

GENERAL INFO & CODE/STANDARD REFERENCE

SITework (grading, driveway, flatwork, fence, gate and access)

GENERAL INFORMATION

- A. Tree roots could damage the structure and underground plumbing and protruding roots can be trip hazard, and the tree branches could damage the roof and structure. Trees could be fire hazard as well if not trimmed regularly. Inquire from the seller about any sewer pipeline problem or an evaluation with inline camera is recommended.
- B. Several areas in California contain differing amounts of expansive (also called adobe or clay) soil. Expansive soil swells if excessive amount of moisture is present in the soil and contracts if soil dries up, leaving fissures or cracks. To prevent major damage to the structure, precautions shall be taken to make sure that the soil under the foundation does not become either saturated or completely dried out. Precautionary measures include sloping the ground away from the foundations, provide French drainage system, and provide the roof with rain gutters with downspout terminated away from the walls.
- C. Hills and mountains are worn down by mass wasting (erosion, sliding, creeping, etc.) and the valleys and lowlands collect these products. Most slope and hillside lot problems are associated with water. Wet weather is the largest cause of slope problems, particularly in California where rain is intermittent, but may be torrential. Therefore, drainage and erosion control are the most important aspects of home site stability.
- D. All sulfates are potentially harmful to concrete. Sodium and calcium are the most common sulfates in soil. Magnesium sulfates is less common but more destructive. Plant fertilizers are high in sulfates and should not be used near the foundation.
- E. California Civil Code § 841 requires adjacent landowners equally contribute to maintain walls and fences between them.
- F. Building permit is not required if the building is not more than 64 square feet in area or 8 feet in height and does not contain any heating, plumbing or electrical installation.

BUILDING CODE REFERENCE

- 1. Displacement at public sidewalk – Contact the city of Los Angeles Bureau of Street Services for repair of displaced public concrete sidewalks to prevent the hazard of tripping.
- 2. Differential displacement at sidewalk – The concrete slab elevation difference shall not exceed the smallest by 3/8 inch to prevent the hazard of tripping.
- 3. Improperly sloped ground – Lots shall be graded evenly so as to drain surface water away from foundation walls and shall fall a minimum 6" within the first 10', and towards the public storm drain, or otherwise an underground storm drain shall be installed.
- 4. Improperly sloped/leveled driveway – Driveway shall be sloped at minimum 2% and maximum 5% with parking towards the street curb and shall be leveled properly so as to prevent water ponding.
- 5. Ground too close to weep screed /sill plate or wood sidings – All sills or plates that rest on concrete or masonry exterior walls shall not be less than 8" from exposed ground for protection against decay by capillary action. Additionally, if the ground is close to the foundation plate of slab on grade foundation, the water could seep through the junction between the concrete and wood plate that could eventually damage the exterior and interior wall coverings.

6. Retaining walls not provided with weepholes – Weepholes shall be provided in the outside wythe of masonry walls at a maximum spacing of 33" on center. Weepholes shall not be less than 3/16" Ø.
7. Wood support embedded in concrete requirement – Posts, poles and columns supporting permanent structures that are embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather shall be approved pressure preservatives treated wood suitable for ground contact use.
8. Access clearance around the building – A 30" minimum clear access shall be provided around the main building(s) and accessory living quarters.
9. Ramp – Ramp slopes shall not exceed one foot in 8'.
10. Concrete block fence joints – Concrete block fences shall be provided with vertical control joint at 30' on center maximum to minimize cracking, sagging and tilting.
11. Concrete slabs control joints – Concrete slabs for sidewalks shall be provided with transverse control joints at least 1/4" wide by 3/4" deep spaced 5 to 6 foot intervals and for driveway, patio and floor slab spaced at 12' to 20' base upon the thickness of slab. A nominal 4" thick slab should have a control joints spaced at 12' or less. The joint may be filled with a flexible joint sealing compound to prevent water penetration, if desired. This is not necessary for sidewalks or patios.
12. Fence requirement – California Civil Code § 841 requires adjacent landowners equally contribute to maintain walls and fences between them.
13. Retaining wall – Retaining walls are designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift; and that they be designed for a safety factor of 1.5 against lateral sliding and overturning.
14. Driveway width – Driveway width shall be minimum 8' but 10' is more practical minimum width.

PATIO/ DECK/ GAZEBO

BUILDING CODE REFERENCE

1. Wood support embedded in concrete requirement – Posts, poles and columns supporting permanent structures that are embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather shall be approved pressure preservatives treated wood suitable for ground contact use.
2. Wooden Posts improper footing – Posts shall be installed on a metal post base with at least 1 3/4" thick spacer, bolted to a concrete floor or foundation with minimum 1/2" Ø bolt and 8-10d nails and post and beam metal cap/base with minimum 6-16D nails.
3. Distance from property line – Any structure attached to the house that is made of combustible materials such as wood shall have a fire separation distance not less than 3' from the property line unless otherwise covered with material that has at least one-hour fire-resistive rating with exposure from both sides.

CARPORT

BUILDING CODE REFERENCE

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STRUCTURE/FOUNDATION

GENERAL INFORMATION

- A. The bearing wall, floor and roof of wood frame buildings built prior to 1967 were not required by Uniform Building Code to have minimum 1/2" thick plywood sheathing to resist horizontal and vertical shears.
- B. Cripple walls must be the strongest part of the building other than the foundation because it must resist the greatest force as seismic forces called base shear accumulate downward in a building. The bigger the building the greater seismic shear occurs. Typically, many older buildings built in 1940's have cripple walls; and consequently retrofit standards that require strengthening of the cripple walls is suggested.
- C. Prior to 1950, most wood frame residential buildings were built with raised wood floors supported by short wood stud walls known as cripple walls. These cripple walls are typically braced with weak seismic materials such as portland cement plaster or horizontal wood siding.
- D. Wood frame buildings built prior to 1940 were not required to be bolted to their foundations. Wood frame buildings built after 1940 were required to be bolted to their foundations with 1/2" Ø at 8' O.C. but some were built without them. Wood frame buildings built after 1958 were required to be bolted to their foundations with 1/2" Ø at 6' O.C. Wood frame buildings built after 1990 were required to be bolted to their foundations with 5/8" Ø at 4' O.C.
- E. Unreinforced masonry bearing walls are the form of construction most vulnerable to earthquake damages. Floors and walls of these structures are often not tied together or, when tied together, are only weakly connected. Some older structures have mortar that has deteriorated. Long, unreinforced masonry wall sections, unsupported by intersecting cross-walls, are particularly prone to severe cracking or failure due to the lack of bracing or reinforcing steel.
- F. Structures built with a fire separation distance less than 3' from the property line could be Nonconforming Grandfathered Use.
- G. Roof truss is more rigid than rafter or stick framing as it is specifically designed, engineered and fabricated at the factory against common forces that the structure is exposed to, such as compression, tension, torsion, bending, and shear. Truss also can span longer distances and eliminate the need for inside load bearing walls.

BUILDING CODE REFERENCE

1. Maximum settlement of foundations – Many structures can tolerate substantial downward movement or settlement without cracking, however, total settlement should not exceed 2" for most facilities. A typical specification of total settlement for commercial buildings is 1 inch. Maximum allowable average settlement of some structures are the following: Plain brick walls is 3", framed structure is 4", reinforced brick walls and brick walls with reinforced concrete is 6", and solid reinforced concrete foundations supporting smokestacks, silos, towers, etc is 12".
2. Anchor bolts – When braced wall panels are supported directly on continuous foundations, the wall wood sill plate or cold-formed steel bottom track shall be anchored to the foundation with anchor bolts spaced a maximum of 6' on center. Anchor bolts shall also be located within 12" from the ends of each plate section. Bolts shall be at least ½" in diameter (5/8" for areas with expansive soil) and shall extend a minimum of 7" into masonry or concrete. Interior bearing wall sole plates on monolithic slab foundations shall be positively anchored with approved fasteners. A nut and washer shall be tightened on each bolt to the plate. Sills and sole plates shall be protected against decay and termites.
3. Maximum cracks at concrete foundations – Vertical cracks in poured concrete foundations not exceeding 3/16" that do not leak water are acceptable. Cracks that are not vertical may or may not need repair depending on severity and would need to be analyzed by Contractor.
4. Cold joint cracks – A cold joint is defect caused when too much time elapses between placements of batches of concrete that do not completely merge. Cold joints are normal and should be expected to be visible but could allow moisture to penetrate the foundation wall. Cold joints should not be an actual separation or a crack that exceeds ¼" in width.
5. Two pour joint cracks – Contractors frequently pour slabs in a two-step process with the footing being the first pour and the slab being the second pour. When the joint between the two pours is not properly cleaned and prepared, there will be a poor connection between the concrete layers. The problem is often discovered after an earthquake causes horizontal sliding between the pours. Typical remedies for this condition include installing vertical steel reinforcing dowels that tie the slab to the footing.
6. Ground too close to the wood structural members in underfloor space – Ordinary wood joists shall not be closer than 18" and wood beams shall not be closer than 12" from exposed ground in crawl spaces. Moisture content greater than 19% can affect structural integrity of materials concerns.
7. Ground too close to the top of foundation – All wooden sills or plates, studs, fire blocking, posts and shear panels shall not be less than 8" from exposed ground; or otherwise, shall be approved pressure preservative treated wood suitable for ground contact use.
8. Wooden posts too close to the ground – All wooden posts shall not be less than 8" from exposed ground; or otherwise, shall be approved pressure preservative treated wood suitable for ground contact use.
9. Earth near the foundation – Earth cannot be disturbed within 1 foot of the stem wall or pier supports, if the earth has been disturbed, then a retaining wall should be installed.
10. Uneven floor – Uneven floor (arching up, twisting or sagging) is caused by normal differential deflection of wood.

11. Notching of joists, rafters and beams – Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4" or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2" to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2" to the notch.
12. Notching of wooden studs – Bearing or exterior wall wooden studs should not be notched 25% and bored 40%; and non-bearing walls can be notched 40% and bored 60%. A galvanized metal tie not less than 0.054 inch thick (16 gage) and 1.5" wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails is necessary to reinforce the notches.
13. Notching of wall top plates – When piping or ductwork is placed in or partly in an exterior wall or interior, braced or load-bearing wall, necessitating a cutting of the top plate by more than 50 percent of its width, a galvanized metal tie not less than 0.054 inch thick (16 gage) and 1.5" wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.
14. Improper alteration of bearing wall – Cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or load bearing support, or the removal or change of any required means of egress, or rearrangement of parts of a structure affecting the egress requirements is prohibited without building permit and inspection.
15. Structural member connections – Girders, beams, rafters, joists, and ties connections shall be made over a post, girder, beam or a load bearing wall so the load can be transferred to the foundations.
16. Floor joists lap over the support – Floor joists framing from opposite sides over a bearing support shall lap a minimum of 3 inches and shall be nailed together with a minimum three 10d face nails. A wood or metal splice with strength equal to or greater than that provided by the nailed lap is permitted.
17. Cantilever joists or rafters lap over the support – Cantilever roof rafters or floor joists framing from opposite sides over a bearing support shall lap a minimum of 2/3 of cantilevered length and shall be nailed together with a minimum three 10d face nails or every 4" O.C. A wood or metal splice with strength equal to or greater than that provided by the nailed lap is permitted.
18. Roof rafter over ledger board – Continuous ledger board of the same size as the rafter shall be anchored to the bearing wall studs with 1/2" Ø x 5 1/2" lag bolts at 16" O.C. staggered. Rafters shall be connected to the ledger board with Simpsons HS24 or H1 rafter ties.
19. Roof overhang and lookouts – Roof overhang shall be maximum 4 times the rafter depth. The continuous ridge board and 2"x4" lookouts at 16" O.C. or the same distance as of the rafters shall support the fly rafter. Lookouts shall be supported by gable-end top-plate and second common rafter.
20. Engineered Truss – It is not permitted to modify, notch, and cut engineered trusses.
21. Beam and rafter sizing – Beams with span of more than 12' and rafters or joists less than 2"x6" shall not be permitted unless substantiated with engineering calculation as per Type V sheet adopted by LADBS as permitted by UBC.

22. Roof purlins – Roof purlins were used to support the rafters at mid-span to prevent them from sagging and shall be sized no less than the required size of the rafters that they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch braces installed to bearing walls at a slope not less than 45 degrees from the horizontal. The braces shall be spaced maximum of 4' and 6' on center for 2"x4" and 2"x6" purlins respectively and the unbraced length of braces shall be maximum of 8'.
23. Rafter ties at unparallelled ceiling joists – Rafter ties hold the outside walls together because the sloping rafters tends to push the outside wall outward. Without rafter ties, the rafters and ridge boards will sag and the walls will bow. Rafter ties spaced 4' on center are required immediately above ceiling joists which are not parallelled to the rafters. Rafter ties shall be connected to the bearing wall top plates with approved metal ties such as Simpsons HS24 or H1.
24. Collar beams – Collar beams of nominal 1x6 or 2x4 lumber shall be installed in the upper one third of the roof space to every third of rafters to secure the ridge framing and minimize rafter deflection.
25. Openings in floor framing – Openings in floor or roof framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4' the header joist may be a single member the same size as the joist. Single trimmer joists may be used to carry a single header joist that is located within 3' of the trimmer joist bearing. When the header joist span exceeds 4', the trimmer joists and the header joist shall be doubled and of sufficient cross section to support the floor joists framing into the header. Approved hangers shall be used for the header joist trimmer joist connections when the header joist span exceeds 6'. Tail joists over 12' long shall be supported at the header by framing anchors or on ledger strips not less than 2" by 2".
26. Openings in wall framing – Openings in wall framing shall be framed with a header, cripple, trimmer and king studs and rough sill. King and jack studs shall be of the same dimension and thickness as the adjacent wall studs. For up to 3'6" span– 1 Jack and 1 King studs; For 5'6" to 8' span– 2 Jack and 2 King studs; For 14' span– 3 Jack and 4 King studs
27. Header over bearing wall opening– All openings 4 feet wide or less in bearing walls shall be provided with headers consisting of either two pieces of 2-inch framing lumber placed on edge and securely fastened together or 4-inch lumber of equivalent cross section. Each end of a lintel or header shall have a length of bearing of not less than 1-1/2 inches for the full width of the lintel.
28. Exterior bearing wall headers – Openings in bearing wall shall be framed with a header. For span of 4'00" – 4"x4"; 4'1" to 5'5" – 4"x6"; 5'5" to 6'10" – 4"x8"; 6'10" to 8'5" – 4"x10"; 8'5" to 10'6" – 6"x10"; 10'6" to 12'2" – 6"x12"; 12'2" to 16'00" – 6"x14". For a span of more than 16' is required to have engineering calculations.
29. Shear walls offset – Shear walls shall not be offset more than 4' from each other. Shear panel types shall not be combined in the same line of resistance. Wall studs shall be 2"x minimum, spaced @16" OC. The 8d nails shall be placed not less than 3/8" from panel edges.
30. Shear wall width–Plywood or OSB fastened to some areas of each wall stabilizes the walls against racking from the force of the wind. "Braced wall panels" (areas of clear wall covered with plywood or OSB) must be at least 4 feet wide, extend to the full wall height, and be located at or near each end of the wall (but no more than 25 feet apart).

31. Shear wall width –For dwellings of “Conventional Light-Frame Construction”, the locations of existing window or door openings are allowed to remain. However, if existing window or door openings are to be widened or if new window or door openings are proposed in the exterior wall(s) a 4’ minimum wall width is required to start within 8’ of ends of exterior wall lines and no more than 25 feet apart.
32. Posts, poles and columns embedded in concrete or in direct contact with ground – Posts, poles and columns supporting permanent structures that are embedded in concrete or in direct contact with the ground or embedded in concrete exposed to the weather shall be approved pressure preservative treated wood suitable for ground contact use.
33. Structure less than 3’ from property line – Structure with a fire separation distance less than 3’ from the property line is prohibited unless otherwise shall have no less than a one-hour fire-resistive rating with exposure from both sides.
34. Dampproofing– Dampproofing is employed to prevent moisture from wicking through the structure and damaging interior finishes. Dampproofing methods however will not work when hydrostatic pressures are present, and are generally employed above grade or below grade in the absence of ground water. The most common methods of dampproofing are the application of 6-mil polyethylene, bituminous material, acrylic modified cement base coating and parging with minimum 3/8” thick Portland cement mortar mixed with waterproofing special additives.
35. Water proofing – Waterproofing treatment of a surface or structure is necessary to prevent a passage of water under hydrostatic pressure. Waterproofing materials are a membrane of rubberized asphalt, polymer-modified asphalt, butyl rubber, neoprene, and 6-mil polyvinyl chloride or polyethylene.

EXTERIOR ENVELOPE

GENERAL INFORMATION

- A. Houses built before 1968 were not required to have weep screed. Weep screed prevents stucco and wood damage from constant water exposure by capillary action (ground water get sucked up into the wall) as aggravated by poor drainage or water ponding around the foundations.
- B. Two primary reasons for stucco cracks are shrinkage or expansion and contraction, and structural. Shrinkage cracks may develop as the excess water evaporates from the drying cement mix. Thermal expansion and contraction crack is normal as material expands when temperature increases and contracts when temperature decreases. Structural cracks can occur in stucco when stress is transferred to the plaster membrane from various external sources. Various external sources are ground movement, foundation settlement, frame/structure movement, shear paneling, offset framing, water penetration, improper curing, lumber moisture content, and even wrongly timed installation of drywall and roofing tiles.
- C. Never nail any part of the fence to the house wall. Nailing could trap rain water between the fence post and the house wall and the termite could invade through the fence.

BUILDING CODE REFERENCE

1. Ground too close to the top of the foundation – Wood siding, sheathing and wall framing on the exterior of a building shall have a clearance of not less than 8” from the ground to prevent water damage due to constant water exposure by capillary action and eventual damage from termite.

2. Veneers/ Chimney/ other wall penetrations– Approved corrosion-resistive flashing shall be provided in the exterior wall envelope in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. The flashing shall extend to the surface of the exterior wall finish and shall be installed to prevent water from reentering the exterior wall envelope.
3. Flashings – Flashing is an integral factor in a building's ability to resist water intrusion. Flashing is required at the head, jambs, and sill of all windows, doors and other similar wall openings, roof penetrations, copings, above wood trim, porches or decks, and at built-in gutters. The intersection of a roof above a wall must have flashing stepped up the roof slope. Flashing is also needed at the meeting of two different roof slopes, such as at projecting gables and dormers.
4. Flashing at connection between two different materials – The connection of two different materials with dissimilar thermal expansion can only be made watertight with proper flashing system.
5. Annular spaces around wall penetration – Annular spaces around wall penetrations shall be sealed properly in such a manner as to prevent entry of air and water into the wall cavity or penetration of water to the building structural framing components.
6. Weep Screed – The purpose of the weep screed is to allow any water that may be flowing across the drainage membrane through its perforations, and it stops the stucco from bonding to the cement foundation and creating a dam where water might pool. The screed should span between the wood framing or sheathing and the concrete foundation, and it should terminate at least 8” above grade.
7. Exterior walls less than 3’ from property line – Exterior walls with a fire separation distance less than 3’ from the property line is prohibited unless otherwise shall have no less than a one-hour fire-resistive rating with exposure from both sides.
8. Separation between buildings – Minimum of 10’ separation shall be maintained between dwelling and accessory building.
9. Panel sheathing – Space joints between panel sheathing shall be 1/8” unless otherwise recommended by the manufacturer. Space butt joints in underlayment shall be 1/32”.
10. EIFS System – Exterior Insulation and Finish Systems (EIFS) are multi-layered exterior wall systems that are used on both commercial buildings and homes. They provide superior energy efficiency and offer much greater design flexibility than other cladding products.
11. Planter box – Planter box shall have 2” air space from wall to planter.
12. Brick Veneer end cap – The brick veneer end cap and rowlock sill shall slope and overhang with minimum 15° and 1 ½” respectively to drain the water away from the wall and the junction with the wall or window subsill/ sill extension shall be flashed with continuous impervious material such as metal sheet or caulked with a high-quality acrylic-latex caulk (paintable).

FIRE BARRIER (Wall between multi dwelling units)

BUILDING CODE REFERENCE

1. Opening at Firewall– The National Fire Protection Association (NFPA) requires that penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a fire barrier be protected by a firestop system or device.

TRIMS/ DECORATIVE ATTACHMENTS

BUILDING CODE REFERENCE

1. Roof eaves distance from property line –Eaves within 3’ from property line shall be 1 hour construction on the underside and the projections beyond the exterior wall shall not extend over the lot line.
2. Roof eaves projection and distance from property line– Eaves shall not project more than 4” for each one foot of required side yard and shall provide a minimum 36” clear span between the eaves and the property line.
3. Fascia/Rake board – Fascia and rake board is necessary to protect the roof eaves from rain water and to provide support to the rain gutters.
4. Flashing at connection between two different materials – The connection of two different materials with dissimilar thermal expansion can only be made watertight with proper flashing system. A “Z” flashing shall be used for exterior wall siding wooden trims.
5. Wooden trim too close to the ground or concrete floor– Wooden trims on the exterior of a building shall have proper clearance from the ground to prevent water damage due to constant water exposure by capillary action and eventual damage from termite, or shall be approved pressure preservatively treated wood suitable for ground contact use.
6. Window overhang and sill extension –The window overhang and sill extension shall be built with 2% slope, covered with continuous impervious material such us metal sheet or waterproofing compound with proper flashing system.
7. Decay resistant wood species– Common wood species that are resistant to decay are redwood, cedars, white oak, black locust and heartwood of any wood species.

WINDOWS & EXTERIOR DOORS ASSEMBLIES

GENERAL INFORMATION

- A. A single pane glazing has an approximate R-value of 0.85, while a double pane glazing has a value of 1.5 - 2.0, a low-e double pane glazing has a 2.4 - 3.0 rating and a low-e double pane glazing using an argon gas fill has a 2.7 - 3.6 R-value.
- B. A building permit is required for window assembly replacement (either “retrofit” or nail-on flange style). Replacement of “glass only” does not require a building permit.

BUILDING CODE REFERENCE

1. Exterior Doors – Doors exposed to the weather shall be of approve exterior type of doors– metal or plastic clad engineered wood, solid type and metal.
2. Second Story Exits – Second story with 3,000 square’ floor area requires at least two exits.
3. Egress – Buildings, residential or commercial, shall be provided with egress (exit) door. The required exit door shall be a side-hinged door not less than 3’ in width and 6’, 8” in height, but not through the garage, bedroom or bathroom.
4. Third Story and Roof Decks Exits – Third story or roof deck larger than 500 square’ floor area requires at least two exits.

5. Windows at wall constructed less than 3' from property line – Openings or windows shall not be permitted in the exterior wall of a dwelling or accessory building with a fire separation distance less than 3' from the property line.
6. Window and Door flashing – A full layer of flashing all around the window and door shall be installed to prevent any moisture from getting behind and rot the wall framing. Flashing of about 6" wide, made of asphalt saturated kraft paper or made from bituthane, foil-coated on one side with a peel-and-stick adhesive on the other side, or 15 lb roofing felt can be used.
7. Door and window casings – In most applications, door and window casing serves both a functional and aesthetic function. It covers the gaps between the edges of the door and window frame and the surrounding wall, which helps the door and window blend in with the wall more effectively. By covering these gaps, door and window casing also blocks air drafts, pests and dirt or dust from passing into the home. Like all trim, door and window casing also creates a decorative addition to a room, and even may help the entire opening serve as a visual focal point within a space.
8. Energy Conservation – Joints and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weatherstripped, or otherwise sealed to limit infiltration and exfiltration.

UNDERFLOOR /ROOF SPACES

BUILDING CODE REFERENCE

1. Wastepipe cleanout location – No underfloor DWV pipe cleanout shall be located more than 20' from an access door, trap door or crawl hole.
2. Crawlspace access opening requirement– A crawlspace access opening shall have a minimum size of 18" x 24" with well opening of minimum 24" wide and 36" depth or a clear working space area of minimum 30" wide, 36" in depth and 6.5' in height, and shall be located in a central and readily accessible location so that no point along the ground line is more than 20', measured horizontally, from another access opening. Pipes and piers must not obstruct the access to space below the floor.
3. Crawlspace access door– Crawlspace access opening shall be provided with a removable cover or door with corrosion-resistant frame and 1/8" wire mesh.
4. Crawlspace access opening requirements – Crawlspace access shall be provided with minimum 18" x 24" opening, at least 6" deep sump pit that will collect undesirable water, and 4" thick concrete barrier extended at least 3" above the ground or pavement to prevent water run-off from going into the crawlspace.
5. Underfloor space moisture barrier – Underfloor ground shall be dry to prevent dry rot (fungus) or termite damage. Improving the drainage around the surrounding wall foundation and installing polyethylene sheeting of minimum 6-mil thickness shall be placed over the ground with joints lapped 6" and left unsealed.
6. Underfloor space debris – The under-floor grade shall be cleaned of all vegetation and organic material. All wood forms used for placing concrete shall be removed before a building is occupied or used for any purpose. All construction materials shall be removed before a building is occupied or used for any purpose.
7. Attic access door– Attic access door shall be made of at least 1/2" thick drywall or plywood.

8. Attic access opening and headroom – An attic access opening shall be provided to attic areas that exceed 30 square feet and have a vertical height of 30” or greater. The rough-framed opening shall not be less than 22” by 30” and shall be located in a hallway or other readily accessible location. A 30-inch minimum unobstructed headroom in the attic space shall be provided at some point above the access opening.
9. Attics containing appliances– Attics containing appliances requiring access shall be provided with an opening and a clear and unobstructed passageway large enough to allow removal of the largest appliance, but not less than 30” high and 22” wide.
10. Roof and underfloor spaces ventilation requirement – Net area of ventilation openings shall be at least 1 sq. foot for every 150 square’ of vented area. Poor ventilation can lead to mold or moisture damage, musty odors in the living area, buckled floors, high humidity in the living area, insect infestations, rot in wooden framing members, and condensation of ducts or pipes.
11. Ventilation screens requirement – Ventilation openings shall be covered for their height and width with corrosion resistant mesh screen with least dimension of not to exceed 1/8 inch.
12. Ventilation cover – Ventilation openings where damage to any building components will occur as a result of water intrusion shall be provided with louvered cover bent downward.
13. Ventilation clearance from ground – Ventilation opening at exterior of a building shall have a clearance of not less than 8” from the ground.

PORCH/LANDING(S)

BUILDING CODE REFERENCE

1. Landing at exterior door – A minimum of 3 foot by 3 foot landing shall be required at each side of an egress door. The landing shall not be more than 1 ½” and ½” lower than the top and bottom of the threshold respectively– more than 1 ½” is a safety issue and less than ½” is water intrusion issue. However, the landing at an exterior doorway shall not be more than 8” below the top of the threshold, provided that the door, other than an exterior storm or screen door, does not swing over the landing.
2. Guard rails – Porches, balconies and raised floor surfaces located more than 30” above the floor or grade shall have guard rails not less than 36” in height.
3. Handrails – Handrails having minimum and maximum heights of 30” and 38” respectively shall be provided on at least one side of stairways of three or more risers.
4. Risers and treads elevation difference– The riser and treads shall not exceed the smallest by 3/8 inch.
5. Risers and treads height and depth – The riser shall not be less than 4” and not more than 7 ¾” and the minimum tread depth shall be 10”. The walking surface of treads and landings of a stairway shall be sloped no steeper than 2 percent slope.
6. Circular stairways treads – Circular stairway shall have a tread depth at a point not more than 12” from the side where the treads are narrower of not less than 11” and the minimum depth of any tread shall not be less than 6”.
7. Floor elevation– The porch floor shall be 1 ½” minimum and 8” maximum lower than interior floor elevation to prevent water intrusion.
8. Floor slope– Balcony floors shall be sloped at minimum 2% towards the drainage and shall be leveled properly so as to prevent water ponding.

BALCONY(IES)

BUILDING CODE REFERENCE

1. Guard rails – Porches, balconies and raised floor surfaces located more than 30” above the floor or grade shall have non climbable guard rails not less than 36” in height. Open side of stairs with a total rise of 30” above the floor or grade below shall have guard rails not less than 34” in height measured vertically from the nosing of the treads.
2. Guard rails opening – Guard rails shall not be climbable and its intermediate rails or ornamental closures shall not allow passage of an object 4” or more in diameter.
3. Guard rails sturdiness – Guardrails must be able to withstand, without failure, at least 200 pounds of weight applied within 2” of the top edge in any downward or outward direction, at any point along the top edge.
4. Floor elevation– The balcony floor shall be 1 ½” minimum and 8” maximum lower than interior floor elevation to prevent water intrusion.
5. Floor slope – Balcony floors shall be sloped at minimum 2% towards the drainage and shall be leveled properly so as to prevent water ponding.

EXTERIOR STAIRWAY(S)

BUILDING CODE REFERENCE

1. Handrails – Handrails having minimum and maximum heights of 30” and 38” respectively shall be provided on at least one side of stairways of four or more risers.
2. Grips– Grips must be 1 ¼” – 2 5/8” circular cross section. Handrail-gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.
3. Riser & thread requirement – The riser shall be minimum 4” and maximum 7 ¾” and the minimum thread depth shall be 10”.
4. Unequal riser & thread – The riser and threads shall not exceed the smallest by 3/8 inch.
5. Guard rails – Porches, balconies and raised floor surfaces located more than 30” above the floor or grade shall have guard rails not less than 36” in height. Open side of stairs with a total rise of 30” above the floor or grade below shall have guard rails not less than 34” in height measured vertically from the nosing of the treads.
6. Rails strength – Handrails and top rails of the stair rail systems must be able to withstand, without failure, at least 200 pounds of weight applied within 2” of the top edge in any downward or outward direction, at any point along the top edge.
7. Guard rails opening –Intermediate rails or ornamental closures at guard rails shall not allow passage of an object 4” or more in diameter.
8. Ground platform– Exterior wooden or steel stairs shall be firmly supported on concrete slab foundation extending 3” minimum above the adjoining ground or pavement to protect from decay, termite, corrosion and the deleterious effects of ponded water.

CHIMNEY(S)

GENERAL INFORMATION

- A. Masonry chimneys built before 1960 were not required to be strapped to the house.
- B. The masonry fireplace is assembled on site brick by brick with the use of mortar.
- C. The pre-cast concrete fireplace is engineered, tested and assembled in a factory and shipped to the site for installation. Precast fireplace is made of lightweight aggregate concrete and the firebox lining is made of a mixture consisting calcium aluminate cement and lightweight aggregate.

BUILDING CODE REFERENCE

1. Cement termination cap – The masonry chimney shall be provided with cement termination cap sloped away from the flue to prevent water intrusion that could damage the chimney and fireplace.
2. Rain cap – Chimney shall be provided with approve rain cap to prevent rain and some other external debris from coming into the house.
3. Spark screen – Every residential occupancy in which is installed any chimney, flue, or stovepipe attached to any fireplace, stove, barbeque, or other device that burns any solid or liquid fuel shall have such chimney, flue, or stovepipe equipped with an approved spark arrester installed in such a manner as to be visible for the purposes of inspection and maintenance.
4. Chimney Decorative Shrouds – Decorative shrouds can cause restrictive condition on top of the chimney. It can create a stall in the airflow and allow the entry of smoke, heat, and carbon monoxide into the building. Shrouds can be used only if it passed U.L. 127 test.
5. Chimney Decorative Shrouds – Decorative shrouds shall not be installed at the termination of chimneys for factory built fireplaces except where such shrouds are listed and labeled for use with the specific factory-built fireplace system and installed in accordance with the manufacturer's installation instructions.
6. Sealant between chimney and wall – The chimney connection with the house shall be provided with flashing and sealed properly to prevent water and air intrusion.
7. Chimney brace detail – Masonry chimneys more than 6' above last support shall be braced to the house structure with one (centered) 2"x2"x1/4" steel angle or two 3/16 by 1 inch straps, anchored to 2"x6" blocking across minimum of four floor joists, roof rafters or ceiling joists with two 1/2" Ø x5" bolts and anchored to the chimney with two 1/2" x2 1/2" expansion bolts into masonry grout space.
8. Chimney flue lining – Masonry chimneys shall be lined to prevent hazardous and noxious gasses and excessive heat from combustible materials that surround the chimney escape through damaged or missing mortar joints of a chimney.
9. Chimney termination at roof – Chimneys shall extend at least 2' higher than any portion of a building within 10', but shall not be less than 3' above the point where the chimney passes through the roof.
10. Antenna attached to chimney – Chimneys shall not support loads other than their own weight unless they are designed and constructed to support the additional load.
11. Metal chimney guard/clearance from combustibles – Metal pipe shall be guarded by a ventilated metal thimble not less than 4" larger in diameter than the vent connector. A minimum 6" of clearance shall be maintained between the thimble and combustibles.
12. Double chimney flue – One flue shall be higher than the other flue by at least 4" to prevent downdraft.

FIREPLACE(S)

GENERAL INFORMATION

- A.** Officials in charge of air quality in Los Angeles and surrounding counties have banned the use of wood-burning fireplaces during certain high-pollution days. The fines would only be levied on about two dozen winter days, and wouldn't affect gas fireplaces, wood-burning ovens in restaurants, or homes above 3,000'.
- B.** Never burn paper or other composite products such as sawdust, wax logs and papers in the fireplace to prevent damaging the linings. Fireplaces require low heat fires only.
- C.** A gas log fireplace is a fireplace that has been fitted with fake, fire-resistant logs. These logs have gas nozzles and igniters underneath, so when they are "burnt" they appear to look like natural logs on a genuine wood fire.

BUILDING CODE REFERENCE

1. Masonry fireplaces thickness –Masonry fireplaces total minimum thickness of back and side walls shall be 8 inches of solid masonry, including the lining. The width of joints between fire-bricks shall not be greater than 1 /4 inch. When no lining is provided, the total minimum thickness of back and side walls shall be 10 inches of solid masonry.
2. Fireplace opening sizing – Fireplace opening shall be no more than 10 times the area of the flue (12 times for round flues).
3. Hearth sizing – Hearth should be at least 20" inside of firebox,
4. Hearth extension width – Hearth extensions shall extend at least 16" in front of and at least 8" beyond each side of the fireplace opening. Where the fireplace opening is 6 square' or larger, the hearth extension shall extend at least 20" in front of and at least 12" beyond each side of the fireplace opening.
5. Hearth extensions thickness – The minimum thickness of hearth extensions shall be 2 inches. **Exception:** When the bottom of the firebox opening is raised at least 8 inches above the top of the hearth extension, a hearth extension of not less than 3 /8 -inch-thick brick, concrete, stone, tile or other approved noncombustible material is permitted.
6. Hearth slab thickness – Hearth slab minimum thickness should be 4" .
7. Flue sizing– Flue size shall be 1/12 to 1/10 of fireplace opening.
8. Mantle around fireplace opening – Woodwork or other combustible materials shall not be placed within 6" of a fireplace opening. Combustible material within 12" of the fireplace opening shall not project more than 1 /8 inch for each 1-inch distance from such opening.
9. Old fireplace damper – Old fireplaces are normally not provided with damper, however, damper stops the escape of warm air and incursion of cold air when the fireplace is not in use and controls backdrafting when in use.
10. Damper standard– Metal dampers shall be minimum of .097-inch, #12 carbon sheet metal gage. Damper opening shall not be less than 90% of the required flue area.
11. Gas valve inside of firebox – All gas outlets located in fireplace shall be controlled by an approved operating valve located in the same room and outside the hearth, but not more than 4' from such outlets.
12. Unused gas pipe – Gas outlets that do not connect to appliances shall be capped gas tight.
13. Gas pipe burner – Gas pipe burner is only an optional attachment for fireplace that can be used for either wood or gas.

14. Gas pipe through masonry firebox – Where installed to pass through masonry, gas piping must be encased in a sleeve. Sleeve material may be Schedule 40 steel pipe or other pipe material capable of supporting the pipe and should be sized one pipe diameter larger than the gas pipe. The sleeve must be sealed at inside of firebox with heat resistant sealant (1000°F Silicate Sealant) and outside of the foundation wall to prevent entry of water.
15. Gas pipe through prefabricated firebox – Where the gas piping installed to pass through prefabricated firebox, the annular space around the gas pipe must be sealed at inside of firebox with heat resistant sealant (1000°F Silicate Sealant).
16. Gas pipe prohibited penetration – Gas piping must not penetrate a building foundation wall below grade.
17. Gas pipe support – Piping installed aboveground outside of the building, must be securely supported every 10' and protected from physical damage.
18. Pre-fabricated fireplaces – Pre-fabricated fireplaces require manufacturer, model, and Underwriter Laboratories certification.
19. Ventless Gas Log Units “Ventless” gas log units are approved in some states and strictly prohibited in others (such as California). “Ventless” is a misnomer; such fixtures should actually be called “room vented” appliances, since that is truly what they are. All combustion products from these fireplaces are simply venting into the rooms and this poses health and safety issues including excessive moisture condensation, since one of the byproducts of gas combustion is water vapor. A potential consequence of indoor air moisture is fungus and mold infestation, a condition whose adverse health effects have been widely publicized during the past year. The other derivative of gas combustion is carbon dioxide—if combustion is incomplete for any reason (such as poor adjustment of the gas/air mixture or contact of the logs with the flame), then carbon monoxide can be produced and vented directly into the home, with the potential for disastrous results.
20. Fireplace doors requirement – A wood or gas-log fireplace shall have the closeable metal or glass doors covering the entire opening of the firebox. The glass doors should open and close freely without sticking and should close with a gap of no more than ¼”.
21. Factory-built fireplace combustion – A factory-built fireplace shall have a combustion air intake to draw air from the outside of the building directly into the firebox, which is at least six square” in area and is equipped with a readily accessible, operable, and tight-fitting damper or combustion-air control device (Exception: An outside combustion-air intake is not required if the fireplace will be installed over concrete slab flooring and the fireplace will not be located on an exterior wall.)
22. Gas fireplace service –Gas fireplace shall get service of the following: check fan operation, clean pilot and burners, check gas pilot safety system, check for proper ignition and combustion, visually check venting and chimney draw, check for adequate combustion and ventilation air, paint firebox, and inspect gasket.

GARAGE(S)

GENERAL INFORMATION

- A. Federal regulations (effective in 1993) requires automatic door opener to reverse when encountering 1” thick or thicker obstruction, or light-beam sensors that detect an obstacle in the path of a closing garage door—except for doors that requires constant pressure on control button. This applies to all automatic door opener installed on or after 1993.

BUILDING CODE REFERENCE

1. Garage/Carport requirement– Single-family dwellings are required to maintain two covered parking spaces on the same lot as the dwelling. If the garage or carport has been converted to another use, a carport or garage will have to be provided before your Certificate of Occupancy can be issued.
2. Pet-door opening at fire door– No opening shall be permitted at a fire door– it shall be airtight to prevent the intrusion of fire and toxic gases from the garage to the living area.
3. Openings at firewall – The fire barrier wall shall be completely covered by not less than 5/8–inch Type X gypsum at the garage side from the top of the floor to the underside of the roof above and shall be continuous through concealed space, and the construction joints and annular spaces shall be sealed with drywall tape or heat resistant sealant to prevent fire and toxic gases infiltration.
4. Penetrations at Firewall – Penetrations for cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires, and similar items to accommodate electrical, mechanical, plumbing, and communications systems that pass through a wall, floor, or floor/ceiling assembly constructed as a fire barrier be protected by a firestop system or device, and the annular spaces shall be filled with heat resistant sealant.
5. Plastic penetrations at firewall – The plastic water and DWV pipe must be protected at each penetration through bearing walls, fire resistive membranes, floors, ceilings, roofs, and floor-ceiling and roof ceiling assemblies, including finishing materials. The space between the pipe and the wall or assembly shall be filled with a material that will occupy the void created should the pipe disintegrate.
6. Living area over the garage – The garage walls, ceiling, posts and beams when supporting an upper floor shall be covered with not less than 5/8–inch Type X gypsum board.
7. Garage door sensor– The automatic garage door opener beam sensor should not be more than 6” above the floor to prevent children from being pinned between the door and the floor.
8. Prohibited door between the garage and bedroom – Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inch in thickness, solid or honeycomb core steel doors not less than 1 3/8” thick, or 20-minute fire-rated doors and equipped with self-closing device, active latch bolt, weather-stripping and artificial bottom seal.
9. Fire door (Door between the garage and living area) – Openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inch in thickness, solid or honeycomb core steel doors not less than 1 3/8” thick, or 20-minute fire-rated doors.
10. Fire door required hardware– Fire doors (door between the garage and the living area) shall be equipped with self-closing device, active latch bolt, and doorjamb and bottom fume-seals.
11. Exterior door – Exterior doors shall be made of solid wood, steel or fiberglass doors. Steel and fiberglass doors are composite construction with door skins (the front and back surfaces) that consist of 24-gauge to 26-gauge galvanized steel or fiberglass that are often shaped to replicate the look of a wood frame-and-panel door. High-density polyurethane insulation fills the space between the two skins, resulting in a stable, energy-efficient door that does not require a great deal of maintenance.

12. Warped and out of plumb doors – The vertical and horizontal planes of the door should not vary from a true plane by more than ¼". Doors should not be installed out of true level and plumb by more than 1/8".
13. Door threshold – Threshold is necessary to prevent infiltration of water and air and shall be installed as per NWWDA Industry Standard.
14. Firedoor and exterior doors opening – Firedoor and other exterior doors shall open inward. If the door opens outward, a 3 foot by 3 foot landing shall be required not more than 1 ½" below the top of the threshold.
15. Flexible ducts in garage – Ducts in the garage and ducts penetrating the walls or ceilings separating the dwelling from the garage shall be constructed of a minimum No. 26 gage sheet steel or other approved material and shall have no openings into the garage.
16. Garage door opener without individual circuit – Permanently connected appliances rated in excess of 0.125 horsepower, shall be supplied by an individual branch circuit.
17. Garage door motor height – The height of garage door motor shall not be less than 7' above the floor or lower than the garage door when fully open.
18. Garage door off center – The automatic garage door opener shall be installed at vertical center line to prevent unbalance weight distribution and prevents undue stress to the door and opener that could led to premature damage.
19. Garage floor elevation – The garage floor elevation shall be minimum 6" lower than the house interior floor to prevent fumes from seeping into the house.
20. Garage floor cover– The garage floor shall not be covered with combustible materials such as wood, carpet, vinyl tiles or black-top to prevent fire from heavy gas vapor, flammable liquids or car exhaust.
21. Residential parking requirement – New 2-car garage or 2-car carport is required to be constructed concurrently with garage conversion.
22. One-car garage size– An average size for a one car garage is generally 14' wide x 22' deep.
23. Racking/ Shearing– Racking/shearing is a result of inadequate bracing of shear walls most especially at vehicle entrance wall opening where the shear wall is narrow at both sides. Racking/shearing at door opening can be resisted by installation of Simpsons Wood Strong-Wall® to reduce lateral force impose on the structure.
24. Fire barrier wall bracing – The fire barrier wall of wood frame buildings which is also a bearing or shear wall shall be covered with minimum ½" thick structural plywood sheathing to resist horizontal and vertical shears.

ROOFING SYSTEM

GENERAL INFORMATION

- A. All roof systems were designed to be in a watertight fashion and not allow any kind of water intrusion only under normal (typical for California) inclement weather conditions. Under extreme weather conditions, water intrusion is considered acceptable.
- B. New roof coverings shall not be installed without first removing existing roof coverings when the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile or the existing roof has two or more applications of any type of roof covering.
- C. Rolled roofing is not acceptable for FHA loans, but cold/hot applied adhesive modified bitumen and metal roofs are acceptable with certification that the roof was installed per manufacturer's specifications. Built-up roofing must be installed by a licensed roofer.
- D. Built-up roof is typically consists of roof deck, vapor retarder, 2" thick rigid thermal insulation, bitumen sandwich between three to five layers of roofing felts and covered with mineral aggregates embedded in three coats of hot mop asphalt at top surface.

- E. Connection between different materials usually has problem with watertightness as a result of different thermal expansions. Flashing is the best way to fix this problem. It is important to check these connections every rainy season starts.

BUILDING CODE REFERENCE

1. Cricket or Saddle Flashing– A cricket or saddle shall be installed at flat valleys and at ridge side of any chimneys, skylights and walls greater than 30” wide to prevent water ponding and eventual leakage.
2. Roof flashings – Roof/wall intersections, penetrations, chimneys, etc, shall be provided with approved flashings to prevent water intrusions.
3. Wall flashing – The proper way of installing roof wall flashing is to use step flashing with "through the wall flashing" called a "Z" Bar Flashing. This "Z" Bar Flashing is placed over a piece of Vertical Blocking Material. The Roof Flashing is then placed up behind this "Z" Bar Flashing on the outside of the Vertical Blocking Material. If "Z" Bar Flashing is not possible, a surface mounted sheet metal counter flashing can be used. Sheet counter flashing shall be fastened to the wall with approved fasteners and sealed with polyurethane or elastomeric sealant .
4. Roof penetration flashing sealant – Roof penetrations annular space against its flashing shall be caulked with approve sealant, specifically high heat silicone sealant for gas flue vent pipes to prevent water intrusion.
5. Shingles around flashing – The lower edge of the flashing flange shall lie above the shingles, and the upper edge shall be underneath the shingles. The shingles were cut to fit around the flashing flange's dome. The shingles adjacent to the flange shall be adhered with roofing cement, and roofing cement shall be applied as sealant where the cut edges of the shingles meet the dome.
6. Shingles under roof rake – Roof rake shall be at least 1 ½” high above the roof covering so that the cover will be continuously laid to the house wall and to prevent the wood from rotting.
7. Valley flashing – Valley flashing shall consist of not less than No. 26-Gauge corrosion-resistant, galvanized sheet metal or other code approved, valley lining material. The metal shall extend at least 12 inches from the center line each way. Sections of flashing shall have an end lap of not less than four inches, and shall lap the hip and ridge a minimum of 6”on each side,
8. Coping at parapet walls – Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width no less than the thickness of the parapet wall.
9. Shingles installed at low sloped roof – Asphalt shingles should not be installed on slopes less than 2:12, provided the shingles are approved self-sealing shingles or are hand sealed and are installed with two underlayments.
10. Roll roofing slope – Modified bitumen membrane roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal for drainage.
11. Clay and concrete roof tile slope – Clay and concrete roof tile shall be installed on roof slopes of two and one-half units vertical in 12 units horizontal (2 1/2:12) or greater. For roof slopes from two and one-half units vertical in 12 units horizontal (2 1/2:12) to four units vertical in 12 units horizontal (4:12), double underlayment application is required.
12. Cal-shake roof – Cal-Shake® (fiber cement roofing product made to look like wood shakes) and were manufactured and distributed between 1980 and 1995–class action lawsuit alleges that Cal-Shake® Shakes are defective.

13. New roof covering over wood shingle or shake roofs – Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other approved materials securely fastened in place.
14. Maximum layers of roof covering – New roof coverings shall not be installed without first removing existing roof coverings when the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile or the existing roof has two or more applications of any type of roof covering or damaged top layer.
15. Panel sheathing – Space joints between panel sheathing shall be 1/8” unless otherwise recommended by the manufacturer. Space butt joints in underlayment shall be 1/32”.
16. Roof eaves Overhang – The minimum required eaves and rake overhang shall be 18” and 12” respectively. In moist climates with significant rainfall, liberal use of overhangs is strongly recommended. They keep unwanted, hot summer sun from heating a home, they help protect the home from moisture damage caused by precipitation, and minimize moisture penetration problems at exterior and foundation walls.
17. Roof tile overhang – First starter course or the tiles along the drip edge shall be installed so that it overhangs the drip edge by at least 1 inch up to 2” to allow the water to drip off the roof rather than run down the side of the building, into undersheathing, fascia or soffits.
18. Drip edge flashing – Metal edging shall be installed on the bottom edge of the eaves (called the “drip edge”) where water drips off the roof. Metal edging primarily purpose is to prevent asphalt shingles from sagging beyond the roof edge and to allow the water to drip off the roof rather than run down the side of the building, into undersheathing, fascia or soffits.
19. Kickout flashing – A kickout flashing is a piece of metal that is used where a lower roof line terminates against a vertical wall. The kickout flashing is installed above the rain gutter and/or drip edge flashing where the roof meets a vertical wall. This specialty flashing “kicks out” rain water and diverts it away from the lower wall. Missing, or incorrectly installed kick-out flashings, are often the source of major structural, mold, and rot damage. When there is no kickout flashing installed major damage can result. Without the needed flashing water can easily enter in behind the exterior wall cladding. Sometimes this damage is concealed until the cladding is opened up, and other times, the damage is obvious, even from across the street.
20. Roof tile closures – Metal or concrete roofing tiles ends shall be provided with closures at the roof eaves, ridge, hip and wall to prevent damage from air and water intrusions.
21. Curbs for skylights – All unit skylights installed in a roof with a pitch flatter than three units vertical in 12 units horizontal (25-percent slope) shall be mounted on a curb extending at least 4” above the plane of the roof unless otherwise specified in the manufacturer’s installation instructions.
22. Rain gutter – The rain gutter with downspout helps protect a building's foundation by channeling water away from its base most especially if the ground alongside the drip edges is not concreted. It helps to reduce soil erosion, prevent leaks in basements and crawlspaces, and protect painted surfaces by reducing exposure to water.
23. Gutter downspouts – Gutters shall be provided with downspouts and terminated to the ground surface at least 5’ from foundation walls, to another gutter or to an approved drainage system to prevent roof backflow, reduce soil erosion, prevent leaks in crawlspaces, and protect painted surfaces by reducing exposure to water.

24. Downspout termination – In areas where expansive or collapsible soils are known to exist, all dwellings shall have a controlled method of water disposal from roofs that will collect and discharge roof drainage to the ground surface at least 5' from foundation walls or to an approved drainage system.
25. Re-roofing – If re-roofing 50% or more of an existing roof within any one year period, then the entire roof must comply with current code. This means that all existing wood shakes or shingles must be removed and the new roof must be a code approved class A, B, or C roof covering, such as asphalt shingles, concrete tile, built up roofing, etc. The roofing must meet class A standards when used on buildings located within a Very High Fire Hazard Severity Zone
26. Flat roof drainage with parapet wall – Flat roof with parapet wall or mansard roofs shall be provided with independent primary and secondary drainage. Overflow scuppers and drains are essential components of the roof drainage system, to prevent potentially damaging overloading of roof structures. Generally, scuppers are installed in adjacent parapet walls no more than 2" above the low point of the roof and spaced no more than 50' on center. Overflow drains of the same size as the roof drains connected to drain lines independent from the roof drains shall be installed.
27. Skylight – Skylights shall withstand air infiltration, water penetration, uniform load deflection, UV ray, hurricane, wind loads and impact and shall also be thermal energy efficient.

PLUMBING SYSTEMS

GENERAL INFORMATION

- A. Life expectancy of existing pipes (Years): Galvanized-iron– 30 to 50 / Copper and plastic– 75 to 100 / Cast-iron–75 to 100 / ABS– 100+ / Black-iron– 75 to 100
- B. Water Adequacy: As a rule of thumb, a two bathroom house needs minimum of ¾" size water service pipe. The desired range of water pressure shall be between 35 to 80 psi.

BUILDING CODE REFERENCE

1. Service shut-off valve near the house – Each dwelling unit shall be provided with a readily accessible main shutoff valve near the entrance of the water service. The valve shall be brass and full-open type (gate, globe or ball valve) having nominal restriction to flow.
2. Valve handle – The shut-off valve must be readily accessible and openable without the use of a tool or effort.
3. Service shut-off valves for multi family building– Residential building with 2 or more units and commercial buildings shall be provided with an accessible independent control valve near the entrance of the water service for each apartment or store in a building. To avoid confusion by responding emergency personnel, proper signage is required to identify each control valve as to what dwelling unit or structure is being supplied.
4. Inadequate service pipe – The water service pipe shall not be less than ¾ inch nominal diameter pipe –1 inch nominal diameter for three bathrooms.
5. Height of faucets and valves above ground – The critical level of faucets and valves shall be minimum 6" above the ground.
6. Water service pipe underground – Water service pipe shall be installed not less than 12" deep or not less than 6" below the frost line.
7. Service pipes – ABS, PVC, PE-AL-PE or PE plastic pipe shall not be used for water distribution piping. Beside copper or galvanized-iron pipe, CPVC, Cross-linked PEX, PEX-AL-PEX or PB plastic pipe is permitted to be used for service pipes.

8. Copper and galvanized pipe connection – Joints between copper or copper-alloy tubing and galvanized steel pipe shall be made with a brass converter fit-ting or dielectric fitting to prevent deterioration of joints by electrolysis.
9. Pipes in concrete– Pipes passing through concrete or cinder walls and floors, cold-formed steel framing or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means with minimum thickness of 0.025 inch that will withstand any reaction from lime and acid of concrete, cinder or other corrosive material.
10. Flexible pipe connectors– Flexible pipe connectors shall not be used to connect two rigid pipes. Flexible connectors shall only be used to connect movable fixtures to the piping system.

Water distribution pipelines

GENERAL INFORMATION

- A. Water softeners can help reduce sediment but it can also reduce the water heater life expectancy. When salt is added to the water (as in softened water), anodes corrode more quickly, and can corrode in as little as six months if the water is over-softened. Do not soften to zero. Leave 50-120 ppm of hardness.
- B. Soft copper pipe is as good as hard copper. Soft copper is easier to use in hard to reach areas. Soft copper are generally joined by flaring when using a compression fitting, but it can be soldered if special tool that does not deform the pipe when cutting is used. Soft copper cannot be installed inside of the finished wall if it has flared joints.

BUILDING CODE REFERENCE

1. Copper and galvanized pipe connection – Joints between copper or copper-alloy tubing and galvanized steel pipe shall be made with a brass converter fit-ting or dielectric fitting to prevent deterioration of joints by electrolysis.
2. Water supply pipes – Water supply pipes can be divided into three main categories: metallic pipes, cement pipes and plastic pipes. Metallic pipes include steel pipes, galvanized Iron (GI) pipes and cast Iron (CI) pipes. Cement pipes include concrete cement (CC) pipes and asbestos cement (AC) pipes. Plastic pipes include low-density, Polythene pipes, and un-plasticized, Poly Vinyl Chloride (PVC) pipes.
3. Plastic water distribution pipes – ABS, PVC, PE-AL-PE or PE plastic pipe shall not be used for water distribution piping. CPVC, Cross-linked PEX, PEX-AL-PEX or PB plastic pipe is permitted to be used for both hot and cold water.
4. Copper pipes– Copper comes in three grades, M for thin wall pipe used mainly inside homes, L for thicker wall pipe, used mainly outside for water services and K, the thickest, used mainly between water mains and the water meter. Copper lasts a long time, is durable and connects well to valves.
5. CPVC pipes– CPVC is a slightly yellow plastic pipe used inside homes that lasts a long time but not quite as tough as copper. Some areas with corrosive water will benefit by the use of CPVC piping.
6. PEX pipes – PEX plumbing systems is a good choice for re-piping and for new homes. It works well for corrosive water conditions, and it can stretch to accommodate the expansion of freezing water and then return to its original size when water thaws.
7. Galvanized pipes – Galvanized pipe corrodes and the water can be severely restricted by corrosion that eventually fills the pipe completely, and has shorter life expectancy compared to other pipes.

8. Pipes support– Piping shall be supported and strapped so as to ensure alignment and prevent sagging and damage, and allow movement associated with the expansion and contraction of the piping system. Pipe hangers and pipe supports include clevis hangers, beam clamps, pipe clamps, brackets, pipe straps and other accessories that hold or support pipes in place. In a piping system, devices such as valves, heavy flanges and pumps should be supported independently. Steel pipe $\frac{3}{4}$ " and under shall be supported every 10' and within 6" from the end. Copper tube $\frac{3}{4}$ " and under shall be supported every 3' and within 2" from the end. Plastic rigid pipe shall be supported every 3'. Plastic flexible tube (PEX) shall be supported every 32" at horizontal runs and 60" at vertical runs.
9. Pipe hanger – The pipes shall be supported with hangers, brackets or anchors which do not compress, distort, cut or abrade the pipe. Sheet metal or plastic straps (i.e. plumbers tape) maybe used for support as long as the strap is flat against the pipe.
10. Pipes strap types – Straps for copper or copper-alloy tubing and galvanized steel pipe shall be made of plastic or material of the same type as the pipe supported.
11. Pipe sizing – Typically, the main supply pipe leading in from the street is 3/4- or 1-inch pipe, supply branches are 3/4-inch pipe, and risers feeding individual fixtures are 1/2-inch pipe. Pipes shall be sized so that it can supply every fixture with 7.5 gallons, or 1 cubic foot, of water per minute.
12. Pipe sizing at water heater – The water supply pipes that get into and out of the water heater shall be minimum $\frac{3}{4}$ " \varnothing or the same size as that of service entrance. Pipes shall be sized so that it can supply every fixture with 7.5 gallons, or 1 cubic foot, of water per minute.
13. Water softener support – Appliances designed to be fixed in position shall be fastened or anchored in an approved manner to prevent displacement.
14. Shut-off valve requirements – An accessible independent shut off valve should be installed on the water supply pipe to each plumbing system, plumbing fixture, appliance, and water heater.
15. Copper pipes in concrete and galvanized metal– Copper pipes passing through concrete or cinder walls and floors, cold-formed steel framing, galvanized metal, or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means with minimum thickness of 0.025 inch that will withstand any reaction from lime and acid of concrete, cinder, galvanic reaction or other corrosive material.
16. Pipes through hollow wall and floor– Pipes passing through hollow walls and floors shall be provided with approved annular plate to control air leakage and pests intrusion.
17. Height of faucets and valves above ground – The critical level of faucets and valves shall be minimum 6" above the ground.
18. Pipe installation under the ground – Water pipe shall be installed not less than 12" deep or not less than 6" below the frost line.
19. Pipes separation – The main purpose of separating pipelines of at least 6" is to prevent heat passage from steam or hot-water pipes to cold-water lines.
20. Pipes insulation – The main purpose of insulating pipelines is to prevent the water from freezing in a pipe, especially when the pipe runs outside a building. Thus, hot-water lines are insulated to prevent loss of heat from the hot water, while potable waterlines are insulated to prevent absorption of heat in drinking water. Insulation also subdues noise made by the flow of water inside pipes, such as water closet discharges.

Drain, waste & vent (DWV) pipelines

GENERAL INFORMATION

- A. Houses that have raised foundation have clean-out in underfloor space. However, old houses that have inaccessible clean-out shall be provided with two-way cleanout fitting near the connection between the building drain and building sewer or installed outside of the building at the lower end of a building drain and extended to grade.
- B. There are 1.2 million homes in California or more than 25 percent of all U.S. households use septic systems. The septic tank pumping frequency depends on the septic tank capacity and household size. The frequencies were calculated to provide a minimum of 24 hours of wastewater retention assuming 50 percent digestion of the retained solids. Typically, for a 900 gallon septic tank in a house with 4 people, the tank should be pumped every 2.3 years.

BUILDING CODE REFERENCE

- 1. “P” trap requirement – Each plumbing fixture shall be separately trapped as close as possible to the fixture outlet in order to provide a liquid seal that prevents the emission of sewer gases without materially affecting the flow of sewage or waste water through it. The vertical distance from the fixture outlet to the trap weir shall not exceed 24”.
- 2. Too many Elbows or traps – Fixtures shall not be double trapped or provided with multiple El-bows within 18” from each other– they slow down the drain flow and the drain is prone to clogging.
- 3. “P” trap design – Traps shall have a liquid seal not less than 2” and not more than 4”.
- 4. “P” trap design – Traps shall be of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions except where integral with the fixture. Traps shall be constructed of lead, cast iron, cast or drawn brass or approved plastic. Tubular brass traps shall be not less than No. 20 gage thickness. Slip joints shall be accessible.
- 5. “P” trap clearances from floor – Trap with removable joints shall be installed minimum of 6” and maximum of 18” above floor.
- 6. Prohibited “S” trap – “S” traps, bell traps, crown vented traps, drum traps, and traps with moving parts are no longer accepted as these traps tend to easily siphon dry even when well-vented.
- 7. Drain arm minimum requirement – The drain arm first section (horizontal) shall be minimum 8” long and the succeeding bend sections shall be one pipe size larger than each of the upstream sections.
- 8. Improper sink tail piece Tee fitting – Approved directional-type branch fittings shall be installed in fixture tailpieces receiving the discharge from food waste disposal units or dishwashers.
- 9. Plumbing vent requirement– Every trap and trapped fixture shall be vented. Plumbing drainage and venting systems maintain neutral air pressure in the drains, allowing flow of water and sewage down drains by gravity. The waste won't flow well if it's held back by low pressure or a vacuum in the pipe behind it. Vents also allow air to be drawn into waste pipes to break a siphon.
- 10. Plumbing vent location –The maximum distance of trap from vent with ¼” fall per foot, shall be 2’6” for 1 ¼” Ø pipe, 3’6” for 1 ½”Ø pipe, and 5’0” for 2” Ø pipe. Too long unvented horizontal drainpipe could slow down the drain flow or siphon the water seal of the trap.

11. Plumbing vent termination – Plumbing vent shall extend outdoors and terminate to the open air no less than 6” above the roof or less than one foot from any vertical surface or terminate to an air admittance valve. Vent pipe for outdoor installations shall extend at least 10’ above the surrounding ground and shall be securely supported.
12. Plumbing vent termination – An open vent terminal from a drainage system shall not be located less than 4 feet directly beneath any door, openable window, or other air intake opening of the building or of an adjacent building, nor shall any such vent terminal be within 10 feet horizontally of such an opening unless it is at least 2 feet above the top of such opening.
13. Air admittance valves mechanics – Air admittance valves are operated by gravity. When water and waste move down a drainline, it creates negative air pressure in the pipe. This negative pressure lifts the sealing washer and lets air in, which allows the waste to drain away freely. When the negative pressure ceases, the sealing washer falls back in place, keeping sewer gases out of the room. The valve shall terminate above the flood level rim of the fixture served.
14. Air admittance valve – Plumbing vent shall extend outdoors and terminate to the open air no less than 6” above the roof or less than one foot from any vertical surface or terminate to an air admittance valve. Every dry vent or air admittance valve shall rise vertically to a minimum of 6” above the flood level rim of the highest trap or trapped fixture being vented.
15. Branch plumbing vent length – Branch vents exceeding 40’ in developed length shall be increased by one nominal size for the entire developed length of the vent pipe.
16. Plumbing vent slope – The horizontal vent pipe shall have a minimum ¼” per foot (2%) slope upward and maximum slope of ½” per foot (4%).
17. Plumbing vent roof flashing – Each vent pipe or stack shall extend through its flashing and shall terminate vertically no less than 6” above the roof nor less than one foot from any vertical surface.
18. Bathtub access panel – Fixtures with concealed slip-joint connections shall be provided with an access panel or utility space at least 12” in its smallest dimension so as to provide access to the slip connections for inspection and repair.
19. Materials for above ground DWV – Approved materials for above ground Drain, Waste and Vent (DWV) pipes are ABS, Coated aluminum, Borosilicate glass, Brass, Cast-iron, Copper, Galvanized steel, Lead, and PVC.
20. Materials for underground DWV – Approved materials for underground Drain, Waste and Vent (DWV) pipes are ABS, Cast-iron, type L and K copper, Bituminized fiber, Vitrified clay, PVC, Concrete, and Asbestos Cement.
21. Drainpipe support – Piping shall be supported and strapped so as to ensure alignment and prevent sagging and displacement, and allow movement associated with the expansion and contraction of the piping system. Cast-iron pipe shall be supported every 5’ except maybe 10’ when 10’ length is installed. ABS pipes shall be supported every 4’.
22. Pipe hanger – The pipes shall be supported with hangers, brackets or anchors which do not compress, distort, cut or abrade the pipe. Sheet metal or plastic straps (i.e. plumbers tape) maybe used for support as long as the strap is flat against the pipe.
23. Drainpipe slope – Horizontal drain-age piping shall be installed in uniform alignment at uniform slopes not less than one-fourth unit vertical in 12 units horizontal for 2 ½” Ø and less, and not less than one-eighth unit vertical in 12 units horizontal for diameters of 3” or more.
24. Drainpipe fittings – Changes in direction in drainage piping shall be made by the appropriate use of sanitary tees, wyes, sweeps, bends or by a combination of these drainage fittings. Sanitary Tee shall not be used at vertical to horizontal and horizontal to horizontal to prevent the wastewater from backing up.

25. ABS plastic exposure to UV light – Long-term exposure to ultraviolet (UV) rays will damage plastic pipes; therefore, it should be covered with pipe insulation or painted according to manufacturer's instructions, which typically dictate that water-based latex paint should cover the exposed areas.
26. Main cleanout –An approved type of two-way cleanout fitting installed inside the building wall near the connection between the building drain and building sewer or installed outside of the building at the lower end of a building drain and extended to grade, or an upper terminal cleanout.
27. Drainage cleanouts – Cleanouts shall be installed at each change of direction of the drainage system greater than 45 degrees, except not more than one cleanout shall be required in each 40' of run regardless of change in direction.
28. Clean-out location – Clean-out shall be readily accessible with at least 3' clearance for rodding.
29. Connections to cleanouts prohibited – Clean-out openings shall not be used for the installation of new fixtures or floor drains except where approved and an acceptable alternate cleanout is provided.
30. Drain and sewer sizing – Pipes shall be normally sized with minimum 4" Ø at building sewer and 3" at building drain for any building with one or two water closets. Any building with three bathrooms must have 4-inch building drain at the junction of flow from all three water closets. The pipe diameters depend on the numbers of fixture units served for horizontal and vertical drains and the length of pipes from main stack and vents.
31. Vent stack requirement – For each building with a single sewer receiving the discharge of a water closet, there must be at least one minimum size vent stack of not less than 3 or 4" extending through and above the building roof.
32. Pipes through hollow wall and floor– Pipes passing through hollow walls and floors shall be provided with approved annular plate to control air leakage and pests intrusion.
33. Abandoning septic tank – When septic systems are no longer to be used septic tanks must be properly abandoned. Local codes may have specific requirements and must be followed. In the absence of specific code requirements, the goal is to render the area of the old tank safe and free of environmental or public health impacts. The tank must first be emptied of its contents so that there is no sewage left in the tank. Three processes for dealing with the empty tank are common. They are removal and disposal at an approved site, normally a landfill; crush completely and backfill; and fill with granular material or a flowable fill such as concrete so that the tanks presents no collapse or confined space hazard. It is recommended that you check with local authorities for the procedure recommended or approved in your area.
34. Water Softener drainage– The softener drain line must not be connected directly to the waste system, but must be emptied into a laundry tray, floor drain, or properly trapped special outlet, preserving an air gap of at least two times the diameter of the drain line, but in no case less than 1-1/2" above the top of the receptacle used. The greater of two times the diameter of the equipment's indirect drain or 1-1/2" is the minimum air gap for whole house (point-of-entry) water treatment equipment. The greater of two times the equipment effective drain line diameter, or one inch, is allowed for point-of-use equipment. In addition, the end of the drain line should be secured so that there is never any chance that it can become immersed in waste fluids

Gas pipelines

GENERAL INFORMATION

- A. Gas Adequacy: As a rule of thumb, a house with natural gas forced-air furnace, water heater, cooktop and oven, clothes dryer and fireplace needs minimum of 1" size service pipe. The service pipe size shall be increased to a minimum 1 ¼" Ø if pool/spa heater is installed.
- B. Any commercial or residential building sold in the City of Los Angeles containing fuel gas piping shall require the installation of an Earthquake Shut-Off Valves (EQV) effective February 5, 1998.
- C. Effective February 10, 2002, California Public Utility Commission (CPUC) prohibits contractors or homeowners from installing Earthquake Shut-Off Valves (EQV) on The Gas Company side of the gas meter.

BUILDING CODE REFERENCE

- 1. Earthquake gas shut-off valve – An earthquake gas shut-off valve (EQV) of the same size as that of the manifold pipe or service entrance pipe shall be installed at the downstream side of the gas meter– see General Information B above.
- 2. Earthquake gas shut-off valve bracket – The earthquake gas shut-off valve (EQV) shall be rigidly attached to the house structure with approved steel brackets and anchored with ¼" Ø x 3" long lag screws. Bracket to the entrance pipe could have been attached to studs inside of the wall if the house/building was built after February 1998.
- 3. Earthquake gas shut-off valve sizing – The earthquake gas shut-off valve (EQV) shall be the same size as that of the manifold pipe or service entrance pipe.
- 4. Gas pipe protection underground – Gas pipe buried under the ground, or exposed to corrosive action such as soil condition or moisture, shall have factory protective coatings or wrappings.
- 5. Gas pipe exposed to corrosion– Metallic pipe or tubing exposed to corrosive action, such as soil condition or moisture, shall be protected in an approved manner. Zinc coatings (galvanizing) shall not be deemed adequate protection for gas piping underground. Ferrous metal exposed in exterior locations shall be protected from corrosion in a manner satisfactory to the code official. Where dissimilar metals are joined underground, an insulating coupling or fitting shall be used. Piping shall not be laid in contact with cinders. Uncoated threaded or socket welded joints shall not be used in piping in contact with soil or where internal or external crevice corrosion is known to occur.
- 6. Plastic gas pipe requirement – Buried plastic requires #18 tracer wire.
- 7. Gas pipe connector length – Connectors shall have an overall length not to exceed 3', except for range and domestic clothes dryer connectors, which shall not exceed 6' in length.
- 8. Shutoff valve at service entrance – Each pipe that independently branches out from the service entrance shall be provided with a readily accessible shutoff valve to prevent shutting off the entire house in the event of repairs.
- 9. Shutoff valve requirement – Each appliance shall be provided with a readily accessible shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6' from the appliance.
- 10. Gas shut-off valve location – Shutoff valves shall be located in places so as to provide access for operation and shall be installed so as to be protected from damage.

11. Meter location – Meters will not be installed within three' of any equipment with an open flame or subject to electric arcing; such as: circuit breaker panel boxes, automatic water heaters, house heating, furnaces, boilers, water spigot etc. (The electric meter is not considered a source of ignition). Meters will not be located where there is less than 5' of clearance between the floor and any overhead structure from driveway or vehicle traffic, and avoid locations directly below roof valleys, water downspouts, decks, stairs, or partial overhangs
12. Meter protection – Guard posts must be installed if meters may be exposed to vehicle damage. Guard posts must be 4" Ø steel posts filled with concrete on a 15" Ø concrete footing, 3' deep and 3' above grade
13. Unused gas pipe – Gas outlets that do not connect to appliances shall be capped gas tight.
14. Pipes support– Piping shall be supported and strapped so as to ensure alignment and prevent sagging and displacement, and allow movement associated with the expansion and contraction of the piping system. Steel pipe $\frac{3}{4}$ " and under shall be supported every 10'.
15. Flexible piping system – “Gestate” flexible piping system shall be installed according to “Gastite” installation standard, and the flexible piping system shall be supported not more than the distance between floor/ceiling joists and roof rafters.
16. Propane Tank Requirements – Mount the tank on a continuous concrete pad and bolt the 4 legs to the pad. The concrete pad should be 6-inches thick and 1-foot wider than the tank on either side in order to provide adequate stability. For a tank of 500 gallons or less, use four $\frac{1}{2}$ " Ø bolts with a minimum of 3-inch embedment into the concrete pad. Provide a flexible hose connection between the tank and the supply line and where the supply line enters the house to prevent potential brittle failures at these locations
17. Pipes through hollow wall and floor– Pipes passing through hollow walls and floors shall be provided with approved annular plate to control air leakage and pests intrusion.
18. Seismic valve installation for multi family buildings– An approved seismic has shutoff valve shall be installed downstream of the gas utility meter for all gas piping serving that building if the building has a single gas line. If the building in which the condominium unit is located has multiple gas lines then the valve only required on the line serving the condominium unit and any other condominium unit in the same building.
19. Gas test port – The service valve outlet port is used by gas service technicians for high pressure gas leak method of testing pipes. The system is monitored for any pressure drop for at least three minutes. If no pressure drop is detected the system is considered not leaking.
20. Gas test port – Gas test port pipe fitting shall not be used for the installation of new fixtures except where alternate port is provided.
21. Gas pipe sizing– The size of gas supply pipe depends on maximum gas demand, length of pipes, number of fixtures, gas gravity or pressure and diversity factor.
22. Galvanized-iron gas pipe– Galvanized-iron pipe is prohibited to be used by many codes because it is made with horizontal welded seam and if the zinc coating gets corroded it will leave the weld exposed to corrosion and could introduce a leak in the pipe, and the zinc coating will flake off and clog up all of your gas regulators and burner. For that reasons only seamless black iron pipe was approved for gas.

23. Types pipes used for natural gas – The codes for the local jurisdiction should always be checked but in general, steel pipes, copper pipes, yellow brass pipe, ductile iron, PVC pipes, PE pipes may be used to natural gas. Steel pipes can be used above ground and inside installations. Copper pipes should be of type L or K and approved for gas can be used for inside installations. Yellow brass pipes may be approved for inside installations. Ductile iron pipes may be approved in some jurisdiction for underground work. PVC - Polyvinyl Chloride - pipes may be used in pipelines buried outside a building. PE - Polyethylene - pipes may be used in pipelines buried outside a building.
24. Propane/LP tank support – Above-ground propane/LP tanks can slide, bounce, or topple during an earthquake, causing a potential fire hazard from a gas leak. Mount the tank on six-inch-thick concrete pad using four half-inch diameter bolts with three-inch minimum embedded into concrete. Provide a flexible hose connection between tank and the rigid supply line.

Irrigation System

GENERAL INFORMATION

- A. Irrigation water will damage walls, may cause foundation cracks due to expansive soil problem, may cause wood rot or termite infestations and may lead to mold or fungi problems. Keep sprinklers a minimum of 18 inches away from house walls. If you don't want water stains on walls, they need to be at least 5 feet away from walls.

BUILDING CODE REFERENCE

1. Sprinkler system zone valve height – The critical level of an atmospheric-type vacuum breaker shall be set a minimum of 6" above the device or highest point of sprinkler heads
2. Garden faucet anti-siphon device – A vacuum-breaker device is required at any water-supply outlet with a hose connection or at outlets which could be submerged and are not protected by an air gap.
3. Water supply shut-off valve – An accessible independent shut off valve should be installed on the water supply pipe to isolate the sprinkler plumbing system so it can easily and quickly shut-down the irrigation system for emergencies or repairs.
4. Plastic pipe depth installation – All plastic mainline pipe must be at least 18" deep as measured from the top of the pipe to the soil surface. Any mainline pipe that is not buried at least 18" deep should be metal, such as copper, brass, or steel. Lateral trenches for home irrigation systems can usually be about 10" deep. For commercial systems the standard is that the pipe is 12" deep.

WATER HEATER(S)

GENERAL INFORMATION

- A. All new and replacement water heaters, and all existing residential water heaters, shall be braced, anchored, or strapped to resist falling or horizontal displacement due to earthquake motion as per CALIFORNIA HEALTH AND SAFETY CODE SECTION 19210-19217. The seller of any real property containing a water heater shall certify to the prospective purchaser that this section has been complied with.
- B. Life expectancy of gas or electric heaters is 10 to 15 years. Individual units or components may vary and may last much longer up to 50% however, depending on the quality of unit or component, how often they were used and how regularly they are checked or serviced.
- C. As a rule of thumb, a house hot water consumption rate is 17 to 20 gallon per bathroom.

- D. The water heater is better located in a garage, basement, or separate outside closet. Place the heater close to the faucets that get the most frequent use (usually the ones in the kitchen) or in a central location, to reduce heat loss from long plumbing runs.
- E. Thermal expansion tank connected at cold water supply to the water heater is necessary to prevent the build up of unusually high pressure in a system (even when a pressure reducing valve is installed); pressure surges; and the chronic or continuous dripping of a temperature and pressure (T&P) relief valve. In addition, dripping faucets and leaking toilet tank ball cock fill valves are also symptomatic of thermal expansion.

BUILDING CODE REFERENCE

1. Water heater requirement– Every dwelling unit shall be provided with heating facilities with minimum capacity in accordance with first hour rating listed in table 5-1 of Uniform Plumbing Code. All design, construction, and workmanship shall be in conformity with accepted engineering practices, manufacturer’s installation instructions, and applicable standards.
2. TPR valve and overflow pipe – The water heater shall be provided with TPR valve with minimum $\frac{3}{4}$ " \varnothing rigid overflow pipe terminated over a suitably located indirect waste receptor or shall extend to the exterior of the building and terminate not less than 6" and not more than 24" above the adjacent ground surface. However, *Watts series 210* Immersion type temperature gas shut-off valve can be used instead for location where the TPR valve not feasible.
3. Water heater catch pan – A 2" deep catch pan with $\frac{3}{4}$ " \varnothing drainpipe shall be provided to a washer where damage to any building components will occur as a result of leak or overflow from TPR valve.
4. Flexible water supply connector – Flexible metallic water heater connectors or reinforced flexible water heater connectors connecting water heaters to the piping system shall be provided to reduce likelihood of damage if movement should occur.
5. Flexible water supply connector – Flexible connector shall be long enough but not more than 3' long to prevent damage when the water heater moves 12" in any sides.
6. Water supply pipes sizing – The inlet and outlet water supply pipes at the water heater shall be minimum $\frac{3}{4}$ " \varnothing .
7. 40 gallon Water heater strap – **Note:** $\frac{3}{4}$ " x 24 gauge perforated iron strap (plumber’s tape) will not be an acceptable method for strapping or bracing water heater over 40 gallons.
8. Water heater strap – Water heaters shall be anchored with DSA approved straps (16-gauge x 1 $\frac{1}{2}$ " wide) at points within the upper one-third and lower one-third of the appliance’s vertical dimensions, and the strapping at lower point shall maintain a minimum distance of 4" above the controls. The water heater shall be maximum 12" and minimum 1" from the supporting wall. The straps shall be anchored to wall studs with two $\frac{1}{4}$ " \varnothing x 3" long lag screws in each strap. The straps shall be installed so that the water heater does not move more than 12" in any sides.
9. Water heater protection – All water heaters installed in areas where they maybe subjected to mechanical damage shall be suitably guarded against such damage by being installed behind adequate barriers or by being elevated or located out of the normal path of a vehicle using any such garage.
10. Water heater enclosure – Water heater installed in outdoor locations shall be provided with protection from outdoor environmental factors that influence the operability, durability and safety of the equipment.

11. Exterior door – Exterior doors shall be made of solid wood or steel doors to provide protection from outdoor environmental factors. Steel doors are composite construction with door skins (the front and back surfaces) that consist of 24-gauge to 26-gauge galvanized steel.
12. Water heater platform in garage – Water heaters having an ignition source shall be elevated such that the source of ignition is not less than 18” above the garage floor.
13. Water heater support from ground – Water heaters supported from the ground shall be level and firmly supported on concrete slab or other approved material extending 3” minimum above the adjoining ground or pavement to protect from corrosion and the deleterious effects of water ponding (standing).
14. Water heater working space – The dimension of the working space shall not be less than 36” in depth, 30” wide in front and 6.5’ in height in the direction of access to parts likely to require examination, adjustment, and servicing or maintenance.
15. Water heater location from property line – Shed clearance to side property line is 2’ 6” and 3’ to rear property line. Vents shall be a minimum of 4’ from the property line.
16. Water heater location inside of the house– No gas fired water heater shall be located in bedrooms, bathrooms, clothes closet or any space opening into a bedroom or bathroom.
17. Water heater distance from gas meter – Meters will not be installed within three’ of any equipment with an open flame or subject to electric arcing; such as: circuit breaker panel boxes, automatic water heaters, house heating, furnaces, boilers, water spigot etc.
18. Gas vent connector joints fastener – Joints between sections of connector piping and connections to flue collars or hood outlets shall be fastened with three sheet-metal screws or other approved means, with the joints running in the direction of air flow.
19. Gas vent termination at roof – Gas vents shall be terminated 12” above the roof provided that such vents are at least 8’ from a vertical wall or similar obstruction to prevent backdrafting.
20. Gas vent termination at wall – The vent shall terminate at least 4’ below, 4’ horizontally from, or 1 foot above any door, window or gravity air inlet for the building.
21. Gas vent termination at property line – The vent shall terminate not less than 4’ horizontally from property line.
22. Vent pipe termination cap – Gas vent pipe shall be provided with UL approved termination cap to protect the building against wind conditions that cause waste gases to spill back into structure through appliance draft hood (backdrafting), and also keeps rain and debris out of vent.
23. Gas vent pipe draft hood– The draft hood is a required component of venting system that allows dilution air to be introduced into the vent and helps prevent overdraft. A draft hood is not required if the venting system has induced blower.
24. Gas vent pipe penetration flashing – Gas vent pipe installed through the roof or metal enclosure shall be provided with roof penetration flashing or storm collar and shall be sealed around it with heat resistant sealant to prevent water intrusion.
25. Gas vent slope – A vent connector shall be installed without any dips or sags and shall slope upward toward the vent or chimney at least 0.25 inch per foot.
26. Gas vent support – A vent connector shall be supported for the design and weight of the material employed to maintain clearances and prevent physical damage and separation of joints.
27. Vent connector sizing –Draft hood outlet 4” in diameter and smaller shall not be reduced in size– do not connect a 3” Ø vent to a 4” Ø draft hood outlet. Vent pipe shall not be increased in size more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter or draft hood outlet diameter.

28. Common vent sizing– The cross-sectional area of a common flue must be equal to the cross-sectional area of the largest connector plus 50% of all other appliances. The vent pipes connector shall be of Wye 45 degree branch type.
29. Two or more vent connectors enter a common gas vent – Where two or more vent connectors enter a common gas vent, chimney flue or single-wall metal pipe, the smaller connector shall enter at the highest level consistent with the available head room or clearance to combustible material.
30. Single wall vent pipe in roof space – Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space or floor.
31. Single wall vent design– Single-wall metal pipe (connector or outdoor use) shall be constructed of galvanized sheet steel not less than 0.0304 inch thick (gauge #20), or other approved, non combustible, corrosion-resistant material.
32. Vent connector – A vent connector shall be made of noncombustible corrosion-resistant material capable of withstanding the vent gas temperature produced by the equipment and of sufficient thickness to withstand physical damage.
33. Flexible vent connector – This Single Wall Gas Connector may be used as a connector for listed gas appliances equipped with a draft hood or other appliances listed for use with Type B Gas Vent. This includes furnaces, boilers and water heaters. Flexible connectors should not be used in applications where Type B Gas Vent is required, should not be totally enclosed, shall not pass through walls, floors, ceilings or install in attics or crawl spaces, and shall not be cut or modified. The connector should be generally installed in as short and straight run as possible with no unnecessary bends, without any dips or sags, slope upwards at least 1/4" per foot, and no bends greater than 90.
34. Vent connector adapter – The flue vent pipe connections shall be made with proper adapters to prevent gas leak. The Bucket Connector (BC) is used to make the connection of either Ameri-Flex single wall connector pipe, or Ameri Vent Type B Gas Vent, utilized as connector, through the bottom of the AmeriVent Bucket.
35. Single wall gas vent clearance from combustibles– Single wall gas vent clearance from combustibles shall be 6" from combustible vertical wall, 9" clearance from horizontal combustible surface, and 1" from around Wall Thimble.
36. Double wall gas vent clearance from combustibles– Double wall gas vent clearance from combustibles shall be 1" from combustible vertical wall, 3" clearance from horizontal combustible surface, and 1" from around Wall Thimble.
37. Single wall vent pipe installation – Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space or floor.
38. Water shut-off valve location – An accessible shut off valve not less than the nominal size of the connector shall be installed ahead of the connector of the water supply pipe to each plumbing fixture, appliance, and water heater.
39. Valve handle – The shut-off valve must be readily accessible and openable without the use of a tool or effort.
40. Gas shut-off valve location – Shutoff valves separate from that of the appliance shall be readily accessible for operation and shall be located in the same room as the appliance, not further than 6' from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.
41. Shut-off valve at appliances – Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6' from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.

42. Improper copper and galvanized pipe connection – Joints between copper or copper-alloy tubing and galvanized steel pipe shall be made with a brass converter fit-ting or dielectric fitting.
43. Gas pipe connector length – Gas pipe flexible connectors shall have an overall length not to exceed 3’.
44. Flexible gas pipe connector – Gas pipe flexible connectors should be of adequate length to reach from the gas supply line to the appliance without stretching – connectors shall not be joined together to form a longer connector.
45. Gas pipe flexible connector – Gas pipe flexible connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.
46. Gas pipe flexible connector requirement – Gas appliances shall be connected to the natural supply system piping by means of an approved flexible connector designed and labeled for the application to reduce likelihood of damage if movement should occur.
47. Combustion in confined place– A confined space shall be provided with two permanent openings with minimum free area of not less than 1 square inch per 1,000 Btu per hour but not less than 100 square inch. One opening shall commence within 12” of the top (air outlet), and one opening shall commence within 12” of the bottom of the enclosure (air outlet). The minimum dimension of air openings shall be not less than 3”.
48. Fuel-fired appliances location– Fuel-fired appliances shall not be located in, or obtain combustion air from sleeping rooms, bathrooms, toilet rooms, storage closets, and surgical rooms.
49. Water heater expansion tank – In line, diaphragm-type, pre-pressurized tank for use with domestic hot water heaters to accept the increased volume of water created when a water storage tank is heated, keeping the system below the relief valve setting. Extends water heater life and protects plumbing fixtures by controlling pressure build-up. Smothers water hammer and eliminates hot water waste. The tank must be properly supported in horizontal applications.
50. Tankless water heater clearances– Tankless water heater shall be installed not less than 4’ directly below or from an opening such as operable windows, doors and any fresh air openings, and from any adjacent wall or shrubbery with clearance; not less than 3’ below a gutter, sanitary pipework, eaves or overhang; not less than 1 foot above the ground; not less than 2’ in front obstruction, and not less than 3’ from a gas meter or gas regulator, electrical box or another water heater.
51. Water heater floor – Water heater must be installed on a non-combustible floor preferably of concrete and properly designed to support the required weight and to protect against any Fire Hazard. Do not install on wood, carpet, vinyl tiles or black-top or consult the Manufacturer for an approved base. Wood with protective metal sheet (minimum gauge #26) or minimum 5/8” thick type X gypsum board can be used.
52. Water heater clearance to combustible construction – Water heater clearance to combustible construction shall be 12” from cabinet sides and rear and 48” from cabinet top.
53. Water heater clearance for access – Water heater recommended clearance for access shall be 18” from passageways & inspection doors, 24” from controls and 30” from heater control panels.

ELECTRICAL SYSTEMS

BUILDING CODE REFERENCE

1. Number of service – Only one service per single family dwelling shall be installed.
2. Service drop clearances – Service drop clearances above walkway is 10'; above ground and driveway is 12'; above roadway is 18'; above flat roof is 8'; above pitched roof requires minimum of 3'; 3' clearance to buildings openings except above window; 3' clearance to doors, porches, balconies, ladders, stairs, etc.
3. Service drop clearance from trees – Service drop clearances shall be minimum 3' away from tree branches. Contact the Power Company for trimming of tree branches.
4. Service drop clearances over pool – Pools and the area extending 10' horizontally from the inside of the walls of the pool and minimum of 14' over the diving board shall not be placed under existing service drop conductors or any other open overhead wiring.
5. Cabled together service drop cables clearances over pool– Service drop cables, supported on and cabled together with an effectively grounded bare messenger or effectively grounded neutral conductor shall have a clearance of about 22' in any direction to the water level, edge of water surface, base of diving platform, or permanently anchored raft, and about 14' in any direction to the diving platform.
6. Service weatherhead – The weatherhead shall be 18" minimum above the roof if less than 6' of conductors runs across roof and if less than 4' from roof edge.
7. Mast location – The service mast must not be more than 4' from the edge of the roof.
8. Mast support – Masts must be braced, secured, and supported in such a manner that no pressure from the attached conductors will be exerted on a roof flashing, meter base, or other enclosures.
9. Service mast – If the service masts is less than 2"Ø and more than 42", braces or guys are required
10. Service mast size – Electrical Services conduit shall be sized for maximum conductor that could be contained. Service conductors in a rigid non-metallic or iron pipe diameter shall be the following: 30 to 60 ampere – 1", 100 ampere – 1 ¼", 150 to 200 ampere – 2"
11. Mast type of support – Rigid conduit or mast extended not over 26" high above the roof shall be provided with two 5/16" U-bolts, one at topmost and one at the connection with the panel board each provided with 2"x4" backing. Rigid conduit or mast extended over 26" high above the roof shall be provided with two 5/16" U-bolts each provided with 2"x4" backing or with two heavy-wall-strut-type channel and clamp anchored to the house studs with 5/16"x3" lag bolts, one at topmost and one at the connection with the panel board. Guy wire (#6 copperweld aircraft cable) or brace ¾" galvanized rigid conduit, installed at 45 degree angle shall be provided.
12. Drip loops – Drip loops shall be formed on individual conductors. To prevent the entrance of moisture, service-entrance conductors shall be connected to the service drop conductors either below the level of the service head or below the level of the termination of the service-entrance cable sheath.
13. Drip loop clearance from roof – A service conductor or its drip loop and splicings up to 300 volts line-to-line that crosses only the eave portion of the roof where it reaches the service mast must have an 18" clearance over the roof.
14. Service cables support – Service cables shall be supported by straps or other approved means within 12" of every service head, gooseneck, or connection to a raceway or shall be mounted on insulators or on insulating supports attached to racks, brackets, or other approved means.

15. Overhead cables mounting – Individual open conductors where installed to the weather, the conductors shall be mounted on insulators or on insulating supports attached to racks, brackets, or other approved means. Where not exposed to the weather, the conductors shall be mounted on glass or porcelain knobs.
16. Service drop cable splicing– The connection of service drop conductors with service entrance cable shall be made with approved splicing connectors and insulated using either preformed insulators or tape equivalent to that on the conductors.
17. Transformer clearances –Underground electric supply, riser pole, padmounted transformer, etc., shall be located 10 feet or more from the water's edge of the pool.
18. Transformer clearances – A 1 Phase padmounted transformer shall be at least 10' from non fire resistive (less than 2 hour fire rating) building construction, windows, doors and vents, and 20' from fire escapes. A screening wall with ventilation openings and 10' wide gate that opens outward shall be provided around the transformer of minimum 10' from the side of the pad.
19. Transformer clearances – A 3 Phase padmounted transformer shall be at least 15' from non fire resistive (less than 2 hour fire rating) building construction, windows, doors and vents, and 20' from fire escapes. A screening wall with ventilation openings and 10' wide gate that opens outward shall be provided around the transformer of minimum 10' from the side of the pad.

PANEL BOARD/ LOAD CENTER(S)

GENERAL INFORMATION

- A. As a rule of thumb, a typical house panel board capacity rating is about 0.065 to 0.075 ampere per foot² of floor area or minimum 100 amperes and minimum of six branch circuits (4-20 ampere and 2-15 ampere).
- B. *Life expectancies*: Panel board –50 to 60 years
- C. Some soils do not give good conductance, so testing of grounding system is recommended. The grounding system resistance between the ground socket on an outlet to the grounding rod shall be checked. The resistance should not be infinity, but it most likely will not be zero. Soils and moisture content determine the conductivity of the system.
- D. Effective January 1, 2002, NFPA 70, The National Electrical Code (NEC), Section 210-12, requires that all branch circuits supplying 125V, single phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms be protected by an Arc Fault Circuit interrupter (AFCI). The NEC 2008 revised code requires all habitable rooms, sunrooms, recreation rooms, closets and hallways and similar rooms or areas shall also be protected by an AFCI.

BUILDING CODE REFERENCE

1. Service shut-off location – The service disconnecting means shall be installed at a readily accessible location either outside of a building or inside the nearest point of entrance of the service conductors. Service disconnecting means shall not be installed in bathrooms. Each occupant shall have access to the disconnect serving the dwelling unit in which they reside.
2. Service panel grounding – Service panel shall be grounded to metal water piping located within 5' from the point of entrance to the building and bonded to grounding electrode conductor.

3. Cold water pipe grounding – Interior metal water piping located more than 5' from the point of entrance to the building shall not be used as part of the grounding electrode system or as a conductor to interconnect the electrodes that are part of the grounding electrode system. The bonding jumper shall be sized and installed accordingly.
4. Grounding electrodes and cold water pipe bonding – The interior metal water piping system shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used.
5. Purpose of grounding– The purpose of the “ground” wire is to carry fault current directly back to the source–this prevents the person from completing the circuit that could lead electrocution– and will immediately trip the breaker when the resistance is low. Electrical items must be grounded in order to be sure they do not acquire a dangerous voltage between their exposed metal parts and earth or another grounded object.
6. Plastic water service pipe– If the water service main pipe is made of plastic, the water distribution metal pipe shall be bonded to a grounding electrode with proper size jumper conductor. The electrode shall be installed such that at least 8' of length is in contact with the soil. It shall be driven to a depth of not less than 8' except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not exceed 45 degrees from the vertical or shall be buried in trench that is at least 2.5' deep.
7. Multiple lugging – Multiple lugging (multiple circuit wires are connected to a single lug) is not permitted. If the circuit breaker isn't designed to hold two wires, the wires could come loose and can lead to overheating, arcing, and possibly a fire. This can be fixed by replacing the offending circuit breaker with tandem breaker (2 half-sized breaker).
8. Dead-front cover requirement – Overcurrent devices shall be enclosed in gauge 16 metal cabinets or cutout boxes with bent edges for rigidity so that the operating handle of a circuit breaker shall be accessible without opening a door or cover.
9. Dead-front cover installation – Dead-front covers shall be installed over the breakers so as to completely cover the opening and seat against the finished surface and to guard energized parts of the panel board against accidental contact.
10. Dead-front cover screws – Dead-front cover screws shall be flat pointed to prevent damage to wire insulation inside the enclosure, short a hot wire, or even cause a fire.
11. Panel board front cover – Overcurrent devices shall be enclosed in gauge 16 metal cabinets with bent edges for rigidity to prevent from mechanical or weather damages.
12. Breakers labeling – The panel board circuits shall be legibly marked and identified of all its use or purpose on a circuit directory located on the face or inside the door of the enclosure, and the marking shall have the durability to withstand the environment involved.
13. AFCI Protection – Effective January 1, 2002, NFPA 70, The National Electrical Code (NEC), Section 210-12, requires that all branch circuits supplying 125V, single phase, 15- and 20-ampere outlets installed in dwelling unit bedrooms be protected by an arc-fault Circuit interrupter. The NEC 2008 revised code requires all habitable rooms, sunrooms, recreation rooms, closets and hallways and similar rooms or areas shall also be protected by an arc-fault Circuit interrupter. AFCI's involve a technology that detects arcing-faults in electrical circuits that could cause fires. By recognizing characteristics unique to arcing and functioning to de-energize the circuit when an arc-fault is detected, AFCI's further reduce the risk of fire beyond the scope of conventional fuses and circuit breakers.
14. Wires across the panel board bus bars – Electrical conductors shall not be installed across the bus bars to prevent arcing-faults in electrical circuits that could cause fires.

15. Wires connection with terminal screws – Strip about 3/4" of an inch of insulation from the electrical wire. Bend the wire in a "U" shape and slip over the screw so that the wire end is wound clockwise over the screw. Tighten the loop with pliers so it's a little snug over the screw, then tighten making sure the wire is firmly under the screw head.
16. Circuit breakers indication – Circuit breakers shall clearly indicate whether they are in the open "off" or closed "on" position.
17. Panel board knock-out cover – Unused openings in boxes, cabinets, equipment cases or housings shall be effectively closed to afford protection equivalent to the wall of the equipment.
18. Wire protection – Smoothly rounded fittings or equivalent be used where no. 4 AWG or larger conductors enter raceway, box, cabinet, or other enclosure.
19. NM cable protection – An approved metal or plastic NM cable connector shall be used where NM cables enter box, cabinet or other enclosure that are made of metal.
20. Romex or NM cables protection – Romex or NM cable that passes through panel board metal housing shall be provided with an approved metal or plastic NM cable connector.
21. Service main breaker – Panel board that consists of more than six switches or six circuit breakers shall be provided with service disconnecting means.
22. Undersized wires – Conductor and overcurrent protection shall be sized accordingly– 15-amp at #14, 20-amp at #12, 30-amp at #10, 40-amp at #8, etc... Aluminum wires shall be sized one size larger than copper wiring requirement. Undersized wire can overheat and burn its insulation and can cause fire.
23. Improper color coding – NEC or NFPA70 recommends green, bare or green w/ yellow tracer for ground, white, gray or red w/white tracer for neutral, red or black for hot wires, and yellow for hot wires from another source such as another control panel. Taping the end of the wires is not acceptable way of color coding.
24. Main panel grounding – The neutral bus bars and the grounding (metal base) shall be connected together by means of a bonding strap because if a neutral wire became disconnected, the return path for electric current could be along a ground wire, and if the ground wire also became disconnected somewhere, parts of the ground system could be energized.
25. Sub panel wiring – The neutral bus bars and the grounding (metal base) shall NOT be connected together by any means. Four wire cable shall be used to connect the sub panel to the main panel board. The hot wires (red and black) are connected to the hot bus bars, the neutral (white) wire is connected to the large lug on the neutral bus bar, and the ground wire (bare copper) is connected to the ground bus. In the main panel board, the neutral and ground wires shall be connected to the neutral/ground bus bar. A 60 ampere sub panel with 6/3 feeder cable can carry up to 6-20 ampere 125 volt branch circuit breakers.
26. Working space around panel board – The dimension of the working space shall not be less than 36" in depth, 30" wide in front (15" from centerline) and 6.5' in height in the direction of access to panel boards and live parts likely to require examination, adjustment, and servicing or maintenance.
27. Location of panel board – Required working space shall not be designated for storage. Panel boards and over-current protection devices shall not be located in clothes closets or bathrooms.

28. Wire splicing in panel board – Conductors can be spliced or joined inside of electric panel board provided it is done with splicing devices identified for the use or by brazing, welding, or soldering with fusible metal or alloy. All splices and joints and the free ends of conductors shall be covered with insulations equivalent to that of the conductors such as approved vinyl caps. The best way however is to install a pull/splice box beside the electric panel board where all the electrical wire splicings shall be done.
29. Overcrowded panel –Overcrowded panel boards can overheat, cause insulation melt, and potentially cause a fire because when too many wires are inside an electrical box, there is not much, if any, air circulation to help cool the wiring. Panel board shall not be filled with wires more than 40% of its volume.
30. NM, NMC and NMS cables in junction boxes and pane boards – Exposed NM, NMC and NMS cables shall be stapled 8” when using metallic cables boxes and the outer jacket of the cable shall extend at least ½ inch from the box.
31. Minimum branch circuits – Two 20-ampere branch circuits is required to feed receptacle outlets for small appliance loads, including refrigeration equipment in the kitchen, pantry, breakfast room, and dining room. One 20-amp branch circuit each must be provided for the laundry, bathroom, garage, living room, family room and bedrooms receptacle outlets and each appliance rated in excess of 0.125 horsepower. Two 15-ampere branch circuits are required for light fixtures. Totally, minimum of 10 branch circuits is required by NEC in an average residential building at current standard.
32. Aluminum and copper connection – The NEC requires that the aluminum and copper wires be connected together using special crimp devices, with an anti-oxidant grease.
33. Testing Laboratories– All electrical systems and components used shall be approved by ANZI or UL testing laboratories for compliance and standards for consumer safety.

Electrical wiring

GENERAL INFORMATION

- A. Life expectancies: Romex (NM cable) PVC insulated, conduit (single strand THHN or THWN)– 75 to 100 years / cloth sheathed rubber insulated knob-and-tube copper, BX (armored) cloth sheathed rubber insulated copper– 60 to 80 years / Panel board –50 to 60 years
- B. CPSC research shows that "homes wired with aluminum wire manufactured before 1972 are 55 times more likely to have one or more connections reach "Fire Hazard Conditions" than are homes wired with copper. Problems due to expansion, or more likely micro-fretting and arcing at the connectors, can cause overheating at connections between the wire and devices (switches and outlets) or at splices. The connections can become hot enough to start a fire without ever tripping a circuit breaker. Repair by pigtail using COPALUM connectors installed by a qualified electrician is the only method considered by CPSC to be a permanent repair.
- C. Cloth sheathed rubber insulated wirings if more than 30 years old reach "Fire Hazard Conditions"– its insulations become brittle due to overheating.
- D. Knob and tube wiring can still be an acceptable wiring system and if it is properly installed, has adequate capacity, properly grounded and has no frayed insulation.
- E. Most NM cable for residential use did not have a grounding conductor until 1962.

BUILDING CODE REFERENCE

1. Romex cables installation in roof space – Exposed NM cables (Romex wiring) where run across the structural members, or run within 7' of floor or floor joists across the face of rafters or studding, in attics and roof spaces that are provided with permanent stairs or ladders, and within 6' of the nearest edge of the attic entrance shall be protected from damage with substantial guard strips that are at least as high as cable.
2. Romex cable installation – Exposed NM, NMC and NMS cables where subject to physical damage, run across the structural members, or run within 7' of floor or floor joists across the face of joists or studs, cables shall be installed as per Article 336-(6–26) of NEC. NM, NMC and NMS cables shall not be installed in a conduit.
3. Bundled Romex cables – Romex cables shall not be bundled together for distances of more than 24", otherwise it maybe necessary to reduce (derate) the conductors ampacity because of possible heat build-up.
4. Romex cable installation – Cables smaller than two #6 or three #8 must be run through bored holes or be run on the surface of a running board. The cables must be strapped or stapled not more than 12" from a box or fitting and intervals between straps or staples must not exceed 4 ½'.
5. Romex cable in metal boxes – Romex or NM cables shall be installed with approved metal or plastic NM cable connector where it enters a box, cabinet or other enclosure that are made of metal.
6. Conductor protection – Smoothly rounded fittings or equivalent be used where no. 4 AWG or larger conductors enter raceway, box, cabinet, or other enclosure.
7. Wire through floors and walls – Wires installed through floor and walls where might be subject to physical damage, shall be protected with short length of EMT, rigid metal conduit, schedule 80 rigid PVC, or other metal pipe with plastic or metal coupling at the ends.
8. Types of outdoor wire protection – Three types of outdoor protection for wires are rigid nonmetallic conduit or PVC, rigid metallic conduit, and electrical metallic tubing or EMT. PVC conduit requires a separate grounding wire and needs to be buried in the ground. Rigid Metallic Conduit will corrode but has many advantages over the PVC style and does not require a separate grounding. Electrical Metallic Tubing (EMT) is not intended for below ground burial.
9. Wire near attic access opening – Exposed electrical wiring within 6' of the nearest edge of the attic entrance shall be protected from damage with substantial guard strips that are at least as high as cable.
10. Wire splicing and terminations – All splicings and terminations must be done inside of electrical boxes. All splices and joints and the free ends of conductors shall be covered with insulations equivalent to that of the conductors such as wire caps and twist connectors. Boxes shall not be filled with wires more than 40% of its volume.
11. Overcrowded boxes –Overcrowded boxes can overheat, cause insulation melt, and potentially cause a fire because when too many wires are inside an electrical box, there is not much, if any, air circulation to help cool the wiring. Boxes shall not be filled with wires more than 40% of its volume.
12. Box installations –All boxes shall be accessible. Boxes shall be installed at each conductor splice point, outlet, switch point, junction point, or pull point.
13. Romex cable as flexible cord – Romex cables shall not be used as flexible power supply cord for an appliance.
14. Flexible cords as permanent wiring – Flexible cords shall not be used in general wiring and shall only be used for appliances listed to be connected with a flexible cord.

15. Extension cord – Extension cords shall not be used in place of permanent facility wiring. Cords shall not be attached to building surfaces or structural members. They shall not be permanently concealed in walls, ceilings or under floors.
16. Overhead conductor clearances – Overhead spans of open conductors and open multi conductor cables clearances above finished grade, sidewalks, or from any platform or projection from which they might be reached and accessible to pedestrian only, is 10'; over residential property and driveways, and those commercial areas not subject to traffic is 12'; over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles such as cultivated, grazing, forest, and orchard is 18', above flat roof is 8', above pitched roof requires minimum of 3', 3' clearance to buildings openings except above window; 3' clearance to doors, porches, balconies, ladders, stairs, etc.
17. Overhead wiring and size – Wirings at overhead spans shall be of individual conductors not be smaller than No. 10 copper or No. 8 aluminum for spans up to 50' in length and No. 8 copper and No. 6 aluminum for a longer span unless supported by a messenger wire.
18. Overhead wiring mounting – Individual open conductors where installed to the weather, the conductors shall be mounted on strain insulators or on insulating supports attached to racks, brackets, or other approved means. Where not exposed to the weather, the conductors shall be mounted on glass or porcelain knobs.
19. Wet location cable type – Wet location and exposed to sunlight cables should be UF type and listed as sunlight resistant.
20. Wet location conduit – Liquidtight flexible steel conduit (LFMC) shall be used for installations requiring motion, vibration and bending. It offers good mechanical and moisture protection to enclosed conductors. The inherent Sunlight Resistance of PVC also enables this product to be used in outdoor applications and power transformers wirings.
21. Single wires separation – Open conductors shall be separated from open conductors of other circuits or systems by not less than 4".
22. Wiring support – Wirings shall be installed as per general installation and support requirements standards.
23. Romex cable support – The cable must be strapped or stapled not more than 12" from a box or fitting. Intervals between straps or staples must not exceed 4 ½'. The 4 ½ –foot securing requirement is not needed where non-metallic-sheath cable is run through holes in framing members such as studs, joists and rafters.
24. Flexible metal conduit support – Flexible metal conduit shall be supported every 4 ½ ft and 12" from box.
25. Rigid metal conduit support – Rigid metal conduit shall be supported every 10' and 36" from box or joint.
26. Junction box cover – Each outlet of the junction box shall be provided with a cover. 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 shall be installed so 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.
27. History of house wires – Knob & tube (1920–1930), Armored cloth sheathed rubber insulated wires (1922–1950), NM cable PVC insulated wires (1950 to date), NM cable aluminum wires (1965 –1975).

Power & Lighting

GENERAL INFORMATION

- A. The receptacles in all habitable rooms and kitchen countertop in houses built before 1968 were not installed within 12' and 4' from each other respectively.
- B. Three-slotted power receptacles are intended for use with appliances that need grounding, although two-pronged plugs can also be used. Two-slotted power receptacles are ungrounded and usually found in old houses and shall be used only for appliances that has two-pronged plugs and if double insulated against shock hazards. However, two-slotted power receptacles are not safe at places within 6' of water.
- C. All 15 and 20 ampere 120-volt receptacles located at outdoors above ground and first floor (1973 and 1996), in bathrooms and within 20' of swimming pool (1975), in garage (1978), within 6' of kitchen sink (1987), all kitchen countertop receptacles (1996), wet bar sink (1993), in accessory buildings that have a floor located at or below grade level not intended as habitable rooms, basements and crawlspaces (1990), in open and enclosed patio (1990 and 2007), and outlet that supplies a self-contained spa or hot tub equipment assembly (2003), shall be GFCI protected.

BUILDING CODE REFERENCE

- 1. GFCI device function– The “GFCI” protection device should trip (open) whenever an imbalance in the electrical current is initiated. “GFCI” may not trip if not wired correctly or if the device is defective.
- 2. GFCI device requirement and purpose – All 15 and 20 ampere 120-volt receptacles near water shall be provided with GFCI protection device. GFCI is designed to prevent electrocution by interrupting the power in less than 1/40 second if it senses problem as little as .005 amps, fast enough to prevent injury to anyone. Please see General Information C above.
- 3. Three-pronged receptacle – Receptacles and cord connectors that have grounding contacts shall have those contacts effectively grounded. A device can be damaged from static electricity, power surge or faulty wiring. The purpose of the ground is to trip the breaker preventing damage to the device or electrical shock to the user. An electrician can easily ground the power outlets and switches back to the panel board if the wires have metal conduits.
- 4. Reversed polarity – No grounded conductor shall be attached to any terminal or lead so as to reverse the designated polarity. Grounding a reversed polarity receptacle will cause the metal cabinets and components of appliances to be electrically charged. An electrician will just simply remove the white (neutral) and black (hot) wires and connect them to their properly intended sides of the receptacle –black gets connected to the dark or copper-colored screw and the white wire gets connected to the silver screw.
- 5. Receptacle and switch faceplates – Faceplates shall be installed to switches and receptacles so as to completely cover the opening and seat against the finished surface and to guard energized parts of the receptacle against accidental contact. Faceplates shall not protrude more than 1/8” from the finished wall.
- 6. Receptacle and switch cover outdoors – In damp or wet locations, the enclosure for a receptacle installed in an outlet box flush-mounted on a wall surface shall be made weather-proof by means of a weatherproof faceplate assembly that provides a water-tight connection between the plate and the wall surface.

7. Switch requirement for exterior light fixture – At least one wall-switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of each outdoor egress door having grade level access.
8. Receptacle requirement in walls – Receptacles shall be installed so that no point along the floor line in any wall space that is more than 6', measured horizontally, from an outlet in that space.
9. Receptacle requirement in bathroom – At least one wall receptacle outlet shall be installed in bathrooms and such outlet shall be located within 36" of the outside edge of each lavatory basin.
10. Spa GFCI protected outlet – The outlet that supplies a self-contained spa or hot tub equipment assembly shall be protected by a ground-fault circuit-interrupter.
11. Electrical fixtures clearance from bathtub/shower – Cord-connected fixtures, hanging fixtures, lighting track, pendants, and ceiling-suspended paddle fans shall not have any parts located within a zone measured 3' horizontally and 8' vertically from the top of a bathtub rim or shower stall threshold. This zone is all encompassing and includes the zone directly over the tub or shower. Recessed light fixture can be used but should be resistant to water vapor.
12. Receptacle requirement at island– At least one receptacle outlet shall be installed at each island counter space with a long dimension of 24" or greater and a short dimension of 12" or greater
13. Receptacle requirement at countertop – Receptacle outlet shall be installed at each wall counter space 12" or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 24", measured horizontally from a receptacle outlet in that space.
14. Receptacle requirement at outdoors – At least two outlets installed outdoors, one on the front and one on the back of the dwelling, accessible at grade level.
15. Switch requirement in rooms – At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom.
16. Switch location in rooms – The control for activation of the required lighting shall be accessible and within arms length from the door inside of the habitable room and bathroom.
17. Stairway lighting switch – The control for activation of the required interior stairway lighting shall be accessible at the top and bottom of each stair without traversing any step of the stair.
18. Stairway lighting requirement – Lighting fixture with three-way switch shall be installed at staircase with six or more risers.
19. Receptacle requirement in garage and basement – At least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage that is provided with electrical power.
20. Switch within sight for bigger appliances – Permanently connected appliances rated in excess of 0.125 horsepower, a branch circuit breaker or switch located within sight of appliance or such devices in any location that are capable of being locked in the open position shall be provided.
21. Lighting fixture and outlet at heating system in roof space– A lighting fixture controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the heating system location.
22. Closet light fixture type– The types of fixtures installed in clothes closets shall be limited to surface-mounted or recessed incandescent fixtures with completely enclosed lamps, and surface-mounted or recessed fluorescent fixtures. Incandescent fixtures with open or partially enclosed lamps and pendant fixtures or lamp-holders shall be prohibited.

23. Closet light fixture location – Surface-mounted incandescent fixtures shall be installed on the wall above the door or on the ceiling, provided there is a minimum clearance of 12” between the fixture and the nearest point of a storage space.
24. Open incandescent light bulb – Open surface-mounted incandescent fixtures shall not be installed within 12” from combustibles.
25. Light fixture requirement at existing system – All exiting systems such as stairways, exit passageways, exterior exit balconies, hallways, corridors, exit courts, stairs, and exit pathways of single or multiple tenant buildings shall be provided with lights having an intensity of not less than one foot candle at any point on the floor level to enable all persons to readily find, distinguish and use such ways of egress.
26. Exterior lighting requirement – Exterior lighting shall be provided in parking areas, walkways, recreation areas and similar locations as well as at the entrance of each dwelling unit.
27. Light fixture requirements – At least one wall switch-controlled lighting outlet shall be installed in hallways, stair-ways, attached garages, and detached garages with electric power. At least one wall-switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of each outdoor egress door having grade level access.
28. Light fixture minimum height– Any part of light fixture shall have a minimum clearance of 7’ from the floor and shall not be installed within 12” from combustibles.
29. Garage door opener without individual circuit – Permanently connected appliances rated in excess of 0.125 horsepower, shall be supplied by an individual branch circuit.
30. Recessed light fixture clearance from insulation – Thermal insulation shall not be installed above a recessed fixture or within 3” of the recessed fixture’s enclosure, wiring compartment or ballast except where such fixture is identified for contact with insulation, Type IC.

Apartment Building Security Lighting and Locks

GENERAL INFORMATION

- A. All apartment buildings (buildings containing three or more dwelling units) shall be provided with security lighting and locks. Exterior lighting shall be provided in parking areas, walkways, recreation areas and similar locations as well as at the entrance of each dwelling unit. Interior lighting shall be provided in recreation or service rooms and in parking garages. Locks shall be provided at all doors and windows leading into each dwelling unit. (Section 91.8607 L.A.M.C. - Effective January 12, 1998)

BUILDING CODE REFERENCE

1. Door exterior lighting – Every door in a security opening for an apartment house shall be provided with a light bulb (60 watt min.) at a maximum height of 8’ on the exterior.

HEATING SYSTEM(S)

GENERAL INFORMATION

- A. Life expectancy of gas or electric furnace is about 20 to 30 years.
- B. Life expectancy of heat pump: 10 to 15 years
- C. Adequacy: As a rule of thumb, a typical house in California may need up to 30–35 Btu per square foot of enclosed area (12,000 Btu = 1 ton). An electric heater KW (kilowatt) produces 3,400 Btu’s of heat.

- D. Certain horizontal furnaces installed within 1983 to 1994 present “a substantial risk of fire” as stated by the Consumer Product Safety Commission (CPSC)

BUILDING CODE REFERENCE

1. Heating requirement – Every dwelling unit shall be provided with heating facilities capable of maintaining a minimum room temperature of 68°F in all habitable rooms – see General Information above.
2. Temperature at register – Most forced-air gas furnace has air temperature at the register of about 120°F. Heat pump has air temperature at the register of about 100°F.
3. Passage/platform in attic containing furnace – Attics containing appliances requiring access shall be provided with an opening and a clear and unobstructed passageway large enough to allow removal of the largest appliance, but not less than 30” high and 22” wide and not more than 20’ in length when measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring not less than 24” wide. A level service space at least 30” deep and 30” wide shall be present along all sides of the appliance where access is required.
4. Lighting in attic containing furnace – Attics containing appliances requiring access shall be provided with a lighting fixture controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the appliance location.
5. Horizontal furnace support in attic – The horizontal furnace may be suspended from the joists using 3/8” all-thread rods with pieces of angle iron underneath the furnace to form a hanging rack at both ends and the midpoint. The rods need to be of sufficient length to allow for proper clearances from combustible materials. The angle iron needs to be at least 32” in length to allow for access to service panels.
6. Furnace braces in attic – Horizontal furnace where not rigidly attached to the structure, lateral bracing must be provided, typically straps running at a 45° angle from each corner of the unit to rigid framing members and tight enough to prevent horizontal movement. Concerns about vibration must be addressed with isolation devices, not by omitting required supports. The rafters or trusses must also be designed to handle the additional weight of the equipment.
7. Heating system in underfloor requirements – Underfloor spaces containing appliances requiring access shall be provided with an unobstructed passageway large enough to remove the largest appliance, but not less than 30” high and 22” wide, nor more than 20’ in length when measured along the centerline of the passageway from the opening to the appliance. A level service space at least 30” deep and 30” wide shall be present at the front or service side of the appliance. If the depth of the passageway or the service space exceeds 12” below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4” above the adjoining grade. The rough framed access opening dimensions shall be a minimum of 22” by 30”, where the dimensions are large enough to remove the largest appliance.
8. Central furnaces clearance – Central furnaces within compartments or alcoves shall have a minimum working space clearance of 3” along the sides, back and top with a total width of the enclosing space being at least 12” wider than the furnace.
9. Single wall vent design– Single-wall metal pipe (connector or outdoor use) shall be constructed of galvanized sheet steel not less than 0.0304 inch thick, or other approved, non combustible, corrosion-resistant material.
10. Single wall vent pipe in roof space – Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space or floor.

11. Vent connector – A vent connector shall be made of noncombustible corrosion-resistant material capable of withstanding the vent gas temperature produced by the equipment and of sufficient thickness to withstand physical damage.
12. Flexible vent connector – This Single Wall Gas Connector may be used as a connector for listed gas appliances equipped with a draft hood or other appliances listed for use with Type B Gas Vent. This includes furnaces, boilers and water heaters. Flexible connectors should not be used in applications where Type B Gas Vent is required, should not be totally enclosed, shall not pass through walls, floors, ceilings or install in attics or crawl spaces, and shall not be cut or modified. The connector should be generally installed in as short and straight run as possible with no unnecessary bends, without any dips or sags, slope upwards at least 1/4" per foot, and no bends greater than 90.
13. Double wall gas vent clearance from combustibles– Double wall gas vent clearance from combustibles shall be 1" from combustible vertical wall, 3" clearance from horizontal combustible surface, and 1" from around Wall Thimble.
14. Single wall gas vent clearance from combustibles– Single wall gas vent clearance from combustibles shall be 6" from combustible vertical wall, 9" clearance from horizontal combustible surface, and 1" from around Wall Thimble.
15. Gas vent support – A vent connector shall be supported for the design and weight of the material employed to maintain clearances and prevent physical damage and separation of joints.
16. Gas vent slope – A vent connector shall be installed without any dips or sags and shall slope upward toward the vent or chimney at least 0.25 inch per foot.
17. Gas vent termination at roof – Gas vents 12" in size or smaller with listed caps shall be terminated 12" above the roof provided that such vents are at least 8' from a vertical wall or similar obstruction to prevent backdrafting.
18. Single wall vent pipe installation – Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space or floor.
19. Gas vent pipe penetration flashing – Gas vent pipe installed through the roof or enclosure shall be provided with penetration flashing and shall be sealed around it with heat resistant sealant to prevent water intrusion.
20. Gas vent termination at wall – The vent shall terminate at least 4' below, 4' horizontally from, or 1 foot above any door, window or gravity air inlet for the building.
21. Vent pipe termination cap – Gas vent pipe shall be provided with UL approved termination cap to protect the building against wind conditions that cause waste gases to spill back into structure through appliance draft hood (backdrafting), and also keeps rain and debris out of vent.
22. Vent pipe through insulation – Where vents pass through insulated assemblies, an insulation shield constructed of not less than 26 gage sheet metal and terminated not less than 2" above the insulation materials shall be installed to provide clearance between the vent and the insulation material.
23. Vent pipe connector joints – Joints between sections of connector piping and connections to flue collars or hood outlets shall be fastened with three sheet-metal screws or other approved means, with the joints running in the direction of air flow.
24. Vent connector sizing –Draft hood outlet 4" Ø and smaller shall not be reduced in size– do not connect a 3" Ø vent to a 4" Ø draft hood outlet. Vent pipe shall not be increased in size more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter or draft hood outlet diameter.

25. Common vent sizing– The crosssectional area of a common flue must be equal to the crosssectional area of the largest connector plus 50% of all other appliances. The vent pipes connector shall be of Wye 45 degree branch type.
26. Heating system power supply – Central heating equipment shall be supplied by an individual-branch-circuit– no appliances shall be plugged into the power supply.
27. Heating system disconnect–Permanently connected appliances rated in excess of 300 volt-amperes or 0.125 horsepower, a branch circuit breaker or switch located within sight of appliance or such devices in any location that are capable of being locked in the open position shall be provided.
28. Heating/cooling system protection – Heating and cooling appliances located in the garage shall be protected from impact by automobiles.
29. Shut-off valve at appliances – Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6' from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.
30. Gas shut-off valve location – Shutoff valves separate from that of the appliance shall be readily accessible for operation and shall be located in the same room as the appliance, not further than 6' from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.
31. Gas flexible pipe connector prohibited locations – Gas pipe flexible connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.
32. Gas pipe flexible connector requirement – Gas appliances shall be connected to the natural supply system piping by means of an approved flexible connector designed and labeled for the application to reduce likelihood of damage if movement should occur.
33. Flexible gas pipe connector – Gas pipe flexible connectors should be of adequate length to reach from the gas supply line to the appliance without stretching – connectors shall not be joined together to form a longer connector.
34. Gas pipe connector length – Gas pipe flexible connectors shall have an overall length not to exceed 3', except for range and domestic clothes dryer connectors, which shall not exceed 6' in length.
35. Return air prohibited locations – Outside or return air for a forced-air heating or cooling system shall not be taken from the following locations: Closer than 10' from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan; Where there is the presence of objectionable, fumes or flammable vapors; A hazardous or insanitary location; A closet, bathroom, toilet room, kitchen, garage, mechanical room, furnace room, laundry, crawlspace or other dwelling unit.
36. FAU return-air ductwork/false floor airtightness – Products of combustion must not be allowed to enter the return air ductwork or the circulating air supply. All return ductwork must be adequately sealed, all joints must be taped, the ductwork must be secured to the furnace with sheet metal screws and enclosure door within 10' from return-air inlet must be airtight. When return air is provided through the bottom of the furnace, the joint between the furnace and the return air plenum must be sealed. The floor or platform on which the furnace is mounted must provide sound physical support of the furnace with no gaps, cracks, or sagging between the furnace and the floor or platform.
37. Plenum leakage sealant – Annular spaces at refrigerant pipes plenum penetration shall be sealed with material such as Permagum to stop air leaks, reduce vibration and retain some flexibility.
38. Return-air inlet cover – Outdoor air inlets shall be covered with screens having not less than 1 /4 -inch openings and not greater than 1 /2 -inch openings.

39. Return-air inlet location – The return-air shall be installed in a central location between air registers. Poor location can cause room-to-room pressure imbalances that lead to uneven room temperatures, higher energy costs, and even moisture problems in walls and ceilings.
40. Thermostat location – The thermostat shall be installed not more than 10' from the return-air inlet. Poor location can cause uneven room temperatures, higher energy costs, and even moisture problems in walls and ceilings.
41. Thermostat requirement – All heating systems other than wood stoves shall have an automatic thermostat with a clock mechanism or other setback mechanism approved by the Executive Director of the California Energy Commission that shuts the system off during peak periods of nonuse and that allows the building occupant to automatically set back the thermostat set points for at least two periods within 24 hours.
42. Heating system strap – Appliances designed to be fixed in position shall be fastened or anchored in an approved manner.
43. Combustion in confined place– A confined space shall be provided with two permanent openings with minimum free area of not less than 1 square inch per 1,000 Btu per hour but not less than 100 square". One opening shall commence within 12" of the top (air outlet), and one opening shall commence within 12" of the bottom of the enclosure (air inlet). The minimum dimension of air openings shall be not less than 3".
44. Combustion taken from outdoors – Appliances installed in a dedicated enclosure in which all combustion air is taken directly from the outdoors, the access to such enclosure shall be through a solid door, weather-stripped in accordance with the exterior door air leakage requirements of the International Energy Conservation Code and equipped with an approved self-closing device.
45. Flexible duct support – Flexible duct shall be supported at manufacturer's recommended intervals, but at no greater distance than 5'. Hanger or saddle material in contact with the flexible duct should be of sufficient width (minimum 1 ½") to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger. Individual ducts should be separately supported.
46. Flexible duct location – Flexible ducts shall not be installed in areas where exposure to direct or indirect sunlight can occur, such as turbine vents, skylights, canopy windows, etc. Prolonged exposure to sunlight will cause degradation of vapor barriers.
47. Flexible duct repair – Torn or damaged vapor barrier jackets shall be repaired with approved duct tape. If the internal core is penetrated, replace the flexible duct or treat it as connection.
48. Flexible duct installation – Ducts shall be installed fully extended. Compressing or using extra lengths will noticeably increase friction losses. Ducts shall not be bent across sharp corners and the radius of the center line shall not be less than on duct diameter.
49. Flexible airducts through the wall – Flexible airducts that pass through the wall shall be provided with a plastic or metal sleeve at least as big as the outer diameter of airduct to prevent constriction.
50. Flexible airduct joints – Flexible airduct joints shall be installed with metal fitting with a "bead" or "lances", draw bands at inner core and at vapor barrier, three metal screws at vertical connections, mastic over the fitting end and/or inside the duct core, and UL standards approved duct tapes.
51. Exposed ducts from mechanical damage – Flexible air ducts installed in locations where they are exposed to mechanical damage or from other causes shall be protected by approved barriers such as wood framing with drywall or plywood panels.
52. Duct support – Air ducts shall be supported for the design and weight of the material employed to maintain alignment and prevent physical damage and separation of joints.

53. Duct separation from ground – Ducts shall be installed with at least 4” separation from earth. However, when approved ground cover is placed between earth and the duct a minimum of 1 inch separation from the earth shall be allowed.
54. Asbestos duct insulation – If asbestos material is more than slightly damaged, or any changes in your home might disturb it, asbestos duct insulation can be encapsulated with foil face fiberglass insulation and taped with cloth of aluminum duct tapes.
55. Duct sizing – The HVAC contractor should perform engineering calculations to determine proper duct sizes according to how much air is designed to reach each room, and figures out how many supply ducts and return air ducts need to be in each room for the best air flow.
56. Air filter – Regular replacement/cleaning of air filter keeps cooling coils and circulating air clean and the airconditioning system efficient. The filter shall snugly fit the holder to prevent air infiltration.
57. Fuel-fired appliances location– Fuel-fired appliances shall not be located in, or obtain combustion air from sleeping rooms, bathrooms, toilet rooms, storage closets, and surgical rooms.
58. Vented floor and wall furnaces clearance – The minimum clearances from casing to combustible construction is 48" on top, 6" on each side and 4" from the floor or from the top surface of carpeting, tile or other floor covering and 0" to rear wall The furnace register shall be located not less than 12” from doors in any position, draperies or similar combustible objects. Furnaces shall be located so as not to cause a fire hazard to walls, floors, combustible furnishings or doors. Furnaces shall not be located where a door can swing within 12” of the furnace air inlet or outlet measured at right angles to the opening. Doorstops or door closers shall not be installed to obtain this clearance.
59. Floor furnace clearance from ground – Appliances suspended from the floor shall have a clearance of not less than 6” from the ground.
60. Noise levels of system – Noise levels in bedrooms shall not exceed 25 dB (decibels) and noise levels in other rooms shall not exceed 40 dB.
61. Heating system start-up delay – All furnace burners shall ignite quickly and smoothly as designed. The time for burner ignition shall be no more than 15 seconds and the startup time of the furnace blower shall be 45 to 120 seconds after ignition.

COOLING SYSTEM(S)

GENERAL INFORMATION

- A. Life expectancy of refrigerant type cooling system: 10 to 15 years. Individual units or components may vary and may last much longer up to 50% however, depending on the quality of unit or component, how often they were used and how regularly they are checked or serviced.
- B. Life expectancy of evaporative cooler: 5 to 10 years
- C. As a rule of thumb, a typical house in a typical U.S. climate may need 17 to 22 Btu (0.00142 to 0.00183 Tons) per square foot of enclosed area (one ton=12,000 Btu) depending on house insulation.
- D. The U.S. Department of Energy mandated the minimum efficiency SEER (Seasonal Energy Efficiency Ratio) to 13 SEER as of January 23, 2006. This applies to all new equipment manufactured on or after January 23, 2006. You may continue to use your current system indefinitely, but when it's time to replace your system, only 13 SEER or higher models will be available.

- E. When replacing the cooling system to a higher SEER, it will be essential to replace your evaporator, or indoor coil with a certified and rated match to the condensing unit located outside. This will ensure proper performance, energy savings, and prevent a host of potential comfort problems. If the new designs require a larger evaporator coil, space requirements may necessitate replacing your furnace with a more compact model.

BUILDING CODE REFERENCE

1. Condensate drainpipes termination – Primary condensate drain of minimum $\frac{3}{4}$ " \varnothing shall discharge to an approved place of disposal such as sink drain or outdoors but not to cause nuisance or damage, or not be directly connected to waste or vent pipes. Overflow condensate drainpipes of minimum $\frac{3}{4}$ " \varnothing shall discharge to a conspicuous point of disposal to alert occupants such as over a window.
2. Auxiliary condensate pan – A secondary drain or auxiliary drain pan with $\frac{3}{4}$ " drain pipe discharge to a conspicuous point of disposal to alert occupants shall be required for each cooling or evaporator coil where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. A water level detector device shall be provided if the auxiliary pan is not provided with separate drain line that will shut-off the equipment prior to the overflow of pan.
3. Auxiliary condensate pan specifications – The auxiliary condensate pan shall have a minimum depth of 1.5", shall not be less than three" larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276 inch galvanized sheet metal. Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch.
4. Condensate drainpipes – A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal if there is no auxiliary pan installed to alert occupants in the event of a stoppage of the primary drain. If auxiliary pan is provided, the overflow drain line can discharge into it or can be connected to the auxiliary pan drain pipe. An overflow drain pipe is not necessary if the evaporator coil is located in area where no damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping.
5. Condensate drain "P" trap – The drainpipes of main condensate pan shall be provided with "P" trap to prevent air from escaping through the vent. The trap shall be installed at upstream of the vent by at least twice the pipe diameter.
6. Condensate pipe vent – Main and auxiliary condensate drainpipes shall be vented to maintain neutral air pressure in the drains, allowing flow of water by gravity. Every dry vent shall rise vertically to a minimum of 6" above the flood level rim of the condensate pan being vented to prevent overflow. The water won't flow well if it's held back by low pressure or a vacuum in the pipe behind it. Vents also allow air to be drawn into drain pipes to break a siphon.
7. Condensate drainpipes – Components of the condensate disposal system shall be cast-iron, galvanized steel, copper, polybutylene, polyethylene, ABS, CPVC or PVC or tubing.
8. Condensate pipe support – Condensate plastic rigid pipe shall be supported and strapped every 3' to ensure alignment and prevent sagging and damage.
9. Condensate drainpipe exposed to sunlight – Long-term exposure to ultraviolet (UV) rays will damage plastic pipes; therefore, it should be covered with pipe insulation or painted according to manufacturer's instructions, which typically dictate that water-based latex paint should cover the exposed areas.

10. Air filter – Regular replacement/cleaning of air filter keeps cooling coils and circulating air clean and the airconditioning system efficient. The filter shall snugly fit the holder to prevent air infiltration.
11. Equipment and appliances on roofs or elevated structures– Where equipment and appliances requiring access are installed on roofs or elevated structures at a height exceeding 16 feet, such access shall be provided by a permanent approved means of access, the extent of which shall be from grade or floor level to the equipment and appliances' level service space. Such access shall not require climbing over obstructions greater than 30 inches high or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope).
12. Equipment and appliances on sloped roofs– Where equipment and appliances installed on roofs having a slope of 3 units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30" above grade at such edge, a level platform on each side of the appliance to which access is required by the manufacturer's installation instructions for service, repair or maintenance. The platform shall not be less than 30" in any dimension and shall be provided with guards.
13. Permanent ladders installed to provide the required access to the equipment and appliances on roofs or elevated structures shall comply with the following minimum design criteria:
 1. The side railing shall extend above the parapet or roof edge not less than 30 inches.
 2. Ladders shall have rung spacing not to exceed 14 inches on center.
 3. Ladders shall have a toe spacing not less than 6 inches deep.
 4. There shall be a minimum of 18 inches (457 mm) between rails.
 5. Rungs shall have a minimum 0.75-inch (19 mm) diameter and be capable of withstanding a 300-pound load.
 6. Ladders over 30 feet in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot.
 1. Ladders shall be protected against corrosion by approved means.
 2. Catwalks installed to provide the required access shall be not less than 24 inches wide and shall have railings as required for service platforms.
14. Condenser elevated platform – Condensers that are supported from the ground shall be level and firmly supported on concrete slab or other approved material to minimize vibration and noise transmission and shall be extended 3" minimum above the adjoining ground or pavement to protect from corrosion and the deleterious effects of ponded water.
15. Condenser strap – Appliances designed to be fixed in position shall be fastened or anchored in an approved manner.
16. Condenser level – Appliances supported from the ground shall be level to as tolerance of 1" in any direction. Tipping or leaning air conditioner compressors can lead to so much movement that the refrigerant lines crack and leak, leading to loss of cooling ability. In extreme cases, a tipped condenser unit may fail to operate properly.
17. Condenser clearance from obstructions– Condenser unit should be located so that air may circulate freely and not be recirculated. For proper air flow and access to all sides, the unit should be minimum 12" away from a wall or obstruction and shall not be installed in inside corners of buildings or under overhead obstructions. It is preferred that this distance be increased if the unit two or more sides are next to the obstructions, and depending on the type and height of obstructions. Care should be taken to see that ample room is left for maintenance work through access doors and panels.
18. Damaged condenser air fins – If the condensing coil fins are extensively bent and damage, airflow across the coil is impeded and the condenser coils will not be cooled efficiently and may result to shorter compressor life.

19. Condenser unit from dryer vents– Condenser unit should be located at least 10' away from dryer output vent so that the air fins and coils will be free from lint, and from debris and leaves falling from trees and cut grass kicked up by the lawnmower. Keeping your evaporator and condenser coils free of dirt and debris can improve your system's performance and prolong its useful life.
20. Metal duct support – Metal ducts shall be supported by 0.5-inch wide 18-gage metal straps, plumbers tape, 12-gage galvanized wire or other approved means at intervals not exceeding 10' on center.
21. Air duct outdoors – Air ducts installed outdoors shall be double walled insulated with outer shell made of sheet metal that protects the insulation from damage during construction and maintenance, and protects the insulation from damage caused by sun, wind, rain, snow, oxidation, and other environmental factors.
22. Fiberglass board duct support – Fiberglass board ducts shall be supported with 0.5-inch wide 18-gage metal straps or plumbers tape not exceeding 10' on center.
23. Flexible duct support – Flexible duct shall be supported at manufacturer's recommended intervals, but at no greater distance than 5'. Hanger or saddle material in contact with the flexible duct should be of sufficient width (minimum 1 ½") to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger. Individual ducts should be separately supported.
24. Flexible duct location – Flexible ducts shall not be installed in areas where exposure to direct or indirect sunlight can occur, such as turbine vents, skylights, canopy windows, etc. Prolonged exposure to sunlight will cause degradation of vapor barriers.
25. Flexible duct repair – Torn or damaged vapor barrier jackets shall be repaired with approved duct tape. If the internal core is penetrated, replace the flexible duct or treat it as connection.
26. Flexible duct installation – Ducts shall be installed fully extended. Compressing or using extra lengths will noticeably increase friction loses. Ducts shall not be bent across sharp corners and the radius of the center line shall not be less than on duct diameter.
27. Flexible airducts through the wall – Flexible airducts that pass through the wall shall be provided with a plastic or metal sleeve at least as big as the outer diameter of airduct to prevent constriction.
28. Flexible airduct joints – Flexible airduct joints shall be installed with metal fitting with a "bead" or "lances", draw bands at inner core and at vapor barrier, three metal screws at vertical connections, mastic over the fitting end and/or inside the duct core, and UL 181 approved duct tapes.
29. Duct separation from ground – Ducts shall be installed with at least 4" separation from earth. However, when approved ground cover is placed between earth and the duct a minimum of 1 inch separation from the earth shall be allowed.
30. Duct condensation barrier – An aluminum foil or plastic sheets with a minimum thickness of 2 mils, shall be installed on the exterior of insulation on cooling supply ducts that pass through non-conditioned spaces conducive to condensation.
31. Duct insulation – All portions of the air distribution system shall be insulated to an installed R-5 when system components are located within the building but outside of conditioned space, and R-8 when located outside of the building.
32. Duct sizing – The HVAC contractor should perform engineering calculations to determine proper duct sizes according to how much air is designed to reach each room, and figures out how many supply ducts and return air ducts need to be in each room for the best air flow.

33. Condenser unit service disconnect – Air-conditioning condensing units and heat pump units shall be provided with a means to disconnect all ungrounded supply conductors— disconnect within sight from unit and with minimum working space of not less than 36” in depth and 30” wide.
34. Plumbing and chimney and gas vents near the evaporative cooler – An open vent terminal from a drainage system shall not be located less than 4’ directly beneath air intake opening of evaporative cooler nor shall any such vent terminal be within 10’ horizontally of such an opening unless it is at least 2’ above the top of such opening. Chimney or gas vents shall terminate at least 3’ above any forced air inlet located within 10’.
35. Air filter – Regular replacement/cleaning of air filter keeps cooling coils and circulating air clean and the airconditioning system efficient.
36. Refrigerant pipe insulation – Piping and fittings for refrigerant vapor (suction) lines shall be insulated to prevent condensation and minimize heat transfer.
37. Return air inlet sizing – Gross sizing of Return Air (RA) filter grilles shall be minimum 200 sq.” per Ton of cooling.
38. Return air intake grille – Intake grille should be designed so that it can be easily opened so the air filter can easily be removed and cleaned or replaced, such as a hinged grille with two quick-release latches, or in the worst case, a grille with four one-quarter turn fasteners.
39. Return-air inlet location – The return-air shall be installed in a central location between air registers. Poor location can cause room-to-room pressure imbalances that lead to uneven room temperatures, higher energy costs, and even moisture problems in walls and ceilings.
40. Return air prohibited locations – Outside or return air for a forced-air heating or cooling system shall not be taken from the following locations: Closer than 10’ from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan; Where there is the presence of objectionable, fumes or flammable vapors; A hazardous or insanitary location; A closet, bathroom, toilet room, kitchen, garage, mechanical room, furnace room, laundry or other dwelling unit.
41. Return-air inlet cover – Outdoor air inlets shall be covered with screens having not less than 1 /4 -inch openings and not greater than 1 /2 -inch openings.
42. Thermostat location – The thermostat shall be installed not more than 10’ from the return-air inlet. Poor location can cause uneven room temperatures, higher energy costs, and even moisture problems in walls and ceilings.
43. Overcurrent protection – Airconditioning units shall be provided with overcurrent protection against overload, short circuit and ground fault –.293 watts/Btu and 12,000 Btu/ton. 1 ton: 15 ampere, 2 tons: 30 ampere, 3 tons: 40 ampere, 4 tons: 60 ampere
44. Suction lines slope– Slope horizontal suction lines on cooling only systems approximately 1 inch every 20’ toward the outdoor unit without sag to facilitate proper oil return and to prevent condensation from dripping.
45. Suction lines slope for heat pump– For heat pumps, all horizontal vapor lines should be level since the flow of refrigerant is bidirectional.
46. Excess tubing – Pre-charged lines with excess tubing should be coiled horizontally in an inconspicuous location to avoid oil trapping.
47. Refrigerant lines wall penetration sealant – Pack fiberglass insulation and a sealing material such as permagum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.
48. Refrigerant pipes insulation– Insulate all vapor lines with a minimum of 1/2 inch of foam rubber. Liquid lines that will be exposed to direct sunlight or high ambient temperatures such as an attic must also be insulated.

49. Refrigerant pipe support– Support all refrigerant lines at minimum 3' on center and within 2" from the end with suitable hangers and brackets. Tape and suspend the liquid and insulated vapor line together.
50. Temperature variation in each room – A temperature variation of 4°F from one room to another is considered acceptable. In two story houses, a temperature variation of 8°F between the first and second floor is considered acceptable.

INTERIOR

GENERAL INFORMATION

- A. Typically, double-hung, casement, jalousie, hinged and old sliding windows have no effective weather-stripping and glazing putties or sealant that could prevent water and air leakage.
- B. Existing glass in every sliding glass panel of sliding-type doors, other than wardrobe doors, bathroom shower doors and French-type wooden doors in residential and commercial buildings sold in the City of Los Angeles shall be impact hazard glazing or an approved film may be installed on the glass effective May 24, 1986.
- C. Walls and ceilings have tendency to crack which is acceptable. Two primary reasons for drywall cracks are poor taping and stress. Cracks may develop when drywall tape does not adhere to the drywall properly due to lack of joint compound between the tape and the drywall surface. Cracks can occur in drywall when stress is transferred to the drywall from various external sources. Various external sources are ground movement, foundation settlement, frame/structure movement, shear paneling, offset framing, water penetration, and lumber moisture content.
- D. Homes built as recently as 1978 may also contain lead paint. Flaking paints shall be encapsulated with at least one coat of paint primer and two coats of approved paint by a licensed painter.
- E. Existing rooms which connect to the enclosed patio will need to be provided with natural light and ventilation by means of exterior wall openings (door or window) not less than 8 percent of the floor area of such rooms, one half of the required area of glazing shall be openable to the outdoor air or for emergency escape and rescue operation and may not open into a patio enclosure.

CODE & STANDARD REFERENCE

Floors:

1. Uneven floor elevation – Changes in level without edge treatment shall be up to ¼". Changes in level between ¼" and ½" shall be beveled with a slope no greater than 1:2 (50% slope).
2. Floor elevation – The floor or landing shall not be more than ½" lower than the threshold of the doorway. Section 1004.9.1a of California Accessibility Standards
3. Floor and ground elevation difference – The surrounding ground and sidewalks shall be at least 6" below the interior floor elevation or the top of the foundation to prevent water intrusion and damage to the wall sill or plate; or otherwise can be minimum 1 ½" as long as the surrounding ground is concrete, sloped away from the walls and the roof is provided with rain gutters and downspouts.
4. Panel sheathing – Space joints between panel sheathing shall be 1/8" unless otherwise recommended by the manufacturer. Space butt joints in underlayment shall be 1/32".
5. Floor cover connection – Two different materials shall be connected with approved connector that allows movement associated with dissimilar thermal expansion and contraction.

6. Floor covers transition and trim edges – Edging trims are used to protect tile edges from damage, while providing an aesthetically pleasing continuous and smooth finish. Transition strips are used to smoothly join floor coverings of different heights, such as vinyl to ceramic floor tiles. Edging trims and transition strips are made of PVC, Aluminum, Stainless Steel, brass and chrome.

Walls:

1. Door stopper – Doors shall be provided with approve stopper to prevent damage to the wall behind of the door.
2. Baseboards – Walls shall be provided with baseboard to cover the inevitable uneven edge as flooring meets the wall and it protects the wall from kicks and abrasion and sometimes prevents furniture from being pushed right against the wall.

Ceilings:

1. Ceiling height –Habitable rooms, hallways, corridors, bathrooms, toilet rooms, laundry rooms and basements shall have a ceiling height of not less than 7' 6".
2. Drop ceiling –Insulation is not allowed on T-bar ceiling.

Exterior doors:

1. Exterior Doors – Doors exposed to the weather shall be of approve exterior type of doors– metal or plastic clad engineered wood, solid type and metal.
2. Strike plate – The strike plate protects the jamb against friction from the bolt, and increases security in the case of a jamb made of a softer material than the strike plate.
3. Exterior doors opening – Egress and other exterior doors shall open to the outdoor air or for emergency escape and rescue operation and hinged doors shall open inward for easy access during an emergency and prevent hitting anything outside of the door and to prevent intruder from removing the door hinge pins. If the door opens outward, a 3 foot by 3 foot landing shall be required not more than 1 ½" below the top of the threshold.
4. Exterior door lockset – All egress doors shall be provided with dead bolts with hardened inserts; deadlocking latch with key-operated locks on exterior. Locks must be readily openable from the side from which egress is to be made without the use of a key or special knowledge or effort.
5. Pin-type door hinges – All pin-type door hinges accessible from outside shall have non-removable hinge pins.
6. Sliding doors with unsafe type of glazing – Glazing at hazardous locations such as sliding doors with exposed area of pane greater that 9 sq feet and bottom edge less than 18" above floor shall be tempered glass or an approved film shall be installed– see General Information B above. The identification label shall be of a type which once applied cannot be removed without being destroyed.
7. Fixed panels with unsafe type of glazing – Glazing at hazardous locations such as vertical edge glazing within 24" of door arc, with exposed area of pane greater that 9 sq feet, bottom edge less than 18" above floor, and within 36" of walking surface, shall be tempered glass or an approved film shall be installed– see General Information B above. The identification label shall be of a type which cannot be removed.
8. Tub or Shower doors with unsafe type of glazing – Glazing at hazardous locations such as tub or shower doors, shall be tempered glass or an approved film shall be installed– see General Information B above. The identification label shall be of a type which cannot be removed.

9. Door casings – In most applications, door casing serves both a functional and aesthetic function. It covers the gaps between the edges of the door frame and the surrounding wall, which helps the door blend in with the wall more effectively. By covering these gaps, door casing also blocks air drafts, pests and dirt or dust from passing into the home. Like all trim, door casing also creates a decorative addition to a room, and even may help the entire opening serve as a visual focal point within a space.
10. Door-stop – Door stop is strip of wood fixed to the center (usually) of door jamb, that the edge of swinging door closes against. It also covers the gaps between the doorjamb and door to block air drafts, water infiltrations, pests and dust from passing into the home.
11. Exterior door weatherstrip – All exterior doors shall be weatherstripped as per NWWDA Industry Standard. Weatherstripping shall be installed in a manner which shall effectively enable the unit to meet the air and water infiltration requirements for the performance level specified.
12. Door threshold –Threshold is necessary to prevent infiltration of water and air and shall be installed as per NWWDA Industry Standard.
13. Door threshold height – Maximum threshold height from floor without edge treatment shall be up to ¼”square edged. Threshold height from floor more than ¼” shall be beveled with a slope no greater than 1:2 (50% slope).
14. Fogged double glazed door – Fogging of double glazed doors is caused by condensation that sets in as caused by the yielding of glass thermal seal. One possible cause maybe intense heat on one side of the door, or heat build-up between the panes. Another reason is deterioration of the original door, especially caulking and sealant, overtime. Check the manufacturer’s warranty for specific coverage. Many door manufacturers will replace either glass or glass in sash in their warranties.
15. Sliding door screen –Screen is an component of door assembly that is necessary to prevent insects and some allergens from getting inside of the house.
16. Egress door – Door with direct access to exterior is required but not through the garage, bedroom or bathroom. The required exit door shall be a side-hinged door not less than 3’ in width and 6’, 8” in height.
17. Firedoor (condominium entry door from corridor) – Condominium entry door from the building corridor shall be equipped with solid wood doors not less than 1 3 /8 inch in thickness, solid or honeycomb core steel doors not less than 1 3 /8” thick, or 20-minute fire-rated doors.
18. Firedoor required hardware– Firedoors (condominium entry door from corridor) shall be equipped with self-closing device, active latch bolt, weather-stripping and artificial bottom seal.
19. Corroding aluminum – In fresh concrete, aluminum reacts principally with alkali hydroxides from cement. Aluminum in contact with plain concrete can corrode, and the situation is worse if the concrete contains calcium chloride as an admixture or if the aluminum is in contact with a dissimilar metal.
20. Warped and out of plumb doors – The vertical and horizontal planes of the door should not vary from a true plane by more than ¼”. Doors should not be installed out of true level and plumb by more than 1/8”.

Interior doors:

1. Interior door opening– All interior doors shall open inward for easy access during an emergency and prevent hitting anything outside of the door, and to prevent intruder from removing the door hinge pins.
2. Room locks – Lock is an integral part of the door for keeping the door closed at all times and shall be so arranged that it can be quickly and easily closed and unlocked.

3. Strike plate – The strike plate protects the jamb against friction from the bolt, and increases security in the case of a jamb made of a softer material than the strike plate.
4. Bathroom doors – All bathroom doors of houses built since early 1990's shall be at least 28-inches wide by 6' 8" in height, and have locking doorknobs from the inside of the bathroom or have other ways of locking the door (standard bathroom door knobs), and shall open inward for easy access during an emergency and prevent hitting anything outside of the door.
5. Bedroom doors – All bedrooms must have a functional door that closes, which, preferably can be locked from the inside. Bedroom doors are commonly 30" wide or larger, however when new construction is undertaken, a 32 inch door should be considered.
6. Door space from floor– The door shall be provided with $\frac{3}{4}$ " to 1 inch clearance from carpeted floor and $\frac{1}{2}$ " clearance from non carpeted floor, necessary to provide good air circulation when conditioned.
7. Door stopper – Door shall be provided with approve stopper to prevent damage to anything behind it.
8. Door casings – In most applications, door casing serves both a functional and aesthetic function. It covers the gaps between the edges of the door and window frame and the surrounding wall, which helps the door and window blend in with the wall more effectively. Like all trim, door and window casing also creates a decorative addition to a room, and even may help the entire opening serve as a visual focal point within a space.
9. Door-stop – Door stop is strip of wood fixed to the centre (usually) of the door jamb, against which the door closes. It also covers the gaps between the doorjamb and door to block air drafts.
10. Warped and out of plumb doors – The vertical and horizontal planes of the door should not vary from a true plane by more than $\frac{1}{4}$ ". Doors should not be installed out of true level and plumb by more than $\frac{1}{8}$ ".

Windows:

1. Window security bars – The window security bars shall be releasable or removable from the inside without the use of a key, tool, or force greater than that which is required for normal operation of the escape and rescue opening.
2. Window security bars opening size –The window security bar opening should be minimum 20" wide and 24" high or 5.7 square feet of openable area, as requirement for emergency escape and rescue operation.
3. Room window/door requirement – All habitable rooms shall be provided with natural light and ventilation by means of exterior wall openings (door or window) not less than 8 percent of the floor area of such rooms, one half of the required area of glazing shall be openable to the outdoor air or for emergency escape and rescue operation.
4. Inadequate window/door requirement – If window/door requirement is inadequate, a mechanical ventilation system capable of producing .35 air-change per hour and skylight or fixed wall glass pane equivalent to minimum 8 percent of the floor area of such room.
5. Bathroom window requirement – Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square', one half of which is openable; or an artificial light and a mechanical ventilation system capable of producing 50 cfm for intermittent ventilation or 20 cfm for continuous ventilation. Ventilation air form the space shall be exhausted directly to outside.
6. Windows within shower or bathtub enclosure – Glazing less than 60" from floor, tub or shower doors shall be tempered glass or an approved film shall be installed. The identification label shall be of a type which once applied cannot be removed without being destroyed.

7. Window maximum height – Window sill height shall be 44” maximum above finished floor as requirement for emergency escape and rescue operation. High windows could be a grandfathered-code-conforming-use if the windows are original. If the existing sill height for emergency egress windows is higher than 44”, it will be allowed to remain. However, if any alterations or repairs are made to the “framed opening” a finished sill height of 44” maximum will be required.
8. Window minimum size – Window opening in the sleeping rooms should be minimum 20 inch width and 24 inch height or 5.7 square feet openable area, as requirement for emergency escape and rescue operation.
9. Fogged window –Fogging of double glazed windows is caused by condensation that sets in as caused by the yielding of glass thermal seal. One possible cause maybe intense heat on one side of the window, or heat build-up between the panes. Another reason is deterioration of the original window, especially caulking and sealant, overtime. Check the manufacturer’s warranty for specific coverage. Many window manufacturers will replace either glass or glass in sash in their warranties.
10. Window screen– Screen is a component of window assembly that is necessary to prevent insects and some allergens from getting inside of the house.
11. Sash cord – A sash cord is a small piece of rope, often called a cord, that is an important part of the mechanical operation of a double hung or single hung wooden window system. A double-hung window has two separate frames of wood and glass that slide up and down that are called sashes. The sash cord connects the sides of the window that are specially designed to allow the window to open and close easily will remain in place once it is either opened or closed.
12. Bathroom glass/window – Frosted glass, stained glass or similar translucent but nontransparent materials shall be installed on bathroom windows within 20’ from property line.
13. Sash cord – Sash cord is made of rope or chain that attaches the sash that is a necessary component which assist in raising double-hung sash and tend to keep the sash in any placed position by counterbalancing the weight of the sash.
14. Louvered windows or other openings protection – Louvered windows and other openings shall be protected by metal bars or grills with openings that have at least one dimension of 6” or less, which are constructed to preclude human entry.
15. Window casings – In most applications, window casing serves both a functional and aesthetic function. It covers the gaps between the edges of the window frame and the surrounding wall, which helps the window blend in with the wall more effectively. By covering these gaps, window casing also blocks air drafts, pests and dirt or dust from passing into the home. Like all trim, window casing also creates a decorative addition to a room, and even may help the entire opening serve as a visual focal point within a space.
16. Aluminum window frame joints– Aluminum window frame assemblies are usually screwed together. The corners are metal to metal, with a dab of sealant, and many of these connections leak. It is good practice to apply extra high-grade flexible sealant on those corners.

Fixed glazing:

1. Fixed panels with unsafe type of glazing – Glazing at hazardous locations such as vertical edge glazing within 24” of door arc, exposed area of pane greater than 9 sq. feet, bottom edge less than 18” above floor, top edge greater than 36” above floor or ground, and within 36” of walking surface, shall be tempered glass or an approved film shall be installed.

Closets and Cabinets:

1. Bedroom closet requirement – All bedrooms must have access to closets for storage of clothing. On existing housing, closets in adjoining hall areas are acceptable.
2. Bedroom closet floor guides– Door floor guide is a necessary component that prevents the sliding hanging door from getting off its track.
3. Closet door – The door is an integral component of clothes closet to conceal clothing and clutter from view.
4. Closet door lock – Lock is an integral part of the door for keeping the door closed at all times and shall be so arranged that it can be quickly and easily closed and opened.

Ceiling fans:

1. Ceiling fan installation standard – Ceiling fans should be installed or mounted in an approved bracket listed for the weight it is supported. Metal utility boxes can only support up to 50 pounds but prohibited to be used for paddle fans. Paddle fans are heavier, has more torque and vibration and has larger screws. Ceiling fans shall be located in the middle of the room and at least 7 feet above the floor, 12 inches from the ceiling and 18 inches from the walls. If ceiling height allows, install the fan 8 - 9 feet above the floor for optimal airflow.
2. Ceiling fan wobbling –The fan may wobble or vibrate if the downrod length is not long enough or the inside blade is too close to the downslope or side wall, or when blade levels are unequal from the ceiling. Extending the downrod length or balancing the blades usually will solve this problem.

STAIRWAY(S) & GUARD RAIL(S)

CODE & STANDARD REFERENCE

1. Handrail requirement– On stairways less than 44” wide having both sides enclosed with four or more risers, at least one handrail having minimum and maximum heights of 30” and 38” respectively shall be affixed, preferably on the right side descending.
2. Grips– Grips must be 1 ¼” – 2 5/8” circular cross section. Handrail-gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.
3. Handrail requirement– On stairways more than 44” wide, but less than 88”, one handrail shall be provided on each enclosed side and one stair rail on each open side.
4. Handrail requirement– On stairways 88” or more in width, one handrail shall be provided on each enclosed side, one stair rail on each open side, and one intermediate stair rail placed approximately in the middle of the stairs.
A "standard stair railing" (stair rail) shall be of construction similar to a standard railing, but the vertical height shall be not more than 34” nor less than 30” from the upper surface of the top rail to the surface of the tread in line with the face of the riser at the forward edge of the tread.
5. Risers and threads elevation difference– The riser and threads shall not exceed the smallest by 3/8 inch.
6. Risers and threads height and depth – The riser shall be minimum 4” and maximum 7 ¾” and the minimum thread depth shall be 10”. The walking surface of threads and landings of a stairway shall be sloped no steeper than 2 percent slope.
7. Stair Slope – The maximum stair slope shall be 20° to 50° or the riser shall be minimum 4” and maximum 7 ¾” and the minimum thread depth shall be 10”.
8. Stair and landing width – Minimum stair and landing width shall be 36”.

9. Guard rails – Porches, balconies and raised floor surfaces located more than 30” above the floor or grade shall have guard rails not less than 36” in height. Open side of stairs with a total rise of 30” above the floor or grade below shall have guard rails not less than 34” in height measured vertically from the nosing of the treads.
10. Guard rails opening – Intermediate rails or ornamental closures at guard rails shall not allow passage of an object 4” or more in diameter.
11. Rails strength – Handrails and top rails of the stair rail systems must be able to withstand, without failure, at least 200 pounds of weight applied within 2” of the top edge in any downward or outward direction, at any point along the top edge.
12. Stair headroom – The minimum headroom in all parts of the stairway shall not be less than 6’ 8”.
13. Enclosure under the stair – Enclosed usable space under the interior stair requires one-hour fire resistive construction on enclosed side. When the underside of stairs is enclosed with walls and a door, the walls, ceilings, and under side of the stair must be covered with ½ inch gypsum board.
14. Stair allowable load – Handrail must be continuous and can resist 50 pounds per lineal foot uniform load and 200 pounds concentrated load in any direction, and the intermediate rails and filler panels to withstand 50 pounds per square foot.
15. Landing at exterior door – A minimum of 3 foot by 3 foot landing shall be required at each side of an egress door. The landing shall not be more than 1 ½” lower than the top of the threshold. However, the landing at an exterior doorway shall not be more than 8” below the top of the threshold, provided that the door, other than an exterior storm or screen door, does not swing over the landing.

LIFE SAFETY / FIRE PROTECTION

GENERAL INFORMATION

- A. Effective August 1, 1980, residential and commercial buildings sold in the City of Los Angeles, smoke detectors shall be provided in each existing room used for sleeping purposes and in existing corridor or area giving access to these rooms. Where a dwelling unit has more than one story or where a dwelling units has a basement, a detector shall be installed on each story or basement. Smoke detectors may be battery operated in Single Family Dwellings only.
- B. Dwellings Built or Remodeled Before August 14, 1992– Smoke detectors may be solely battery operated.
- C. Dwellings Newly Built/ Remodeled On or After August 14, 1992– Smoke detectors must be hard-wired with battery backup.
- D. Two Family Dwellings, Condominiums and Apartments – Smoke detectors shall be hard wired and be equipped with a battery back-up effective Aug 1, 1980 (Hard wired detectors installed prior to May 11, 1999 DO NOT require battery backup).

- E. All vegetation is fuel for a wildfire, though some trees and shrubs are more flammable than others. To reduce the risk, you will need to modify or eliminate brush, trees and other vegetation near your home. Create a 30-foot safety zone around the house. Keep the volume of vegetation in this zone to a minimum. If you live on a hill, extend the zone on the downhill side. Fire spreads rapidly uphill. The steeper the slope, the more open space you will need to protect your home. Swimming pools and patios can be a safety zone and stone walls can act as heat shields and deflect flames. In this zone, you should also do the following: Remove vines from the walls of the house; Move shrubs and other landscaping away from the sides of the house; Prune branches and shrubs within 15 feet of chimneys and stove pipes; Remove tree limbs within 15 feet of the ground; Thin a 15-foot space between tree crowns; Replace highly flammable vegetation such as pine, eucalyptus, junipers and fir trees with lower growing, less flammable species; Replace vegetation that has living or dead branches from the ground-level up (these act as ladder fuels for the approaching fire); Cut the lawn often keeping the grass at a maximum of 2 inches; Watch grass and other vegetation near the driveway, a source of ignition from automobile exhaust systems; and Clear the area of leaves, brush, evergreen cones, dead limbs and fallen trees.

CODE & STANDARD REFERENCE

1. Smoke detector location – Smoke detectors shall be located one per each level of the home within 10' of every bedroom door, and between the door and the living area. The basement detector must be mounted on the basement ceiling, within three' of the stairwell. When installed on the wall, smoke detectors must be placed no less than 6" or more than 12" from the ceiling. Alarms should be no closer than 3' from supply registers of central heating and cooling systems (that might blow on the alarm preventing it from detecting smoke) and no closer than 3' from the door to a kitchen or a bathroom containing a shower that can set the alarm off when the door is opened. Cathedral ceilings are considered a level and must have a smoke detector within 12" measured vertically of the highest point.
2. Smoke detector requirement in dwelling unit with more than one story or where there is a basement – Where a dwelling unit has more than one story or where a dwelling units has a basement, a detector shall be installed on each story or basement.
3. Smoke detector requirements at room addition– When interior alterations, repairs or additions requiring a permit occur, or when one or more sleeping rooms are added or created existing dwellings, the individual dwelling unit shall be pro-vided with smoke alarms located as required for new dwellings; the smoke alarms shall be interconnected and hard wired.
4. Apartment security lighting – All apartment buildings (buildings containing 3 or more dwelling units) shall be provided with security lighting and locks. Exterior lighting shall be provided in parking areas, walkways, recreation areas, entrance of each dwelling unit shall be provided with security lighting. Interior lighting shall be provided recreation or service and in parking garages. Locks shall be provided at all doors and windows leading in the dwelling units. See Section 91.8607 L.A.M.C. effective January 12, 1998.
5. Sprinkler system for four-story – A sprinkler system is required for a four-story building.
6. Fire blocking – Fire blocking shall be installed in openings around vents, pipes, ducts, chimneys, fireplaces and similar openings that afford a passage for fire at ceiling and floor levels, with non combustibile materials.

7. Fire blocking materials – Fire blocking shall consist of 2-inch nominal lumber, or two thicknesses of 1-inch nominal lumber with broken lap joints, or one thickness of 23 /32 – inch wood structural panels with joints backed by 23 /32 -inch wood structural panels or one thick-ness of 3 /4 -inch particleboard with joints backed by 3 /4 -inch particleboard, 1 /2 -inch gypsum board, or 1 /4 -inch cement-based mill-board. Batts or blankets of mineral wool or glass fiber or other approved materials installed in such a manner as to be securely retained in place shall be permitted as an acceptable fire block. Loose-fill insulation material shall not be used as a fire block.
8. Fire blocking materials – Unfaced fiberglass batt insulation used as fire blocking shall fill the entire cross section of the wall cavity to a minimum height of 16 inches measured vertically. When piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

LAUNDRY

CODE & STANDARD REFERENCE

1. Dryer vent – The dryer shall have an independent exhaust vent system, shall convey the moisture to the outdoors, and equipped with backdraft damper or other means to control infiltration/exfiltration when not in operation. Ducts shall not terminate in an attic or crawl space or areas inside the building, within 3' from power vent inlet, condenser units and open flames, and might cause nuisance or damage.
2. Dryer vent – Flexible transition ducts used to connect the dryer to the exhaust duct system shall be limited to single lengths, not to exceed 8' in length and shall be listed and labeled in accordance with UL 2158A.
3. Dryer vent pipe design – The dryer vents shall be constructed of rigid metal ducts, having smooth interior surfaces with joints running in the direction of air flow.
4. Dryer vent length – The maximum length of a 4" Ø exhaust vent shall not exceed 25' from the dryer to wall or roof termination.
5. P" trap installation – Traps shall have a liquid seal not less than 2" and not more than 4". Traps shall be placed as close as possible to the fixture outlet.
6. "P" trap requirement – Each plumbing fixture shall be separately trapped as close as possible to the fixture outlet in order to provide a liquid seal that prevents the emission of sewer gases without materially affecting the flow of sewage or waste water through it. The vertical distance from the fixture outlet to the trap weir shall not exceed 24".
7. Plumbing vent requirement– Every trap and trapped fixture shall be vented. Plumbing drainage and venting systems maintain neutral air pressure in the drains, allowing flow of water and sewage down drains by gravity. The waste won't flow well if it's held back by low pressure or a vacuum in the pipe behind it. Vents also allow air to be drawn into waste pipes to break a siphon.
8. Too many Elbows or traps – Fixtures shall not be double trapped or provided with multiple El-bows within 18" from each other– they slow down the drain flow and the drain is prone to clogging.
9. "P" trap clearances from floor – Trap with removable joints shall be installed minimum of 6" and maximum of 18" above floor. No trap shall be installed below floor.
10. Prohibited "S" trap – "S" traps, bell traps, crown vented traps, drum traps, and traps with moving parts are no longer accepted as these traps tend to easily siphon dry even when well-vented.

11. Stand pipe requirement – Standpipes for automatic clothes washers shall extend a minimum of 39” and a maximum of 48” above the finished floor. The trap for a clothes washer standpipe shall be installed at a maximum of 12” above the finished floor. Access shall be provided to all standpipe traps and drains for rodding.
12. Laundry sink drain strainer – Each compartment of a laundry tub shall be provided with a waste outlet not less than 1.5” Ø and a strainer or crossbar to restrict the clear opening of the waste outlet.
13. Gas shut-off valve location – Shutoff valves separate from that of the appliance shall be readily accessible for operation and shall be located in the same room as the appliance, not further than 6’ from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.
14. Shut-off valve at appliances – Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6’ from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.
15. Washer overflow pan – A 2” deep x 32” x 34” overflow pan with ¾” Ø drainpipe shall be provided to a washer where damage to any building components will occur as a result of overflow from the washer or stoppage in drain piping.
16. Flexible gas pipe connector – Gas pipe connectors should be of adequate length to reach from the gas supply line to the appliance without stretching but not exceed 6’ in length– connectors shall not be joined together to form a longer connector.
17. Gas pipe flexible connector – Connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.
18. Laundry enclosure– Laundry appliances installed in outdoor locations shall be provided with protection from outdoor environmental factors that influence the operability, durability and safety of the equipment.
19. Laundry Facility requirement – The 1998 building code requires that every dwelling unit shall be provided with laundry facility or a space for laundry facility, or grouped elsewhere in the building in a location conveniently accessible to occupants.

KITCHEN

CODE & STANDARD REFERENCE

1. Backing up sink drain– The wastewater backs-up to the other sink when using the garbage disposal could be the result of a constricted drainline, or the drainpipe Tee is not a special directional type, or too many bends/elbows.
2. Directional type drainpipe fitting – Approved directional-type branch fittings shall be installed in fixture tail pieces receiving the discharge from food waste disposal units or dishwashers.
3. Sink drainpipe Tee – Sanitary Tee shall not be used at vertical to horizontal and horizontal to horizontal prevent the wastewater from backing up.
4. Sink drain pipe extensions – Sink drain pipe extensions shall be of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions or corrugation except where integral with the fixture. Drain pipe extensions shall be constructed of lead, cast iron, cast or drawn brass or approved plastic and shall be not less than No. 20 gage thickness.
5. Drainpipe slope – Horizontal drainpipe shall be installed in uniform alignment at uniform slopes not less than one-fourth unit vertical in 12 units horizontal.

6. "P" trap arm support– Sink drain "P" trap arm with slip joints with length 18" or more shall be provided with support and straps to ensure alignment and prevent sagging and displacement.
7. Dishwasher air-gap requirement– No domestic dishwasher machine shall be directly connected to a drainage system or food waste disposer without the use of an approved dishwasher air-gap fitting on the discharge side of the dishwashing machine. Listed airgaps shall be installed above the flood level of the sink or drainboard, whichever is higher, connected to the Dishwasher with minimum ½" I.D. and maximum of 12' long. The water won't flow well if it's held back by low pressure or a vacuum in the drainhose behind it. Airgap also allow air to be drawn into drainhose to break a siphon.
8. Reverse osmosis drain tube – The reverse osmosis drain tube must not be connected directly to the waste system, but must be emptied into a laundry tray, floor drain, or properly trapped special outlet, preserving an air gap of at least two times the diameter of the drain line, but in no case less than 1-1/2" above the top of the receptacle used.
9. Appliance clearance above gas burners –A clearance of at least 24" shall be maintained between the cooking surface and the combustible material or cabinet. If clearance between cooking surface and overhead combustible material cannot be maintained, protect the underside of the cabinets above the cooktop with not less than 1/4" insulating millboard covered with sheet metal not less than 0.0122" thick.
10. Clearances between cooktop and side wall or combustible –Clearances between cooktop and side wall or combustible material must be at least 12" on each side or 22" high backsplash made of non combustible material or at least 1/4" thick insulating millboard covered with sheet metal not less than 0.0122" thick.
11. Reversed hot and cold water supplies – Fixture fittings, faucets and diverters shall be installed and adjusted so that the flow of hot water from the fittings corresponds to the left-hand side of the fitting.
12. "P" trap installation – Traps shall have a liquid seal not less than 2" and not more than 4". Traps shall be placed as close as possible to the fixture outlet.
13. "P" trap design – Traps shall be of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions except where integral with the fixture. Traps shall be constructed of lead, cast iron, cast or drawn brass or approved plastic. Tubular brass traps shall be not less than No. 20 gage thickness. Slip joints shall be accessible.
14. "P" trap clearance – Trap with removable joints shall be installed minimum of 6" and maximum of 18" above floor.
15. Prohibited "S" trap – "S" traps, bell traps, crown vented traps, drum traps, and traps with moving parts are no longer accepted as these traps tend to easily siphon dry even when well-vented.
16. "P" trap requirement – Each plumbing fixture shall be separately trapped as close as possible to the fixture outlet in order to provide a liquid seal that prevents the emission of sewer gases without materially affecting the flow of sewage or waste water through it. The vertical distance from the fixture outlet to the trap weir shall not exceed 24".
17. Too many Elbows or traps – Fixtures shall not be double trapped or provided with multiple El-bows within 18" from each other– they slow down the drain flow and the drain is prone to clogging.
18. Gas shut-off valve location – Shutoff valves separate from that of the appliance shall be readily accessible for operation and shall be located in the same room as the appliance, not further than 6' from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.

19. Shut-off valve requirements – An accessible independent shut off valve should be installed on the water supply pipe to each plumbing system, plumbing fixture, appliance, and water heater.
20. Reversed hot and cold water supplies – Fixture fittings, faucets and diverters shall be installed and adjusted so that the flow of hot water from the fittings corresponds to the left-hand side of the fitting.
21. Shut-off valve requirements – An accessible independent shut off valve should be installed on the water supply pipe to each plumbing system, plumbing fixture, appliance, and water heater.
22. Water supply flexible connectors – Flexible connectors shall be used to connect plumbing fixtures to the piping system. Flexible connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings and appliance housings.
23. Valve handle – The shut-off valve must be readily accessible and openable without the use of a tool or effort.
24. Garbage Disposer requirement – Each dwelling unit, having access to a public sanitary sewer, the construction of which commenced after December 31, 1958, and each existing kitchen unit having access to public sanitary sewer shall, prior to occupation or continued use thereof for residence purposes, be equipped with a properly installed mechanical garbage disposer.
25. Garbage Disposer use – Using a garbage disposer with septic tank disposal system will greatly affect the frequencies of pumping the septic tank. Food scraps ground and sent down a drain from a kitchen sink disposal unit increase the solids load in the septic tank. These solids may also be slow to separate and settle into the sludge layer or combine with the floating scum layer in the septic tank. One garbage disposer would be counted equivalent to two additional people when estimating the frequencies of pumping the septic tank.
26. Hardwired garbage disposer switch – Permanently connected appliances rated in excess of 300 volt-amperes or 0.125 horsepower, a branch circuit breaker or switch located within sight of appliance or such devices in any location that are capable of being locked in the open position shall be provided.
27. Garbage disposer power cord – The garbage disposer power cables that enter the splicing box shall be protected with approved metal or plastic cable connector.
28. Garbage disposer wall switch – The wall switch for a garbage disposer shall be located at arms length or maximum of 5 ft measured horizontally.
29. Garbage disposer vibration – Excessive vibration at garbage disposer could be the result of a problem either with a broken or loose impeller creating an unbalanced flywheel, or the disposer is not tight enough on its base.
30. Permanent wiring for appliances – Only conduit (single strand THHN or THWN) or BX (armored cable) shall be used for permanent wiring of appliances, otherwise flexible cord with plug shall be used. If permanent wiring is used, a branch circuit breaker or switch located within sight of appliance or such devices in any location that are capable of being locked in the open position shall be provided.
31. Appliance individual circuit– Garbage disposals, dishwashers, refrigerator, trash compactors and other motor loads (rated in excess of 0.125 horsepower) shall have an individual branch circuits.
32. Flexible cords as permanent wiring – Flexible cords shall not be used in general wiring and shall only be used for appliances listed to be connected with a flexible cord.
33. Countertop backsplash – Walls above countertop shall be provided with backsplash finished with a non-absorbent material of at least 4” high to prevent water damage to the wall.

BATHROOM(S)

GENERAL INFORMATION

- A. The City of Los Angeles has passed an ordinance on June 1998 requiring high efficiency water fixtures on any commercial or residential building sold.
- B. The City of Los Angeles has passed an ordinance that come into effect on December 1, 2009 requiring high efficiency water fixtures for all new buildings and renovations.

CODE & STANDARD REFERENCE

- 1. Ultra low flow water closet – Water closets (toilet) shall be ultra low-flow type (not more than 1.6 gallons of water per flush) – see General Information A above. This type of water closet may not be required in the area but is recommended for water conservation.
- 2. Ultra low flow shower head – Showerheads shall be ultra low-flow type (not to exceed a water supply flow rate of 2.5 gallons per minute) – see General Information A above.
- 3. Water closet clearances – The center line of water closets or bidets shall not be less than 15” from adjacent walls or partitions, 12” minimum to fixture or not less than 30” center to center from an adjacent water closet or bidet. There shall be at least 21” clearance in front of the water closet, bidet or lavatory to any wall, fixture or door.
- 4. Water closet clearance from bathtub/shower – Clearance between a water closet and bathtub/shower shall be minimum 2”.
- 5. Floor space for parallel approach to a bathtub – A minimum clear floor space for a parallel approach to a bathtub shall be 30”x60” and a minimum clear floor space for a forward approach of 48”x60”.
- 6. Floor space for parallel approach to a shower– A minimum clear floor space access to a shower with minimum inside dimensions of 36”x36” shall be 36”x48” and a minimum clear floor space access to a shower with minimum inside dimensions of 36”x60” shall be 36”x60”.
- 7. Shower receptors construction – Shower receptors shall have a finished curb threshold not less than 1 inch below the sides and back of the receptor. The curb shall be not less than 2” and not more than 9” in depth when measured from the top of the curb to the top of the drain. The finished floor shall slope uniformly toward the drain not less than one-fourth unit vertical in 12 units horizontal nor more than 0.5 inch, and floor drains shall be flanged to provide a water-tight joint in the floor.
- 8. Walls around shower and bathtub – Walls above bathtub and shower floors shall be finished with a non-absorbent surface, and shall extend to a height of not less than 6’.
- 9. Shower head height – Shower head height shall be at least 67” above the shower pan or 3” below the shower stall walls.
- 10. Shower head location – Control valves and shower heads shall be located on the sidewall of shower compartments or be otherwise arranged so that the shower head does not discharge directly at the entrance to the compartment and the bather can adjust the valves prior to stepping into the shower spray.
- 11. Shower doors – Hinged shower doors shall open outward and against the wall so as not to obstruct the passageway in case of emergency. The clear opening of a doorway should be at least 32”.
- 12. Bathtub and shower enclosures –Bathtub and shower enclosures shall extend to a height of not less than 72” from the bathroom floor. The top rail of enclosure should be screwed to the frame or mechanically connected.

13. Lavatory sink clearance from wall or fixture – The centerline of sink shall not be less than 14” from side wall, and its edges 18” from opposite wall, 4” from water closet and 2” from other fixture.
14. Lavatory sink height from finish floor – The front of lavatories and sinks shall be 34” maximum above the floor or ground, measured to the higher of the fixture or counter surface.
15. Sink support – Lavatory sinks shall be rigidly supported to the wall so that strain is not transmitted to the plumbing system.
16. Sink/Countertop contact with wall – Where fixtures come in contact with walls, the contact area shall be watertight.
17. Sink/Countertop attachment to the wall – The lavatory sink shall be secured and sealed to the wall to prevent movement that could damage the plumbing and prevent water intrusion that could damage the wall respectively.
18. Bathtub / Sink drain strainer and stopper – Bathtub /Sinks shall be provided with strainer, crossbar or other device to restrict the clear opening of the waste outlet and shall be equipped with an approved stopper.
19. P” trap installation – Traps shall have a liquid seal not less than 2” and not more than 4”. Traps shall be placed as close as possible to the fixture outlet.
20. “P” trap requirement – Each plumbing fixture shall be separately trapped as close as possible to the fixture outlet in order to provide a liquid seal that prevents the emission of sewer gases without materially affecting the flow of sewage or waste water through it. The vertical distance from the fixture outlet to the trap weir shall not exceed 24”.
21. Too many Elbows or traps – Fixtures shall not be double trapped or provided with multiple El-bows within 18” from each other– they slow down the drain flow and the drain is prone to clogging.
22. Drain “P” trap design – Traps shall be of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions except where integral with the fixture. Traps shall be constructed of lead, cast iron, cast or drawn brass or approved plastic. Tubular brass traps shall be not less than No. 20 gage thickness. Slip joints shall be accessible
23. Bathtub access panel – Bathtub with concealed slip-joint connections shall be provided with an access panel or utility space at least 12” in its smallest dimension so as to provide access to the slip connections for inspection and repair.
24. Drainpipe slope – Horizontal drainpipe shall be installed in uniform alignment at uniform slopes not less than one-fourth unit vertical in 12 units horizontal.
25. Sink drainpipe Tee – Sanitary Tee shall not be used at vertical to horizontal and horizontal to horizontal prevent the wastewater from backing up.
26. Drain “P” trap clearance from floor – Trap with removable joints shall be installed minimum of 6” and maximum of 18” above floor.
27. Prohibited flexible drainpipe tail piece – Drainpipe connector shall be of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions except where integral with the fixture.
28. Prohibited “S” trap – “S” traps, bell traps, crown vented traps, drum traps, and traps with moving parts are no longer accepted as these traps tend to easily siphon dry even when well-vented.
29. “P” trap arm support– Sink drain “P” trap arm with slip joints with length 18” or more shall be provided with support and strap to ensure alignment and prevent sagging and displacement.

30. Reversed hot and cold water supplies – Fixture fittings, faucets and diverters shall be installed and adjusted so that the flow of hot water from the fittings corresponds to the left-hand side of the fitting.
31. Shut-off valve requirements – An accessible independent shut off valve should be installed on the water supply pipe to each plumbing system, plumbing fixture, appliance, and water heater.
32. Pipe escutcheon – Pipe escutcheon (flange) is to completely cover pipe penetration annular spaces between pipe and sleeve in floors, walls, or ceilings. Brass escutcheon shall be used for copper pipes and chrome plated for galvanized-iron pipes to prevent corrosion from electrolysis.
33. Valve handle – The shut-off valve must be readily accessible and openable without the use of a tool or effort.
34. Loose sink/counter assembly – Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
35. No window or exhaust fan provided – Bathrooms shall be provided with window not less than 8 percent of the floor area of such rooms or a mechanical ventilation system capable of producing .35 air-change per hour shall be provided to convey the moisture or steam and odor to the outdoors.
36. Hydromassage individual circuit– Permanently connected appliances rated in excess of 0.125 horsepower, shall be supplied by an individual branch circuit.

EXHAUST VENT(S) / INDOOR AIR QUALITY

GENERAL INFORMATION

- A. There are many sources of indoor air pollution in any home. These include combustion sources such as oil, gas, kerosene, coal, wood, and tobacco products; building materials and furnishings as diverse as deteriorated, asbestos-containing insulation, wet or damp carpet, and cabinetry or furniture made of certain pressed wood products; products for household cleaning and maintenance, personal care, or hobbies; central heating and cooling systems and humidification devices; and outdoor sources such as radon, pesticides, and outdoor air pollution.
- B. A proper air exchange rate is vital for maintaining healthy indoor air. Homes on night cooling shall have 10-18 effective air exchanges (the rate at which outdoor air replaces indoor air) per hour. Air exchange rate is managed through natural (windows or walls) and/or mechanical ventilation.
- C. Exhaust ventilation systems work by depressurizing the building. By reducing the inside air pressure below the outdoor air pressure, they extract indoor air from a house while make-up air infiltrates through leaks in the building shell and through intentional, passive vents. Adjustable, passive vents through windows or walls can be installed in other rooms to introduce fresh air to balance the negative indoor pressure against outdoor air pressure. Negative air pressure inside of the house can cause back drafting of combustion appliances (carbon monoxide); mold, mildew and moisture as well as condensation; lack of fresh air, a musty smell, lingering odors around the house; stagnant, stale, heavy, air causing high humidity and condensation; and rush of air or draft when opening an exterior door.

CODE & STANDARD REFERENCE

1. Range hood design and termination – Range hoods shall discharge to the outdoors through a single-wall duct. The duct serving the hood shall have a smooth interior surface, shall be airtight and shall be equipped with a backdraft damper. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building.
2. Range hood/ Exhaust fan requirement– Kitchen range hood or exhaust fan is necessary to convey the moisture or steam, odor, heat, smoke, hazardous gases, and grease to the outdoors – see General Information A above.
3. Range hood duct connector– Range hoods shall discharge to the outdoors with minimum 6" Ø or 3.5" x 8" single-wall metal duct constructed of galvanized sheet steel not less than gauge #23, or other approved, non combustible, corrosion-resistant material with smooth interior surface, airtight and equipped with a backdraft damper. Rangehood outlet shall not be reduced in size– do not connect a 5" Ø vent to a 6" Ø outlet. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building.
4. Range hood design and termination – Range hoods shall discharge to the outdoors through a single-wall duct. The duct serving the hood shall have a smooth interior surface, shall be airtight and shall be equipped with a backdraft damper or other means to control infiltration/exfiltration when not in operation. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building.
5. Rangehood height– The bottom of a range hood shall be minimum 60" above the floor or 24" above the gas stove or counter top which is typically 36" high.
6. Bathroom and Laundry exhaust vent termination – Bathroom and laundry exhaust vent pipe shall terminate outdoors (shall not terminate in an attic or crawl space or areas inside the building), and shall be equipped with backdraft damper or other means to control infiltration/exfiltration when not in operation.
7. Abnormally noisy exhaust fan– Noise levels in bedrooms shall not exceed 25 dB (decibels) and noise levels in other rooms shall not exceed 40 dB. Try cleaning the fan assembly and lubricating the exhaust fan bearing with WD40. If noise persists, replace with higher quality low noise type of exhaust vent.
8. Bathroom and laundry exhaust vent design – Exhaust vent shall discharge to the outdoors with minimum 4" Ø single-wall duct, airtight and equipped with a backdraft damper.
9. Dryer vent termination – The dryer shall have an independent exhaust vent system, shall convey the moisture to the outdoors, and equipped with backdraft damper.
10. Dryer vent design – The dryer vents shall be constructed of rigid metal ducts.
11. Dryer vent length– The maximum length of a 4" Ø exhaust vent shall not exceed 25' from the dryer to wall or roof termination.
12. Central exhaust fan guard – The central exhaust fan shall be provided with approved protection grill to prevent accidental contact with the blades.
13. Window/ exhaust fan requirement – Bathrooms/Laundry shall be provided with window not less than 8 percent of the floor area of such rooms, one half of the required area of glazing shall be openable, otherwise a mechanical ventilation system capable of producing .35 air-change per hour or 50 cfm for intermittent ventilation or 20 cfm for continuous ventilation, to convey the moisture or steam and odor to the outdoors.

WOOD DESTROYING PESTS ISSUES

GENERAL INFORMATION

- A. Section 1 in Termite Inspection Report contains items where visible evidence of active infestation of wood destroying insects or infection (wood decay fungi) were found. Damage is defined as a wood member which has been structurally weakened to a point that it no longer performs its intended function. If the damage exists at a visible portion of the interior or exterior it must be repaired or replaced as it is cosmetically compromised. Only damaged portions of wood members must be repaired or replaced if the wood member does not bear structural loads. Structural members must be repaired in a manner as to retain the structural integrity. The correction must be related to an active infestation or infection to be categorized as a section one item.
- B. Section 2 in Termite Inspection Report contains items where a condition exists that is "deemed likely" to lead to infestation or infection. This includes, but not limited to, plumbing leaks, excessive moisture conditions, wood to ground contact, roof leaks and shower leaks. Damage caused by leakage or some other moisture condition is a section two item unless infestation or infection is present.
- C. A mature, well-established termite colony with as many as 60,000 members will eat only about one-fifth of an ounce of wood a day.

CODE & STANDARD REFERENCE

1. Underfloor space debris – The under-floor grade shall be cleaned of all vegetation and organic material. All wood forms used for placing concrete shall be removed before a building is occupied or used for any purpose. All construction materials shall be removed before a building is occupied or used for any purpose.
2. General Ways to Kill Termites– Liquid termiticides are sprayed around your house to kill or repel any termites coming into contact with them. Baits are placed around your home and gradually kill off a colony by spreading small amounts of pesticides through the workers. Borate treatments are applied directly to wood in your house, sort of like a coat of paint. Fumigation method is commonly used for drywood termites.
3. Repair of rotted wood – Rotted woods can be repaired with epoxy if not excessively damaged. Epoxy-stabilized wood can be shaped with regular woodworking tools and painted. Epoxies are useful for consolidating rotted wood, restoring lost portions of molding's and carvings, and for strengthening weakened structural members.
4. Treating dry rot – If dry rot or fungus has gained a foot-hold, the wood should be treated to inhibit the growth of the fungus. Boric acid, or borate, is an excellent fungicide (a pesticide that kills fungi) against the dry rot fungus. Borate also prevents insect damage. Wood can be treated during construction, during repair, or as a remedial treatment to stop an active infestation.

INSULATIONS

GENERAL INFORMATION

- A. House insulation began in the 1950's and came into general use in the US during the 1970s. Insulation gained significant national attention as a cheap and available technology to increase the energy efficiency of homes. In 1977, following a particularly severe winter, a tax credit was given for homeowners who installed insulation. Code requires insulation to exterior walls, ceiling and floor approximately after 1977.

- B. Roof space insulations shall be separated a minimum of 3" from recessed lighting fixtures, fan motors and other heat-producing devices and 2" from metal flues and masonry chimneys, except when heat-producing devices are listed for lesser clearances.

CODE & STANDARD REFERENCE

1. Roof space insulation – R-30 Batt insulation with vapor retarder shall be installed in between joists over the conditioned living areas with the air/vapor barrier facing the warm side during winter or the interior of the house, minimize heat loss and control condensation. When adding insulation with vapor retarder, the existing loose insulations shall be removed first to prevent trapping the condensation.
2. Double wall gas vent clearance from combustibles– Double wall gas vent clearance from combustibles shall be 1" from combustible vertical wall, 3" clearance from horizontal combustible surface, and 1" from around Wall Thimble.
3. Wall cavity insulation – R-13 Batt insulation with the air/vapor barrier facing the warm side or the interior of the house during winter, when conditioned to minimize heat loss and control condensation.
4. Floor space insulation – R-19 insulation with vapor retarder shall be installed in between the floor joists with the air/vapor barrier facing the warm side or the interior of the house during winter, when conditioned to minimize heat loss and control condensation.
5. Insulation air/vapor barrier – The insulation shall be installed with the air/vapor barrier facing the warm side or the interior of the house during winter.
6. Recessed light fixture, gas vent & chimney insulation clearance – Combustible insulation shall be separated a minimum of 3" from recessed lighting fixtures, fan motors and other heat-producing devices, except when heat-producing devices are listed for lesser clearances.
7. Vents through insulation – Where vents pass through insulated assemblies, an insulation shield constructed of not less than 26 gage sheet metal shall be installed to provide clearance between the vent and the insulation material. Double wall gas vent clearance from combustibles shall be 3" clearance from horizontal combustible surface. Where vents pass through attic space, the shield shall terminate not less than 2" above the insulation materials and shall be secured in place to prevent displacement.
8. Double wall gas vent clearance – Double wall gas vent clearance from combustibles shall be 1" from combustible vertical wall and 3" clearance from horizontal combustible surface.

ENVIRONMENTAL ISSUES

GENERAL INFORMATION

- A. *Stachybotrys chartarum* (atra) is the black mold that grows in materials high in cellulose and low nitrogen content, such as paper wallboard, jute, wicker, straw & baskets. *Stachybotrys chartarum* is known to produce the mycotoxin, satratoxin. The effects of inhaling mycotoxins that occur on mold spores are not known and there is little if any direct evidence to support this claim, mainly because it is difficult to study these cases of exposure after the fact. Remediation is recommended if 1 CFU/m³ of *Stachybotrys* is found in the indoor air. If 1000 CFU/m³ of *Stachybotrys* is found in the indoor air, the guidelines recommend immediate evacuation.

- B. Excessive humidity can cause severe damage to your property if not controlled properly. Flaking paint, rust damage, mold and mildew, rotting wood and other problems can be caused by too much moisture. To control moisture, the house should be kept well ventilated. Evaporative cooler, clothes dryer, kitchen and pantry, bathroom, closets, and even the number of persons living in the house could cause excessive moisture.

CODE & STANDARD REFERENCE

1. Moldy walls/floor/ceiling – Scrub mold thoroughly with ¼ cup bleach to ¼ quart of water, wipe with borate-based detergent solution and lastly apply with mold and mildew resistant paint products.
2. Mold colonization – Cellulose materials exposed to prolonged moisture is susceptible to fungus or mold colonization within 1 to 12 days. Stachybotrys mold doesn't grow in bathroom grout, windows with metal frames or window sills, foundation walls and plaster walls.

SWIMMING POOL / SPA

GENERAL INFORMATION

- A. Life expectancy of pool/spa pumps is 10 to 12 years.
- B. An outdoor swimming pool, including an in-ground, aboveground, or on-ground pool, hot-tub or spa shall be provided with 48" high non climbable barrier, and gates with self-closing and latching device. Where the wall of the dwelling serves as part of the barrier, all doors with access to the pool through the wall shall be equipped with an alarm which produces an audible warning when the door and its screen are opened.
- C. Prior to repairing, modifying, or changing any pump, heater, and/or recirculation equipment, or before beginning and type of remodeling of the pool or spa, contact your local Environmental Health office for your area or call (909) 358-5172, to make sure these changes meet current codes and requirements.

CODE & STANDARD REFERENCE

1. Expansion Joint caulk – The expansion joints at between the pool and coping tiles shall be caulked with elastomeric sealant, suitable for outdoor use. Deck-o-Seal and Vulken are two popular brand names. Replace or repair caulking annually.
2. Metal grounding – Bond all metal less than 5' from swimming pool with 8AWG copper.
3. Body grounding – Metal parts of electrical equipment associated with the pool water circulating system including pump motors and metal parts of equipment associated with pool covers, and all metallic parts of the pool structure including steel reinforcement of pool shell, coping stones and deck shall be bonded with solid copper conductor, insulated, covered or bare, not smaller than No. 8.
4. Receptacle requirement – Where permanently installed pool is installed at a dwelling unit, at least one 125-volt 15 or 20-ampere receptacle on a general purpose branch circuit shall be located a minimum of 10 ft from and not more than 20 ft from the inside wall of the pool. This receptacles shall be located not more than 6 ft 6 in. above the floor, platform, or grade level serving the pool.
5. GFCI receptacle requirement – All receptacles located within 20 ft of a pool or fountain shall be protected with GFCIs. This applies to pools located outdoors or indoors, permanently installed or storable, as well as residential and commercial use.

6. GFCI receptacle requirement – All grade-accessible receptacles shall be GFCI protected except inside the house.
7. GFCI receptacle requirement at spa– The outlet that supplies a self-contained spa or hot tub, or a packaged spa or hot tub equipment assembly, or a field-assembled spa or tub with a heater load of 50 amperes or less, shall be protected by a ground-fault circuit-interrupter.
8. Wall switches limitation – Control switches shall be located at maximum of 5 ft measure horizontally, from the inside walls of the spa or hot tub.
9. Pool heater guard – Pool heaters shall be located or protected to guard against accidental contact of hot surfaces by persons.
10. Pumps and Heater elevated platform – Appliances supported from the ground shall be level and firmly supported on concrete slab or other approved material extending 3” minimum above the adjoining ground or pavement.
11. Pumps and Heater anchor – Appliances designed to be fixed in position shall be fastened or anchored in an approved manner.
12. Air bubbles at water inlets – Air bubbles at the water inlets is an indication of leakage at circulation system.
13. Algae growth – Heavy algae growth is an indication of inadequate water circulation and poor water PH value.
14. Pool heater clearance – Pool heater vent to be at least 4’ from property line.
15. Pool equipment clearance – Pool equipment to be at least 3’ from property line.
16. Shut-off valve at appliances – Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance, not further than 6’ from the appliance, and shall be installed upstream from the union, connector or quick disconnect device it serves.