BUILDING CONSTRUCTION INFORMATION

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INTRODUCTION AND GENERAL STANDARDS

CONSTRUCTION CODES

The City of Sunnyvale enforces the following codes:

- 2007 California Building Code;
- 2007 California Mechanical Code;
- 2007 California Plumbing Code;
- 2007 California Fire Code;
- 2007 California Electrical Code;
- 2006 International Property Maintenance Code;
- Sunnyvale Municipal Code; and
- 2005 Building Energy Efficiency Standards

Building regulations prescribe only such minimum requirements of construction materials and methods as are deemed necessary to provide adequate individual health, safety, and general public welfare.

This book contains general information from the construction codes that relates to single family homes and is intended to assist with remodels, additions, and new construction. For specific information regarding a project, please contact the Building Safety Division for more detailed or specific information.

DEFINITIONS

The following definitions are provided for clarification and use in this section.

Dwelling Unit
A single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Habitable Space
A space in a building for living, sleeping, eating, and cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

Structure
That which is built or constructed.

PERMIT, PLAN CHECK, FEE, AND INSPECTION INFORMATION

Permits

A permit is required from the Building Safety Division to erect any building or structure, or addition, alter, repair, move or demolish any building or structure in the City of Sunnyvale. Permits shall be obtained prior to the start of any construction or demolition. Applications for permits may be obtained at the One-Stop Permit Center at City Hall. Many remodeling permits can also be obtained on-line at www.e-onestop.net.

Permits can be issued to a contractor licensed by the State of California to perform such work (roofing, plumbing, electrical, etc.) or the property owner of record.

Permits are valid for 180 days from the date of issuance or the last inspection. A permit can be extended for an additional 180 days at the request of the permit applicant.

Permits are not required for the following:

1. Cosmetic work such as painting, papering, replacing floor coverings, trim work, etc.

2. Detached accessory structures (e.g. utility sheds and play structures) less than 120 square feet of floor area.
   Note: Approval from the Planning Division may be required depending on the location of the fence. See the Fence Information page of the Planning Division web site for more information.

3. Window awnings supported by an exterior wall on a dwelling unit when not projecting more than 54 inches.

4. Swings and other playground equipment accessory to a detached one- or two-family dwelling.

5. Window replacements when the manufactured frame of the window (nailing flange and existing weather protection) is not altered (commonly referred to as retrofit window replacement). See Residential Window Replacement handout for more information.

6. Replacement or repair of less than 100 square feet of an existing roof within any 12-month period.

7. Fences less than six feet high.
   Note: Approval from the Planning Division may be required depending on the location of the fence. See the Fence Information page of the Planning Division web site for more information.

8. Retaining walls less than four feet high when no other structure is attached to the retaining wall (height is measured from the bottom of the footing to the top of the wall).

9. Platforms, walks, and driveways not more than 30 inches above grade and not over any basement or story below.
   Note: Repair or replacement of public sidewalks or driveway curb cuts requires review and approval by the Public Works Department. They can be contacted at (408) 730-7415 for more information.

   Review and approval by the Planning Division may be required prior to issuance of a building permit. Contact a planner at the One-Stop Permit Center or (408) 730-7444 for more information.

10. Movable cases, counters, and partitions not over five feet nine inches high

11. Prefabricated swimming pools meeting all of the following criteria:
    - Installed on a single family property,
    - Is entirely above ground, and
    - Does not exceed 5,000 gallons.
    - A fence is required to completely surround the pool or spa not less than 5 feet in height with all gates having a self-closing and self-latching device, with no openings in their horizontal dimension greater than four inches. (Sunnyvale Municipal Code Section 16.44.030.)

    Note: Electrical, mechanical, and plumbing permits may be required for any pool equipment.

    Depending on the type of pool or spa being installed, review and approval by the Planning Division may be required. Contact a planner at the One-Stop Permit Center or (408) 730-7444 for more information.

12. Repair or replacement of existing toilets, faucets, sinks in the same location.

13. Replacement of existing electrical receptacles, switches, and lights (in existing boxes) in the same location and where no change to the outlet or switch type is made.
14. Replacement of overcurrent devices such as circuit breakers & fuses.
    Exception: Replacement of a main disconnect does require a permit.

15. Temporary decorative lighting for a dwelling installed for not more than 90 days (such as seasonal Christmas lights).

16. Portable appliances such as heating appliances, ventilating equipment, cooking equipment, cooling units, and evaporator coolers where no change

to the existing electrical (receptacles, switches, etc.) or plumbing (gas line, water line, etc.) systems are made.

17. Portable equipment and appliances with listed cord and plug connections.

Exemption from the permit requirements shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of the building codes or any other laws or ordinances of this jurisdiction.

Fees

Plan check fees are charged for all permits requiring plan review by one or more divisions. Plan check fees are payable at the time the plans are submitted. Permit fees are based on the type of work being performed, the value of the construction, and the square footage of the area of work. Permit fees are payable at the time the permit is issued.

For all new construction and when additional living space of 500 square feet or more is added, school impact fees are required and payable directly to the school districts. Forms are provided by the Building Division which is taken by the applicant to the school district offices for payment. Receipt of payment is required prior to issuance of a building permit.

Additional fees may be required by the Planning Division for review of various types of projects prior to submittal of a building permit. See the Planning Division section of this book or contact a Planner at the One-Stop Permit Center for further information.

Contact the Building Division at the One-Stop Permit Center or refer to the web site at www.SunnyvaleBuilding.com for the current fee schedule and a fee estimate.

Plan Check

Plans that are submitted for building plan check and permits shall clearly show all applicable details such as foundation details, framing of floors, walls and roof, size of windows, and details of special features such as fireplaces, chimneys or balconies. Typical plans that may be required include plot/site plan, floor and roof framing plan, floor plan, elevation, and sections.

Express Plan Check

The Express Plan Check process is typically for single story additions and interior remodels. Three complete sets of plans and two sets of other applicable documentation (Title 24 energy calculations, structural calculations, etc.) are required for plan review. Two sets of the plans and any structural calculations shall be wet signed and stamped by the architect or engineer as necessary.

The building plan check and permit issuance process for most of these types of permits can be completed at the One-Stop Permit Center between the hours of 8:00 a.m. and 12:00 noon.

Regular Plan Check

Second story additions, basement additions, and new construction require five complete sets of plans, three copies of the soils report (for new construction and basement additions), and two sets of other applicable documents (Title 24 energy calculations, structural calculations, etc.) to be submitted for a 21 day plan check. Two sets of the plans, the soils report, and any structural calculations shall be wet signed and stamped by the architect or engineer. After the plan review has been completed by all City departments, comments will be returned to the project applicant. After all comments have been addressed, five corrected sets of plans and two sets of other documents are to be re-submitted for a 14 day plan review.

Plans can be submitted between the hours of 8:00 a.m. to 12:00 noon and 1:00 p.m. to 5:00 p.m. at the One-Stop Permit Center.

Inspections

Building, plumbing, electrical, and mechanical inspections are required to be completed and approved by the building inspector at various stages of construction. No portion of a building or structure (structural framework, electrical, plumbing, or mechanical) shall be covered or concealed without first obtaining inspection and approval of the Building Division.

Required Approvals

The following is a summary of typical inspections and the stage when the inspection should be scheduled. Each project will require the inspections relative to the work that is being done.

- **Foundation:** A foundation inspection shall be scheduled when the trenches are excavated, forms and steel reinforcing bars are in place, but prior to concrete being poured.
- **Under Floor:** An inspection shall be scheduled after all under floor framing, plumbing, electrical, and mechanical is complete and before insulation and the sub-floor are installed.
- **Roof Nail:** A roof nail inspection is required after the roofing deck is installed and before applying any roofing materials.
- **Exterior Shear Nail:** A shear nail inspection is required after the shear walls are installed and before any exterior protection in applied.
- **Fire Inspection:** A residential fire sprinkler system inspection is required for piping, hangers and sprinkler location before the rough framing inspection.
- **Rough Frame:** The rough framing inspection shall be scheduled after the roof and walls are weather tight. All rough framing, rough electrical, rough plumbing, and rough mechanical shall be completed prior to the inspection. Also, if automatic fire sprinklers are installed, a fire inspection shall be completed prior to a rough framing inspection.
- **Electrical:**
  - A rough electrical inspection shall be scheduled after all the electrical wiring is run and before the receptacles are installed. If a rough framing inspection is required, the electrical system will be inspected at that time.

    - After all the work is completed, a final inspection shall be scheduled and the electrical fixtures and receptacles will be inspected.
- **Plumbing:**
    - Under floor plumbing: When all under floor work is installed, at under floor inspection. Drainage systems shall be tested and inspected while under 10 foot headwater test and water piping shall be tested under working pressure.
    - Rough plumbing: A rough plumbing inspection shall be scheduled after all the plumbing systems (drainage, vents, water and gas piping) are completed. If a rough framing inspection is required, the plumbing system will be inspected at that time. Drainage and vent systems shall be tested and inspected while under 10 foot headwater and water piping shall be tested under working pressure.
    - Main Sewer Line: The main sewer line and its connection to the public sewer shall be scheduled for a water test inspection.
    - Gas Lines: All gas lines and systems require an inspection before connections are made to the supply lines. If a rough framing inspection is required, the inspection for the gas line shall be inspected along with the rough frame. For the inspection, the installer shall supply equipment to conduct an air pressure test of ten pounds for 15 minutes to be verified by the Building Inspector.
- **Mechanical:**
    - Under floor inspection: An inspection is required for under floor ducts or vents. If an under floor inspection is required, the mechanical ducts and vents will be inspected at that time.
    - Rough mechanical: A rough mechanical inspection shall be scheduled after the mechanical system, heat ducts, exhaust and vent ducts are installed. If a rough framing inspection is required, the inspection for the mechanical system shall be inspected along with the rough frame
- **Lath and Plaster:** An inspection shall be scheduled to inspect the attachment (screwing or nailing) or all firewalls and water-resistant wallboard. An inspection shall also be scheduled to inspect the attachment for all exterior lath.
- **Insulation:** All required insulation shall be inspected after installation and before the material is covered.
- **Final Inspection:** When all work is completed a final inspection shall be scheduled prior to occupancy or use of the area. If automatic fire sprinklers were installed, a final inspection from the Fire Inspector shall be scheduled and approved prior to scheduling the final Building inspection.

Scheduling Building Inspections

Building inspections can be scheduled on-line at www.e-onestop.net. Building inspections can also be scheduled by calling (408) 730-7790 between the hours of 8:00 a.m. and 5:00 p.m. at least one day prior to the requested inspection date. Inspections can be scheduled for either the morning (8:30 a.m. to 1:00 p.m.) or the afternoon (12:00 noon to 4:30 p.m.).

Fire Inspections can be scheduled by calling (408) 730-7652 between the hours of 8:00 a.m. and 5:00 p.m. Fire inspections are scheduled at specific times and can typically be scheduled within two days of the inspection request.

ALLOWABLE HOURS OF COSNTRUCTION

The Sunnyvale Municipal Code Section 16.08.110 limits construction activity to the following hours:

HOURS OF CONSTRUCTION	
Day	**Time**
Monday through Friday	7:00 a.m. to 6:00 p.m.
Saturday	8:00 a.m. to 5:00 p.m.
Sundays and national holidays	No activity allowed
Extended Hours Allowed for Single Family Detached Housing When the Work is Performed by the Homeowner*	
Monday through Friday	7:00 a.m. to 7:00 p.m.
Saturday	8:00 a.m. to 7:00 p.m.
Sundays and national holidays	9:00 a.m. to 6:00 p.m.

* It is permissible for up to two persons to assist the homeowner as long as they are not hired by the owner to perform the work.

When determined by the Chief Building Official, the following exceptions may be made to the allowable hours of construction:

- No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc. will be allowed where such noises may be a nuisance to adjacent properties.
- Where emergency conditions exist, construction activity may be permitted at any hour or day of the week. Such emergencies shall be completed as rapidly as possible to prevent any disruption to other properties.
- Where additional construction activity will not be a nuisance to surrounding properties, based on location and type of construction, a waiver may be granted to allow hours of construction other than as stated in this section. To request a waiver, contact the Building Safety Division.

FLOOD ZONES

Properties within the AE or AO flood zones may be subject to special building requirements to limit potential flood damage. All new construction and additions greater than 50% of the existing building floor area within these flood zones must design the finished floor to be above the base flood elevation. A licensed Civil Engineer must provide an Elevation Certificate for the designed project that shows the finished floor elevation is above the base flood elevation prior to issuance a building permit. Prior to the final inspection, a final Elevation Certificate must be provided verifying the built structure is above the base flood elevation.

Additions less than 50% of the existing building floor area are not subject to these requirements.

RESIDENTIAL AUTOMATIC FIRE SPRINKLERS

All new residential structures shall be provided with an approved automatic fire sprinkler system. When an addition to an existing residential structure exceeds 50% of the existing living area and the addition is a minimum of 500 square feet, an approved fire sprinkler system shall be installed throughout the building.

Typically, fire sprinkler systems shall be designed and installed in accordance with NFPA Standard 13D standard for the *Installation of Sprinkler Systems in One and Two Family Dwellings and Mobile Homes*.

Plan Check for Fire Sprinkler Systems

When an automatic fire sprinkler system is to be installed, the plans submitted for review for the building permit shall include the following notes:

- Automatic fire sprinkler systems shall be installed in accordance with NFPA 13D.
- Fast response fire sprinkler heads shall be installed in habitable spaces.
- The automatic fire sprinkler system shall be installed by a licensed (C-16) contractor, who shall have a City of Sunnyvale Business License and proof of worker's compensation insurance.
- Three complete sets of fire sprinkler plans and calculations (wet signed and stamped by the engineer) shall be submitted for a 21 day plan review at the One Stop Permit Center. Plans and calculations shall be reviewed and permit issued prior to installation.

The plans for fire sprinkler systems shall be designed by a licensed fire sprinkler contractor (C-16). These plans shall be submitted for review and approval independently from the building permit plans.

When automatic fire sprinklers are required, the existing water meter may be required to be upgraded by the local water jurisdiction (California Water Service or City of Sunnyvale). The domestic water line from the water meter to the residence may also need to be increased in size to accommodate the fire sprinkler system.

Fire Sprinkler Inspection

The first fire sprinkler inspection shall be completed by the fire inspector prior to scheduling the rough framing inspection with the building inspector. Fire sprinkler plans shall be submitted with sufficient time for review and approval by the Fire Protection Engineer prior to the rough frame inspection.

FRAMING AND FOUNDATION CONSTRUCTION

QUALITY OF LUMBER

Joists, rafters, beams and other structural members must be equal to or better than No. 2 Douglas Fir and shall be identified with a grade marking by an approved grading agency.

NAILING SCHEDULE

Following is a framing and foundation nailing schedule:

NAILING SCHEDULE		
	Connection	**Nailing**
1	Joist to sill or girder, toenail	3-8d
2	Bridging to joist, toenail each end	2-8d
3	1" x 6" sub-floor or less to each joist, face nail	2-8d
4	Wider than 1" x 6" sub-floor to each joist, face nail	3-8d
5	2" sub-floor to joist or girder, blind and face nail	2-8d
6	Sole plat to joist or blocking, typical face nail Sole plate to joist or blocking, at braced wall panels	16d at 16" o.c. 3-16d per 16"
7	Top plate to stud, end nail	2-16d
8	Stud to sole plate	4-8d, toenail or 2-16d, end nail
9	Double studs, face nail	16d at 24" o.c.
10	Doubled top plates, typical face nail Double top plates, lap splice	16d at 16" o.c. 8-16d
11	Blocking between joists or rafters to top plate, toenail	3-8d
12	Rim joist to top plate, toenail	8d at 6" o.c.
13	Top plates, laps and intersections, face nail	2-16d
14	Continuous header, two pieces	16d at 16" along each side
15	Ceiling joists to plate, toenail	3-8d
16	Continuous header to stud, toenail	4-8d
17	Ceiling joists, laps over partitions, face nail	3-16d
18	Ceiling joists to parallel rafters, face nail	3-16d
19	Rafter to plate, toenail	3-8d
20	1" brace to each stud and plate, face nail	2-8d
21	1" x 8" sheathing or less to each bearing, face nail	2-8d
22	Wider than 1" x 8" sheathing or less to each bearing, face nail	3-8d
23	Built-up corner studs	16d at 24" o.c.
24	Built-up girder and beams	20d at 32" o.c. at top and bottom and staggered 2-20d at ends and at each splice
25	2" planks	2-16d at each bearing

FOUNDATIONS

Footings and foundations shall be constructed of masonry, concrete or treated wood and shall extend below the frost line. Footings shall have a minimum depth as

indicated in the table below, unless another depth is recommended by a foundation investigation.

FOUNDATIONS FOR STUD BEARING WALLS (MINIMUM REQUIREMENTS)				
Number of Floors Supported By the Foundation	**Thickness of Concrete Foundation Wall (inches)**	**Width of Footing (inches)**	**Thickness of Footing (inches)**	**Depth Below Undisturbed Earth (inches)**
1	6	12	6	12
2	8	15	7	18
3	10	18	8	24

Foundation Plates or Sills

Wood plates or sills shall be bolted to the foundation or foundation wall. Steel bolts with a minimum nominal diameter of 5/8 inch shall be used. Bolts shall be embedded at least seven inches into the concrete or masonry and shall be spaced not more than six feet apart. There shall be a minimum of two bolts per mudsill with one bolt located not more than 12 inches or less than four inches from each end of the sill. Plate washers a minimum of three inches by three inches by 1/4 inch thick shall be used on each bolt. Foundation plates and sills shall be foundation grade redwood or other pressure treated wood with an approved preservative.

Foundation Details

Typical foundation details for raised floors and slab construction are located in Appendix B.

Plates, Sills And Sleepers

All foundation plates or sills and sleepers on concrete or masonry, which is in direct contact with earth, shall be of naturally durable or preservative-treated wood. The minimum size must be two inches nominal in thickness by the full width of studs.

Under Floor Access

Accessible under floor areas shall be provided with a minimum 18 inch by 24 inch opening unobstructed by pipes, ducts, or similar construction.

Under Floor Clearance

All wood floors shall be provided with an 18 inch clearance to earth from underside of floor joists (or bottom of wood structural floors without joists). Clearance from girders to earth shall be 12 inches minimum.

Under Floor Ventilation

Under floor areas shall be ventilated by openings in the exterior foundation wall, with a net area of not less than one square foot for each 150 square feet of under floor area. Openings shall be located as close to corners as practical and shall provide cross ventilation. The required area of such openings shall be approximately equally

distributed along the length of at least two opposite sides. They shall be covered with corrosion-resistant wire mesh with mesh openings of 1/8 inch.

Mechanical under floor ventilation may be provided in-lieu of natural ventilation. Mechanical ventilation shall be continuously running and provide ventilation at a rate of 1.0 cubic foot per minute for each 50 square feet of under floor area and the ground surface shall be covered with an approved vapor retarder.

FLOOR CONSTRUCTION

Girders for single- story construction or girders supporting loads from a single floor shall not be less than 4 inches by 6 inches for spans 6 feet or less, provided that girders are spaced not more than 8 feet on center. The end of beams and girders supported on masonry or concrete shall not have less than 3 inches of bearing. The ends of wood girders entering exterior masonry or concrete walls shall be provided with ½ -inch air space on top, sides and end unless naturally durable or preservative – treated wood is used.

WALL FRAMING

Studs supporting floors and bearing walls shall be a minimum 2 x 4 and spaced not more than 16 inches on center. Stud spacing at 24 inches on center may be used for wall supporting the ceiling and roof only.

When using 24 inch spacing the wall material will need to be verified that it is approved for installation with supports at 24 inches on center. Studs that are 2x may be used at 16 inches or 24 inches on center for non-bearing partitions only. Top plates shall be doubled and splices shall be offset minimum of 48 inches nailed with 16d at eight inches on center within 48 inches of laps. Where top or bottom plates are cut or partially cut for passage of pipes, a metal tie 1/8 inch x 1½ inch shall be fastened to each side of plate with four 16d nails.

All bearing walls and partitions shall have double top plates, with joints in top plates staggered not less than four feet. Top plates shall be lapped at corners and intersections.

In exterior walls and bearing partitions, any wood stud may be cut or notched to a depth not exceeding 25 percent of its width. Cutting or notching to a depth not greater than 40 percent of the stud width is permitted in non-bearing partitions supporting no loads. A hole not greater than 40 percent of the stud width may be bored in any wood stud. Bored holes not greater than 60 percent of the width of the stud are permitted in non-bearing partitions or in any wall where each bored stud is doubled provided not more than two such successive doubled studs are bored. In no case shall the edge of the bored hole be nearer than 5/8 inch to the edge of the stud. Bored holes shall not be located at the same section of a cut or notch.

All exterior walls and main interior partitions shall be effectively braced. All openings in bearing walls shall be provided with headers to support loads. Walls shall be

effectively fire stopped with 2x material at floor, ceiling, and stairways. Fire stopping shall be provided at a maximum of ten foot intervals

All openings four feet wide or less may have double studs on edge and all openings more than four feet wide shall have headers of sufficient size to support the load. Headers shall have not less than 1½ inch solid bearing to the floor. Angles and corners where walls and partitions meet shall be framed solid so that no lath or other wall covering can extend through from room to room.

All walls and partitions shall be effectively fire stopped with two inch lumber or ½ inch gypsum board the full width of the studs at the floor, ceiling and between the floor and ceiling at intervals not to exceed ten feet vertically or horizontally.

All wood frame walls covered with plaster, tile, or similar materials which are subject to water splash shall be protected with 15 pound asphalt-saturated felt.

All wood columns and posts shall be framed to true end bearing and shall extend down to supports of such design as to hold the column or post securely in position and to protect its base from deterioration.

Typical details for wall framing and framing around opening are located in Appendix B.

ROOFS

Rafters and Joists Design

The following rafters and joist table may be used to determine conventional frame member size requirements based on general design requirements. The allowable spans for horizontal load bearing members shall be taken as the clear horizontal distance between supports.

RAFTER AND JOIST TABLE #2 OR BETTER DOUGLAS FIR MAXIMUM ALLOWABLE SPANS (partition loads not included)				
Size	**Spacing**	**Floor Joist**	**Ceiling Joist**	**Rafters (light**

	(inches o.c.)			roof only)
2 X4	12		12, 5”	
2 X4	16		11’ 3”	
2 X4	24		9’ 10”	
2 X 6	12	10’ 9”	19’ 6”	14’ 9”
2 X 6	16	9’ 9”	17’ 8”	12’ 10”
2 X 6	24	8’ 6”	15’ 6”	10’ 5”
2 X 8	12	14’ 2”	25’ 8”	18’ 9”
2 X 8	16	12’ 10”	23’ 4”	16’ 3”
2 X 8	24	11’ 3”	20’ 5”	13’ 3”
2 X 10	12	18’ 0”		22’ 10”
2 X 10	16	16’ 5”		19’ 10”
2 X 10	24	14’ 4”	26’ 0”	16’ 2”
2 X 12	12	21’ 11”		
2 X 12	16	19’ 11”		23’ 0”
2 X 12	24	17’ 5”		18’ 9”

All joists shall have a minimum bearing of 1½ inches when supported on wood or metal and three inches bearing on masonry walls except when supported on a ribbon board and nailed securely to the adjoining stud.

Where ceiling joists are not parallel to rafters, an equivalent rafter tie shall be installed in a manner to provide a continuous tie across the building, at a spacing not more than 4 feet on center.

All floor joists under and parallel to bearing partitions shall be doubled, spiked together or may be separated by solid blocking not more than four feet on center to permit the passage of pipes.

Solid blocking not less than two inches thick and the full depth of the joists shall be provided over each support and at the ends of each joist.

Header joists over six feet long and tail joists over 12 feet long shall be hung in approved joist hangers. Trimmers and headers more than four feet long shall be doubled.

Notches on the end of joists shall not exceed one-fourth the joist depth. Holes bored in joists shall not be within two inches of the top or bottom of the joist and the diameter of any such holes shall not exceed one-third the depth of joist. Notches in the top or bottom of joists shall not exceed one-sixth the depth and shall not be located in the middle third of the span.

Girders, beams, or trusses shall not be notched, bored or otherwise reduced in size.

All joists and beams shall be kept not less than two inches from all flues and chimneys; except that reduction to one inch is permitted for fireplaces and chimneys in exterior

walls, and at least two inches from back of fireplaces. All spaces between chimneys and wood framing at floors, ceilings and roof shall be fire stopped with noncombustible material.

Attic Access

Attic areas with a height greater than 30 inches shall be accessible. The attic access shall not be less than 20 inches by 30 inches. A minimum of 30" clear headroom shall be provided at or above the access opening.

Attic Ventilation

Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing members shall be cross ventilated for each separate space. Ventilation shall be provided at a rate of one square foot for each 150 square feet of attic area, with 50% of the required ventilating area provided by vents located at least three feet above eave or cornice vents.

A minimum of one inch of air space shall be provided between the insulation and the roof sheathing.

Ventilation openings shall be protected against rain. Openings shall also be covered with corrosion-resistant wire cloth screening, or similar material, with openings between 1/8 inch and 1/4 inch.

> *Exception: The opening area may be one square foot for each 300 square feet of attic area provided a vapor retarder having a transmission rate not exceeding 1 perm in stalled on the warm side of the attic insulation.*

ROOF CONSTRUCTION

Roof framing and trussing shall be effectively angle-braced. Roof rafters, when supported on a ribbon, shall be well nailed to the studs. Trusses shall not be nailed to interior walls.

The allowable span of roof rafters shall be measured along the rafter from plate to ridge except that where rafters are braced with purlins and struts to bearing partitions, the span shall be considered between purlins.

The maximum span for 2 x 4 purlins is four feet, the maximum span for 2 x 6 purlins is six feet. The minimum size for purlin supports (kickers) is 2 x 4 and shall be installed vertical or may be installed at angle up to 45% measured from vertical. All purlin supports (kickers) shall be connected to the top plate of a bearing wall. In no case shall a purlin be less in size than the rafters it supports.

A ridge board shall be installed at all ridges at least two inches thick not less in depth than the end cut of the rafter. Where the slope of the roof is less than 3:12 the ridge member shall be designated as a load-bearing member.

All valley and hip rafters shall be not less than 2 inches thick and not less in depth than the end cut of the rafter.

Where ceiling joists run opposite to rafters, rafters shall be provided with cross ties at 48 inches on center placed near the plate. The minimum size for the cross ties shall be 1 inch by 4 inch.

The use of roof trusses shall require Building Safety Division approval of engineering design, details, and calculations. Trusses shall not be cut without review and approval from the Building Safety Division.

ROOF COVERING

Roof decks shall be covered with an approved roof covering secured to the building or structure. Roof covering shall be designed, installed, and maintained in accordance with the building code and the manufacturer's instructions to ensure the roof covering protects the building or structure.

The Sunnyvale Municipal Code requires that all new roof material be a minimum of a Class B fire rating.

Replacement roofs on residential structures may require review and approval from the Planning Division prior to issuance of a building permit. Contact the Planning Division for specific information on roofing requirements.

Roof drains shall be provided and shall be direct water away from the building and toward a permeable surface. Roof drains shall not connect to any sanitary sewer system.

A maximum of two layers of roofing material may be installed on a roof.

The following are general requirements for the installation of different roofing materials. For further information consult Chapter 15 of the 2007 California Building Code. All roof material shall be installed in accordance with the following requirements and the manufacturer's installation standards.

Asphalt Shingles

Asphalt shingles shall be installed over one layer of 15 pound felt on roofs with a minimum slope of 4:12. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped two inches, fastened sufficiently to hold in place.

Asphalt shingles may be installed on roofs with a minimum slope of 2:12 provided the underlayment consists of two layers of 15 pound felt. A minimum 19 inch wide strip of underlayment felt shall be installed parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36 inch wide sheets of underlayment overlapping successive sheets 19 inches and fastened sufficiently to hold in place.

Flashing shall be installed in accordance with the manufacturer's instructions and the following requirements:

ROOF FLASHING REQUIREMENTS	
Location	**Requirements**
Base and Cap	corrosion resistant 26-gage galvanized sheet metal
Open Valleys (valleys lining is exposed)	When lined with metal. Valley lining shall be at least 16 inches wide and of corrosion resistant metal. When lined with two plies of approved mineral-surfaced roll roofing, the bottom layer shall be 18 inches wide and the top layer shall be 36 inches wide.
Closed Valleys (valleys covered with shingles)	One ply of approved smooth roll roofing at least 36 inches wide.

Drip edges shall be provided at eaves and gables of shingle roofs and overlapped a minimum of 2 inches. Eave drip edges shall extend ¼ inch below the sheathing and extend back on the roof a minimum of 2 inches. The drip edge shall be mechanically fastened at 12 inches on center maximum.

A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches wide, measured perpendicular to the slope. Cricket or saddle covering shall be sheet metal or the same material as the roof covering.

Wood Shingles

Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing board shall be a minimum of 1-inch by 4-inch nominal dimensions and shall be spaced on centers equal to coincide with the placement of shingle fasteners.

Wood shingles shall only be used on sloped of 4:12 or greater.

Fasteners for wood shingles shall be corrosion resistant with a minimum penetration of ¾ inch into the sheathing. Each shingle shall be attached with a minimum of 2 fasteners approximately 3/4 inch from each edge and approximately 1 inch from the exposed line.

Shingles shall be laid with a side lap of not less than 1½ inches between joints in adjacent courses, and not in direct alignment in alternate courses. Spacing between shingles shall be not less than 1/4 inch nor more than 3/8 inch. Starter course at the eaves shall be doubled.

At the juncture of the roof and vertical surfaces, flashing and counter-flashing shall be provided in accordance with the instructions. Metal flashing shall be a minimum of 26-gage galvanized sheet metal. Valley flashing shall extend a minimum of 11 inches from the centerline each way and have a splash diverter rib not less than 1 inch high at the

flow line formed as part of the flashing. Flashing shall have an end lap of 4 inches minimum.

Wood Shakes

Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing board shall be a minimum of 1-inch by 4-inch nominal dimensions and shall be spaced on centers equal to coincide with the placement of shingle fasteners. Where 1-inch by 4-inch sheathing is installed at 10 inches on center, additional 1-inch by 4-inch boards shall be installed between the sheathing boards.

Wood shakes shall only be used on sloped of 4:12 or greater.

Fasteners for wood shakes shall be corrosion resistant with a minimum penetration of 3/4 inch into the sheathing. Each shingle shall be attached with a minimum of 2 fasteners approximately 1 inch from each edge and approximately 2 inches from the exposed line.

Shakes shall be laid with a side lap of not less than 1½ inches between joints in adjacent courses. Spacing between shakes shall not be less than 3/8 inch nor more than 5/8 inch, except for preservative-treated wood shakes, which shall have a spacing of not less than 1/4 inch or more than 3/8 inch. The starter course at the eaves shall be doubled. The bottom or first layer may be either shakes or shingles.

Fifteen-inch or 18-inch shakes may be used for the final course at the ridge. Shakes shall be laid with not less than 18-inch wide strips of not less than type 30 felt shingles between each course in such a manner that no felt is exposed to the weather below the shake butts.

At the juncture of the roof and vertical surfaces, flashing and counter-flashing shall be provided in accordance with the instructions. Metal flashing shall be a minimum of 26-gage galvanized sheet metal. Valley flashing shall extend a minimum of 11 inches from the centerline each way and have a splash diverter rib not less than 1 inch high at the flow line formed as part of the flashing. Flashing shall have an end lap of 4 inches minimum.

EXTERIOR DOORS AND GARAGE DOORS

Exterior Doors

All exterior doors shall have a landing with a minimum dimension in the direction of travel of not less than 36 inches and a minimum width equal to the size of the opening.

Each exterior door shall have an exterior lighting fixture controlled by a switch. Outdoor lighting fixtures shall comply with the energy efficiency requirements as described in Energy Conservation Requirements section of this book.

Garage Doors

Doors between the living space of a dwelling and the garage shall have a landing as described above for exterior doors.

Exception: If the door swings into the living space (and not over the lower floor area), a landing is not required. Rather a step with a maximum rise of 7.75 inches and a minimum run of 10 inches is allowed.

EXTERIOR WALL COVERINGS

Weather Protection

Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing, prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer, and a means for draining water that enters the assembly to the exterior.

A minimum of one layer of No. 15 asphalt felt shall be attached to the studs or sheathing to provide a continuous water-resistive barrier behind the exterior wood veneer. Building paper and felt shall be free from holes and breaks and shall be applied over studs or sheathing of all exterior walls. Felt or paper shall be applied horizontally, with the upper layer lapped over the lower layer not less than two inches. Where vertical joints occur, laps shall be not less than six inches.

Weather-resistive barrier may be omitted in the following cases:

- When exterior covering is of approved weatherproof panels.
- When there is no human occupancy.
- Over water-repellant panel sheathing.
- Under approved paperbacked metal or wire fabric lath.
- Behind lath and Portland cement plaster applied to the underside of roof and eave projections.

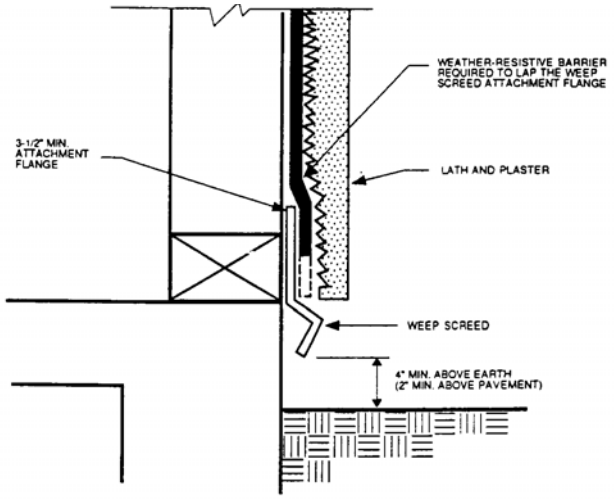
Exterior Plaster (Stucco)

When exterior plaster (stucco) is installed it shall be a minimum 3-coat, 7/8" thick and installed over two layers of Grade D building paper and wire lath. The lath shall be installed with metal reinforcements that shall be furred out from the backing material at least 1/4 inch and shall be nailed with galvanized nails with minimum of 3/4 inch penetration which shall be spaced not more than six inches on center horizontally. Metal reinforcement shall be lapped at least one full mesh at all joints. When no sheathing is used all vertical joints shall be made at studs and horizontal joints shall have at least one metal tie between studs made with 18 gauge U.S. steel wire galvanized.

A minimum 26 gage galvanized sheet metal, corrosion-resistant weep screed with a minimum vertical attachment flange of 3-1/2" shall be provided at or below the foundation plate line on exterior stud walls. The weep screed shall be a minimum of 4 inches above earth or 2 inches above paved areas. The water-resistive building paper

shall lap the attachment flange. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

The following illustrates these requirements:



Exterior Siding

Exterior siding shall be applied over one layer of 15-pound asphalt-saturated felt or other approved waterproof paper.

Exterior Veneer

Masonry veneer shall be supported upon the footings and attached to the structural wall with corrosion-resistive metal ties. Each tie shall support not more than two square feet of wall area. Veneer over openings shall be supported upon lintels on non-corrosive non-combustible material.

Exterior Openings

Exterior openings exposed to weather shall be flashed with rust-resistant metal or other approved flashing in such a manner to make them waterproof.

SKYLIGHTS

Operable skylights shall be ten feet from all plumbing vents or the vent shall terminate three feet above the skylight. Operable skylights shall be a minimum of three feet from any environmental air vent (i.e. stove hood, bathroom fan, etc.)

Plastic skylights shall be a minimum of four feet from each other, unless:

- the skylights are located within the same room or space and the maximum area of the skylights is 100 square feet, or
- the building is equipped throughout with a automatic fire sprinkler system.

Joists and rafters shall be doubled when adjacent to any joists or rafters cut in order to install a skylight. If roof framing is engineered trusses, they shall not be cut without details provided by a licensed civil engineer and approved by the Building Division.

FIREPLACES AND CHIMNEYS

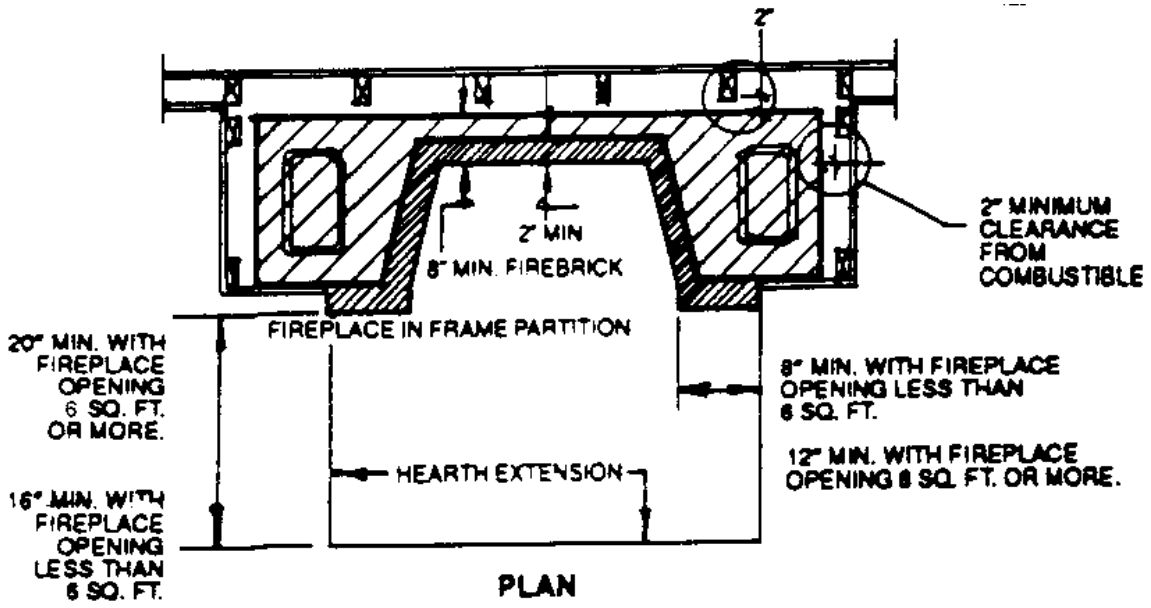
Fireplaces

The Sunnyvale Municipal Code prohibits construction or installation of new wood burning fireplaces (unless the fireplace is constructed completely of masonry). Existing and lawful wood burning fireplace can be repaired and remodeled.

Masonry fireplaces shall be provided with a brick, concrete, stone or other non-combustible hearth slab not less than 4 inches thick. Hearths extensions shall be as follows:

REQUIRED HEARTH EXTENSIONS		
Size of Fireplace Opening	**Front Hearth Dimension**	**Side Hearth Dimension**
6 sq. ft or less	16 inches min.	8 inches min.
6 sq. ft or larger	20 inches min.	12 inches min.

The following illustrates the hearth requirements:



Combustible materials shall not be placed within six inches of the fireplace opening. Combustible material within 12 inches of the fireplace opening shall not project more than 1/8 inch for each one inch of clearance from the fireplace opening.

False fireplaces shall not be recessed into the wall more than six inches, and must in all cases be solidly enclosed.

Factory-built Fireplaces and Pellet Fueled Wood Heaters

Factory-built fireplace units and pellet fueled wood heaters may be used providing such units are installed in accordance with approved standards and that such units are

specifically approved by the Building Safety Division for the proposed use and the units are ICC listed or UL listed.

Masonry Chimneys

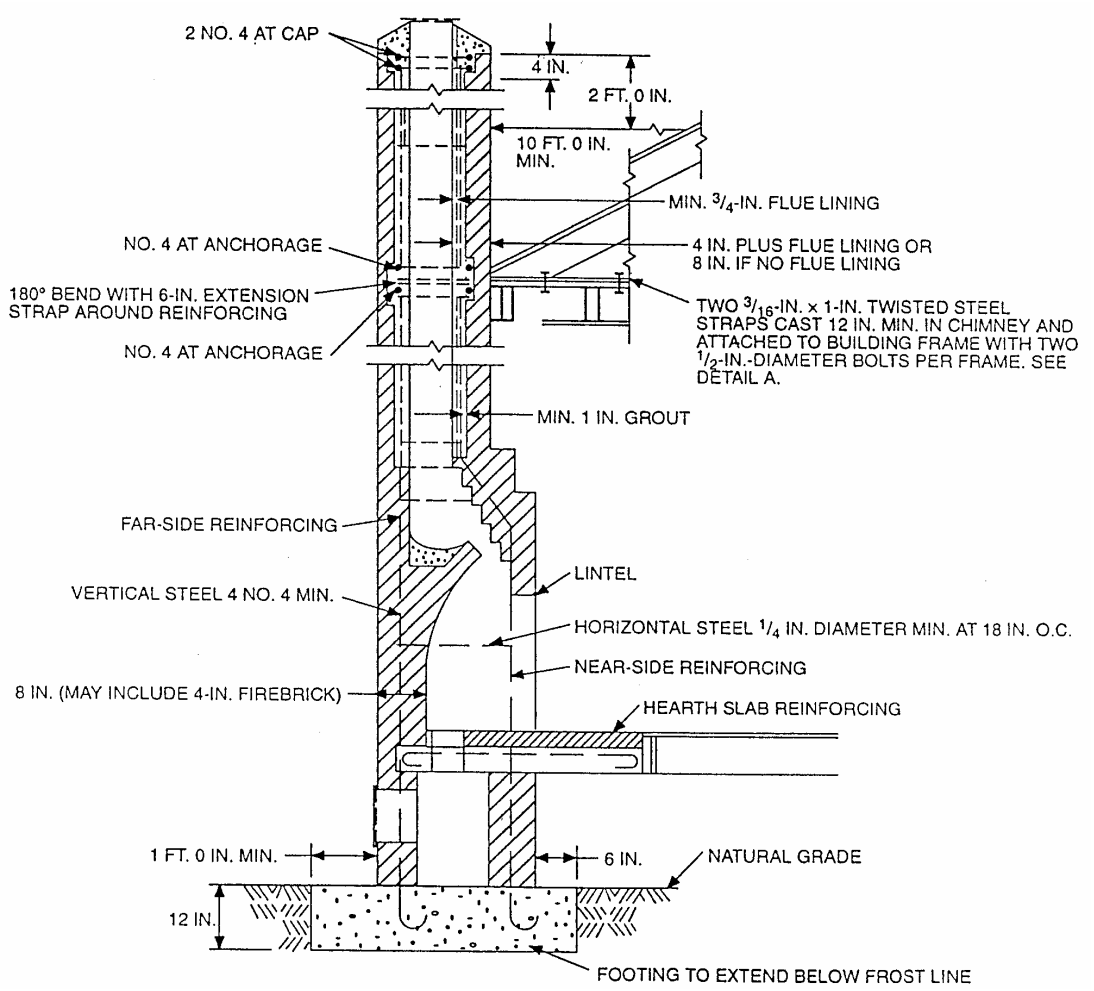
Masonry chimneys shall be constructed of concrete or masonry. Masonry chimneys shall be constructed, anchored, supported, and reinforced as required by the 2007 California Building Code. Masonry chimneys are required to be designed by an architect or engineer licensed by the State of California.

Chimneys shall have a clay flue lining not less than 5/8 inch in thickness, except as mentioned below. Flue lining shall start at the apex of the smoke chamber of a fireplace, and shall be continuous to a point not less than four inches above the top of chimney.

Chimneys shall extend to a point at least two feet above any portion of the building within ten feet of the chimney. Each chimney shall terminate in an approved spark arrestor. The spark arrestor shall be minimum 12 gauge welded or woven wire-mesh with a maximum opening of ½ inch.
At each floor or ceiling line, other than interior fireplaces, two anchorage straps consisting of 3/16 inches by one inch steel cast at least 12 inches into the chimney with 180-degree bend around vertical reinforcing bars in the outer face of the chimney. These are to be fastened to the structural framework of the building with two ½ inch lag bolts or equivalent.

Clean out openings shall be provided at the base of every chimney.

Following is a typical chimney section:



Note: Structural calculations and diagonal bracing may be required for heights more than five feet above the roofline.

INTERIOR SPACE REQUIREMENTS

FIRE-RESISTIVE CONSTRUCTION BETWEEN A DWELLING AND GARAGE

The common walls between a private garage and a dwelling unit shall have 1/2 inch sheetrock installed on the garage side extending to the roof. When habitable space is located above a garage, the ceiling of the garage shall have 5/8 inches type X sheetrock installed. Any openings between the garage and dwelling unit shall have a

solid core door that is self-closing, tight-fitting, 1-3/8 inches thick or a 20 minute rated metal door that is self-closing. Such doors cannot open into a sleeping room.

A carport fully open on two or more sides need not have a fire-resistive separation between the carport and dwelling. Windows between a carport and a dwelling shall not be operable and doors shall be self-closing.

SMOKE ALARMS

Smoke Detector Installation in New Construction and Additions

In new construction and additions, required smoke detectors shall receive their primary power from the permanent building electrical power system (and shall be on the lighting circuit connected within the same room as the smoke detector). In dwellings where two or more smoke detectors are required they shall be interconnected in such a manner that actuation of one shall cause actuation of all detectors in the dwelling unit. (CBC 907.2.10)

All new bedroom electrical outlets (including smoke detectors, receptacles, switches, lighting, etc.) shall be on circuits protected with a combination arc-fault circuit interrupter. (2007 CEC 210.12)

Smoke Detector Installation in Remodeled Dwelling Units
When a permit is required for any repair, alterations, or addition smoke detectors shall be installed in accordance with the following location and maintenance provisions. In existing dwelling units, smoke detectors may be battery operated. (CBC 907.2.10)

Smoke Detector Installation and Location Requirements

Smoke detectors shall be installed in the following locations (CBC 907.2.10):

- On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms (i.e. hallway);
- In each sleeping room;
- In each story within a dwelling unit, including basements. In dwellings or dwelling units with split levels and without an intervention door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level;
- In enclosed common stairwells of apartment complexes and other multiple-dwelling complexes; and
- In a group R-3.1 (i.e. adult residential facilities), in addition to the above, smoke alarms shall be provided throughout the habitable areas of the dwelling unit except kitchens.

Smoke Detector Maintenance

The owner of the dwelling unit shall maintain smoke detectors in an operable condition. The owner shall ensure that all required smoke detectors are installed and in proper working order each time an occupant takes possession. After the occupant has taken possession of the premises it shall be the duty of the occupant to regularly test each smoke detector and notify the owner immediately, in writing, of any

problem, defect, malfunction or failure of any smoke detector. Upon being notified by an occupant that a smoke detector is not in proper working order, the owner shall have such smoke detector repaired or replaced within seven days.

WINDOWS

Emergency Escape Windows (Egress)

Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue that shall open directly into a public street, public alley, yard, or exit court. The emergency door or window shall be operable from the inside to provide a full clear opening without the use of separate tools.

All escape or rescue windows shall meet he following requirements:

- Minimum net 5.7 square feet of openable area (minimum of 5.0 net square feet required for grade level bedrooms; i.e. first floor)
- Minimum net 20" clear width when open, or minimum net 24" clear height when open
- Maximum height of 44" from the finished floor to the bottom of the clear opening

Escape and rescue windows with a finished sill height below the adjacent ground elevation (i.e. basement windows) shall have a window well. Window wells at escape or rescue windows shall comply with the following:

- The clear horizontal dimension shall allow the window to be fully opened and provide a minimum accessible net clear opening of nine square feet with a minimum dimension of 36 inches.
- Window wells with a vertical depth of more than 44 inches shall be equipped with an approved permanently affixed ladder or stairs that are accessible with the window in the fully open position. The ladder or stairs shall not encroach into the required dimension of the window well by more than six inches.

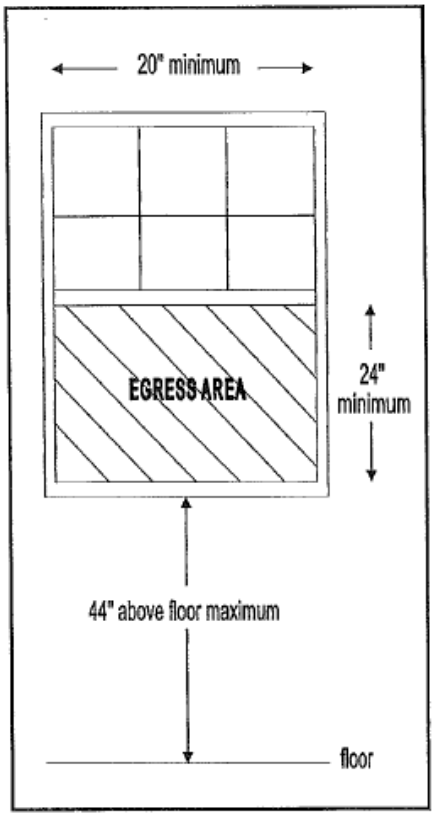
Emergency escape window requirements are illustrated below:

Examples of
EGRESS WINDOW DIMENSIONS

Above Grade 5.7 sq. ft.	
Width	*Height*
20	41
20 ½	40
21	39 ⅛
21 ½	38 ⅛
22	37 ⅜
22 ½	36 ½
23	35 ¾
23 ½	34 ⅞
24	34 ¼
24 ½	33 ½
25	32 ⅞
25 ½	32 ¼
26	31 ⅝
26 ½	31
27	30 ⅜
27 ½	29 ¼
28	29 ⅜
28 ½	28 ¾
29	28 ¼
29 ½	27 ⅞
30	27 ⅜
30 ½	26 ⅞
31	26 ½
31 ½	26 ⅛
32	25 ⅝
32 ½	25 ¼
33	24 ⅞
33 ½	24 ½
34	24 ⅛

At Grade * 5.0 sq. ft.	
Width	*Height*
20	36
20 ½	35 ⅛
21	34 ¼
21 ½	33 ½
22	32 ¾
22 ½	32
23	31 ¼
23 ½	30 ⅝
24	30
24 ½	29 ⅜
25	28 ¾
25 ½	28 ¼
26	27 ¾
26 ½	27 ⅛
27	26 ⅝
27 ½	26 ⅛
28	25 ¾
28 ½	25 ¼
29	24 ⅞
29 ½	24 ⅜
30	24

** Not more than 44" above or below grade*



Bars, grilles, grates or similar devices may be installed on emergency escape or rescue windows, doors or window wells, provided:

- The devices are equipped with approved release mechanisms that are operable from the inside without the use of a key or special knowledge or effort and
- The building is equipped with smoke alarms installed in accordance with the California Building Code.

Safety Glazing

Safety glazing (i.e. tempered glass) shall be installed in the following locations:

- Within a two foot arc of either the edge of a door and where the bottom exposed edge of the glazing is less than 60 inches above the walking surface.
- Glazing in wall enclosing stairway landings or within five feet of the bottom and top of stairways where the bottom edge of the glazing is less than 60 inches above the walking surface.
- Glazing within a portion of wall enclosing a tub/shower where the bottom exposed edge of the glazing is less than 60 inches above the standing surface and drain inlet.
- Any glazing meeting all the following conditions:
  - Exposed area of an individual pane greater than nine square feet
  - Exposed bottom edge is less than 18 inches above the finished floor
  - Exposed top edge is greater than 36 inches above the finished floor
  - Where a walking surface is within 36 inches horizontally of the glazing

Where required, safety glazing (except tempered spandrel glass) shall be permanently identified by a manufacturer marking that is permanently applied and cannot be removed without being destroyed (e.g. sand blasted, acid etched, ceramic fired, laser etched, or embossed). Stickers attached to the window are not sufficient. (2403.1)

Protective Guardrails

Where the window opening (measured at the window sill) is located more than 72 inches above the exterior finished grade, any window located less than 24 inches above the finished floor on the interior shall be either fixed glazing or have a protective guardrail.

LIGHT AND VENTILATION

For the purpose of determining light and ventilation requirements any room may be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed providing an opening of not less than 1/10 of the floor area of the interior room or 25 square feet, whichever is greater.

Light

Every room shall be provided with natural light by means of exterior glazed opening with an area not less than 8% of the floor area of such rooms. For natural lighting purposes, any room is permitted to serve as a portion of another room provided half of the common wall is open and provides an opening on not less than 1/10 of the floor area of the interior room, or 25 square feet, whichever is greater.

In lieu of natural light, artificial light may be provide that is adequate to provide average illumination of 10 foot-candles over the area fo the room at a height of 30 inches above the floor.

Ventilation

Every room shall be provided with natural ventilation by means of operable exterior openings with an area of not less than 4% of the floor area of such rooms. When ventilation is provded through an adjoining room, the opening between the rooms shall be clear and not less than 8% of the interior room or 25 square feet, whichever is greater.

Bathrooms, water closet compartments, and similar rooms shall be provided with natural ventilation by means of operable exterior openings with an area not less than three square feet.

In lieu of required exterior opening for natural ventilation, a mechanical ventilating system may be provided. When installed in a single room, such ventilations system shall be capable of supplying outdoor ventilations air at a rate of 15 cubic feet per minute per occupant (for purposes of this section, assume two occupants for the first bedroom and one occupant for each additional bedroom).

In lieu of required exterior openings for natural ventilation in bathrooms water closet compartments, and similar rooms a mechanical ventilation system connected directly

to the outside capable of providing ventilation at a rate of 50 cubic feet per minute for intermittent ventilation or 20 cubic feet per minute for continuous ventilation.

INTERIOR SPACE DIMENSIONS

Size of Rooms

Dwelling units must have at least one room, which has no less than 120 square feet of floor area. Other habitable rooms (except kitchens) shall have an area of not less than 70 square feet. Kitchens shall have a minimum of 50 square feet of gross floor area.

Habitable spaces, other than kitchens, shall not be less than seven feet in any dimension.

Bathrooms

The water closet shall have a minimum clearance of 30 inches in width (fixture is to be centered with a minimum of 15" clear on each side) and 24 inches clear in the front.

Shower stalls shall have a minimum finished interior space of 1024 square inches and shall have a clear center dimension of 30 inches. The shower door shall be a minimum of 22 inches in width.

Ceiling Height

Occupied spaces, habitable spaces, hallways shall have a ceiling height of not less than seven feet six inches. Bathrooms, toilet rooms, kitchen, storage rooms, and laundry rooms shall have a ceiling height of not less than seven feet.

Beams or girders spaced not less than four feet on center and projecting not more than six inches below the ceiling may encroach into the required ceiling height.

In rooms with a sloping ceiling, the seven feet six inch height shall be provided in at least 50 percent of the area. When determining the ceiling height, any portion of the room with a ceiling height of less than five feet shall not be included in the overall size of the room.

STAIRWAYS

The width of private residential stairways may not be less than 36 inches and clear of all obstructions except handrail. The rise of stairs shall not be more than 7.75 inches and the tread shall not be less than 10 inches exclusive of the nosing. Headroom clearance shall be not less than six feet eight inches measured vertically from nosing to the nearest ceiling.

There shall be a floor or landing at the top and bottom of each stairway or stair run. Landings shall have a width and length dimensions not less than the width of the stairs.

Handrails

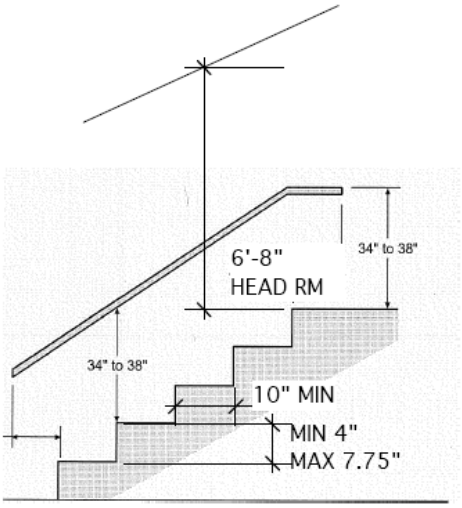
Interior stairways shall be provided with minimum of one handrail; exterior stairways shall have two handrails. Such handrail shall be placed not less than 34 inches or more

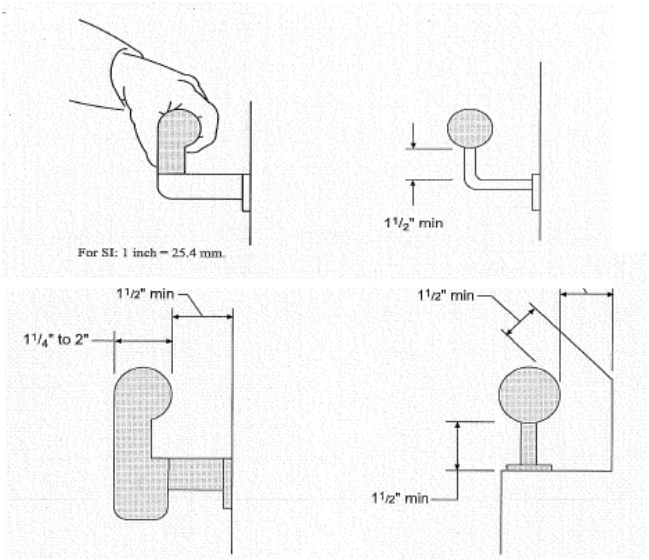
than 38 inches above the nosing of treads and the ends of handrails shall be returned or shall terminate in post or safety terminals.

Exception: Stairways having less than four risers and serving one individual dwelling unit need not have handrails.

The circular cross-section of handrails shall have a diameter of at least 1.25 inches and not greater than two inches, or shall provide equivalent graspability.

The following illustrates typical handrail and stair requirements:



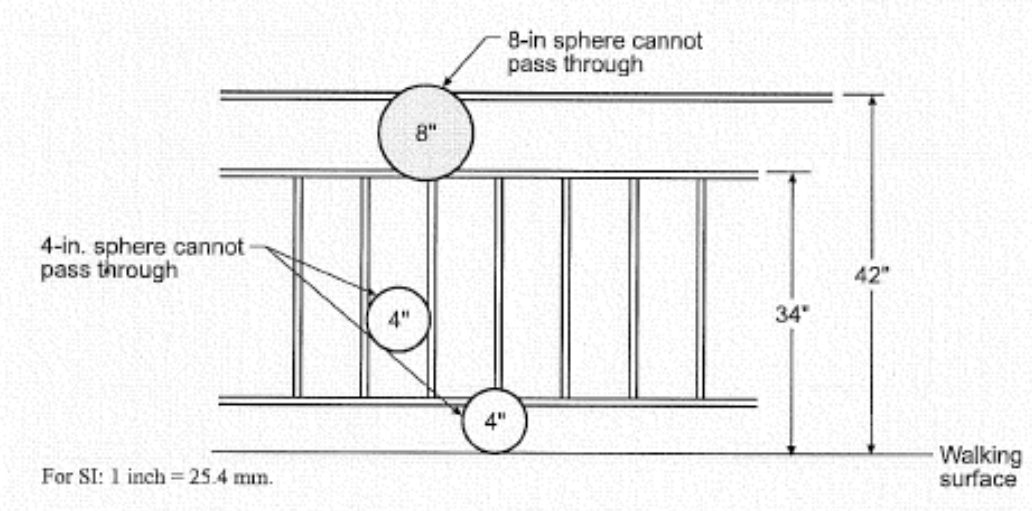


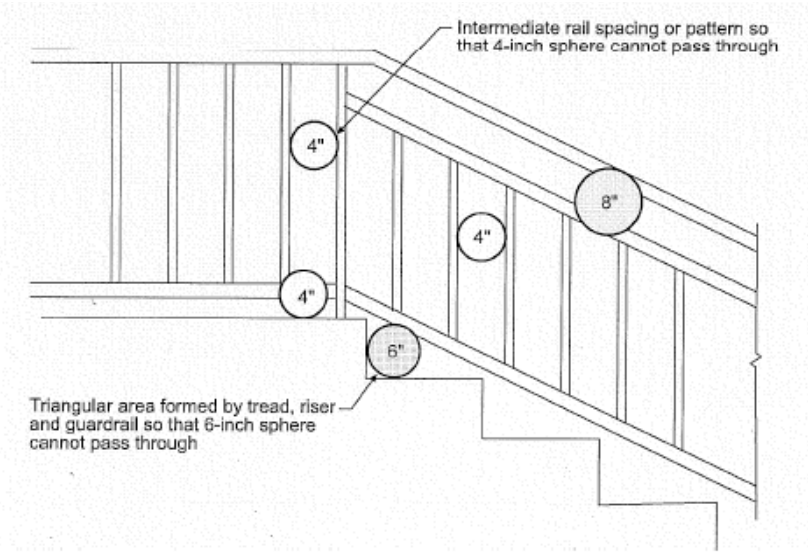
GUARDRAILS

Guardrails shall be provided along open-sided walking surfaces, mezzanines, stairways, ramps, balconies, landings, porches. And other areas that are more than 30 inches above the floor or grade level. Such railing shall be not less than 42 inches in height above the floor. The intermediate members in open type railing shall be spaced so a 4-3/8 inch sphere can not pass through.

Exception: Guardrails that also serve as a handrail shall have a height of 24 inches to 38 inches measured vertically from the leading edge of the stair tread nosing.

Guardrail requirements are illustrated below:





WALLBOARD

Gypsum wallboard shall be not less than 1/2 inch thick and shall be nailed as set forth in the table below. All edges and ends of wallboard shall occur over nailing members except for treated joints at right angles to framing members.

APPLICATION OF SINGLE-PLY GYPSUM WALLBOARD					
Thickness	**Plane of**	**Long Dimension of**	**Maximum**	**Maximum**	**Maximum**

of Gypsum Wallboard (inches)	Framing Surface	Gypsum Wallboard Sheets in Relation to Direction of Framing Members	Spacing of Framing Member (o.c.)	Spacing of Nails (o.c.)	Spacing of Screws[1] (o.c.)
1/2”	Vertical	Either Direction	16”	8”	16”
1/2”	Horizontal	Either Direction	16”	7”	12”
1/2”	Vertical	Perpendicular	24”	7”	12”
1/2”	Horizontal	Either Direction	24”	8”	12”
5/8”	Vertical	Either Direction	16”	8”	16”
5/8”	Horizontal	Either Direction	16”	7”	12”
5/8”	Vertical	Either Direction	24”	7”	12”
5/8”	Horizontal	Perpendicular	24”	8”	12”

[1] *Screws shall be of an approved type long enough to penetrate into wood framing not less than 5/8 inch and through metal framing not less than 1/4 inch.*

When gypsum is used as a base for tile or wall panels for tub, shower or water closet compartment walls, water-resistant gypsum backing board (green board) shall be used. Water-resistant gypsum board shall not be used in the following locations:

- Over a vapor retarder
- In areas subject to continuous high humidity, such as saunas or steam rooms
- On ceilings where frame spacing exceeds 12 inches on center

For information regarding gypsum wallboard installed in a garage adjacent to a dwelling, please refer to the section on this book titled *Fire-Resistive Construction Between a Dwelling and a Garage*.

CLOTHES DRYER VENTILATION

Moisture exhaust ducts for clothes dryers shall terminate outside of the building and have a back-draft damper. Such ducts shall be metal with a smooth interior surface and shall not contain sheet metal screws or other fasteners that obstruct the flow.

Clothes dryer ducts shall have a maximum length of 14 feet including two 90 degree elbows. Where more than two 90 degree elbows exist, two feet shall be deducted from the maximum length of each additional 90 degree elbow. If the installation instructions provided by the clothes dryer manufacturer allows a longer duct vent length, this can be reviewed by the Chief Building Official.

When a clothes dryer is installed in a closet or compartment, the exhaust duct shall be a minimum of four inches in diameter. The closet or compartment shall also have a minimum opening of 100 square inches for make up air.

ELECTRICAL REQUIREMENTS

The following information is provided as general requirements for individual dwelling units. For more specific information, consult the 2007 California Electrical Code or the Building Safety Division.

INSTALLATION OF ELECTRICAL SERVICE

The main electrical service shall be installed with rigid conduit. Electrical metallic tubing may be used where the service drop is attached to the building. The service entrance cable may be used, provided the approved fittings are used with the cable, such as a rain-tight service head or forming the cable goose-neck, taped or painted, and held securely in place by a fitting approved for the purpose.

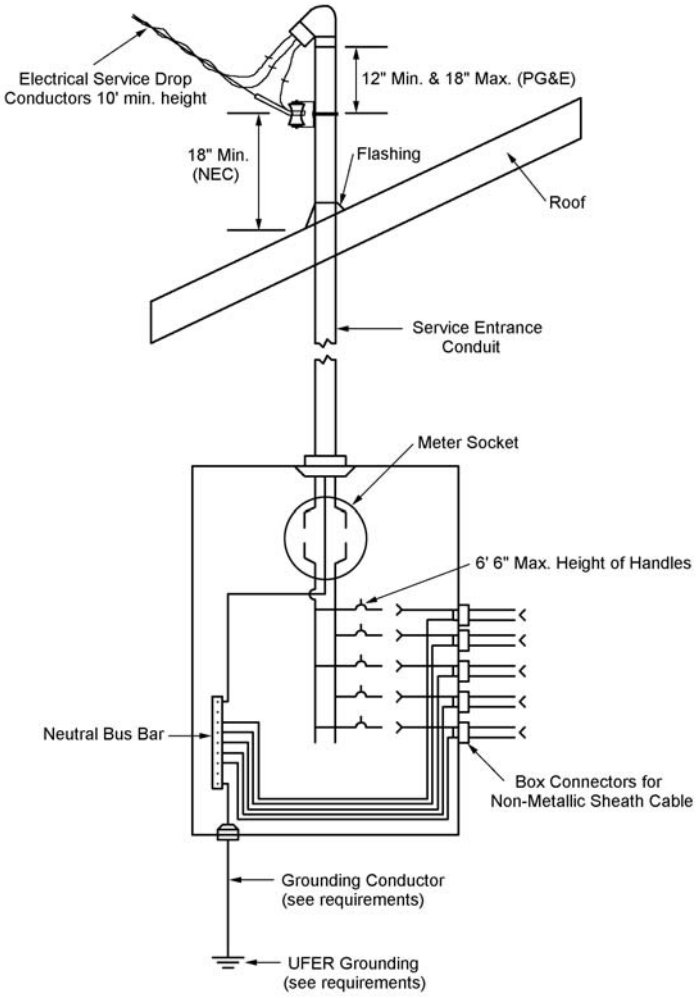
The minimum size service conduit shall be 1-1/4 inch. The minimum size service entrance wire shall be rated 100 amperes minimum if the load is 10 kW or more, or has more than six two-wire branch circuits. A larger service may be required for new homes or additions to existing homes. See *Electrical Load Estimating Worksheet* in Appendix A to determine the minimum electrical service required. It is recommended that spare electrical capacity be installed to allow for the addition of future electrical equipment at minimum cost.

The service head shall be installed where directed by the serving agency (Pacific Gas and Electric – PG&E), and a substantial support for the drops shall be provided at a single point of attachment. The attachment of the drop shall be below the service head and drip loops formed to prevent moisture entering the conduit.

Conductors and cables exposed to direct sunlight, including overhead service conductors, shall be listed and marked as "sunlight resistant." Service entrance conductors shall be sized as follows:

SERVICE ENTRANCE CONDUCTORS SIZE AND RATING		
Service or Feeder Rating	**Copper Conductors**	**Aluminum or Copper-Clad Aluminum**
100 Amps	#4 AWG	#2 AWG
125 Amps	#2 AWG	#1/0 AWG
150 Amps	#1 AWG	#2/0 AWG
200 Amps	#2/0 AWG	#4/0 AWG

The Planning Division requires that the electrical service be placed underground for all new construction.



Clearance of Service Conductors (Wires)

Conductors shall have a vertical clearance of not less than eight feet above the roof surfaces. The service head shall be so located that the service drops together with the open wires between the service head and service drop will have a minimum clearance of ten feet vertically above ground and three feet radius from doors and windows.

A minimum clearance of ten feet is required for service drops passing over buildings including premises being served, except as follows:

Exception No. 1: If the roof has a slope of not less than 4 inches in 12 inches, a reduction in clearance of three feet is permitted.

Exception No. 2: A reduction in clearance above only the overhanging portion of the roof to not less than 18 inches is permitted if not more than six feet of service-drop conductors, four feet horizontally, pass over the roof overhang and they are terminated at a through-the-roof raceway or approved support.

Location of Main Switch

Service switches shall be installed at the nearest readily accessible point to the entrance of the service wires. The maximum height of the service switch or circuit

breaker handle shall not exceed six feet six inches above ground and shall have a clear space of three feet in front and width, and six feet three inches headroom.

Grounding of Services

Any work involving adding sub-panels, upgrade of electrical service, change of water service, or re-piping of a structure will require upgrading of the grounding of the electrical service. The underground water service shall not be used as the grounding electrode.

Grounding shall consist of a continuous grounding conductor run from the panel to a ground rod and to the cold water pipe. Grounding of the electrical service at the main water line must be within the first five feet of water piping into the building.

For existing structures and additions not affecting the main electrical service panel location, the grounding electrode shall be nonferrous (copper), listed, and not be less than ½ inch in diameter. The electrode shall be installed such that at least eight foot of length is in contract with the soil. It shall be driven to a depth of not less than eight feet. The upper end of the electrode shall be flush with or below ground level unless the above-ground end and the grounding electrode conductor attachment are protected against physical damage.

For new construction and additions where the main electrical service panel is located in the new area, a concrete encased grounding electrode shall be installed (UFER ground). The grounding electrode shall be a minimum of 20 feet in length and be located in the concrete footing covered by a minimum two inches of concrete. If using ½" diameter bare or zinc coated re-bar, an inspection plate shall be installed where the grounding electrode is connected to the grounding conductor. If using copper for the grounding electrode, a minimum #4 AWG is required and it can be run directly to the main panel.

The required grounding electrode conductor (from electrode to panel) size is listed in the following table:

GROUNDING ELECTRODE CONDUCTOR SIZING		
Size of Main Panel	**Copper Conductors**	**Aluminum or Copper-Clad Aluminum**
100 Amps	#8 AWG	#6 AWG
125 Amps	#8 AWG	#6 AWG
150 Amps	#6 AWG	#4 AWG
200 Amps	#4 AWG	#2 AWG

Bonding

Any work involving adding sub-panels, upgrading of the electrical service, change of water service, or re-piping of a structure will require upgrading of the bonding of the electrical service

Bonding shall consist of a continuous bond jumper installed at the water heater between the hot, cold, and gas lines. The bonding jumper size shall be equal to the grounding conductor size.

Bonding shall consist of a continuous bond jumper installed at the water heater between the hot, cold, and gas lines. The bonding jumper shall be sized based on the following table:

BONDING JUMPER SIZING		
Size of Main Panel	**Copper Conductors**	**Aluminum or Copper-Clad Aluminum**
100 Amps	#8 AWG	#6 AWG
125 Amps	#6 AWG	#4 AWG
150 Amps	#6 AWG	#4 AWG
200 Amps	#6 AWG	#4 AWG

RECEPTACLE OUTLET INSTALLATION

All receptacles shall be grounded with the ground wire carried with the branch circuit.

Wires shall be of adequate size for supplying their connected load. Wires shall be considered as properly protected when the protective device is set at a rating that does not exceed the allowable current carrying capacity as noted in the following table:

CURRENT CARRYING CAPACITY	
Breaker Size	**Wire Gauge**
15 amp	14
20 amp	12

Receptacle Outlet Locations

Receptacle outlets shall be provided and installed in every kitchen, dining room, breakfast room, living room, parlor, library, den, sunroom, recreation room, family room and bedroom, or similar room or area of dwelling units. Receptacle outlets shall be installed so that no point along the floor line in any wall space is more than six feet measured horizontally from an outlet in that space including any walls two feet wide.

The receptacle outlets shall, insofar as practicable, be spaced equal distance apart. Receptacle outlets in the floor shall not be counted as part of the required number of receptacle outlets unless located within 18 inches of the wall.

Kitchens

In the kitchen, pantry, breakfast room, dining room, or similar area two or more 20-ampere shall appliance branch circuits shall serve all receptacle outlets and outlets for refrigeration equipment. The small appliance branch circuits shall have no other outlets.

Exception: The receptacle outlets for refrigeration equipment shall be permitted to be supplied from an individual branch circuit rated 15 amperes.

The spacing for receptacle outlets for counter space shall be installed as noted in the following table:

KITCHEN COUNTERTOP RECEPTACLES	
Location	**Requirements**
Wall Counter Space	Receptacle outlets shall be installed so that no point along the wall line is more than 24 inches measured horizontally from a receptacle outlet in that space. A receptacle outlet shall be installed at each wall counter space 12 inches or wider.
Island Counter Space	At least one receptacle outlet shall be installed at each island counter space with a long dimension of 24 inches or grater and short dimension of 12 inches or greater.
Peninsular Counter Space	At least one receptacle outlet shall be installed at each peninsular counter space with a long dimension of 24 inches or grater and a short dimension of 12 inches or grater. A peninsular countertop is measured from the connection edge.
Separated Spaces	Countertop spaces separated by range tops, refrigerators, or sinks shall be considered as separate counter space in applying these requirements.
Receptacle Outlet Location	Receptacle outlets shall be located not more than 20 inches above the countertop. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops. Receptacle outlets rendered not readily accessible by appliances fastened in place or appliances occupying dedicated space shall not be considered as these required outlets.

Note: For construction for the physically impaired or on island and peninsular countertops where the countertop is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means to mount a receptacle within 20 inches above the countertop, such as an over head cabinet. Receptacles shall be permitted to be mounted not more than 12 inches below the countertop. Receptacles mounted below the countertop in accordance with this exception shall not be located where the countertop extends more than six inches beyond its support base.

Bathrooms

At least one wall receptacle outlet shall be installed in bathrooms adjacent to each basin location. Bathroom receptacle outlets shall be supplied by one dedicated 20-ampere branch circuit. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.

Outdoor Outlets

At least one receptacle outlet accessible at grade level and not more than six feet six inches above grade shall be installed at the front and back of the house. The enclosure for such receptacles shall be weatherproof whether or not the attachment plug cap is inserted (typically referred to as a bubble cover).

Laundry Areas
At least one receptacle outlet shall be installed for the laundry. The laundry receptacle(s) shall be on a dedicated 20-ampere branch circuit.

Basements and Garages
At least one receptacle outlet, in addition for any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage with electric power.

Hallways
Hallways ten feet or more in length shall have at least one receptacle outlet. The hall length shall be considered the length along the centerline of the hall without passing through a doorway.

Ranges and Cooking Appliances
Branch-circuit conductors supplying household ranges, wall-mounted ovens, counter-mounted cooking units and other cooking appliances shall have an ampacity not less than the maximum load to be served. For ranges of $8^{3/4}$ kW or more rating, the minimum branch-circuit rating shall be 40 amperes.

LIGHTING OUTLETS

At least one wall switch-controlled lighting outlet shall be installed in every habitable room, bathroom, hallways, stairways, attached garages, detached garages with electric power, and at exterior side of outdoor entrances or exits. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

At least one lighting outlet shall be installed in an attic, under floor space, utility room and basement when these spaces are used for storage or contain equipment-requiring servicing.

Exception No. 1: In habitable rooms, other than kitchen and bathrooms, one or more receptacles controlled by a wall switch shall be permitted in lieu of lighting outlets.

Exception No. 2: In hallways, stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

Exception No. 3: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to wall switches, or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

Bathrooms

Lighting fixtures located within three feet horizontally and eight feet vertically of the bathtub rim or shower stall threshold shall be listed for a damp location, or listed for wet locations where subject to shower spray.

Recessed Lighting

All incandescent lighting fixtures recessed into insulated ceilings must include an approved zero-clearance insulation cover (IC-rated). Although this requirement does not apply to fluorescent fixtures, recessed lighting fixtures left un-insulated significantly increase the heat loss through the roof/ceiling area reducing the effectiveness of the insulation. Heat lamps are not required to be IC-rated.

Closet Lighting

Lighting fixtures installed in a closet shall be either incandescent with a sealed lens or fluorescent. Lighting fixtures shall be installed as follows:

CLOSET LIGHTING INSTALLATION		
Lighting Fixture Type and Location	**Installation Location**	**Minimum Distance to Nearest Point of Storage**
Fluorescent – Surface Mounted	On wall above door or on the ceiling.	6”
Incandescent – Surface Mounted	On wall above door or on the ceiling.	12”
Fluorescent – Recessed	Any wall or on the ceiling.	6”
Incandescent – Recessed	Any wall or on the ceiling.	6”

GROUND FAULT CIRCUIT INTERRUPTER – GFCI

Ground-Fault-Circuit-Interrupters (GFCI) are devices that function to interrupt the electrical current to the load when a fault current to ground exceeds a (very low) pre-determined value that is less than that required to operate the over-current protective device (i.e. fuse or breaker) of the supply circuit.

All 15 or 20 ampere receptacles installed in the locations specified below shall have ground-fault-circuit-interrupters protection for personnel:

- Bathrooms
- Garages and grade-level portions of unfinished accessory buildings used for storage or work areas
- Outdoors
- Crawl spaces at or below grade level
- Unfinished basements. For purposes of this requirement, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and the like
- Kitchens, where the receptacles are installed to service the counter top surfaces
- Wet bar sinks, where the receptacles are installed to serve the countertop surfaces and are located with in 6 feet of the outside edge to the wet bar sink

See swimming pool wiring section for additional requirements.

ARC FAULT CIRCUIT INTERRUPTER – AFCI

All branch circuits that supply 15- and 20- ampere outlets (lighting, switches, receptacles, smoke detectors, etc.) in dwelling unit bedrooms shall be protected by a combination arc-fault circuit interrupter. An arc-fault circuit interrupter is a circuit breaker device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

ELECTRICAL WIRING DETAILS

Raceways, cable assemblies, boxes, cabinets and fittings shall be securely fastened in place. Raceways and cable assemblies shall be continuous from outlet to outlet and from fitting to fitting. Wires in raceways shall be continuous from outlet to outlet and there shall be no splice or taps made within the raceway itself.

An approved box shall be installed at each outlet, switch point, splice or junction point of conduit, electrical metallic tubing, surface metal raceway, armored cable, or non-metallic sheathed cable. At least six inches of wire shall be left at each outlet and switch point for making up joints for the connection of fixtures or devices. Splices shall be electrically and mechanically secure.

Non-metallic sheathed cable may be used for both concealed and exposed work in normally dry locations. When used in exposed work, it must be protected from physical damage by covering or placing along running boards.

When in concealed work, wire cables are run through holes in studs, joists or similar wood members, holes shall be bored at the approximate center of wood members or at least two inches from nearest edge.

Outlet, switch and junction boxes, fittings and cabinets shall be securely fastened in place. Non-metallic boxes may be used only with a non-metallic wiring system. Metallic boxes used with non-metallic wiring systems shall be grounded when within eight feet vertically or five feet horizontally of a grounded surface. Boxes and fitting installed in damp or wet locations shall be weatherproof. Outlet boxes for concealed work shall have a depth of at least 1½ inches. Where raceway or cable is used with metal boxes or fittings, the raceway or cable shall be secured to such boxes and fittings with approved clamps or connectors. Where non-metallic outlet boxes are used with non-metallic sheathed cable, clamping or individual cables to the box is not required if cable is secured within eight inches of the box and covered.

Each outlet or junction box shall be provided with a cover. A metal plug shall effectively close unused openings in boxes and cabinets. In walls or ceilings constructed of wood or other combustible material, outlet boxes and fittings shall be flush with the finished surface. In walls of non-combustible materials boxes and fittings should be so installed that the front edge of the box or fitting will not set back more than 1/4 inch.

Junction boxes shall be installed in an accessible location with a minimum clearance of not less than three feet.

Electrical Cable Underground Installation

The following table lists the burial depth requirements for electrical cables installed underground:

MINIMUM COVER REQUIREMENTS (IN INCHES) FOR ELECTRICAL CABLE BURIAL					
Location or Wiring Method of Circuit	**Direct Burial Cables or Conductors**	**Rigid Metal Conduit or Intermediate Metal Conduit**	**Non-metallic Raceways Listed for Direct Burial Without Concrete Encasement**	**Residential Brach Circuit, Maximum 120 Volts, with GFCI Protection, Maximum 20 Amps**	**Circuits for Irrigation and Landscape Lighting, Maximum 30 Volts, Installed with Type UF Cable or Raceway**
All locations not specified below	24	6	18	12	6
In trench below 2-inch thick concrete	18	6	12	6	6
Under a building	0 (in raceway)	0	0	0 (in raceway)	0 (in raceway)
Under 4-inch thick concrete	18	4	4	6 (direct burial) 4 (in raceway)	6 (direct burial) 4 (in raceway)
Under street, driveways, and parking lots	24	24	24	24	24
One- and two-family driveways or outdoor parking area	18	18	18	12	18

SWIMMING / WADING POOLS AND OUTDOOR SPAS / HOT TUBS

The following are general requirements for receptacles, lighting fixtures, lighting outlets, switching devices, and ceiling fans located around a pool area.

Receptacles

A receptacle that provides power to a water-pump motor or other loads directly related to the circulation and sanitation system, a permanently installed pool or fountain; shall be permitted between five feet and ten feet from the inside walls of the pool or fountain. The receptacle shall be single and of the locking and ground types and shall be protected by a ground –fault circuit interrupter (GFCI).

Where a permanently installed pool/spa is installed at a dwelling at least one 15 or 20 ampere receptacle on a general-purpose branch circuit shall be located a minimum of ten feet from and not more than 20 feet from the inside wall of the pool. This receptacle shall be located not more than six feet six inches above the floor, platform or grade level serving the pool or spa/hot tub.

All 125-volt receptacles located within 20 feet of the inside wall of a pool or spa/hot tub shall be protected by a ground –fault circuit interrupter (GFCI).

Lighting Fixtures, Lighting Outlets, and Ceiling Suspended Fans

In indoor pool areas, lighting fixtures, light outlets, and ceiling-suspending fans shall not be installed over the pool or spa. For and area extending five feet horizontally from the inside walls of a pool/spa unless no part of the lighting fixture or fan is less than 12 feet above the maximum water level.

Existing lighting fixtures and lighting outlets located less than five feet measured horizontally from the inside walls of a pool/spa shall be at least five feet above the surface of the maximum water level. Lighting fixtures and lighting outlets shall be rigidly attached to the existing structure, and be protected by a ground-fault circuit interrupter (GFCI).

Lighting fixtures and lighting outlets installed in the area extending between five feet and ten feet measured horizontally from the inside walls of a pool/spa shall be protected by a ground-fault circuit interrupter (GFCI). A ground-fault circuit interrupter (GFCI) is not required if fixtures are installed at least five feet above the maximum water level and rigidly attached to the existing structure adjacent to or enclosing the pool/spa.

Disconnecting

A disconnecting means shall be provided and accessible, located within sight from all pools, spas, and hot tub equipment, and shall be located at least five feet from the inside walls of the pool, spa, or hot tub.

Bonding / Wiring

The following parts shall be bonded together by a solid copper conductor not smaller than #8 AWG:

- All metallic parts of the pool structure, including the reinforced steel
- The forming shell
- All metallic fittings within or attached to the pool structure

- Metal parts of electrical equipment associated with the pool water circulating system, including pump motors
- Metallic conduit and metallic piping within five feet of the inside walls of the pool by a permanent barrier
- All fixed metallic parts that are within five feet of the inside walls of the swimming pool and that are not separated from the pool area by a permanent barrier

Wiring shall not be placed over a pool or within ten feet horizontally from the inside of the walls of the pool, nor over a diving structure, observation stand, tower or platform.

INDOOR SPAS AND HYDROMASSAGE BATHTUBS

At least one receptacle shall be located a minimum of five feet from and not more than ten feet from the inside wall of the spa or hot tub. Receptacles located within ten feet of the inside walls of a spa or hot tub shall be protected by a ground-fault circuit-interrupter. Receptacles that provide power shall be ground-fault circuit-interrupter protected.

Wall switches shall be located at least five feet measured horizontally, from the inside walls of the spa or hot tub.

PHOTOVOLTAIC PANEL INSTALLATION

All photovoltaic panels shall be installed in accordance with the manufacturer's instructions and the building code requirements. All equipment shall be UL listed for the installation and purpose.

All systems shall have an electrical disconnect, sized at not more than 20% of main electrical panel load, between the PG&E meter and the converters. A ground conductor shall be provided and sized based on the disconnect size connected to the existing UFER ground AC system. GFCI protection is required at the inverters. All equipment frames are to be grounded.

A sign shall be provided at the main electrical panel disconnect that reads "WARNING, ELECTRICAL SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION."

The majority of roof top photovoltaic tiles are able to be supported by the existing roof framing. However, if the weight of the tiles is excessive the existing roof structure and lateral design may need to be upgraded to accommodate the added load.

PLUMBING REQUIREMENTS

Each plumbing fixture shall be provided with an adequate supply of potable running water piped in an approved manner, so arranged as to flush and keep it in a clean and sanitary condition without danger of back flow or cross-connection. All plumbing

fixtures shall be provided with hot and cold running water except water closets (toilets) shall be provided with cold water only.

EQUIPMENT

All plumbing appliances, equipment, and fixtures shall be listed by an approved testing agency (e.g. Underwriters Laboratories-UL, International Association of Plumbing and Mechanical Officials – IAPMO, etc.) or approved by the Chief Building Official. All equipment shall also comply with the energy efficiency standards of the State of California Energy Commission.

INSTALLATION STANDARDS

All plumbing appliances, equipment, and fixtures shall be installed and located as specified in the manufacturer's installation standards.

WATER SUPPLY

Materials used for plumbing systems shall be as follows:

WATER SUPPLY PIPING MATERIALS	
Location	**Allowable Materials**
Inside of a building	brass, copper (Type L or M), cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel, PVC, or PEX
Outside of a building	PVC, brass, copper (type L or M), cast iron, galvanized malleable iron, galvanized wrought iron, or galvanized steel

Underground water lines shall be buried a minimum of 12 inches below grade.

All materials used in the water supply system within the building shall be of like materials, except valves and similar devices, unless otherwise approved by the Chief Building Official Following are acceptable methods of joining dissimilar materials:

- Joints from copper tubing to threaded pipe shall be made by the use of brass adapter fittings.
- Dielectric unions shall be used at all point of connection where dissimilar metals are used. Listed clamps and bonding jumpers shall be installed at all such connections.
- When connecting plastic pipe to other types of piping, approved types of fittings and adapters designed for the specific transition shall be used.
- When dielectric fittings are used to join dissimilar metals, listed clamps and a bonding jumper shall be installed at such connections.

WATER HEATERS

Seismic Bracing

Water heaters require two seismic straps; one located within the top 1/3 of the water heater unit and one at the bottom 1/3. The bottom strap must be located at least 4" away from the water heater controls.

There are a number of seismic strap kits that are available commercially, however, metal plumbers tape can be used if it completely encircles the water heater and is then attached to a structural framing member at each end. Any platform supporting the water heater must be secured to the structure or the slab. Additional blocking at the water heater may be required to resist horizontal displacement.

Venting

The vent and the water heater must maintain clearance from combustible materials such as wall framing or roofing. Generally this clearance is required to be 6" when the vent material is single-walled and 1" when the vent material is double-walled, but check the manufacturers listing on the materials. The vent shall terminate a minimum 6" above the roof through flashing at the roof and terminate in a listed and approved vent cap. Vents may require additional supports depending on the material and design.

All single-walled vents and single-walled to double-walled vent joints shall be secured with a minimum of three sheet metal screws, rivets or similar positive connection.

Pressure/Temperature Valve

All water heaters have a pressure/temperature (P/T) relief valve. The valve shall be drained to the exterior and terminate toward the ground maintaining between 6" and 24" of clearance from the ground and pointing downward. The diameter of the valve opening (generally 3/4") must be maintained to the termination of the drain. Check the manufacturer's requirements. Relief valve drains shall not terminate in a building's crawl space. No part of such drain pipe shall be trapped or subject to freezing. When approved by the Chief Building Official, such drain may terminate at other locations (i.e. laundry tub, floor sink, or floor drain). No part of such drain shall be trapped and the terminal end of the drain shall not be threaded.

Located in an Attic or Closet with Wood Framing Underneath

If located in an attic or furred space (i.e. closet) where leaking could cause damage to underlying wood framing, the water heater must be set in a pan constructed of water tight corrosion resistant material. The pan must be fitted with a minimum 3/4" drain that drains to an approved location. The P/T line is not allowed to terminate at this pan or be connected to it.

When located in attic, the water heater shall be accessible through an opening and passageway at least large as the largest component of the appliance, and not less than 22" by 30". Where the height of passageway is less than 6 feet the distance from the passageway access to appliance shall not exceed 20 feet measured along the centerline of the passageway. The passageway shall be unobstructed and shall have solid flooring not less than 24 inches. A level working platform not less than 30 inches by 30 inches shall be provided in front of the service side of the appliance. A permanent 120-volt receptacle outlet and lighting fixture shall be installed near the appliance. The switch controlling the lighting fixture shall be located at the entrance to the passageway.

Located in a Garage

Appliances generating a glow, spark or flame capable of igniting flammable vapors may be installed in a garage provided the pilots and burners or heating elements and switches are at 18 inches above floor level (unless the unit is listed as flammable vapor ignition resistant). If subject to vehicular damage, adequate barriers must be installed (e.g. four inch diameter steel post installed in a one foot diameter by two foot deep footing).

Located in a Bedroom, Bathroom, or Closet

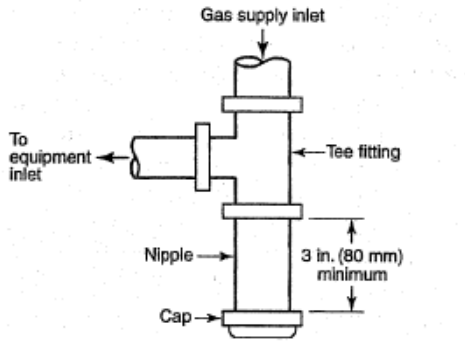
Water heaters shall be permitted to be installed in a bedroom, bathroom, or closet when provided with a listed self-closing, gasketed door and all combustion air shall be obtained from outdoors. Closets shall not be used for any other purpose.

Combustion Air

Combustion air must be maintained per California Plumbing Code. When the appliance is located in an unconfined space (e.g. garage) the combustion air can be used from that area. When located in a closet, combustion air must be provided at a minimum of two openings (one at the top and one at the bottom) sized at 100 square inches each.

Sediment Trap

A sediment trap shall be installed on the gas line as close to inlet of the equipment as practical. The following diagram illustrates sediment trap installation details:



Tankless Water Heaters

Tankless water heaters shall be listed by an approved testing agency (UL, UPC, etc.) and be installed in accordance with the manufacturer's requirements. Category II stainless venting material and larger gas supply lines may be required based on the manufacturer's specifications/recommendations.

IRRIGATION SPRINKLERS

Water supplies to lawn sprinkler systems shall be equipped with an approved vacuum breaker installed on the discharge side of each of the last valves. Vacuum breakers to be installed at least six inches above the surrounding ground and above a sufficient number of heads so at no time will the vacuum breaker be subject to back pressure to drainage. Irrigation pipes shall be installed a minimum of 12 inches below grade.

BATHTUBS AND SHOWERS

All tub/shower valves shall be set to provide a maximum of 120º F (setting shall be made at the valve not the water heater).

Jacuzzis and spas shall have motor access, a dedicated circuit, and be UL listed. All metal cables, fittings, piping, or other metal surfaces, within 5' of the inside wall of the Jacuzzi/spa shall be properly bonded.

DRAINAGE SYSTEM

The building drain is that part of the lowest piping which receives the discharge from soil, waste and other drainage pipes inside the wall of a building and conveys it to the building sewer beginning three feet outside the building wall.

The building drain piping must be installed of appropriate material and fittings approved for the use with such material, cast iron, plastic ABS, plastic PVC with proper grade and alignment to maintain a gravity flow waste discharge.

BUILDING SEWERS

All piping of the building sewer which connects a draining system to the public or private sewer must be of approved material and sizing. Sewers are to be kept in proper alignment and installed with a minimum slope of two percent or 1/4 inch per foot of pipe.

All sewage, human excrement, and other liquid waste must be discharged through approved plumbing and drainage systems to the public or private sanitary sewer system, which shall be installed and maintained in a safe and sanitary condition and in accordance with all applicable laws.

Clean outs shall be installed at the exterior of the building, at each aggregate horizontal change in direction exceeding 135°, and at the property line.

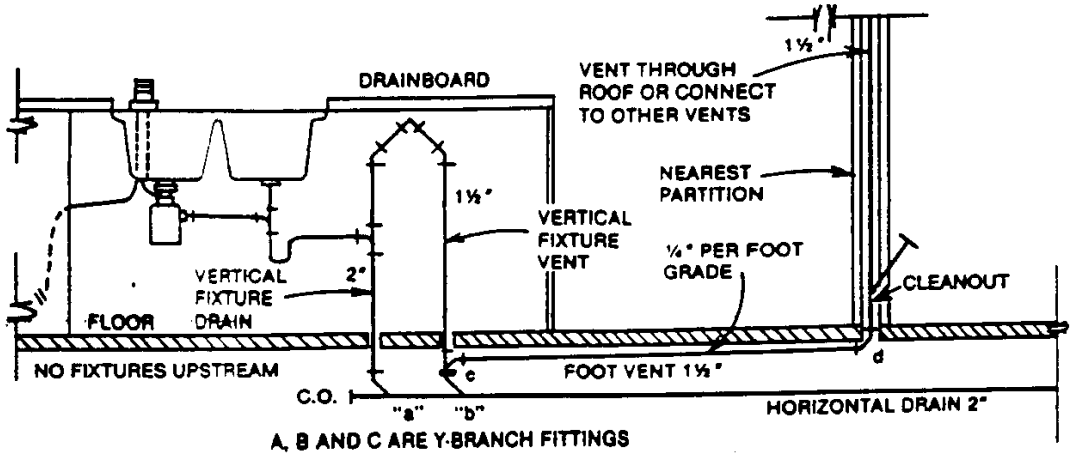
Traps

An approved type water seal must be installed immediately on the discharge side of every plumbing fixture, except for those fixtures having an integral trap (toilet), to prevent the back passage of air without materially affecting the flow of sewage or waste water through the fixture.

Venting

An atmospheric vent of acceptable size and material is required on the discharge side of each and every fixture trap. Vents provide airflow to protect trap seal from siphonage and back pressure.

Island sinks have special venting requirements as illustrated in the following diagram:



GAS PIPING

Gas piping material shall be of wrought iron or steel (galvanized or black), yellow brass, or copper types K, L, or ACR.

Gas pipe shall not be installed below ground within the exterior boundaries of an building. Gas piping installed below ground outside of the exterior boundaries of any building shall be protected from corrosion by an approved coatings or wrapping material. Installation requirements for gas lines are listed in the following table:

INSTALLATION OF GAS PIPING (MINIMUM REQUIREMENTS)	
Location	**Requirements**
Installed outside, above ground	Installed a minimum six inches above grade secured to wall every 6 feet for ½" pipe and every 8 feet for ¾" - 1" pipe.
Installed underground, beyond the exterior boundaries of any building	If metal piping is used, burial depth shall be 12 inches If plastic piping is used, burial depth shall be 18 inches

Valves used in connection with gas piping shall be of the approved types. An accessible shut-off valve of a type set forth in the paragraph above shall be installed in the fuel supply piping outside of each appliance and ahead of the union connection thereto, and in addition to any valve on the appliance. Shut-off valves shall be within three feet of the appliance. Shut-off valves may be located immediately adjacent to and inside or under an appliance when placed in an accessible and protected location so that such appliance may be removed without removal of the valve. Shut-off valves may be accessibly located inside wall heaters and wall furnaces listed for recessed installation where necessary maintenance can be performed without removal of the shut-off valve.

All gas outlets located in a barbecue or fireplace shall be controlled by an approved operating valve located in the same room and outside the hearth, but not more than four feet from such outlets. When piping on the discharge side of any such control

valve is standard weight iron or galvanized steel, such piping may be imbedded in or surrounded by not less than two inches of concrete or masonry.

A gas appliance may be connected with an approved listed metal appliance connector under the following conditions:

- Listed metal appliance connectors shall have an overall length of not to exceed three feet except a range connector, which may not exceed six feet
- No part of such connector shall be concealed within or extended through any wall, floor or partition
- A listed accessible appliance connector valve not less than the nominal size of the connector shall be provided at the gas piping outlet immediately ahead of the connector
- All connectors shall be of such size to provide the total demand of the connected appliance
- Aluminum alloy connectors may be used only in interior locations where they shall not be in contact with masonry, plaster or insulation, or are not subject to repeated corrosive wettings

The connection of an indoor appliance with any type of gas hose is prohibited, except when used with laboratory or shop equipment or equipment that requires mobility during operation. Such connections shall have the shut-off or stopcock installed at the connection to the building piping. When gas hose is used, it shall be of the minimum practical, but not to exceed 6 feet, except for hand torches and special mobile equipment, and shall not extend from one room to another nor pass through any walls, partitions, ceilings, or floors. Under no circumstances shall gas hose be concealed from view or used in a concealed location. Only listed gas hose shall be used and only in accordance with its listing. Gas hose shall not be used where it is likely to be subject to excessive temperatures (above 125 degrees Fahrenheit) nor shall it be used as a substitute for a standard appliance connector.

Outdoor portable appliances may be connected with an approved outdoor hose connector not to exceed 15 feet in length provided it connects outdoors to approved gas piping including an approved valve at the inlet of the hose connector.

All gas piping shall be tested prier to connection to the gas system. The gas line is required to hold 3 pounds per square inch of air for 10 minutes. Test gauge shall have a scale not greater than 15 pounds.

SPACE HEATING AND COOLING REQUIREMENTS

EQUIPMENT

All heating and comfort cooling appliances shall be listed by an approved testing agency (e.g. Underwriters Laboratories-UL, International Association of Plumbing and Mechanical Officials – IAPMO, etc.) or approved by the Chief Building Official. All equipment shall also comply with the energy efficiency standards of the State of California Energy Commission.

INSTALLATION LOCATIONS

Heating and comfort cooling equipment shall be installed and located as specified in the manufacturer's installation standards. Wall heaters located in a bedroom, bathroom, or closet shall have a sealed combustion chamber and be directly vented to the exterior of the building.

Furnaces shall be installed in accordance with the manufacturer's installation requirements. When installed in a closet or alcove, the clear space around the furnace shall comply with the manufacturer's installation requirements.

COMBUSTION AIR

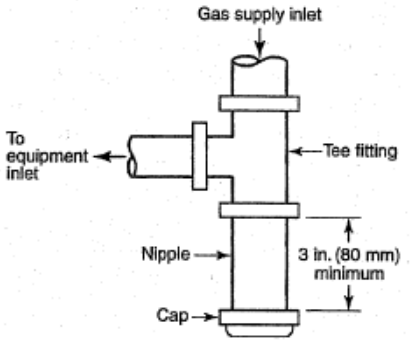
All fuel burning equipment shall be assured a sufficient supply of air for proper fuel combustion, ventilation and draft hood dilution installed with approved material and in such a manner to comply with the intent of the 2007 California Mechanical Code.

HEATING SYSTEM

Every dwelling unit and guest room shall be provided with heating facilities capable of maintaining a room temperature of 68 degrees Fahrenheit at a point three feet above the floor in all habitable rooms. Such facilities shall be installed and maintained in a safe condition.

No un-vented fuel-burning heater shall be permitted. All heating devices or appliances shall be of an approved type.

A sediment trap shall be installed on the gas line as close to inlet of the equipment as practical. The following diagram illustrates sediment trap installation details:



AIR CONDITIONING SYSTEM

The condenser unit shall be located and secured to a 3" thick slab or approved platform. The condensate line shall drain to a landscaped area or to the sanitary sewer line.

Insulation on the suction line (cooling refrigerant line) shall be protected from physical damage or ultraviolet deterioration by an aluminum or metal shroud, paint, plastic cover, or ultraviolet resistant tape.

The exterior air conditioning condenser units shall meet the minimum setback requirements for the zoning district. Additionally, noise generated by condenser, regardless of its location, cannot exceed 65 decibels during the day, or 50 decibels at night as measured from any property line.

VENTING OF APPLIANCES

Every vented appliance shall be connected to an approved venting system designed and constructed as to develop a positive flow adequate to convey all combustion products to the outside atmosphere.

DUCTS

Every duct and plenum which is a portion of any comfort heating, comfort cooling system shall be of galvanized sheet 30 gage if 14 inches or less and 28 gage if over 14 inches. All seams shall be made substantially airtight. Non-metallic duct system shall be of approved type for the use intended and identified by a label of other suitable identification.

MEANS OF DISCONNECT

An approved, independent means of disconnect for the electrical supply to each piece of equipment shall be provided in sight (but not more than 50' away) of the equipment served when the supply voltage exceeds 50 volts. The main electrical panel shall be labeled with the circuit for the new equipment.

SERVICE RECEPTACLE

Provide a 15- or 20 amp receptacle at an accessible location within 25' of the condenser unit. If located outside, the receptacle shall be GFI protected and in a weatherproof cover (bubble cover). The service receptacle shall not be connected on the load side of the required means of disconnect.

ILLUMINATION

Permanent switch controlled lighting shall be installed for maintenance of equipment and shall be accessible. Such lighting shall provide sufficient illumination to safely approach the equipment and perform the tasks for which access is provided. Control of the lighting shall be provided at the access entrance.

EQUIPMENT LOCATED IN A GARAGE

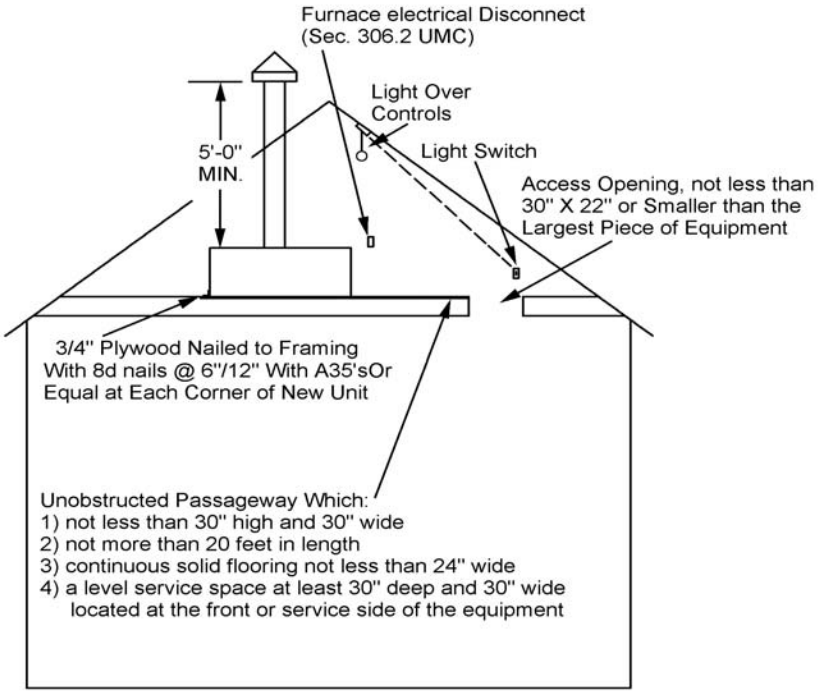
Appliances generating a glow, spark, or flame capable of igniting flammable vapors may be installed in a garage provided the pilots and burners or heating elements and switches are at least 18 inches above floor level.

Exception: Sealed combustion system appliances may be installed at floor level.

If subject to vehicular damage, adequate barriers must be installed (e.g. 4 inch diameter steel post installed in a one foot diameter by two foot deep footing).

EQUIPMENT LOCATED IN AN ATTIC

Furnaces located in an attic area shall comply with the diagram below. Additionally, if the attic and roof is conventionally framed, ceiling joist under the location of the FAU unit shall be doubled with a minimum 2X6 joists. If the attic and roof framing is a pre-fabricated engineered truss system, an engineering report (wet stamped and signed by a licensed engineer) shall be submitted for review and approval prior to issuance of a building permit.



ENERGY CONSERVATION REQUIREMENTS

The State of California Energy Commission requires all residential construction (including new buildings and additions/remodels to existing buildings) to meet minimum energy efficiency. These energy efficiency standards are commonly referred to as "Title 24." Following is a synopsis of these standards for single family homes. For further information, refer to www.enery.ca.gov/title24 or contact an energy consultant.

Energy compliance documentation is required when submitting plans for new construction or an addition to an existing home. Completion of the documentation ensures that the construction, as planned, will comply with the State of California Energy Commission standards. Compliance with these standards at the construction phase is ensured by the contractor completing an Installation Certificate or Insulation Certificate stating that all equipment was installed according to the approved plans.

When remodeling an existing residential building where no new square footage is added, specific forms or documentation is not be required; however, minimum mandatory features must still be met. Refer to the Mandatory Measures section below for specific information.

The Energy Commission offers two methods of ensuring new construction and additions meet the energy efficiency standards; a prescriptive package or a performance method. The prescriptive package provides a standardized list of requirements for energy efficiency measures. The required documentation is typically completed by the project designer or architect. When these prescriptive measures are not met, a computer-based performance method can be used to determine compliance with the energy standards. The performance method is typically done by an energy consultant.

The following describes the applicable Title 24 energy efficiency requirements for various types of residential construction/alternations:

ENERGY EFFICIENCY REQUIREMENTS FOR RESIDENTIAL CONSTRUCTION/ALTERATIONS	
Type of Construction/Alteration	**Title 24 Standards**
Interior Alternation/Remodel (no additional square footage)	Mandatory Measures
Addition to Existing Buildings and New Construction	Mandatory Measures and either the Prescriptive Package or Performance Standards

MANDATORY MEASURES

The following mandatory measures are required for all interior alternations/remodels, additions to existing buildings, and new construction. These are minimum requirements and more efficient standards may be required with the computer Performance Standards method, which is typically completed by an energy consultant.

Building Insulation

The following table shows the minimum insulation ratings allowed:

MINIMUM INSULATION RATINGS	
Locations	**Insulation Rating**
Ceiling (wood framed)	R-19
Walls (wood framed)	R-13
Raised floors	R-13

Water Heater Tank Insulation

Water heater tanks shall be externally insulated with an R-12 wrap unless the energy factor rating of the water heater unit exceeds the Federal minimum standards (this information is on the manufacturer informational label on the unit).

Pipe Insulation

Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind including but not limited to the following:

- Insulation exposed to weather shall be suitable for outdoor service; e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provided shielding from solar radiation that can cause degradation of material.
- Insulation covering chilled water and refrigerant suction piping located outside the conditioned space shall include a vapor retardant located outside the insulation (unless the insulation is inherently vapor retardant), all penetrations and joints of which shall be sealed.

Pipe insulation is required in the following locations:

- Recirculating sections of domestic hot water systems.
- Piping from the heating source to the storage tank for indirect-fired domestic hot water systems.
- The first five feet of hot and cold water pipes from the storage tank for non-recirculating systems.

PIPE INSULATION REQUIREMENTS MINIMUM R-VALUE	
System	**Insulation Thickness Required for Pipe Diameter Less than or Equal to 2"**
Domestic Hot Water	1.0”
Hydronic Heating Supply Lines	1.0”
Cooling Systems (pipes below 55ºF)	0.75”

Windows, Skylights, and Exterior Doors

Manufactured exterior doors and windows/skylights (window) products must be certified by the California Energy Commission. The minimum standards for new windows, skylights, or exterior doors are a maximum U-factor of 0.40 and Solar Heat Gain Coefficient (SHGC) of 0.40. This certification will be shown as a label on the window, skylight, or exterior door. The label shall not be removed before inspection.

Joints and Other Openings

The following openings in the building envelope must be caulked, gasketed, weather-stripped or otherwise sealed:

- Exterior joints around window and door frames, between wall sole plates, floors, exterior panels and all siding materials
- Opening for plumbing, electricity, and gas lines in exterior walls, ceilings, and floors
- All other such openings in the building envelop

Fireplaces, Decorative Gas Appliances, and Gas Logs

Because conditioned air can escape through a fireplace chimney, fireplace efficiency can be greatly improved through proper air control. Installation of a factory-built or masonry fireplace shall include:

- Closable metal or glass doors covering the entire opening of the firebox which can be closed when the fire is burning.
- Combustion air intake to draw air from the outside of the building directly into the firebox. This intake must be at least six square inches in area and be equipped with a readily accessible, operable and tight-fitting damper. Outside combustion air intakes are not required if the fireplace is installed over a concrete slab and will not be located on an exterior wall.
- A flue damper with a readily accessible control.

Continuous burning pilot lights are prohibited.

Space Conditioning, Water Heating, and Plumbing System

The design and installation of a building's space conditioning, water-heating and plumbing systems have a significant impact on the building's energy consumption. In view of this, the standards set a number of minimum requirements for these systems.

Only HVAC (heating, ventilating, and air conditioning), water heating, and plumbing system equipment certified by the manufacturer as complying with applicable Appliance Efficiency Standard may be installed.

This certification will be shown on the label on the equipment. The label shall not be removed before inspection. A certificate of compliance with the Appliance Efficiency Standards must be posted at the building site when any equipment subject to the standards is installed.

Setback Thermostats

All heating and/or cooling systems must have an automatic setback thermostat with a clock mechanism. The setback thermostat or mechanism is required to shut the system off during periods of non-use and allows the building occupant to automatically setback the thermostat to set points for at least four periods within 24 hours.

Pilot Lights

Continuously burning pilot lights are not permitted on any of the following equipment:

- Fan type central furnaces.
- Household cooking appliances, except cooking appliances without an electrical supply and which each pilot consumes less than 150 Btu/hr.
- Pool heaters or spa heaters.

Lighting

High Efficiency Lighting Fixtures

High efficiency lighting fixtures for residential lighting shall contain only high efficiency lamps and shall not contain a medium screw base socket. Ballasts for

fluorescent lamps rated 13 watts or greater shall be electronic and shall have an output frequency not less than 20 kHz.

The following table lists the minimum lumens per watt rating for lighting in order to qualify as high efficiency:

HIGH EFFICIENCY LAMP REQUIREMENTS	
Lamp Power Rating	**Minimum Lamp Efficiency**
5 or less	30 lumens per watt
Over 5 to 15 watts	40 lumens per watt
over 15 watts to 40 watts	50 lumens per watt
over 40 watts	60 lumens per watt

Occupant Sensors and Motion Sensors
Occupant sensors and motion sensors are lighting controls that are capable of automatically turning off all the lights in area no more than 30 minutes after the area has been vacated. All devices shall be approved by and comply with requirements of the California Energy Commission.

Lighting in Kitchens
Permanently installed lighting fixtures in kitchens shall have a total rated wattage shall be high efficiency lighting fixtures. However, a maximum of 50 percent of the total rated wattage (manufacturer's maximum wattage) may be low efficiency lighting. Any low efficiency lighting shall be on separate switches from the high efficiency lighting.

When calculating the total rated wattage of permanently installed lighting, include lighting in areas adjacent to the kitchen if they are controlled by the same switch as the kitchen lighting.

Permanently installed lighting that is located within cabinetry shall be designed so that the lighting fixtures use a maximum of 20 watts per lineal foot of illuminated cabinetry.

Lighting in Bathrooms, Garages, Laundry Rooms, Closets, and Utility Rooms
Permanently installed lighting fixtures in bathrooms, garages, laundry rooms, closets (greater than 70 square feet) and utility rooms shall be high efficiency lighting fixtures or controlled by an occupant sensor. Refer to section above title *Occupant Sensors and Motion Sensors* for specific requirements for these devices.

Lighting other than in Kitchens, Bathrooms, Garages, Laundry Rooms, and Utility Rooms
Permanently installed lighting fixtures located in rooms other than kitchens, bathrooms, garages, laundry rooms, and utility rooms shall be high efficiency lighting fixtures or shall be controlled by a dimmer switch or occupancy sensor.

Recessed Luminaries in Insulated Ceilings
Lighting fixtures recessed into insulated ceilings shall be approved for zero clearance insulation cover (IC) and include a label certifying air tight (AT), and shall be sealed with a gasket or caulk between the housing and ceiling.

Outdoor Lighting
Lighting fixtures providing outdoor lighting and permanently attached to a residential building or to other buildings on the same lot shall be high efficiency lighting fixtures or shall be controlled by a motion sensor with integral photo control.

Air-Distribution System Ducts and Fans

Portions of supply-air and return-air ducts and plenums shall either be insulated to a minimum installed level of R-4.2 or be enclosed entirely in conditioned space.

Connections of metal ducts and the inner core of flexible ducts shall be mechanically fastened. Openings shall be sealed with mastic, tape, or other duct-closure system that meets the applicable requirements of UL 181, UL 181A or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used. Products that meet the Underwriters Laboratories, Inc. (UL) standards will display such sticker on the product and shall be installed in accordance with the manufacturer's installation requirements.

All fan systems that exhaust air from the building to the outside, regardless of capacity, must be provided with back draft or automatic dampers to prevent air leakage.

Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.

Protection of Insulation

Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind but not limited to the following:

- Insulation exposed to weather shall be suitable for outdoor service (e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover).
- Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

NEW CONSTRUCTION AND ADDITIONS TO EXISTING BUILDINGS

New construction and additions to existing residential buildings shall meet the requirements Mandatory Features as described above and either the Prescriptive Package or the Performance Standards as described below.

The Prescriptive Package is a standard list of energy efficiency requirements for additions and new construction. The benefit of the Prescriptive Package is that the required compliance documentation can typically be completed by a residential designer or homeowner and may not require the use of an energy consultant. In order to use the Prescriptive Package, all of the requirements must be met without deviation. If the Prescriptive Package requirements are not met, compliance with the energy efficiency standards can be demonstrated by using the Performance Standards. This is typically completed by an energy consultant.

Prescriptive Package

While Title 24 offers various Prescriptive Packages, the package most commonly used in Sunnyvale is Package D and contains the following requirements:

PRESCRIPTIVE PACKAGE D	
Feature or Equipment	**Minimum Standards**
Insulation	Ceiling: R-30 Wall: R-13 Raised-floor: R-19
Radiant Barrier	The required radiant barrier is a highly reflective, low emitting material installed at the underside surface of the roof deck and the inside surface of the gable ends or other exterior vertical surfaces in attics to reduce solar heat gain into the attic.
Windows/skylights	Total maximum area is 20% of floor area with no more than 5% facing west. Maximum U-factor: 0.40 Maximum Solar Heat Gain Coefficient (SHGC): 0.40
Space Heating and Space Cooling Equipment	Gas furnaces shall be approved by the California Energy Commission.
Water Heating Systems	A single gas or propane storage type water heater that has a tank capacity of 50 gallons or less and no recirculation pumps.
Setback Thermostats	All heating systems shall have an automatic thermostat with a clock mechanism or other setback mechanism which the building occupant can manually program to automatically set back the thermostat set points for at least four periods within 24 hours.
Space conditioning ducts	Duct insulation: R-6 Ducts joints shall be sealed and verified through third-party diagnostic testing by a HERS (Home Energy Rating System) rater.

The Prescriptive Package D requirements, as described above, are applicable to new construction and additions as described below:

PRESCRIPTIVE PACKAGE D FOR RESIDENTIAL ADDITIONS	
Size of Addition	**Title 24 Standards**
Up to 100 square feet	If no more than 50 square feet of windows/skylights area is installed, the new area is required to comply with the Mandatory Features and only the Windows/skylights requirements of Prescriptive Package D (as listed below). If more than 50 square feet of windows/skylights area is installed, all the Mandatory Features and Prescriptive Package D requirements must be met.
Up to 1,000 square feet	Comply with the Mandatory Features and all the requirements of Prescriptive Package D, except that the addition's total windows/skylights area limit is 20% of the floor area plus the area of any existing windows/skylights which was removed by the addition.
Over 1,000 square feet and New Construction	Comply with the Mandatory Features and all the requirements of Prescriptive Package D.

Performance Standard

When the requirements of the Prescriptive Package, as noted above, are not met, the Performance Standard method can be used to show compliance with the Title 24 energy requirements. The Performance Standard method uses an approved computer program to weigh and balance areas which do not meet the Prescriptive Package requirements with other areas that may be enhanced beyond the minimum requirements. The Performance Standards are typically completed by an energy consultant.

ACCESSORY BUILDINGS AND STRUCTURES

POOLS, PONDS, AND OUTDOOR SPAS

Lighting fixtures, lighting outlets, and ceiling fans located over the spa or hot tub or within five feet from the inside walls of the spa or hot tub shall be a minimum of seven feet six inches above the maximum water level and shall be protected by a ground-fault circuit-interrupter.

The electrical portion of the pool and/or spa installation shall comply with the following requirements:

- If the existing main electrical service is 100 amps or less, provide load calculations for all existing loads and the new pool to justify the service is adequate.

- All metallic structural components, underwater lighting, metal fittings, electrical equipment, etc. within 5 feet of the inside of the pool wall shall be bonded to the equipment grid with a #8AWG copper conductor. Bonding clamps for direct burial or concrete encasement shall be brass, copper, copper alloy, or other listed material.
- Junction boxes shall be a minimum vertical distance of 8 inches above the water or 4 inches above the deck, whichever provides the greater elevation. Junction boxes shall be a minimum horizontal distance of 4 feet from the inside wall of the pool (unless separated by a solid wall, fence, or other permanent barrier).
- At least one GFCI receptacle shall be located at least 10 feet and not more than 20 feet from the inside wall of the pool.
- Lighting and fixtures within 5 feet horizontally of the pool shall be installed at a height of not less than 12 feet; lighting fixtures installed between 5 feet and 10 feet from the pool or fixtures less than 5 feet in height shall be GFCI protected.
- Underground wiring within 5 feet of the pool edge shall meet the following burial depth requirements (CEC Table 680.10):

MINIMUM BURIAL DEPTHS	
Wiring Method	**Minimum Burial (inches)**
Rigid metal Conduit	6
Intermediate Metal Conduit	6
Nonmetallic Raceways Listed for Direct Burial Without Concrete Encasement	18
Other Approved Raceways	18

All properties with a pool, spa, or other body of water greater than 18” in depth shall provide a fence that meets the following criteria:

- A minimum height of 60”
- Any gates shall be self-closing with a self-latching device placed no lower than 60” above the ground
- A maximum vertical clearance from the ground to the bottom of the fence of 2”
- Any gaps or voids to be less than 4”
- An outside surface free of protrusions, cavities, or other physical characteristics that would serve as handholds or footholds that could enable a child below the age of 5 years to climb over

All new and remodeled pools and spas shall have all suction outlets shall be provided with an anti-entrapment cover meeting current standards of the American Society for Testing and Materials (ASTM) or the American Society of Mechanical Engineers (ASME).

Glass within 5 feet horizontally from the pool edge and within 5 feet vertically of the walking surface shall be safety glazing. (CBC 2406.3)

Review and approval from PG&E is required prior to issuance of building permits for pools or outdoor spas.

Setbacks For Pools, Spas, and Related Equipment

Pools and spas have different required setbacks depending upon whether the installation is above or below ground. The height is measured from grade.

Any pool/spa than extends 18 inches or more above the ground has a rear yard setback of ten feet. The pool/spa must meet the side yards setbacks required for the zoning district.

A pool or spa less than 18 inches in height does not have any specific Planning Division setbacks. However, it cannot be located closer than five feet to a building or property line unless it is designed by an engineer to meet certain criteria.

All pool/spa equipment is considered an accessory utility building and cannot be located closer than three feet to any other structure or property line, measured at the closest point. Noise generated by pool/spa equipment, regardless of its location, cannot exceed 65 decibels during the day, or 50 decibels at night as measured from any property line.

DECKS

Guardrails are required for all decks greater than 30 inches above grade. Guardrails shall be a minimum of 42 inches high and the railing shall have no intermediate spacing of less than four inches.

Decks higher than 30 inches above grade require a building permit.

Any decking constructed greater than 18 inches above the finished grade, shall meet the setback requirements for the zoning district. Decks less than 18 inches in height require a minimum three foot setback from property line.

FENCES

Zoning and Setback Information

When high fences are built next to sidewalks, the neighborhood begins to look walled-in and detracts from the appearance and quality of the community. To ensure an attractive and safe neighborhood, the Planning Division reviews fence location, design and building materials.

The type of permit you need depends on the location and height of the proposed fence. The chart below summarizes the fence permitting requirements. If the property is part of a Planned Development, a letter from the homeowner's association will be required to obtain a permit.

FENCE PERMITS		
Location	**Fence Heights**	**Permit Required**

Required front yard or reducible front yard[1]	No more than 7’	MPP. If fence is over 6’ high, adjacent property owners will be notified. No fee charged for fences less than 3’ high.
	Greater than 7’	Use Permit
Between the required front yard and the house	No more than 6’	No permit
	Greater than 6’ up to 7’	MPP
	Greater than 7’	Use Permit
Side or rear yard	No more than 6’	No permit
	Greater than 6’ up to 7’	MPP with an approved fence agreement from all adjacent property owners
	Greater than 7’	Use Permit
Within a corner or driveway vision triangle	No more than 3’	MPP (no fee charged)
	Greater than 3’	Variance

[1] *In areas where there is a landscape strip between the sidewalk and the curb, fences may be built to the edge of the sidewalk. When fences are built to the sidewalk, a portion of the fence might be located in the public right-of-way. The City assumes no responsibility for private fence in the public right of way, and if the fence has to be removed to make repairs to City facilities, the cost of rebuilding the fence will be the responsibility of the property owner.*

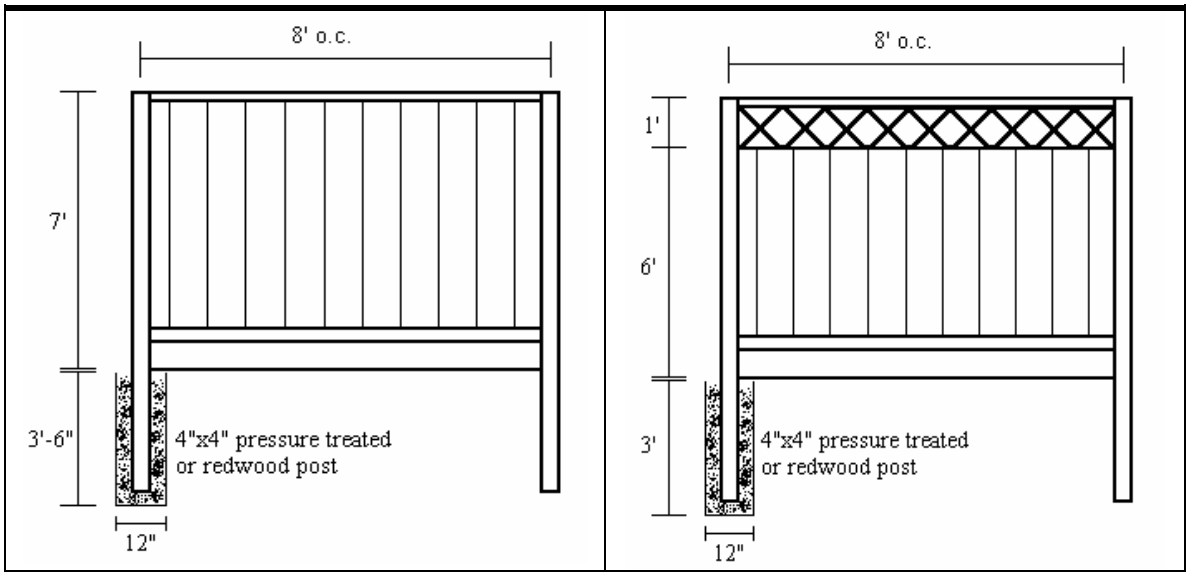
In areas where there is no landscape strip between the sidewalk and the curb, the fences may be built up to the property line, which is typically located 11 feet back from the face of the curb.

Building Permit Information

Fences over six feet high require a Building Permit. For building permit purposes, fence height is measured from the lowest adjoining grade. Fences constructed on top of a retaining wall require a building permit regardless of the fence height.

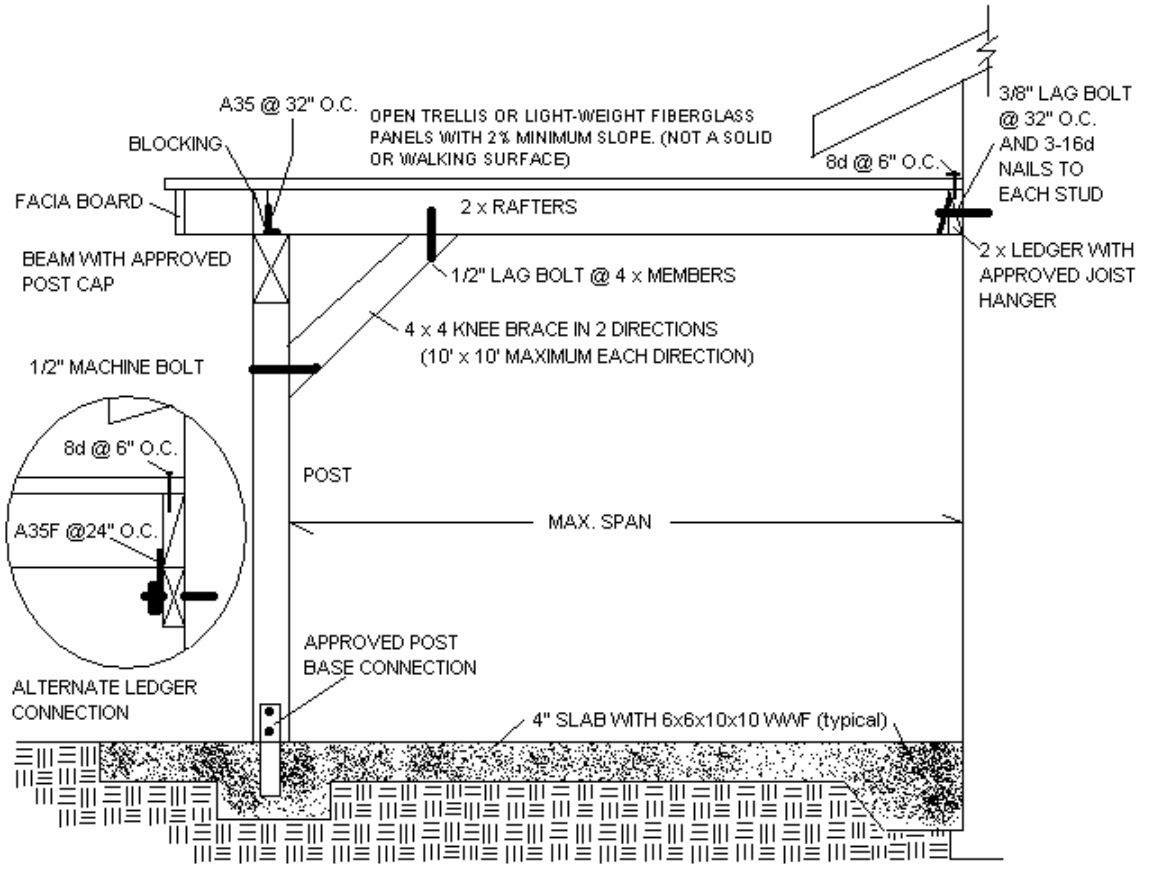
Following are standard details for typical fence construction:

Typical Seven Foot High Wood Fence	Typical Six Foot High Wood Fence with One Foot of Lattice



PATIO COVERS

All patio covers (attached to the house) require a building permit.



ANTENNAS AND SATELLITE DISHES

Antennas

Standard television reception antennas are exempt from any planning requirements provided that the:

- antenna has a diameter of 39 inches or less
- antenna is mounted on a mast less than 12 feet high
- antenna is not located in a historic district or on a historic building
- antennas location, to the extend feasible, is not readily visible from the public right-of-way
- amateur radio antennas do not exceed the maximum building height limits of the zoning district

Satellite Dishes

Receive-only parabolic dishes or antennas less than 39 inches in diameter are exempt from any planning requirements. These types of dishes over 39 inches in diameter require review and approval of a Miscellaneous Plan Permit prior to installation.