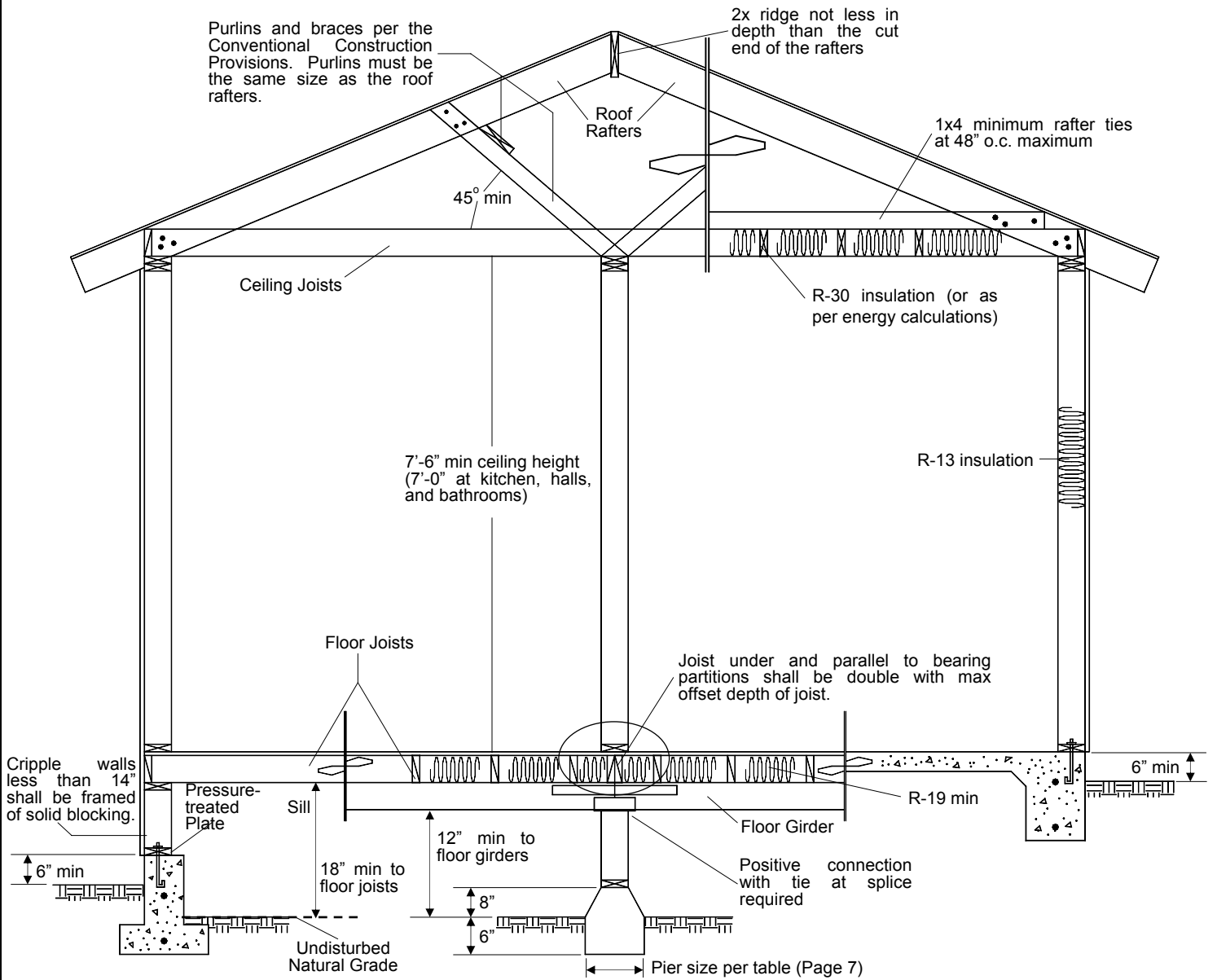


## TYPICAL SINGLE-STORY FRAMING DETAILS



**ALLOWABLE SPAN FOR DR#2 HEADERS**

SIZE OF HEADER	MAXIMUM SPAN
4 X 4	4'-0"
4 X 6	6'-0"
4 X 8	8'-0"
4 X 10	10'-0"
4 X 12	12'-0"
4 X 12 DF#1	May be used over 16'-0" garage door opening on one-story attached or detached garages

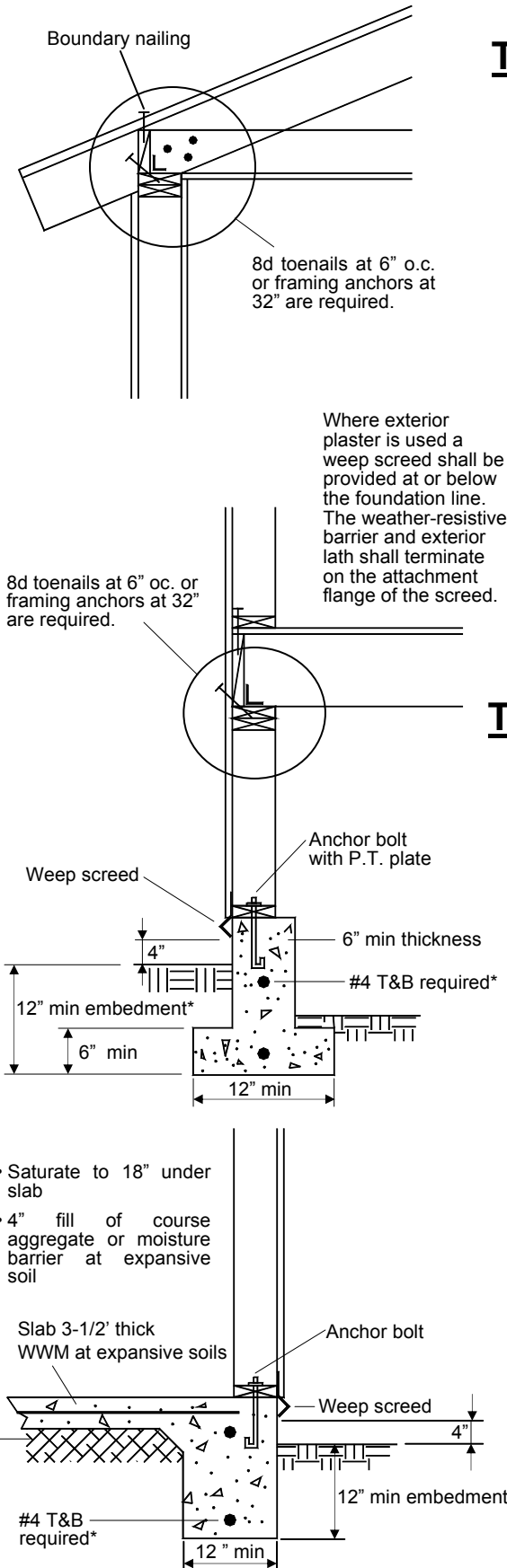
## TYPICAL ROOF-CEILING FRAMING DETAILS

1. Roof sheathing shall be of 3/8" in thickness and have a panel span rating of not less than 24/0.
2. All plywood edges shall be nailed with 6d nails for plywood thickness at 1/2" or less; or with 8d nails for plywood of greater thickness at 6" o.c. At all panel edges supported by roof framing members and at 12" o.c. at intermediate supports.
3. Top plates shall be end nailed in studs with 2-16d nails.
4. Double top plates shall be face nailed with 16d nails with 16" o.c.
5. Top plate laps and intersections shall be faced nailed with 2-16d nails.
6. Roof rafters and ceiling joists shall be toe nailed to the top plate with 3-8d nails.
7. Ceiling joists shall be faced nailed to roof rafters with minimum 3-16d nails.
8. Ceiling joists laps over partitions shall be face nailed with 3-16d nails.

## TYPICAL ROOF-CEILING FRAMING DETAILS

1. Floor plywood shall not be less than 15/32 in thickness and shall have panel rating of not less than 32/16.
2. Floor sheathing shall have approved tongue-and-groove joints or shall be supported with blocking unless 1/4" minimum thickness underlayment is placed over plywood sub-floor.
3. Floor sheathing shall be nailed with 6d common or deformed shank nails for plywood thickness of 15/32" or less and 8d common nails for plywood of greater thickness at 6" o.c. at all panel edges and 10" o.c. minimum at all intermediate supports.
4. Floor joists shall be toenails to the sole plate and girders with 3-8d nails.
5. Wall studs shall be nailed to the sole plate with 4-8d nails or 2-16d endnails.
6. Sole plate shall be face nailed to joists or blocking with 16d nails at 16" o.c.
7. Sill plates shall be bolted to foundation with 5/8" diameter bolts embedded at least 7" o.c. in concrete footing or footing stem wall and spaced no more than 6'-0" o.c.
8. There shall be a minimum of two bolts per piece with one bolt located not more than 12 inches or less than 7 bolt diameter from each end of the piece.
9. Each anchor bolt shall be installed with a plate washer of a minimum 2-inch by 2 inch by 3/16 inch thick.
10. Foundation supporting wood shall extend at least 6" above the adjacent finished grade.

\* Expansive soil areas min 24" depth (18" for interior) with 2-#4 T & 2-#4 B. (Additional requirements may apply.)



## DEFINITION

**HABITABLE SPACE (ROOM)** is space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, halls, storage or utility space, and similar areas are not considered habitable space. [209]

## ROOM DIMENSIONS

**CEILING HEIGHTS.** Rooms used for living, sleeping, and eating shall have a ceiling height of not less than 7'-6". Kitchens, halls, bathrooms, and toilet compartments may have a ceiling height of not less than 7'-0" measured to the lowest projection from the ceiling. Rooms with a sloped ceiling are required to have the prescribed ceiling height over a minimum of one-half of the room area, with no portion measuring less than 5'-0". [310.6.1]

**FLOOR AREA.** Habitable rooms, except kitchens, shall have an area of not less than 70 sq. ft., and at least one room shall have not less than 120 square feet. [310.6.2]

**WIDTH.** Habitable rooms other than a kitchen shall be not less than 7'-0" in any dimension. Halls shall be not less than 3'-0" in width. [310.6.3]

## LIGHT AND VENTILATION

**GENERAL.** For the purpose of determining the light and/or ventilation requirements, any room may be considered as a portion of an adjoining room when half of the area of the common wall is open and unobstructed and provides an opening of not less than 1/10 of the floor area of the interior room of 25 sq. ft., whichever is greater. Required windows may open into a roofed porch where the porch cover has a height of not less than 7' and has the longer side at least 65 percent open and unobstructed. [1203.1]

**NATURAL LIGHT.** All habitable rooms within a dwelling shall be provided with natural light by means of exterior glazed openings with an area not less than 1/10 of the floor area of such rooms with a minimum of 10 sq. ft. [1203.2]

**NATURAL VENTILATION.** All habitable rooms within a dwelling shall be provided with natural ventilation by means of operable exterior openings with an area of not less than 1/20 of the floor area of such rooms with a minimum of 5 sq. ft. or a minimum 1-1/2 sq. ft. in bathrooms, water closet compartments, laundry rooms, and similar rooms. [1203.3]

**MECHANICAL VENTILATION.** In lieu of required exterior openings for natural ventilation in bathrooms containing a bathtub or shower or combination thereof, and similar rooms, a mechanical ventilation system connected directly to the outside capable of providing five air changes per hour shall be provided. The point of discharge of exhaust air shall be at least 3' from any opening into the building. Bathrooms which contain only a water closet or lavatory or combination thereof, and similar rooms may be ventilated with an approved mechanical recirculating fan or similar device designed to remove odors from the air. [1203.3]

## EXITS AND EMERGENCY ESCAPES

Every sleeping room shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a yard or exit court open to the sky. The window or door shall be operable from the inside to provide a full clear opening without the use of separate tools. All escape or rescue windows shall have a minimum net clear operable area of 5.7 square feet. The minimum net clear operable height dimension shall be 24". The minimum net clear operable width dimension shall be 20". When windows are provided as a means of escape or rescue, they shall have a finished sill height not more than 44" above the floor. [310.4]

## GUARDRAILS

All unenclosed floor and roof openings, open and glazed sides of landings and ramps, balconies or porches which are more than 30" above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail. Guardrails shall be not less than 36" in height. Open guardrail and stair railings shall have intermediate rails or an ornamental pattern such that a sphere 4" in diameter cannot pass through, except that a 6" diameter sphere may occur at the triangular portion

## DOORS

**OPENING SIZE.** At least one exit door shall be of a size as to permit the installation of a door not less than 3'-0" in width and not less than 6'-8" in height. [1003.3.1.3]

**SWING REQUIREMENTS.** When doors swing out over a landing, the landing shall not be lower than 1" below that of the door threshold. A door may open at the top step of an interior flight of stairs or at a landing which is not more than 8" lower than the floor level, provided the door does not swing over the top step or landing. When doors swing over a landing, the landings shall have a dimension in the direction of travel of not less than the width of the door or landing but need not exceed 36" (36" x 36" min). [1003.3.1.6]

## HEATING

Every dwelling shall be provided with heating facilities capable of maintaining a room temperature of 70° Fahrenheit in all habitable rooms. [310.11]

## PROJECTIONS

Projections which extend into the 3' setback between the structure and the property line (or other structures), including eaves, shall be 1-hour fire-resistive construction. Eaves shall be not less than 24" from property lines and eaves over required windows shall be not less than 30" from property lines. [705]

## STAIRS

**GENERAL.** Every stairway having two or more risers shall conform to the following requirements:

**WIDTH, RISE, RUN, AND HEADROOM.** Stairways shall be not less than 36" in width. The rise of every step in a stairway shall be not less than 4" or not greater than 8". The run shall be not less than 9". Every stairway shall have a headroom clearance of not less than 6'-8". Such clearance shall be measured vertically from a plane parallel and tangent to the stairway tread nosing to the soffit above at all points. [1003.3.3.3, 1003.3.3.4]

**LANDINGS.** Every stairway landing shall have a dimension measured in the direction of travel equal to the width of the stairway, but need not exceed 44" when the stair has a straight run. [1003.3.3.5]

**HANDRAILS AND GUARDRAILS.** Interior and exterior stairways having four or more risers shall have handrails on at least one side. Stairways 30" or less in height may have handrails on one side only. Stairways open on one or both sides shall have guardrails on the open side or sides. The handgrip portion of handrails shall be not less than 1-1/4" or more than 2" in cross-sectional dimension. Handrails projecting from a wall shall have a space of 1-1/2" between the wall and the handrail. The top of handrails and guardrails at open sides of stairs shall be placed not less than 34" or more than 38" above the nosing of treads and landings. Ends shall be returned or shall terminate in newel posts or safety terminals. [509, 1003.3.3.6]

**MISCELLANEOUS.** Enclosed usable space under stairs shall be protected on the enclosed side, as required, for 1-hour fire-resistive construction. [1003.3.3.9]

## DWELLING/GARAGE SEPARATION

Walls and ceilings completely separating the dwelling from an attached garage or a carport enclosed on three or more sides may be limited to the installation of materials approved for 1-hour fire-resistive construction (5/8" Type "X" gyp-board or 7/8" stucco) on the garage side, openings into dwelling shall have a self-closing, tight-fitting solid wood door 1-3/8" in thickness, or a self-closing tight-fitting door having a fire protection rating of not less than 20 minutes. Fire dampers need not be installed in air ducts passing through the wall, floor, or ceilings separating Group R, Division 3 occupancy from a Group U occupancy, provided such ducts within the Group U occupancy are constructed of steel having a thickness not less than 0.019". Under no circumstances shall a private garage have any openings into a room used for sleeping purposes. [302.4, 312.4]

**SMOKE DETECTORS**

**POWER SOURCE.** In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source and shall be equipped with a battery backup. The detector shall emit a signal when the batteries are low. The wiring shall be permanent and without a disconnecting switch other than those required for over current protection. Smoke detectors may be battery operated when installed in existing construction in buildings which undergo alterations, repairs, or additions or in buildings without commercial power. [310.9.1.3]

**LOCATION WITHIN DWELLING UNITS.** In dwelling units, a detector shall be installed in each sleeping room and at a point centrally located in the corridor or area giving access to each separate sleeping area. When the dwelling has more than one story and in dwellings with basements, a detector shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper level, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24" or more, smoke detectors shall be installed in the hallway and in the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located. [310.9.1.4]

**ACCESS OPENINGS**

**UNDERFLOOR AREAS.** Accessible underfloor areas shall be provided with a minimum 18" by 24" access opening unobstructed by pipes ducts and similar construction. All underfloor access openings shall be effectively screened or covered, pipes, ducts, and other construction shall not interfere with accessibility to or within under floor areas. [2306.3]

**ATTIC WARM-AIR FURNACE.** An attic space in which a warm-air furnace is installed shall be accessible by an opening and passageway as large as the largest piece of the furnace and in no case less than 30" by 30" continuous from the opening to the furnace and its controls. The distance from the passageway access to the furnace shall not exceed 20' measured along the centerline of the passageway. The passageway shall be unobstructed and shall have continuous solid flooring not less than 24" wide from the entrance opening to the furnace. [UMC 307.3, .4]

**ROOFING [UBC Chapter 15]**

**ASPHALT SHINGLES.** Asphalt shingles require a minimum roof slope of 4:12 and one layer of Type 15 felt underlayment. The slope may be reduced to 2:12 provided the shingles are an approved self-sealing type or are hand-sealed and installed over two layers of Type 15 felt underlayment applied shingle fashion. Wood Shingles. Wood shingles require a minimum slope of 3:12.

**WOOD SHAKES.** Wood shakes require a minimum roof slope of 4:12, but the slope may be reduced to 3:12 when installed over Type 15 felt underlayment.

**SLATE SHINGLES.** Slate shingles require a minimum roof slope of 2.5:12. Where the slope is less than 3:12, 3-ply minimum built-up roofing is required as underlayment. When the slope is 3:12 or greater, one layer of Type 30 felt underlayment or one layer of heavy-duty felt underlayment is required.

**CLAY OR CONCRETE TILE.** Clay or concrete roofing tile require a minimum slope of 4:12 with one layer of Type 30 felt underlayment.

**ROOF DRAINS.** Unless roofs are sloped to drain over roof edges or are designed to support accumulated water, roof drains shall be installed at each low point of the roof. Roof drains shall be adequate in size to convey the water tributary to the roof drains. Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet flow line located 2" above the low point of the roof, or overflow scuppers having three times the size of the roof drains may be installed in adjacent parapet walls with the inlet flow line located 2" above

the low point of the adjacent roof and having a minimum opening height of 4". Overflow drains shall be connected to drain lines independent from the roof drains. [1506.2, .3] Note: Class "A" roof required in high fire exposure zones. All roofs shall be class "C" minimum.

**MISCELLANEOUS**

**PROPERTY LINE CONSTRUCTION.** Walls closer than 3'-0" to the property line shall be 1-hour fire-resistive construction and shall have no openings. A 30" high parapet is also required if the building floor area exceeds 1,000 square feet on any floor. Exterior garage and carport walls closer than 3'-0" to the property line may be protected on the exterior side only with materials approved for 1-hour fire-resistive construction. Exterior stairways shall not be located closer than 3'-0" to the property line. [T-5-A, 503.2.1, 705, 709.4, 1204]

**SHOWERS.** Showers shall have a smooth, hard, nonabsorbent surface such as ceramic tile or other approved material to a height of no less than 70" above the drain inlet. Glazing in shower and bathtub doors and enclosures shall be safety glazing. Hinged shower doors shall open outward. [UPC 408.6, 412.7]

**WATER CLOSETS.** Each water closet stool shall be located in a clear space not less than 30" in width and have a clear space in front on the water closet stool of not less than 24". [2904]

**WATER HEATERS.** No furnaces/water heater which depends on the combustion of fuel for warm-air furnaces/heat shall be installed in any room use door designed to be used for sleeping purposes, for a bathroom, for a clothes closet, or other confined space opening into any bathroom or bedroom. All water heaters shall be strapped for lateral support. [UPC 507.3, T-5-1, 509, 510.5, 511, UMC 303.1.3]

**DOMESTIC CLOTHES DRYERS.** Domestic clothes dryer shall be exhausted to the outside if in an area that is habitable or containing other fuel-burning appliances. Moisture exhaust ducts shall not terminate beneath the building or in the attic area, and shall not exceed a total combined horizontal and vertical length of 14'-0", including two 90 degree elbows. Two feet shall be deducted for each 90-degree elbow in excess of two. Duct shall be a minimum 4" diameter smooth metal. [UMC 504.3 & 908]

**APPLIANCES INSTALLED IN GARAGES.** Appliances installed in garages, or other areas where they may be subjected to damage shall be suitably guarded against such damage by being installed behind protective barriers or by being elevated or located out of the normal path of vehicles. Heating and cooling equipment located in a garage and which generates a glow, spark, or flame capable of igniting flammable vapors shall be installed with pilots and burners or heating elements and switches at least 18" above the floor level. [UMC 308, UPC 510, UBC 302.4]

**GARAGE FLOOR.** In areas where motor vehicles are stored or operated, floor surfaces shall be of noncombustible materials or asphaltic paving materials. [312.5]

**FIREPLACES.** Every chimney shall be listed by an approved test agency and extend a minimum of 2'-0" above the highest point of the roof within 10'-0" of the chimney. Spark arrestors shall have a net opening a least four times that of the chimney. All terminations shall be manufacturer approved. [3102.3.6, T-31-B]

**SAFETY GLAZING.** All glazing in hazardous locations shall be identified with a permanent label for safety glazing. [2406.2]

**WEATHER-RESISTIVE BARRIERS.** All weather-exposed surfaces shall have a weather-resistive barrier to protect the interior wall covering. Building paper and felt shall be free from holes and breaks other than those created by fasteners and shall be applied over studs or sheathing of all exterior walls. Such felt or paper shall be applied weatherboard fashion, lapped not less than 2" at horizontal joints and not less than 6" at vertical joints. Plywood wall sheathing shall be covered by two layers of Grade "D" paper. [1402, 2506.4]

**DRAINAGE.** Provisions shall be made to ensure that all drainage from new impervious area is taken to an approved drainage course without draining on to or across adjacent properties. Drains into the public way shall be cast-iron and approved by the City Engineer. [1804.7]

**SECURITY**

**SWINGING DOORS.** Swinging wooden doors which are operable from the inside without the use of a key shall be solid core construction not less than 1" in thickness or shall be of a construction having equivalent forced-entry resistance. Single swinging doors, the active leaf of a pair of doors, and the bottom leaf of Dutch doors shall be equipped with a dead bolt and a latch. If a key-locking feature is incorporated in the latching mechanism, a dead latch shall be used. The dead bolt and latch may be activated by one lock or by individual locks. In dwellings the dead bolt lock or locks shall be key operated from the exterior side of the door and engaged or disengaged from the interior side of the door by a device not requiring a key, tool, or excessive force. Non removable pins shall be used in pin-type hinges which are accessible from the outside when the door is closed.

**OVERHEAD AND SLIDING GARAGE DOORS.** Metal or wooden overhead and sliding garage doors shall be secured with a dead bolt lock, padlock with a hardened steel shackle, or equivalent when not otherwise locked by electric power operation. Locking devices, when installed at the jamb of metal or wooden overhead doors, shall be installed on both jambs when such doors exceed 9'-0" in width.

**GLASS ADJACENT TO DOORS.** Glass panels within 40" of a required locking device on a door when in the closed and locked position and operable from the inside without the use of a key shall be fully tempered glass; laminated glass of at least 1/4" thickness; approved burglary-resistant material; or guarded by metal bars, screens, or grilles in an approved manner.

**WINDOWS.** Locking devices installed on windows providing the emergency egress shall be operable from the inside without the use of a key, tool, or excessive force. Operable glass windows shall be provided with locking devices

**GENERAL CONSTRUCTION REQUIREMENTS**

**UNDER-FLOOR CLEARANCE.** When wood joists are located closer than 18" or wood girders are located closer than 12" to exposed ground in crawl spaces or unexcavated areas located within the periphery of the building foundations, the floor assembly, including posts, girders, joists, and subfloor, shall be approved wood of natural resistance to decay or treated wood. [2306.3]

**FOUNDATION VENTILATION.** Under-floor areas shall be ventilated by openings in the exterior foundations walls. Such openings shall have a net area of not less than 1 square foot for each 150 square feet of under-floor area. Openings shall be located as close to corners as practical and shall provide cross ventilation. The required area of such openings shall be approximately equally distributed along the length of at least two opposite sides. They shall be covered with corrosion-resistant wire mesh with mesh openings of 1/4" in dimension. [2306.7]

**FOUNDATION PLATES AND SILLS BOLTING**

Wood sill plates or sills shall be bolted to the foundation or foundation wall. Steel bolts with a minimum nominal diameter of 5/8-inch shall be embedded at least 7 inches into concrete or masonry and shall be spaced not more than 6 feet apart. There shall be a minimum of two bolts per piece with one bolt located not more than 12 inches or less than 7 bolt diameter from each end of the piece. [1806.6] Each anchor bolt shall be installed with a plate washer of a minimum 2-inch by 2 inch by 3/16 thick. [1806.6.1, No. 2]

**GIRDERS ENTERING CONCRETE WALLS.** Ends of wood girders entering concrete walls shall be provided with a 1/2" air space on tops, sides, and ends unless approved wood of natural resistance to decay or treated wood is used. [2306.6]

**WOOD AND EARTH SEPARATION.** Wood used in construction of permanent structures and located nearer than 6" to earth shall be treated wood or wood of natural resistance to decay. Where located on concrete slabs placed on earth, wood shall be treated wood or wood of natural resistance to decay. Where not subject to water splash or to exterior moisture and located on concrete having a minimum thickness of 3" with an impervious membrane installed between concrete and earth, the wood may be untreated and of any species. [2306.8]

**POST-BEAM CONNECTIONS.** Positive connection shall be provided to ensure against uplift and lateral displacement. [2314]

**ATTIC ACCESS.** Access shall be provided where the maximum vertical height exceeds 30" with at least a 22"x30" opening at a readily accessible location. [1505.1]

**ACCESS VENTILATION.** Attic vents shall be provided with corrosion-resistant metal mesh (openings 1/4" max). Vents shall have openings at least 1/150 of the space to be vented.

**CONVENTIONAL CONSTRUCTION PROVISIONS**

**FLOOR JOISTS.** Joists shall have not less than 1-1/2" of bearing on wood or metal. Joists shall be supported laterally at the ends and at each support by solid blocking, except where ends of joists are nailed to a header or rim joist. [2320.8]

**FOUNDATION CRIPPLE WALLS.** Cripple walls shall be framed of studs not less in size than the studding above. Studs less than 14" in height shall be laterally braced with solid blocking or plywood sheathing. Cripple walls greater than 14" in height shall be braced, as required, for first story walls. [2320.11.5]

**PIPES IN WALLS.** Stud partitions containing plumbing, heating, or other pipes shall be so framed and the joists underneath so spaced as to give proper clearance for the piping. Where a partition containing such piping runs parallel to the floor joists, the joists underneath such partitions shall be doubled and spaced to permit the passage of such pipes and shall be bridged. Where plumbing, heating, or pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 1/8" thick and 1-1/2" wide shall be fastened to the plate across and to each side of the opening with not less than 4-16d nails. [2320.11.7]

**CUTTING AND NOTCHING.** Notches on the ends of joists shall not exceed 1/4 the joist depth. Notches in the top or bottom of joists shall not exceed 1/6 the depth of the joist and shall not be located in the middle third of the span. In exterior walls and bearing partitions, any wood stud may be cut or notched to a depth not exceeding 25 percent of its width. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonbearing partitions supporting no loads other than the weight of the partition. [2320.11.9]

**BORED HOLES.** Holes bored in joists shall not be within 2" of the top or bottom of the joist, and the diameter of any such hole shall not exceed 1/3 the depth of the joist. A hole not greater in diameter than 40 percent of the stud width may be bored in any wood stud. Bored holes not greater than 60 percent of the width of the stud are permitted in nonbearing partitions or in any wall where each bored stud is doubled, provided not more than two such successive doubled studs are so bored. In no case shall the edge of the bored hole be nearer than 5/8" to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch. [2320.12.4]

**FRAMING AROUND OPENINGS.** Trimmer and header joists shall be doubled, or of lumber of equivalent cross section, when the span of the header exceeds 4'-0". The ends of header joists more than 6'0" long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition, or wall. [2320.12.5]

**ROOF AND CEILING FRAMING.** When the roof slope is less than 3:12, members supporting rafters and ceiling joists such as ridge boards, hips, and valleys shall be designed by an engineer. Rafters shall be framed directly opposite each other at the ridge. There shall be a ridge board of at least 1" nominal thickness and not less in depth than the cut end of the rafter. [2320.12.1, 2320.12.3]

**PURLINS.** Purlins to support roof loads may be installed to reduce the span of rafters within allowable limits and shall be supported by struts to bearing walls. The maximum span of 2x4 purlins shall be 4'-0", the maximum span of 2x6 purlins shall be 6'-0", but in no case shall the purlin be smaller than the supported rafter. Struts shall be not smaller than 2x4. The unbraced length of struts shall not exceed 8'-0", and the minimum slope of the struts shall be not less than 45 degrees from the horizontal. [2320.12.7]

**RAFTER TIES.** Rafter shall be nailed to adjacent ceiling joists to form a continuous tie between exterior walls when such joists are parallel to the rafters. Where not parallel, rafters shall be tied to 1x4 minimum cross ties. Rafter ties shall be spaced not more than 4'-0" on center. [2320.12.6]

## BRACING, SHEATHING, AND FINISH MATERIALS

**GENERAL.** All exterior walls and main cross-stud partitions shall be effectively and thoroughly braced to resist wind and seismic forces by one of the methods listed below. Braces shall be located at each corner or as near thereto as possible (no more than 8'), and shall be installed so that there is no unbraced section along the wall exceeding 25'-0". [2320.11.3]

- A. Three-eighth inch plywood wall sheathing nailed to wall studs or blocking with 6d common, box, or casing nails at 6" o.c. around panel edges and 12" o.c. at intermediate supports. All panels' edges shall occur over framing members or blocking.
- B. One-half inch gypsum wallboard nailed with 5d cooler or wallboard nails. 5/8 inch gypsum wallboard shall be nailed with 6d cooler or wallboard nails. Nails shall not be spaced further than 7" o.c. Gypsum wallboard shall not be installed until weather protection for the installation is provided.
- C. Portland cement plaster applied in not less than three coats having a combined minimum thickness of 7/8". Expanded metal or woven wire lath shall be used with either No. 11 Ga.. 1-1/8" long nails having 7/16" heads or No. 16 Ga.. staples having 7/8" legs. Fasteners shall be installed at a maximum spacing of 6" o.c. to all studs, top plates, bottom plates, and blocking. A minimum 4'-0" panel is required for method A and B. A minimum 8'-0" panel is required for method C.

An alternate 2'-8" wide panel (10' high max) may be used in place of the 4'-0" panel. These panels must be nailed with 3/8" plywood w/8d @ 6" O.C. EW and 12" O.C. FN (common or box). Two anchor bolts each panel minimum with holdowns each end of panel capable of resisting 1800# of force connected to a 4X post. A #4 bar top and bottom is required at the footings. [2320.11.4]

*Note: All shear walls and diaphragms shall maintain shear transfer. Shearwalls shall extend to the diaphragms.*

## REQUIRED INSPECTIONS. [108.5]

**GENERAL.** It shall be the duty of the applicant to cause the work to remain accessible and exposed for inspection purposes. The jurisdiction shall not be liable for expense entailed in the removal or replacement of any material required to allow inspection.

**FOUNDATION.** To be requested after trenches are excavated and forms erected, any required reinforcing steel is in place, anchor bolts spaced not more than 6'-0" o.c. are in place, and all holdowns are in place.

**UNDERFLOOR OR UNDERSLAB PLUMBING.** To be requested after all drainage piping and venting is complete to above the level of the floor sheathing or above the top of floor slab and the plumbing is subjected to 10' head of water.

**SLAB.** To be requested after all in-slab or under-slab service equipment, conduit, piping accessories, and other ancillary equipment are in place.

**FLOOR JOIST.** To be requested after all sill plates are secured to the foundation, floor girders and joists are installed or in place, and all shear transfer connections are complete.

**UNDERFLOOR INSULATION.** To be requested after insulation is in place and supported. Insulation must be installed with the paper against the conditioned surface.

**FLOOR SHEATHING.** This inspection is required at every floor level prior to standing any walls. To be requested after the sheathing is in place and nailed, as required. First story shear walls must be framed and the shear transfer connection to the second floor completed when requesting inspection for second floor sheathing.

**ROOF SHEATHING.** To be requested after roof sheathing is in place and nailed, as required. All interior shear walls must be framed to the roof, and shear transfer connections for all shear walls are completed.

**BUILDING FRAME, ROUGH ELECTRIC, ROUGH PLUMBING, ROUGH MECHANICAL.** To be requested after all framing, windows, doors, fireblocking, bracing, electric, plumbing, chimneys, vents, and mechanical equipment is complete and in place.

**INSULATION.** To be requested after insulation and caulking is in place.

**DRYWALL.** To be requested after drywall is in place and nailed or screwed, as required, and prior to taping over joints and fastener heads.

**EXTERIOR LATH.** To be requested after lathing is in place and nailed or stapled, as required, prior to application of scratch coat.

**GAS TEST.** To be requested after all gas piping is concealed in the walls and prior to installation of any fixtures, appliances, or shutoff valves. Gas piping with glued or screwed joints shall be subjected to a pressure test of 10 psi for a minimum of 15 minutes. Gas piping with welded joints shall be subjected to a pressure test of 60 psi for 30 minutes.

**FINAL INSPECTION.** To be requested after finish grading and the building shell are complete and ready for occupancy

**ADDITIONAL INSPECTIONS.** In addition to the inspections specified above, the building official may make or require any other inspection of any construction work to ascertain compliance with the provisions of the applicable codes.

## ENERGY

**PACKAGE REQUIREMENTS.** Unless calculations are prepared by an energy consultant, the requirements listed in the Table for Package D Requirements shall be incorporated into the construction of new conditioned space. (See Page 7)

**MANDATORY MEASURES.** All openings in the building envelope must be caulked, gasketed, weather-stripped, or otherwise sealed:

Insulation specified or installed meets California Energy Commission quality standards.

- Doors and windows between conditioned and unconditioned spaces designed to limit air leakage.
- Manufactured fenestration products have label with certified U-value, and infiltration certification.
- Exterior doors and windows weather-stripped; all joints and penetrations caulked and sealed.
- Masonry and factory-built fireplaces have:
  - a. Closeable metal or glass door
  - b. Outside air intake with damper and control
  - c. Flue damper and control
  - d. No continuous burning gas pilots allowed.
- HVAC equipment, water heaters, showerheads, and faucets certified by the Commission.
- Setback thermostat on all applicable heating systems.
- Indirect hot water tanks (e.g., unfired storage tanks or backup solar hot water tanks) have insulation blanket (R-12 or greater) or combined interior/exterior insulation (R-16 or greater).
- First 5 feet of pipes closest to water heater tank, non-recirculating systems, insulated (R-4 or greater).
- Ducts constructed, installed, and sealed to comply with UMC Section 603; ducts insulated to a minimum installed value of R-4.2 or ducts enclosed entirely within conditioned space.
- The use of building cavities as ducts is no longer allowed; ducts must be installed
- Exhaust fan systems have backdraft or automatic dampers.
- Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers.
- Forty lumens/watt or greater for general lighting in kitchens and rooms with water closets (fluorescent fixture); and recessed ceiling fixtures IC (insulation cover) approved.

**OF RAFTER, CEILING JOIST, AND FLOOR JOIST  
SPAN TABLE FOR DOUGLAS-FIR LARCH No. 2**

Member Size	Member Spacing	ROOF RAFTERS SLOPING MORE THAN 3:12				Ceiling Joists	Floor Joists
		NOT SUPPORTING A CEILING		SUPPORTING A CEILING			
		Light Roofing	Heavy Roofing	Light Roofing	Heavy Roofing		
2x4	12" o.c.	8'-10"	8'-7"	8'-3"	8'-1"	12'-5"	-
	16" o.c.	8'-1"	7'-9"	7'-7"	7'-5"	11'-3"	-
	24" o.c.	7'-0"	6'-9"	6'-8"	6'-5"	9'-10"	-
2x6	12" o.c.	13'-11"	13'-6"	13'-2"	12'-9"	19'-6"	10'-9"
	16" o.c.	12'-8"	12'-3"	12'-0"	11'-8"	17'-8"	9'-2"
	24" o.c.	11'-1"	10'-8"	10'-6"	10'-2"	15'-6"	8'-6"
2x8	12" o.c.	18'-5"	17'-9"	17'-5"	16'-10"	25'-8"	14'-2"
	16" o.c.	16'-9"	16'-2"	15'-10"	15'-4"	23'-4"	12'-10"
	24" o.c.	14'-7"	14'-1"	13'-9"	13'-5"	20'-5"	11'-3"
2x10	12" o.c.	23'-6"	22'-8"	22'-2"	21'-6"	26'-0" Max.	18'-0"
	16" o.c.	21'-4"	20'-7"	20'-2"	19'-7"		16'-5"
	24" o.c.	18'-8"	18'-0"	17'-6"	16'-9"		14'-4"
2x12	12" o.c.	28'-7"	27'-7"	27'-0"	26'-2"	-	21'-11"
	16" o.c.	26'-0"	25'-1"	24'-7"	23'-10"	-	19'-11"
	24" o.c.	22'-1"	21'-0"	20'-4"	19'-5"	-	17'-5"

Roof rafters NOT supporting a ceiling are based on a 7psf dead load for light roofing and 10psf dead load for heavy roofing. Roof rafters supporting a ceiling are based on 12psf dead load for light roofing and 15psf dead load for heavy roofing.

All roof rafters are based on a 20psf live load. All deflections are limited to L/240. Ceiling Joists are based Table 23-IV-J-3. Floor joist are based on Table 23-IV-J-1

**FLOOR GIRDER AND INDIVIDUAL PIER SIZING TABLE FOR DOUGLAS FIR-LARCH No.1**

Max. Spacing of Floor Girders	Max. Floor Girder Span	Min. Size of Floor Girder	Min. Area Of Individual Pier
4'-0"	4'-10"	4x4	12"x12"
4'-0"	5'-6"	4x4	14"x14"
5'-0"	5'-0"	4x4	15"x15"
6'-0"	4'-6"	4x4	15"x15"
5'-0"	7'-5"	4x6	18"x18"
6'-0"	6'-9"	4x6	18"x18"
7'-0"	6'-0"	4x6	18"x18"
8'-0"	5'-9"	4x6	24"x24"
6'-0"	8'-11"	4x8	24"x24"
7'-0"	8'-3"	4x8	24"x24"
8'-0"	7'-8"	4x8	24"x24"
9'-0"	7'-3"	4x8	24"x24"
10'-0"	6'-10"	4x8	24"x24"
7'-0"	10'-7"	4x10	24"x24"
8'-0"	9'-11"	4x10	24"x24"
9'-0"	9'-3"	4x10	30"x30"
10'-0"	8'-10"	4x10	30"x30"

Values in this table may be interpolated. Girders and piers are based on 40 psf live load, 10 psf dead load, and live load deflection is limited to L/360. Pier areas are based on a 1000 psf allowable soil bearing pressure.

**Table for Package D Requirements**

	Climate Zone 6		Climate Zone 8		Climate Zone 9	
	Basic Package D	Alternate Package D	Basic Package D	Alternate Package D	Basic Package D	Alternate Package D
Ceiling	R-30	R-30	R-30	R-30	R-30	R-30
Wall	R-13	R-13	R-13	R-13	R-13	R-13
Raised Floor	R-19	R-19	R-19	R-19	R-19	R-19
Max. Glazing Area	20%	20%	20%	20%	20%	20%
Glazing U-Value	0.75	0.55	0.75	0.4	0.75	0.4
Glazing SHGC	--	--	0.4	0.35	0.4	0.35
Roof	RB	NR	RB	NR	RB	NR
Duct	Sealed	NR	Sealed	NR	Sealed	NR
TXV	TXV	NR	TXV	NR	TXV	NR
SEER	Min.	Min.	Min.	Min.	Min.	11

Basic Package D requires third party inspection (HERS rater)

R= Required

NR= Not required

RB= Radiant Barrier at Roof

SEALED= Ducts to have less than 6% leakage (must be field verified by HERS rater).

TXV= Thermostatic Expansion Valve in split system air conditioner (must be field verified by HERS rater).

SEER= Air Conditioner Seasonal Energy Efficiency Ratio.

SHGC= Window Solar Heat Gain Coefficient.

**ALTERNATE BRACED PANEL**  
[SECTION 2320.11.4]  
1998 CALIFORNIA BUILDING CODE

8d TOENAILS AT 6" oc OR  
FRAMING ANCHORS AT 32" ARE  
REQUIRED

ROOF OR FLOOR SHEATHING

3/8" STRUCTURAL PLYWOOD WITH 8d COMMON NAILS  
AT 6" oc AT PANEL EDGES (EN) AND 12" oc AT  
INTERMEDIATE MEMBERS (FN). PANEL SHALL BE 2'-8"  
MINIMUM IN LENGTH AND 10'-0" MAXIMUM IN HEIGHT.  
(\*\*)

ROOF RAFTERS  
TYPICAL

2 INCH MINIMUM  
BLOCKING TYPICAL

CONTINUOUS 2-2X4  
TOP PLATES

WALL STUDS AT  
16" oc TYPICAL.

4X4 END POSTS  
EACH SIDE

FN

EN

EN

2X SILL PLATE

#4 REBARS

3" CLEAR (TYP.)

APPROVED TIE-DOWN OR HOLDOWN DEVICE ON EACH END WITH AN  
UPLIFT CAPACITY OF NOT LESS THAN 1800 LB AND INSTALLED PER  
MANUFACTURER'S SPECIFICATIONS (\*\*)

STANDARD CONTINUOUS FOOTING  
WITH 1-#4 REBAR TOP AND 1-#4  
REBAR BOTTOM MINIMUM

(\*\*) PANELS LOCATED ON THE  
FIRST STORY OF TWO STORY  
BUILDINGS SHALL CONFORM  
TO THE FOLLOWING:

1. PLYWOOD SHEATHING SHALL BE APPLIED ON BOTH SIDES.
2. TIE-DOWN OR HOLDOWN DEVICES SHALL HAVE UPLIFT CAPACITY OF NOT LESS THAN 3000 POUNDS.
3. THREE ANCHOR BOLTS SHALL BE PLACED AT ONE-FIFTH POINTS.

**THE DISCRETION OF THE  
BUILDING DEPARTMENT  
BASED ON INDIVIDUAL  
CONDITIONS**

ANCHOR BOLTS - TWO 5/8"  
DIAMETER BOLTS, WITH 7"  
MINIMUM EMBEDMENT, WITH  
2"X2"X3/16" SQUARE WASHER,  
AND PLACED AT PANEL QUARTER  
POINTS. (\*\*)

