by means of a minimum ½-inch gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than a 5/8-inch Type X gypsum board or equivalent. Door openings between a private garage and the dwelling unit shall be equipped with either solid wood doors or solid or honeycomb core steel doors not less than 1-3/8 inches (34.9 mm) thick. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Doors shall be self-closing and self-latching.

BUILDING SIZES: Residential structures located on lots greater than thirty feet (30') in width and greater than five thousand (5,000) sq. ft. in area, require a minimum living area of seven hundred twenty-five (725) sq. ft., with a minimum floor width and depth each averaging twenty feet (20'). All measurements are from the exterior of the structure.

Residential structures located on lots of thirty feet (30') or less in width or five thousand (5,000) sq. ft. or less in area, require a minimum living area of six hundred (600) sq. ft., with a minimum floor width of fifteen feet (15'). All measurements are from the exterior of the structure.

Some exceptions are allowed under our Alternate Housing Standards, check with your local Building and Safety Office to see if they apply.

ROOM SIZES: The main room in a dwelling needs to have a minimum 120 sq. ft. of floor area. Other rooms except kitchens need only be 70 sq. ft. in area exclusive of cabinets or other built-ins. These rooms need not be wider than 7 ft. A 30 in. wide compartment with 24 in. of clear space in front of the toilet is necessary for a toilet compartment.

CEILING HEIGHT: The ceiling in living rooms, bedrooms and other habitable rooms is at least 7 ft. above the floor including halls, laundries, kitchens and storerooms. Bathrooms need only be 6 ft. 8 in. For rooms with sloping ceilings, the code requires only that the prescribed ceiling height be maintained in one-half the area of the room. However, no portion of the room which has a ceiling height of less than 5 feet shall be used in the computations for minimum floor area. In the case of a room with a furred ceiling, the code requires the prescribed ceiling height in two thirds of the area and, as in all cases for projections below the ceiling, the furred area may not be less than 7 feet above the floor.

ATTIC ACCESS AND VENTILATION: In order to get into the attic for repairs and maintenance, a 20 in. x 30 in. scuttle is required for attics 30 in. or more in height. Enclosed attics and enclosed rafter spaces shall have cross ventilation for each separate space by ventilated openings protected against the entrance of rain and snow. A minimum of 1" air space shall be provided between the insulation and the roof sheathing. The net free ventilating area shall not be less than 1/150 of the area of the space ventilated. The required ventilation may be decreased to 1/300 provided a vapor retarder having a transmission rate not exceeding 1 perm is installed. If the attic is used as a source of combustion air for gas fired appliances refer to the combustion air requirements under the heating and air conditioning section in this booklet. Cover these openings with rust resistant wire netting with ¼ inch mesh or in the fire safety overlay areas, use 1/8" mesh.

WINDOWS: All habitable rooms need windows for natural light. Kitchen and bathrooms are an exception and may use artificial light. To determine the area of the required windows, multiply the floor area of the room by 8% (0.08).

An exterior exit door out of a bedroom is not required if one of the windows has a 20 in. wide openable area of at least 5.7 sq. ft. The opening height needs to be at least 24 in. and the sill no more than 44 in. above the floor (the two dimensions alone, 20 x 24, do not provide the required 5.7 sq. ft. of openable area). See Table below. If the sill height of the required net opening is no more than 44" above or below the finish grade, a 5.0 sq. ft. net opening is allowed.

**MINIMUM NET CLEAR OPENING TABLE
FOR ESCAPE/RESCUE WINDOWS**

NET WIDTH	X	NET HEIGHT	=	TOTAL SQ. FT.
20" min.	X	41¼"	=	5.73
21"	X	39¼"	=	5.72
22"	X	37½"	=	5.73
23"	X	36¾"	=	5.72
24"	X	34¾"	=	5.71
25"	X	33"	=	5.73
26"	X	31¾"	=	5.73
27"	X	30½"	=	5.72
28"	X	29½"	=	5.74
29"	X	28½"	=	5.74
30"	X	27½"	=	5.73
31"	X	26½"	=	5.70
32"	X	25¾"	=	5.72
33"	X	25"	=	5.73
34¾"	X	24" min.	=	5.71
NET WIDTH	X	NET HEIGHT	=	TOTAL SQ. FT.

Ventilation may be by either mechanical or natural means. To determine the area of openable exterior openings for natural ventilation, multiply the floor area of each room by 4% (0.04). (See above for bedroom exits.) For mechanical ventilation, provide a system that will completely change the air in each room every 30 minutes, with a minimum of 15 cubic feet per minute of outside air per occupant in dwellings (the occupant load of a dwelling will be based on 200 sq. ft. per occupant). For bathrooms, the minimum opening is 4% of the floor area. Manually switched mechanical ventilation for bathrooms shall be exhaust ventilated with at least 50 cubic foot per minute to the outside.

STAIRWAYS: Stairs in dwellings need only be 36 in. wide. The height of the risers should not exceed 7 ¾ in. and the tread should be at least 10 in. Open sides of stairways and landings more than 30 in. above floor or grade below require guards with balusters or ornamental patterns such that a 4-inch-diameter sphere cannot pass through any opening. On landings and balconies guards shall be 42 in. high and on stairs 34 to 38 in. high.

Openings for required guards on the sides of stair treads shall not allow a sphere of 4.375 inches (4 3/8") to pass through. It can also serve as the handrail for stairs if the top rail has an approved gripping surface. The headroom clearance, measured vertically from the nosings of the treads, must be at least 6 ft. 8 in.

FIRE SPRINKLER REQUIREMENTS

R313.2 One- and two-family dwellings automatic fire systems. An automatic residential fire sprinkler system shall be installed in one- and two-family dwellings.

Exception: An automatic residential fire sprinkler system shall not be required for additions or alterations to existing buildings that are not already provided with an automatic residential sprinkler system.

R313.2.1 Design and installation. Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section R313.3 or NFPA 13D.

R313.3 Dwelling Unit Fire Sprinkler Systems.

R313.3.1 General. Where installed, residential fire sprinkler systems, or portions thereof, shall be in accordance with NFPA 13D or Section R313.3, which shall be considered equivalent to NFPA 13D. Section R313.3 shall apply to stand-alone and multi-purpose wet-pipe sprinkler systems that do not include the use of antifreeze. A multipurpose fire sprinkler system shall supply domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. A backflow flow preventer shall not be required to separate a stand-alone sprinkler system from the water distribution system.

FIRE WARNING SYSTEMS: To warn you when a fire starts while you are sleeping, an approved smoke detector with an audible alarm is required. Install the detectors in accordance with the approved manufacturer's instructions. Locate the detectors in each bedroom, in the hallway or area leading to bedrooms, in basements, and at least one on each floor. When bedrooms are above the first floor, a detector is required to be placed at the ceiling of the upper level in close proximity to the stairway. Other conditions such as ceilings of different height require special treatment. Contact us for these additional requirements.

CARBON MONOXIDE ALARMS

R315.1 CARBON MONOXIDE ALARMS: For new construction, an approved carbon monoxide alarm shall

be installed in dwelling units and in sleeping units within which fuel-burning appliances are installed and in dwelling units that have attached garages.

FIRE SAFETY OVERLAY AREAS: In high fire hazard areas, there are special requirements for roofing and exterior construction. Check with us to see if your property is located in one of these designated areas. The Fire Department may place conditions on the construction. A Fire Department Project Condition Letter is required for most construction activity.

ENERGY CONSERVATION: Energy conservation standards have been established by the State. Due to the climatic extremes in our County, there are no typical designs which would apply to all locations. The standards for insulation, windows and orientations will vary according to the compliance approach chosen as well as the climate zone. Contact any of our offices for clarification of the minimum information necessary for compliance.

Mandatory features for all residential buildings:

1. Weather-strip exterior doors and windows.
2. Caulk and seal joints and penetrations to unconditioned areas.
3. Manufactured doors and windows to be certified and labeled.
4. Exhaust fans need damper controls.
5. For fireplaces:
 - a) Tight-fitting, closeable metal or glass door(s).
 - b) Outside air intake with dampers and controls in fireplaces located on the outside walls or over wood floors.
 - c) Flue dampers and controls.
 - d) No continuous burning gas pilots.
6. Vapor barriers in Upper Desert and Mountain areas.
7. Insulate heating and air conditioning ducts.
8. Automatic setback thermostats for heating and cooling system.
9. Wrap storage type water heater and storage and backup solar water heaters with R-12 insulation.
10. Insulate the first 5 feet of hot and cold water pipes closest to the water heater with R-12 insulation.
11. Gas cooking appliances equipped with intermittent ignition devices.
12. Use fluorescent fixtures or another approved energy saving means for all lighting.
13. Slab edge insulation should be water and vapor resistant.
14. Heating and air conditioning equipment, water heaters, shower heads and faucets to be certified by the California Energy Commission (CEC).
15. Insulation to meet CEC standards and be listed.

NOISE INSULATION: Noise insulation is necessary in the floors and walls between various units in multiple family dwellings. Contact us for detailed requirements.

WOOD FRAME CONSTRUCTION

SITE PREPARATION AND FOUNDATIONS: In order to protect your building from termites, be sure that all roots, stumps, wood forms and wood scraps are removed from under the building to a depth of 12 in. below the ground.

A continuous concrete foundation is needed for bearing walls. See the framing detail provided on page 5 for size and framing attachment. If your lot slopes more than 1 ft. in 10 ft., the foundation should be stepped with the top and bottom level.

CONCRETE MIX: When ordering ready-mix concrete specify at least 2500 psi concrete. When mixing your own, use 1 and 1/3 sacks of cement to 3 cu. ft. of sand and 4 cu. ft. of crushed rock or gravel.

UNDERFLOOR VENTILATION AND ACCESS: Areas under the first floor of a wood frame house need cross ventilation openings on at least two (2) opposite sides of the building. The total area in square feet of all openings needs to be 1 sq. ft. for each 150 sq. ft. of underfloor area. Cover these openings with rust-resistant wire netting with ¼ inch mesh or in the fire safety overlay areas, use 1/8" mesh. An 18 in. x 24 in. access can be either through the floor or through the outside wall.

MUDSILLS: Foundation plates and other members in contact with the foundation are to be either approved treated lumber or foundation grade redwood.

FOUNDATION STUDS: Foundation studs 14 in. or less in height can be the same size as the studs above. When over 14 in. they are to be sized as for an additional story. Studs less than 14 inches in height are to be braced by solid blocking or structural wood panel sheathing.

GIRDERS: Floor joists may be supported on girders with piers. Girder ends resting on concrete requires 3 in. bearing and if in a girder pocket, provide ½ in. air space at the tops, sides and end.

FLOOR JOISTS: Floor joists bearing on sills and girders shall have 1½ in. of bearing. Be sure to lap them 3 in. and nail to the joist coming from the other side.

If a header joist is over 4 ft. long, it and the trimmer joists are required to be doubled. Use joist hangers when the header joist is over 6 ft. long and/or when the tail joists are over 12 ft. long.

To prevent floor joists from turning, the ends are required to be blocked solid. Also block them at each support.

Be sure to double the joists under and parallel to bearing walls. Bearing walls perpendicular to the joist do not have to line up exactly with the wall or beam below as long as they are not more than one (1) joist depth offset.

WALLS AND PARTITIONS: The top plate on a frame wall should be doubled to tie all the walls in the building together. This is done by lapping all the corners and intersections and by lapping splices at least 4 feet. These plates also serve as fireblocks. Other places still need fireblocks. Some of them are between the studs in line with stair stringers, at the top and bottom riser, at dropped ceilings, bay windows and raised floors.

Openings for windows and doors are allowed in bearing walls if the load above them is supported by a properly sized header. A king stud and trimmer is needed at each end of the header.

BRACING: Your home must be constructed with adequate bracing to resist wind and seismic forces. Braced wall panels are required at each corner and along the building perimeter, not more than 25 ft. end to end. To meet this requirement, typical light-frame construction usually incorporates plywood braced wall panels on exterior walls. 1" x 4" diagonal braces are no longer considered adequate bracing for wind and seismic forces in San Bernardino County. Refer to the "Guide to Conventional Light Frame Bracing" or contact us for additional information on braced wall panel requirements and options.

**WALLS AND PARTITIONS TABLE
SIZE, HEIGHT AND SPACING OF WOOD STUDS¹**

STUD SIZE (Inches)	BEARING WALLS				NONBEARING WALLS	
	LATERALLY UNSUPPORTED STUD HEIGHT ¹ (Feet)	SUPPORTING ROOF AND CEILING ONLY	SUPPORTING ONE FLOOR, ROOF AND CEILING	SUPPORTING TWO FLOORS, ROOF AND CEILING	LATERALLY UNSUPPORTED STUD HEIGHT ¹ (Feet)	SPACING (Inches)
1. 2x3 ²	—	—	—	—	10	16
2. 2x4	10	24	16	—	14	24
3. 3x4	10	24	24	16	14	24
4. 2x5	10	24	24	—	16	24
5. 2x6	10	24	24	16	20	24

¹Utility grade studs shall not be spaced more than 16 inches on center, nor support more than a roof and ceiling, nor exceed 8 feet in height for exterior walls and load bearing or 10 feet for interior nonload-bearing walls.

²Shall not be used in exterior walls.

³Listed height are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in supported height are permitted where justified by an analysis.

MECHANICAL FASTENERS:

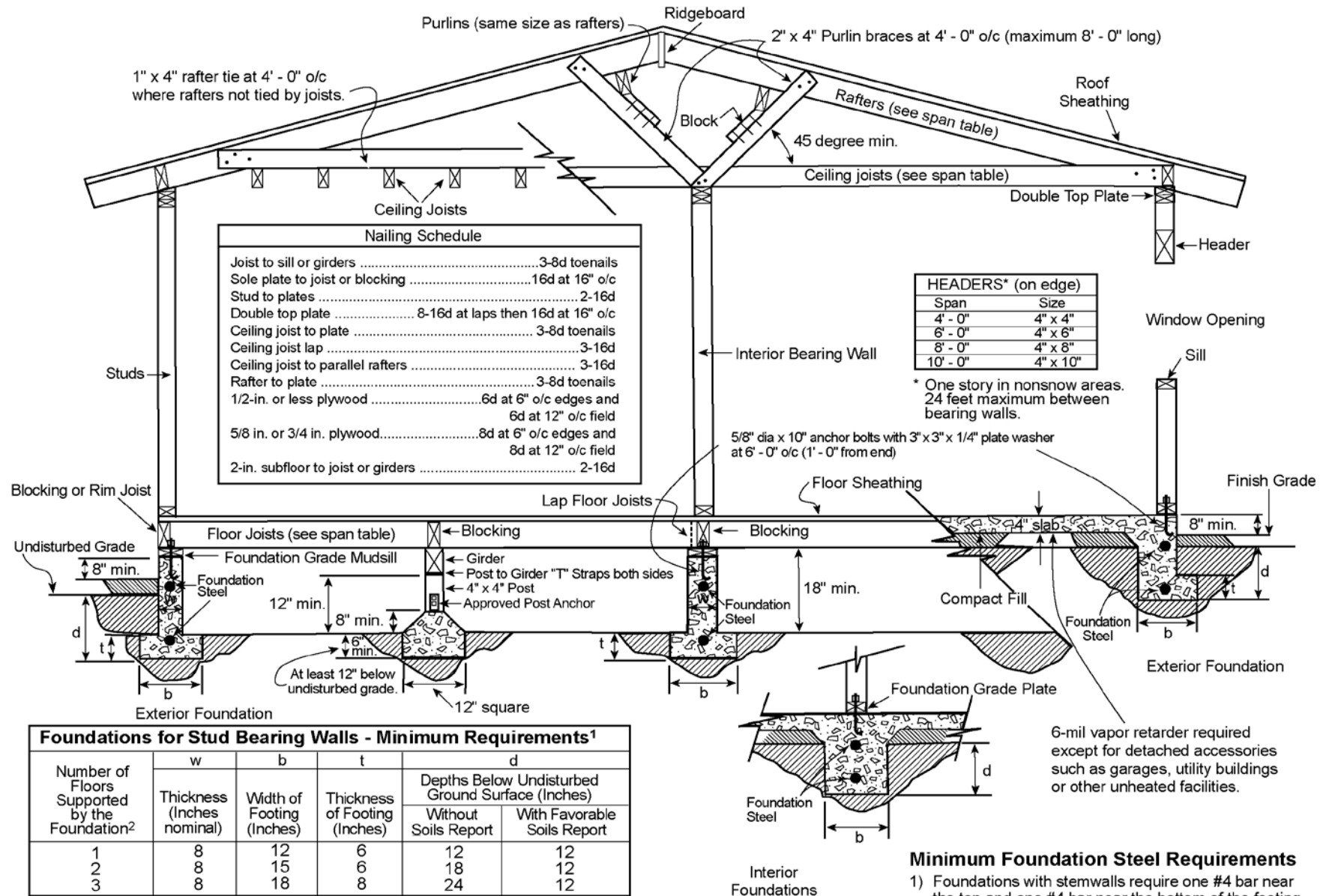
Connections depending upon joist hangers or framing anchors, ties and other mechanical fastenings may be used where approved.

ROOF CONSTRUCTION: Hips, valleys and ridges are required to be one size larger than the common rafters. Ridge board may be 1 in. nominal thickness. Since valleys are about the weakest point in the roof they need special attention to bracing.

When the roof slope is less than 3:12, members supporting rafters and ceiling joists such as ridges, hips and valleys are required to be designed as beams.

Roofing materials are to comply with Cool Roof Requirements per the California Energy Code (CEC).

Construction Details



¹ Special foundation reinforcement may be required for use in expansive soils. A soils report may be required in questionable soil regardless of footing depth.

² Foundations may support a roof in addition to the stipulated number of floors. Foundations supporting roofs only shall be as required for supporting one floor.

Minimum Foundation Steel Requirements

- Foundations with stemwalls require one #4 bar near the top and one #4 bar near the bottom of the footing
- Slab-on-ground with turned-down footings require one #4 bar near the top and one #4 bar near the bottom of the footing
- Where the slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks on each end shall be provided. Ask for detail from Figure R403.1.3.2 and R611.5.4.5 of the 2010

RAFTER AND JOIST TABLES - VALLEY AND DESERT AREAS (no snow loads)

These tables are based on Douglas Fir or Larch lumber of No. 2 grade. Roofing material such as rock, gravel, tile or shake shingles are **heavy** roofs. Composition shingles and wood shingles are **light** roofs. High slope roofs are those with a slope greater than 3 inches in 12 inches. The spans are the clear horizontal distance between supports, in feet and inches. Cantilevered rafters have a 1½ in. notch. If you are in a snow area, obtain a Snow Load Table for your area.

<u>2 x RAFTERS</u>										<u>4 x RAFTERS</u>			
<u>ALL SLOPES</u>					<u>LOW SLOPES</u>		<u>HIGH SLOPES</u>			<u>Size</u>	<u>Spacing</u>	<u>Span</u>	<u>Cantilevered</u>
<u>Size</u>	<u>Spacing</u>	<u>With Drywall Ceiling</u>		<u>Cantilevered</u>	<u>Light</u>	<u>Heavy</u>	<u>Light</u>	<u>Heavy</u>	<u>Light</u>	4 x 4			
2 x 4	12	9-10	9-9	2-7	9-10	9-10	10-7	10-7		24	10-4	-	
	16	8-11	8-5	2-4	8-11	8-11	9-7	9-7		32	9-1	-	
										36	8-7	-	
	24	7-4	6-11	2-1	7-9	7-4	8-4	7-10		48	7-5	-	
2 x 6	12	15-4	14-4	5-3	15-5	15-4	16-7	16-3		4 x 6	24	16-3	3-11
	16	13-3	12-5	4-9	14-0	13-3	15-1	14-1		32	13-4	3-2	
										36	12-7	3-0	
	24	10-10	10-1	3-11	11-8	10-10	12-7	11-6		48	10-11	2-5	
2 x 8	12	19-5	18-2	7-7	20-4	19-5	21-11	20-7		4 x 8	24	21-5	5-8
	16	16-10	15-8	6-8	18-2	16-10	19-6	17-10		32	17-7	4-7	
										36	16-7	4-3	
	24	13-8	12-10	5-5	14-10	13-8	15-11	14-7		48	14-4	3-9	
2 x 10	12	23-9	22-2	9-11	25-7	23-9	26-0	25-2		4 x 10	24	26-0	7-4
	16	20-6	19-2	8-7	22-2	20-6	23-10	21-10			32	21-7	5-11
											36	20-4	5-7
	24	16-9	15-8	7-0	18-1	16-9	19-5	17-10			48	17-7	4-10
2 x 12	12	26-0	25-9	11-11	26-0	26-0	26-0	26-0		4 x 12	24	26-0	8-10
	16	23-10	22-3	10-4	25-9	23-10	26-0	25-4			32	25-2	7-1
											36	23-9	6-9
	24	19-5	18-2	8-5	21-0	19-5	22-7	20-8			48	20-6	5-10

CEILING JOISTS W/O STORAGE

PATIO RAFTERS

2 x FLOOR JOISTS (40 lb. Live Load)

4 x FLOOR JOISTS (40 lb. Live Load)

<u>Size</u>	<u>Spacing</u>	<u>Span</u>	<u>Light</u>	<u>Aluminum or</u>	<u>Other</u>	<u>Size</u>	<u>Spacing</u>	<u>Span</u>	<u>Cantilevered</u>	<u>Size</u>	<u>Spacing</u>	<u>Span</u>	<u>Cantilevered</u>
2x4	12	12-5	2x4	16	8-7	8-2	2x6	12	10-8	4-4	4x6	24	11-3
	16	11-3		24	7-11	7-4		16	9-8	4-0		32	10-0
	24	9-10		32	6-11	6-3		24	8-1	3-5		36	9-5
												48	8-2
2 x6	12	19-6	2x6	16	14-7	13-7	2x8	12	14-1	5-9	4x8	24	14-10
	16	17-8		24	13-2	12-0		16	12-7	5-3		32	13-2
				32	11-1	9-10		24	10-3	4-4		36	12-5
	24	14-10										48	10-9
2x8	12	25-8	2x8	16	20-0	18-6	2x10	12	17-9	7-4	4x10	24	18-11
	16	23-0		24	17-11	15-10		16	15-4	6-5		32	16-2
				32	14-7	12-11		24	12-6	5-3		36	15-3
	24	18-9										48	13-2
2x10	12	26-0	4x4	16	12-1	11-3	2x12	12	20-7	8-8	4x12	24	23-1
	16	26-0		24	10-11	10-2		16	17-9	7-6		32	18-10
				32	10-2	9-4		24	14-6	6-1		36	17-9
	24	22-11										48	15-4
2x12	12	26-0											
	16	26-0											
	24	26-0											

VALLEY / MOUNTAIN PLYWOOD ROOF SHEATHING

ALLOWABLE UNIFORM ROOF LIVE LOADS FOR APA RATED SHEATHING WITH LONG DIMENSION PERPENDICULAR TO SUPPORTS^{1,2}

<u>APA RATED SHEATHING</u>		<u>ROOF</u>											
<u>SPAN</u>	<u>RATING</u>	<u>PANEL THICKNESS</u>	<u>MAXIMUM SPAN (Inches)</u>		<u>ALLOWABLE LIVE LOADS (psf)</u>								
<u>Roof/Floor Span</u>		<u>(Inch)</u>	<u>With Edge</u>	<u>Without Edge</u>	<u>Spacing of Supports Center-to-Center (Inches)</u>								
			<u>Support³</u>	<u>Support</u>	<u>12</u>	<u>16</u>	<u>20</u>	<u>24</u>	<u>32</u>	<u>40</u>	<u>48</u>	<u>54</u>	<u>60</u>
12/0		5/16	12	12	30								
16/0		5/16, 3/8	16	16	70	30							
20/0		5/16, 3/8	20	20	120	50	30						
24/0		3/8, 7/16, 1/2	24	20 ⁴	190	100	60	30					
24/16		7/16, 1/2	24	24	190	100	65	40					
32/16		15/32, 1/2, 5/8	32	28	325	180	120	70	30				
40/20		9/16, 19/32, 5/8, 3/4, 7/8	40	32		305	205	130	60	30			
48/24		23/32, 3/4, 7/8	48	36			280	175	95	45	35		
54/32		7/8, 1	54	40				245	130	75	50	35	
60/32		7/8, 1	60	40				305	165	100	70	50	35
60/48		7/8, 1, 1-1/8	60	48				305	165	100	70	50	35

¹ The allowable live loads were determined using a dead load of 10 psf. If the dead load exceeds 10 psf then the live load shall be reduced accordingly.

² Applies to panels 24 inches or wider.

³ Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking, or other. Only lumber blocking will satisfy blocked diaphragm requirements.

⁴ Twenty-four inches for 1/2 inch panels.

ELECTRICAL

Show lighting, switching, receptacle spacing and location on the floor plan. Special lighting features required by the energy compliance approach and mandatory measures shall be shown on the electrical floor plan. A schedule of the electrical panel showing all circuits, main overcurrent device, size of the service entrance conductors and the grounding electrode conductor, will generally provide sufficient electrical information.

LOAD CALCULATION SINGLE-FAMILY DWELLING, 100 AMP MINIMUM

_____ sq. ft. floor area @ 3 watts per sq. ft	=	_____	watts
Two appliance circuits @ 1500 watts each	=	3,000	watts
Laundry circuit	=	1,500	watts
Range at nameplate rating	=	_____	watts
Water heater at nameplate	=	_____	watts
Dishwasher at nameplate rating	=	_____	watts
Clothes dryer at nameplate rating (5,000 watts minimum)	=	_____	watts
Either space heating or 100% of air conditioning, whichever had greatest demand, counting 65% of heating load	=	_____	watts
Total wattage of all other fixed appliances, garbage disposers, evaporative coolers, trash compactors, etc. (Not electric ranges, dryers, A/C equipment or heating equipment.)			
If 4 or more, compute 75% of the total load	=	_____	watts
	TOTAL	_____	watts
Compute first 10,000 watts at 100%	=	10,000	watts
Compute remainder at 40%	=	_____	watts
	LOAD	=	_____ watts
	NET LOAD	=	_____ watts
NET LOAD _____ divided by 240 volts	=	_____	AMP.

The service disconnecting means requires a rating not less than the load served, determined by the load calculation above.
The following are minimum requirements for a single-family dwelling:

Main Switch Rating	100 amp.(minimum)
Service Entrance Conduit Size	1-1/4"
Service Entrance Conductor Size (copper)	3-No. 4 THW
Service Entrance Conductor Size (aluminum)	3-No. 2 THW
Service Grounding Electrode Conductor	No. 8 copper (Armored)

SERVICE: The serving utility company will not normally make a service drop and attach to conduit less than 1¼ in. rigid steel. If you plan to use electrical metallic tubing or other approved service entrance, or are building in areas subject to snow loading, consult with the local electrical utility company and your Building Inspector.

For main circuit breakers, 200 amperes and smaller, install breakers with a 10,000 ampere interrupting capacity (single-family residences, duplexes or individually metered mobilehomes).

Install the service conduit or other point of attachment so that the service drop will be at least 12 ft. above any residential yard or driveway.

Extend the service conductors at least 18 in. beyond the weatherhead and identify the neutral conductor white or gray.

Mount the service so the center of the meter socket is between 4 ft. and 6 ft. 3 in. above grade.

GROUNDING AND BONDING: The 100 amp. service ground may be No. 8 if armored or in conduit, or No. 6 bare if it follows closely along the building finish.

Use a UL listed ground clamp to attach the grounding electrode conductor to an approved electrode in a location which will remain accessible without crawling when the building is completed.

Where aluminum grounding conductors are used, install one (1) size larger than required for copper and maintain at least 18 in. above ground. Provide protection for any aluminum grounding conductor run through stucco or concrete.

When using a metallic water service for the service ground, supplement it with an additional electrode. Contact your local Building Inspector for information on the "UFER" (concrete encased) electrode before placing your foundation.

Bond interior water and gas piping to the grounding conductor's terminal at the service. Isolate neutral wires from the bond wires in subpanels in the same building. All subpanels require bonding back to the main panel ground. Contact the building inspector for details of subpanels installed in separate buildings.

WORKING SPACE: Maintain at least a 30 in. wide x 36 in. deep work space in front of the electrical service equipment.

WIRING: Use approved raintight equipment in exposed areas outside of a building.

If nonmetallic sheathed cable is installed in exposed locations it must be run on the inside edge of framing members. Provide running boards at any location where cables are subject to damage. (See Article 300 of the NEC for additional wiring requirements.)

Neutral conductors No. 6 and smaller require white or gray insulation along their entire length. Conductors No. 4 or larger may be identified where terminating in enclosures with a white or gray color paint or tape.

When the white wire in nonmetallic sheathed cable is used as a hot wire, as in a 240-volt circuit, identify the conductor red or black where it is visible.

Install a properly sized outlet or junction box at each outlet, switch or junction point. A junction box may be installed in an attic where there is at least 30 in. of headroom.

Leave at least 6 in. of "make-up" wire at each outlet (receptacle, switch, fixture or junction box).

Use nonmetallic sheathed cable with 15 or 20 and 30 ampere capacity circuits with a grounding conductor of the same size as the circuit conductors. For cable with 40 and 60 ampere capacity, the grounding conductor needs to be 30 ampere capacity.

For lighting or convenience outlet circuits, install wiring with a minimum 15 ampere capacity (No. 14 copper).

Install at least two small appliance circuits, rated at 20 amperes each, in the kitchen/dining area (No. 12 copper).

Provide separate circuits for garbage disposals, trash compactors and dishwashers. Their recommended circuit ampacities are 15, 15 and 20 amperes respectively.

Provide receptacles at any wall space 2 ft. or more in width in livable rooms, including the wall space occupied by fixed panels (i.e. fixed panel of sliding glass door) in exterior walls, so that no point on any wall is over 6 ft. from an outlet in that space (one receptacle every 12 ft). Include fixed room dividers or free-standing bar-type counters in the 6 ft. measurement. In kitchen and dining areas, install a receptacle at each counter space 12 in. or wider. Any outlet rendered inaccessible by the installation of stationary appliances, including refrigerators, are not counted as one of these required receptacles. Any receptacle which is part of a fixture or appliance, or is located over 5½ ft. above the floor, is also not counted as one of the required outlets.

All branch circuits that supply 125-volt, single phase, 15- and 20-ampere outlets in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways or similar rooms or areas are required to be protected by an ARC-Fault Circuit Interrupter (AFCI) type circuit breaker.

All 125-volt, single-phase, 15 and 20 ampere receptacles installed to serve kitchen counter top surfaces need ground-fault circuit-interrupter (GFCI) protection for personnel.

Install receptacles within 36 in. to each washbasin, in each basement, attached garage, detached garages with electric power and at least one receptacle in hallways 10 ft. or more in length and one exterior receptacle at the front and rear of one and two family dwellings.

Install grounding-type receptacles throughout. Ground-fault circuit-interrupters (GFCI) are required for all receptacles located outdoors, in crawl spaces under building, in kitchens and bathrooms, within 6 ft. of wet bar, laundry and utility sinks and for the required convenience work with receptacles in garages.

LIGHTING OUTLETS: Provide lighting outlets as follows:

At least one (1) wall-switch controlled light in every habitable room, hallway, stairway, attached garage, detached garage with electric power, bathrooms, and at all outdoor entrances. A wall-switched receptacle in lieu of a lighting outlet is permitted in all habitable rooms except kitchens and bathrooms. Install at least one (1) lighting outlet in the attic, underfloor space, utility room or basement suitable for storage or if it contains equipment which requires service.

Lighting fixtures maintaining at least a 12 in. horizontal clearance in clothes closets from any area where combustible material may be stored is a proper installation (storage shelf area is considered to continue vertically to the closet ceiling). A flush recessed fixture with a solid lens or ceiling mounted fluorescent fixture requires 6 in. horizontal clearance from any area where combustible materials may be stored. Incandescent fixtures with open or partially enclosed lamps and hanging lights (pendant fixtures) are not allowed in clothes closets.

LAUNDRY AND BATHROOM CIRCUITS: Provide separate 20 ampere circuits for laundry and bathroom receptacle outlets. If there is only one (1) receptacle on the circuit, install a 20 ampere rated receptacle.

OUTLET/JUNCTION BOXES: Plastic boxes are usually marked on the inside with their volume (in cubic inch capacity) along with the maximum number and size of conductors allowed in the box.

CENTRAL HEATING EQUIPMENT: Central heating equipment requires an individual branch circuit sized per the manufacturer's installation instructions.

Use the following table and rules to size plastic or metal boxes that are not marked with their volumes and number of conductors allowed.

AREA REQUIRED FOR EACH CONDUCTOR IN OUTLET BOXES

A.W.G. Size	Free Space For Each Conductor
#18	1.5 cu. in.
#16	1.75 cu. in.
#14	2 cu. in.
#12	2.25 cu. in.
#10	2.50 cu. in.
# 8	3 cu. in.
# 6	5 cu. in.

Add the area of two (2) conductors for the following:

- Each yoke or strap containing one or more devices (switch or receptacles) mounted in the box. (The free space will be based on the largest conductor connected to the device.)
- Conductors spliced together (with wire nuts, etc.).

Add the area of one (1) conductor for the following:

- Each type of fixture stud, hickey, or cable clamp. The free space will be based on the largest conductor entering the box. (Romex connectors attached to the outside of the box do not count.)
- One or more equipment grounding conductors (the free space will be based on the largest equipment grounding conductor entering the box).
- Isolated equipment grounding conductors.
- Unspliced conductors running through the box.
- Each conductor originating outside of the box and terminating inside the box.

No additional area required for the following:

- Maximum 4 fixture wires not larger than No. 16 plus ground from fixture canopy.
- Conductors that do not leave the box.

Make sure all work is inspected and passed by the Building Inspector before concealing.

Your local Building Inspector is prepared to assist you with any construction questions that may arise.

HEATING AND AIR CONDITIONING

ACCEPTANCE: Appliances are designed for the use of a particular type of fuel. Be sure they are only connected to the type of fuel specified on the label. Some appliances can be converted to use another fuel provided it is re-labeled to indicate that such a conversion has been made.

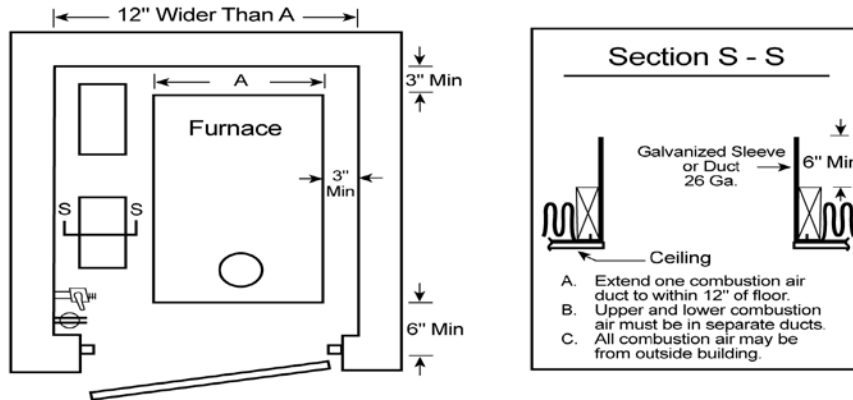
GAS-FIRED WATER HEATERS: Water heaters are allowed in their own closet in a bedroom or bathroom if it is a direct vent type water heater or the closet has a gasketed self-closing door and all the combustion air comes from outdoors. Water heater installations are routinely made with a minimum 3/4 in. cold water supply line and a 3/4 in. gate valve installed ahead of the transition connection. (See illustration on next page for earthquake anchorage requirements).

VENTING AND VENT CONNECTORS: Typically, gas-fired appliances, such as water heaters and blower-type warm air furnaces, are vented using type "B" venting materials which are listed, generally by Underwriters Laboratory (UL) and are installed with not less than the minimum clearances indicated in the label. When single-wall vent connector material is used for connecting a gas-fired appliance to a type "B" vent, a minimum of 6 in. from combustibles is maintained for the connector installation.

CONDENSING FURNACES: A plastic pipe venting system which is an integral part of a listed condensing appliance shall be installed in accordance with the appliance listing, manufacturer's installation instructions and applicable local requirements. Provide the instruction booklet with the unit when calling for inspection.

BLOWER-TYPE WARM AIR FURNACES: Warm air furnaces are not allowed to be installed in a room used or designed to be used as a bedroom, bathroom or clothes closet. Furnaces may be installed in a closet located in the bedroom or bathroom provided combustion air is obtained from outdoors and the closet is equipped with a listed, gasketed door assembly and a listed, self closing device. Furnaces installed in attics and under floor spaces may have access through a closet. For conventional installations, (as illustrated on the next page) the room or space is 12 in. wider than the furnace(s). Provide clear spaces of 3 in. along the sides and back of the furnace with 6 in. in front when the access door is closed. Sufficient working space, generally not less than 30 in. in the least dimension is provided along the entire front or firebox side of the furnace when the door of the furnace enclosure is fully opened.

Typical Residential Forced Air Furnace Installation



NOTES:

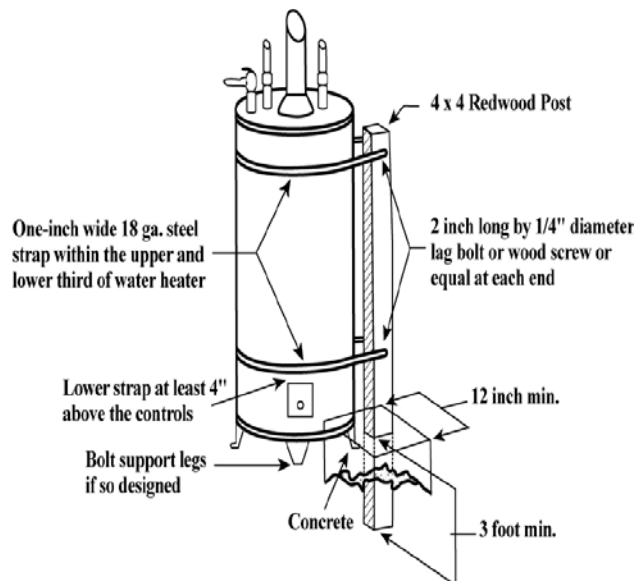
1. Combustion Air: One-half within 12" of ceiling and one-half within 12" of floor.
2. Ducts:
Supply and Return — Insulated galv. steel or approved equal, or approved factory made airducts.
Combustion Air — Galv. steel — 26 gauge. Unlined stud and joist spaces also permitted, provided:
 - a. Not more than one required fire stop is removed.
 - b. The space used forms a continuous sealed air passage to the opening into the compartment.
3. Front Working Space: 30" in front of furnace when door is open.
4. Vent: U. L. approved type "B" gas vent.
5. Vent Connector: Galv. Steel
To 5" diameter 28 ga. min.
5" to 9" diameter 26 ga. min.
6. Clearances: Manufacturer's recommended clearances shall apply when greater than those shown.

WATER HEATER ANCHORAGE REQUIREMENTS

The California Plumbing Code requires water heaters to be anchored for earthquakes. One of the following methods shall be deemed to meet that requirement:

- A. Anchor the water heater to an adjacent wall with a minimum of two, one inch wide, 18 gauge, galvanized steel straps. Straps to be within the upper one-third (1/3) and lower one-third (1/3) of the water heater. At the lower point, a minimum distance of four (4) inches shall be maintained above the controls with the strapping. Provide a two inch long by 1/4 inch diameter lag screw at each end of each strap. The lag screws shall penetrate a minimum of one and one quarter inches into a minimum two by four framing member in the adjacent wall.

Water Heater Anchorage Requirements



twelve inch diameter by three feet in depth). The length of post shall equal at least the height of the water heater after the imbedment. And the straps shall then be anchored to the post (see adjacent illustration).

- B. Where there is no solid construction for attaching the straps, a 4 x 4 redwood post or equal shall be imbedded in a concrete foundation, (minimum

- C. Other method(s), when found to be equal.

COMBUSTION AIR TO FUEL-BURNING APPLIANCES: Insufficient oxygen for combustion will result in the formation of carbon monoxide. This gas is poisonous and, if it remains within a building, it can cause illness or even death to the occupants. Incomplete combustion can also cause soot to build up in the heat exchanger, flues, and vents.

Energy conservation regulations now require that buildings be more tightly sealed, weather stripped, and insulated to avoid infiltration of outside air to the interior of the building. It is, therefore, more essential than it used to be to make accurate calculations and adequate provision for the supply of air to fuel-burning appliances.

Combustion air ducts must be constructed to allow an unrestricted flow of air and to prevent the spread of fire and the entry of foreign material and living creatures into the building. Caution must be exercised to void negative pressures that can be created by exhaust fans or the natural draft of large appliances. If smaller appliances are located in the same room, air will flow downward through the vents or flues, carrying poisonous flue gas into the room. The vents, flues, and combustion air ducts must be adequately sized to maintain atmospheric pressure and adequate ventilation for combustion.

The following are methods of supplying the required combustion air.

ALL AIR SUPPLIED FROM INDOORS: The volume of the room or space must be at least 50 cu. ft. per 1,000 btu input rating of all appliances in the room or space. Rooms or spaces that communicate through at least two fixed openings, each of which are a minimum of 1 sq. in. per 1,000 btu input rating of all appliances in the room but not less than 100 sq. in. and that are within 12" of the top and bottom of the enclosure may be counted as part of the required volume.

ALL AIR SUPPLIED FROM OUTDOORS: **Two Openings,** within 12" of the top and bottom of the enclosure that communicate directly or through ducts with the outdoors sized as follows: Vertical ducts – 1 sq. in. per 4,000 btu input rating of all equipment in the enclosure. Horizontal ducts – 1 sq. in. per 2,000 btu input rating of all equipment in the enclosure.

OR

One opening, within 12" of the top of the enclosure that communicates directly or through a duct with the outdoors that is 1 sq. in. per 3,000 btu input of all equipment in the enclosure and not less than the total area of all vent connectors in the space. The equipment must have clearances of 1" min. from the sides and back and 6" in the front.

COMBINATION INDOOR AND OUTDOOR COMBUSTION AIR: When indoor openings are sized and located as in "all air supplied from indoors" and adequate volume does not exist, additional openings to obtain combustion air from the outside are required. The size of the outdoor openings are located as in "all air supplied from outdoors" but is calculated as follows:

1. The ratio of interior spaces shall be the available volume of all communicating spaces by fixed openings divided by the required volume.
2. The outdoor size reduction factor shall be 1 minus the ratio of interior spaces.
3. The minimum size of outdoor openings shall be the full size of outdoor openings calculated in accordance with the size requirements above and multiplied by the reduction factor. The minimum dimension of air openings shall not be less than 3".

COMBINATION INDOOR AND OUTDOOR AIR EQUATION:

$$\frac{A}{R} = X \quad 1 - X = \text{Reduction Allowed}$$

A = Cubic Feet Available.

R = Cubic Feet Required.

Combustion air ducts shall comply with the following:

1. Ducts shall be of galvanized steel or a material having equivalent corrosion resistance, strength, and rigidity.
Exception: Within dwelling units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one fireblock is removed.
2. Ducts shall terminate in an unobstructed space, allowing free movement of combustion air to the appliances.
3. Ducts shall serve a single space.
4. Ducts shall not service both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion-air openings shall be maintained to the source of combustion air.
5. Ducts terminating in attics shall not be screened.

6. Intakes for combustion-air ducts located exterior to the building shall have the lowest side of the combustion-air intake openings located at least twelve (12) inches vertically from the adjoining grade level.
7. Horizontal upper combustion-air ducts shall not slope downward toward the source of combustion air.
8. The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry chimney flue metal or factory-built chimney shall not be used to supply combustion air unless it is listed and shown in the manufacturer's installation instructions.
9. Where not otherwise prohibited, the combustion air supply may be obtained from an attic area provided:
 - A. Attic ventilation if properly sized is sufficient to provide the required volume of combustion air.
 - B. The combustion air opening is provided with a galvanized sleeve of not less than No. 26 gauge extending from the appliance enclosure to at least 6 in. above the top of the ceiling joists and insulation. (See illustration on page 11).

AIR RETURN: Circulating air may be taken from outside the building, from rooms used for living quarters or from both. The minimum unobstructed total area of the circulating-air opening or ducts to a heat pump is 6 sq. in. per 1,000 Btu/h nominal output rating or as indicated by the conditions of listings of the heat pump. The minimum unobstructed total area of the circulating air openings or ducts to a blower-type warm air furnace is never less than two (2) sq. in. for every 1,000 Btu/h output rating of the furnace. Such air shall be conducted into the blower housing from outside the furnace space by continuous airtight ducts. The practice of using drywall materials or concealed construction spaces as the interior surface of a duct or plenum is not allowed. Circulating air ducts and fittings are insulated to a minimum installed thermal resistance level of R-4.2, or greater when required by the California Energy Code. Locate circulating air inlet so it will not be in the following positions:

1. Closer than ten feet (10') from any appliance firebox or draft diverter which is located in the same enclosed space as the air supply inlet.
2. Closer than ten feet (10') from any appliance vent or plumbing vent outlet.

3. Where it will pick up objectionable odors, fumes or flammable vapors.
4. Where it is located in: the same enclosed space as the combustion air inlet, a closet, bathroom, toilet room or kitchen.

AIR SUPPLY: The combined area of not less than two (2) sq. in. for every 1,000 Btu of the output rating of a blower-type warm air furnace is the minimum size for conditioned air duct, but never less than the area of the furnace outlet plenum collar. Use only approved ducts or duct materials for the ducts. Pipes, ducts, boxes and fittings for the conditioned air system are to be insulated as designated by the California Energy Code. Supports for ducts and pipes may be of acceptable strapping material. Do not puncture the conditioned air supply system.

UL LISTED METALLIC OR NONMETALLIC DUCTS: Underwriters Laboratories listed, type 1 or 2 air ducts may be installed in accordance with the conditions of listing. The manufacturer's installation instructions must be available to the inspector at the time of inspection.

EQUIPMENT LOCATIONS AND ACCESSIBILITY

HORIZONTAL AND ATTIC FURNACES: Generally an attic access opening and passageway of not less than 30" x 30" with continuous flooring of 24 in. wide from the opening to the furnace will accommodate servicing or replacing the equipment. If the height of the passage is less than six feet, the distance from the access to the appliance shall not exceed 20 ft. and provide a light at the furnace with the switch at the access.

EXCEPTION: The access opening and passageway into the space may be 22 in. by 30 in., provided the largest piece of equipment can be removed through the opening. Provide documentation to use the exception on the plans.

FLOOR FURNACE: Locate a 24 in. x 18 in. access opening in the foundation or through the floor within 20 ft. of the furnace. Floor furnaces are not intended for installation on concrete floors. Clearances for floor furnaces are as follows:

1. All sides - 12 in.
2. From ground - 6 in. (for sealed units, 2 in.).
3. Nearest wall(s) and corners - 24 in. on two (2) adjoining sides and 6 in. from walls.
4. Doors - not closer than 12 in. to any portion of furnace register.

VENTED WALL HEATERS: Wall heaters are installed in walls between studs (2 in. x 4 in.) spaced 16 in. on center and are vented to an approved type "BW" vent. Doors should be arranged to swing no closer than 12 in. of the furnace register. There are several conditions with which the "BW" vent must comply. Check your installation instructions and consult with your inspector if necessary.

ROOM HEATERS: To prevent accidental displacement, freestanding room heaters are secured as permanent installations. Such heaters shall be so placed as not to cause a hazard to walls, floors or doors. Room heaters designed and marked "For use in incombustible fire-resistive fireplace only," shall not be installed elsewhere.

RANGES: ¾ in. minimum gas piping is recommended for freestanding kitchen ranges.

CLOTHES DRYER: Moisture-exhaust ducts for clothes dryers are required to terminate on the outside of the building and be equipped with a back-draft damper. The duct must not be connected or installed with sheet metal screws or similar fasteners which may obstruct the flow. Clothes dryer moisture-exhaust duct shall not be connected to a gas vent connector, gas vent or chimney. The maximum duct length cannot exceed a total combined horizontal and vertical length of 14 ft., including two (2) 90 degrees elbows. Two ft. (2') shall be deducted for each 90-degree elbow in excess of two (2). When a compartment or space for domestic clothes dryer is provided, a minimum 4-in. diameter moisture-exhaust duct of rigid metallic material shall be installed. When installed in a closet or room with a volume of less than 1,750 cubic feet, a 100 square inch opening is required in the door or other approved location for make-up air.

APPLIANCES IN GARAGES: Except for laundry appliances (washer and dryer), appliances generating a glow, spark or flame capable of igniting flammable vapors may be installed in a garage, if the pilots and burners or heating elements and switches are at least 18 in. above the floor level.

LIQUEFIED PETROLEUM GASES: Liquefied petroleum gas-burning appliances, except range-top burners, shall be capable of automatically shutting off the gas to the pilot and main burner in the event of ignition failure. Liquefied petroleum gas appliances shall not be located in a pit or basement where heavier-than-air gas might collect to form a flammable mixture. Appliances using liquefied petroleum gas, installed under first floor construction and similar locations, or in attics, shall be equipped with a minimum 3 in. high vapor-tight pan and a three in. (3") drain, graded to the outside of the building.

AIR CONDITIONING AND COOLING EQUIPMENT: Care should be taken to install air intake openings of air conditioning and cooling equipment ten ft. (10') from any plumbing fixture vent outlet or fuel-burning combustion products vent outlet, unless the outlet is three ft. (3') above the air intake.

ROOF OR WALL-MOUNTED EQUIPMENT: Heating or cooling equipment located on exterior walls, or roofs having a slope greater than four in. (4") in twelve in. (12"), is subject to special weather protection, platform and access requirements. All equipment must be secured to prevent seismic displacement. Consult your Building Inspector for detailed instructions.

OPEN TOP BROILER UNITS: Listed open top broiler units and hoods shall be installed in accordance with their listing and the manufacturer's instructions.

An exhaust duct and fan having a minimum capacity of 100 cu. ft. per sq. ft. of hood intake area shall be installed for a barbecue unit and when such duct penetrates a ceiling or a floor, it shall be enclosed in a fire-restrictive shaft covered on one (1) side as required for one-hour fire-resistive construction with no combustible material used inside the fire protection.

Such shaft shall be separated from the duct by a minimum one in. (1") air space vented to the outside air and the duct shall terminate not less than 18 in. above the roof surface. A minimum clearance of 24 in. shall be maintained between the cooking top and the combustible material, and the hood shall be as wide as the open-top broiler unit and be centered over the unit.

PREFABRICATED FIREPLACES AND FIREPLACE STOVES: Prefabricated fireplaces, fireplace stoves, and their chimneys may be used when listed and installed in accordance with their listing.

PLUMBING

MATERIALS: Plumbing materials and fixtures have been tested for your safety. Any labeled approved materials and fixtures may be used in accordance with their approval. You may contact your Building Inspector to verify acceptance of new or unique plumbing products and applications.

SOIL AND WASTE LINES: Soil and waste lines usually require a minimum fall of 1/4 in. to the foot. Cast iron, ABS-DWV, or PVC-DWV are used under structures. ABS-DWV, or PVC-DWV plastic are limited to three stories. ABS and PVC are not to be exposed on the outside of a building, except for vents projecting through the roof. Such vents are to be painted with vinyl paint.

All piping in the ground is to be laid on a firm soil bed. Do not place piping into or embed it in concrete or masonry walls or footings.

WATER PIPE AND FITTINGS: Use type "M" copper tubing or galvanized steel water piping for installations above the floor and for outdoor, in ground locations. For jointless installations under a slab floor, type "L" copper may be used. Approved PE or PVC water pipe may be used underground, outside the building. PEX and CPVC water pipe may be used within a building. Install a fullway valve to control all water outlets on the discharge side of the meter or at the building on unmetered systems. Used pipe may be installed provided it was previously used only for water piping. Use factory wrapped or coated piping, with joints primered and wrapped with approved tape if you plan to use galvanized pipe under the slab. Be sure not to run it in or below the foundations. The building supply will be 3/4 in. or larger depending on the demand, length and other factors.

Care must be exercised when installing any pipe (especially plastic) in rocky soils. Pipe should be installed in a rock-free trench, and bedded with rock-free selected soil to prevent damage to pipe.

The burial depth, under ordinary soil conditions, is 12 in. for plastic, steel or copper pipe. Where a frost problem exists, bury pipes 12 in. below maximum-recorded frost level. In Big Bear and Green Valley Lake areas bury pipes 36 in., other mountain areas 30 in. burial depth is required.

When installing water lines, both hot and cold, in mountain areas where freezing is a problem, be sure all sections can be drained. Electric thawing devices can be used on metallic water services to keep them from freezing, but not in lieu of the draining requirements. Insulation is required on all water piping below the floor and on outside walls.

Check with one of our offices for more detailed information.

INADEQUATE WATER PRESSURE: Install a tank and pump if the water pressure in the main supply will not provide at least 15 lb. per sq. in. at the highest fixture.

EXCESSIVE WATER PRESSURE: Install an approved type pressure regulator preceded by an adequate strainer to reduce the pressure to 80 psi, or less where the pressure is in excess of 80 psi.

PRESSURE RELIEF VALVES: Water heaters require an approved combination pressure and temperature relief

valve which is adequately sized and set to relieve at not more than 150 P.S.I. A 3/4 in. valve with a 3/4 in. drain will take care of most installations. Drain the valve to the outside of the building and terminate the drain line 6 to 24 inches above grade. Point the drain line downwards and make sure there are no traps in the line or threads on the end of the pipe.

GAS PIPE AND FITTINGS: Approved plastic Polyethylene (PE) natural and liquefied petroleum gas (LPG) yard piping and fittings may be installed in exterior underground locations. For other locations use standard weight iron, steel, or brass, of iron pipe size. The use of corrugated stainless steel tubing requires plans and prior approval. Valves and fittings must be approved for the gas being used.

SHUT-OFF VALVE: Install a shut-off valve for each appliance, ahead of the union or listed metal appliance connector. The shut-off valve is required within 3 ft. of the appliance. This valve is in addition to the one on the appliance.

PIPING INSTALLATION: Use factory wrapped or coated gas piping in underground locations with primer and approved tape on joints.

Gas piping cannot be imbedded in any kind of masonry or concrete or be installed under a slab floor building. Locate exposed gas piping 6 in. above grade. Underground gas piping is to be buried a minimum of 18 inches below grade. A number 14 gauge yellow insulated copper tracer wire is required to be installed with plastic piping and terminate above grade at a building wall or riser.

Bushings, right and left couplings, swing joints, tubing fittings and compression couplings shall not be used in concealed locations. Ground joint unions shall only be used at exposed fixtures or appliance connections, and in exposed exterior locations immediately on the discharge side of a building shut-off valve.

GAS TEST: An air test is required for final inspection of the building, without shut-off valves installed. Install a maximum 15 lb. pressure gauge pump air into the line to 3 P.S.I. The gauge should show no drop for 10 minutes. The Building Inspector will check the test.

CONNECTION: Semi-rigid or flexible gas connectors may be used in lieu of standard pipe to connect appliances to the gas system when not more than 3 ft. long. The length is 6 ft. for gas ranges or dryers. This type connector cannot be run through walls, ceilings, floors or appliance housing. The connector material shall be approved for the location.

LOCATION OF SEWAGE DISPOSAL SYSTEM

Minimum Horizontal Distance in Clear Required From:	Bldg. Sewer	Septic Tank	Disposal Field	Seepage Pit or Cesspool
Buildings or Structures ₁	2 ft.	5 ft.	8 ft.	8 ft.
Property line adjoining private property	Clear	5 ft.	5 ft.	8 ft.
Water supply wells	50 ft. ₂	*100 ft.	100 ft.	150 ft.
Streams and lakes	50 ft.	50 ft.	*100 ft.	100 ft.
Large trees	—	10 ft.	—	10 ft.
Seepage pits or cesspools	—	5 ft.	5 ft.	12 ft.
Disposal field	—	5 ft.	4 ft.	5 ft.
Domestic water line	1 ft.	5 ft.	5 ft.	5 ft.
Distribution box	—	—	5 ft.	5 ft.

*By Ordinance 3627

NOTES: When disposal fields and/or seepage pits are installed in sloping ground, the minimum horizontal distance between any part of the leaching system and ground surface shall be fifteen (15) feet.

- Including porches and steps whether covered or uncovered, breezeways, roofed porte-cocheres, roofed patios, car ports, covered walks, covered driveways and similar structures or appurtenances.
- All non-metallic drainage piping shall clear domestic water supply wells by at least fifty (50) feet. This distance may be reduced to not less than twenty-five (25) feet when approved type metallic piping is installed. Where special hazards are involved, the distance required shall be increased, as may be directed by the Health Officer or the Administrative Authority.

GENERAL INFORMATION ON SEPTIC TANKS

Septic tanks should be cleaned before too much sludge or scum is allowed to accumulate. If either the sludge or scum approaches too closely to the bottom of the outlet device, particles will be scoured into the disposal field and will clog the system. Eventually, when this happens, liquid may break through to the ground surface, and the sewage may back up in the plumbing fixtures. When a disposal field is clogged in this manner, it is not only necessary to clean the tank, but it also may be necessary to construct a new disposal field.

There are no formulas which determine how often septic tanks should be cleaned. Many have gone as long as ten years without requiring cleaning, even when servicing a garbage disposal. Others have had to be cleaned within a year. As a general rule, tanks should be inspected yearly to determine whether or not cleaning is required. There are firms which specialize in cleaning septic tanks.

The life of an absorption field will be drastically shortened if the septic tank is not operating properly. Every time that sewage which has not been properly treated in the septic tank is discharged into the field, it causes the layer of impervious material to build up with alarming rapidity. This over-all condition can be caused by an undersized tank, or one in need of cleaning.

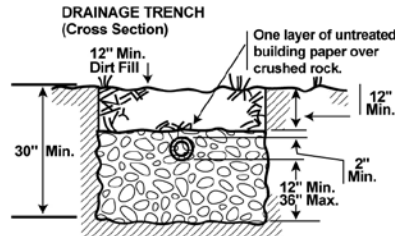
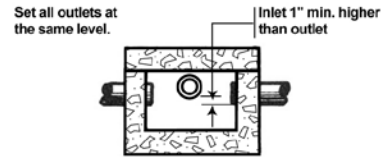
According to the U.S. Public Health Service, there are more than 1,200 additives on the market, which are claimed to aid the function of a septic system in one manner or another. As far as is known, none has proved an advantage in properly controlled tests.

Normal household waste, including that from the laundry, bath, and kitchen, should pass into a septic system.

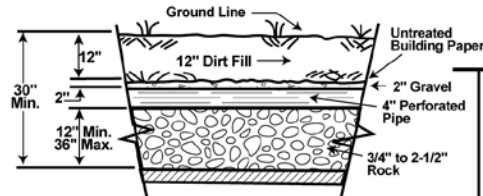
Toilet-paper substitutes should not be flushed into a septic tank. Paper towels, newspaper, wrapping paper, rags, and sticks may not decompose in the tank, and are likely to lead to clogging of the plumbing and disposal system.

Soil conditions in some areas are unsuitable for septic tank systems, particularly in the mountain areas. Percolation tests determine the acceptability of the soil and the size and design of the subsurface disposal system.

DISTRIBUTION BOX



DRAINAGE TRENCH (Longitudinal Section)



NOTE A: Add two (2) feet to this dimension for each additional foot of gravel below the twelve (12) inch gravel bed in trench.

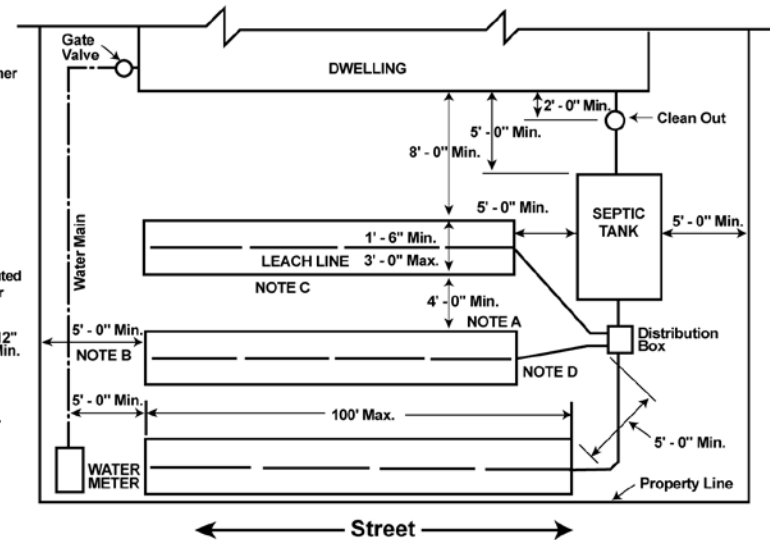
NOTE B: Where no water main exists, the leach line or seepage pit may be located a minimum of five (5) feet and eight (8) feet, respectively, from side property line.

NOTE C: Leach line must contain at least one hundred and fifty (150) square feet of trench bottom. There must be sufficient yard space to increase the leach line by one hundred (100) percent.

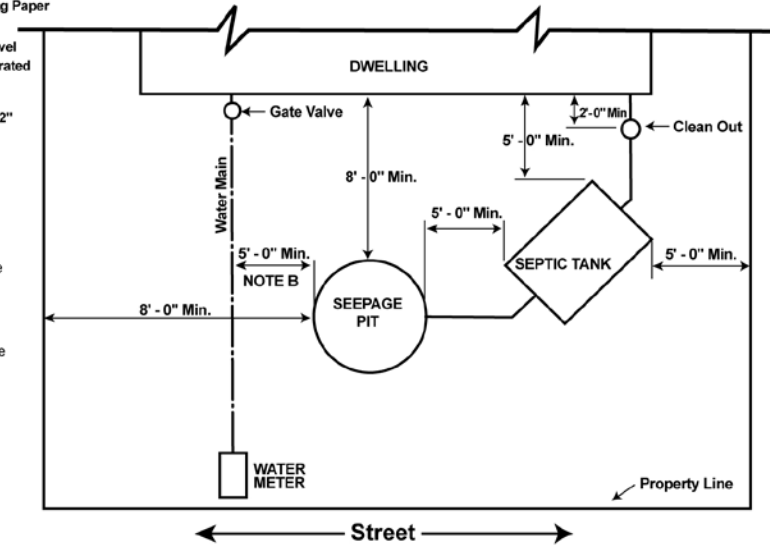
NOTE D: These lines from the distribution box to the leach line area shall be water-tight lines.

SEPTIC TANK SIZE

BEDROOMS	GALLONS
1 or 2	750
3	1,000
4	1,200
5 or 6	1,500



LEACH LINE SYSTEM



SEEPAGE PIT SYSTEM

COUNTY OF SAN BERNARDINO
BUILDING AND SAFETY DIVISION
San Bernardino County Web Site: cms.sbcounty.gov

AREA	OFFICE LOCATION	OFFICE HOURS	TELEPHONE
BARSTOW Daggett Hinkley Newberry Springs	301 East Mt. View Avenue Barstow, CA 92311	Monday-Friday 8:00 a.m. – 8:30 a.m.	Phone: (760) 995-8140 Fax: (760) 995-8167
BIG BEAR Fawnskin	477 Summit Boulevard P.O. Box 2835 Big Bear Lake, CA 92315	Tuesday 8:00 a.m. to Noon 1:00 p.m. to 4:30 p.m.	Phone: (909) 387-8311 Fax: (909) 387-3249
SAN BERNARDINO Angelus Oaks Barton Flats Bloomington Forest Falls Lytle Creek Muscoy Yucaipa	San Bernardino Government Center 385 North Arrowhead Avenue San Bernardino, CA 92415-0187	Monday - Friday 8:00 a.m. to 5:00 p.m.	Phone: (909) 387-8311 Fax: (909) 387-3249
TWIN PEAKS Crestline Lake Arrowhead Running Springs	26010 State Highway 189 P.O. Box 709 Twin Peaks, CA 92391	Monday, Wednesday, Thursday, & Friday 8:00 a.m. to Noon 1:00p.m. to 4:30 p.m.	Phone: (909) 387-8311 Fax: (909) 387-3249
NORTH DESERT Apple Valley Hesperia Lucerne Valley Phelan Trona Victorville Wrightwood	High Desert Government Center 15900 Smoke Tree Street Hesperia, CA 92345	Monday - Friday 8:00 a.m. to Noon 1:00 p.m. to 5:00 p.m.	Phone: (760) 995-8140 Fax: (760) 995-8167
SOUTH DESERT Joshua Tree Landers 29 Palms Yucca Valley	63655 29 Palms Hwy. Joshua Tree, CA 92252	Wednesday 9:00 a.m. to Noon 1:00 p.m. to 4:00 p.m.	Phone: (760) 995-8140 Fax: (760) 995-8167
RANCHO Ontario San Antonio Heights Rancho Cucamonga Upland	8575 Haven Ave. Suite 130 Rancho Cucamonga, CA 91730	Monday – Friday 8:00 a.m. to Noon 1:00 p.m. to 4:30 p.m.	Phone (909) 948-5075