

A. General

Applicable codes. All projects will comply with the following building codes and associated City of Moreno Valley amendment.

2022 California Building Code (CBC) and/or California Residential Code (CRC)
 2022 California Green Building Standards Code (CalGreen)
 2022 California Electrical Code (CEC)
 2022 California Mechanical Code (CMC)
 2022 California Plumbing Code (CPC)
 2022 California Fire Code (CFC)
 2022 California Building Energy Efficiency Standards (CEES)

B. Electrical, Plumbing, and Mechanical

- Exterior lighting.** All projects shall comply with the City of Moreno Valley lighting ordinance.
- GFCI outlets.** Ground Fault Circuit Interrupter (GFCI) outlets are required in bathrooms, at kitchen countertops, at laundry and wet bar sinks, in garages, in crawlspaces, in unfinished basements, and outdoors. (CEC 210.8)
- AFCI outlets.** Electrical circuits in bedrooms, living rooms, dining rooms, dens, closets, hallways, or similar rooms must be protected by Arc Fault Circuit Interrupters (AFCI). (CEC 210.12)
- Luminaire requirements.** Installed luminaires shall meet the efficacy and fixture requirements of CEES 150.0(k).
- Smoke detectors in building remodels.** Smoke detectors are required in each existing sleeping room, outside each separate sleeping area in the immediate vicinity of sleeping rooms, and on one story of a dwelling including basements. Battery-operated detectors are acceptable in existing areas with no construction taking place and in alterations not resulting in removal of interior wall or ceiling finishes and without access via an attic, crawl space, or basement. (CRC R313.4)
- Carbon monoxide detectors in building remodels.** Carbon monoxide detectors are required outside each separate sleeping area in the immediate vicinity of sleeping rooms and on each story of a dwelling including basements. Battery-operated detectors are acceptable in existing areas with no construction taking place and in alterations not resulting in removal of interior wall or ceiling finishes and without access via an attic, crawl space, or basement. (CRC R315.3)
- Water heater seismic strapping.** Minimum two 3/4-inch-by-24-gauge straps required around water heaters, with 1/4-inch-by-3-inch lag bolts attached directly to framing. Straps shall be at points within upper third and lower third of water heater vertical dimension. Lower connection shall occur minimum 4 inches above controls. (CPC 507.2)
- Gas appliances in garages.** Water heaters and heating/cooling equipment capable of igniting flammable vapors shall be placed on minimum 18-inch-high platform unless listing report number permit showing ignition. (CPC 507.13 and CMC 305.1)
- Impact protection of appliances.** Water heaters and heating/cooling equipment subject to vehicular impact shall be protected by bollards or an equivalent measure. (CPC 507.13.1 and CMC 305.1.1)
- Water closet clearance.** Minimum 30-inch-wide by 24-inch-deep clearance required at front of water closets. (CPC 402.5)
- Show size.** Shower compartments shall have minimum area of 1024 square inches and be able to encompass a 38-inch-diameter circle. Shower doors shall have a minimum 22-inch unobstructed width. (CPC 408.5 and CPC 408.6)
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- Fireplace appliances.** Fireplaces with gas appliances are required to have the fire damper permanently fixed in the open position and fireplaces with LPG appliances are to have no "pilot" or "sump" configurations. (CMC 303.1.1)
- Chimney clearance.** Minimum 2-foot chimney clearance required above building within 10-foot horizontally of chimney. The chimney shall extend minimum 3 feet above highest point where chimney passes through roof. (CRC R1003.9)

C. Mechanical Ventilation and Indoor Air Quality (ASHRAE 62.2-2010)

- Transfer air.** Ventilation air shall be provided directly from the outdoors and not as transfer air from adjacent dwelling units or other spaces, such as garages, unconditioned crawlspaces, or conditioned attics. (CEES 150.0(i))
- Instructions and labeling.** Ventilation system controls shall be labeled, and the homeowner shall be provided with instructions on how to operate the system. (CEES 150.0(i))
- Combustion and solid-fuel burning appliances.** Combustion appliances shall be properly vented and air systems shall be designed to prevent back drafting. (CEES 150.0(i))
- Garages.** The wall and openings between occupiable spaces and the garage shall be sealed. HVAC systems that include air handlers or return ducts located in garages shall have total air leakage of no more than 6% of total floor area when measured at 0.1 in. w.c. using California Title 24 or equivalents. (CEES 150.0(e))
- Minimum filtration.** Mechanical systems supplying air to occupiable space through ductwork shall be provided with a filter having a minimum efficiency of MERV 6 or better. (CEES 150.0(i))
- Air inlets.** Air inlets (not exhaust) shall be located away from known contaminants. (CEES 150.0(f))
- Air moving equipment.** Air moving equipment used to meet either the whole-building ventilation requirement or the local ventilation exhaust requirement shall be rated in terms of airflow and sound. (CEES 150.0(i))

- Continuously operating fans shall be rated at a maximum of 1.0 sone.
- Intermittently operated whole-building ventilation fans shall be rated at a maximum of 1.0 sone.
- Intermittently operated local exhaust fans shall be rated at maximum of 3.0 sone.

- Remotely located air-moving equipment (mounted outside of habitable spaces) need not meet sound requirements if at least 4 feet of ductwork between fan and intake grill.

D. Foundation and Underfoot

- Foundation reinforcement.** Continuous footings and stem walls shall be provided with a minimum two longitudinal No. 4 bars, one at the top and one at the bottom of the footing. (CRC R403.1.3.3)
- Shear wall foundation support.** Shear walls shall be supported by continuous foundations. (CRC 403.1.2)
- Concrete slabs-on-grade.** Slabs-on-grade shall be minimum 3-1/2-inches thick. (CRC R506.1)
- Vapor retarder.** A 10-mil polyethylene or approved vapor retarder with joints lapped minimum 6 inches shall be placed between a concrete slab-on-grade and the base course or subgrade. (CRC 506.2.3)
- Anchor bolts and sills.** Foundation plates or sills shall be bolted and anchored to the foundation or foundation wall per the following (CRC R403.1.6 and CRC R602.11.1):
 - Minimum 1/2-inch-diameter steel bolts
 - Bolts embedded at least 7 inches into concrete or masonry
 - Bolts spaced maximum 6 feet on center
 - Minimum two bolts per plate/sill piece with one bolt located maximum 12 inches and minimum 10 bolt diameters from each end of each sill plate/beam
 - Minimum 3-inch by 3-inch by 1/29-inch steel plate washer between sill and nut on each bolt
- Hold-downs.** All hold-downs must be tied in place prior to foundation inspection.
- Protection of wood against decay.** Naturally durable or preservative-treated wood shall be provided in the following locations (CRC R311.1):
 - All wood in contact with ground, embedded in concrete in direct contact with ground, or embedded in concrete exposed to weather
 - Wood joists within 18 inches and wood girders within 12 inches of the exposed ground in crawl spaces shall be of naturally durable or preservative-treated wood
 - Wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches from exposed earth shall be of naturally durable or preservative-treated wood
 - Wood framing, sheathing, and siding on the exterior of the building and having clearance less than 6 inches from the exposed ground or less than 2 inches vertically from concrete steps, porches, patios, and similar horizontal surface exposed to weather
 - Sills and sleepers on concrete or masonry slab in direct contact with ground unless separated from such slab by impervious moisture barrier
 - Ends of wood girders entering masonry or concrete walls with clearances less than 1/2 inch on tops, sides, and ends
 - Wood structural members supporting moisture-permeable floors or roofs exposed to weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier
- Underfoot ventilation.** Underfoot areas shall have ventilation openings through foundation walls or exterior walls, with minimum net area of ventilation openings of 1 square foot for each 150 square feet of underfoot area. On such ventilating opening shall be within 3 feet of each corner of the building. (CRC R408.1)
- Underfoot access.** Underfoot areas shall be provided with a minimum 18-inch by 24-inch access opening. (CRC R408.4)

E. Wood Framing

- Fastener requirements.** The number, size, and spacing of fasteners connecting wood members/elements shall not be less than that set forth in CRC Table R602.3(1), (CRC R502.9, CRC R602.3, and CRC R602.2)
- Stud size, height, and spacing.** The size, height, and spacing of studs shall be in accordance with CRC Table R602.3(5), (CRC R602.3.1)

E. Wood Framing (Continued)

- Sill plate.** Studs shall have full bearing on nominal 2-inch-thick or larger sill plate with depth at least equal to the stud width. (CRC R602.3.4)
- Bearing studs.** Where joists, trusses, or rafters are spaced more than 16 inches on center and the bearing studs below are spaced 24 inches on center, such members shall be nailed with 5 inches of the studs beneath. (CRC R602.3.3)
- Drilling and notching of studs.** Any stud in an exterior wall or bearing partition may be cut or notched to a depth not exceeding 25% of its width. Studs in nonbearing partitions may be notched to a depth not to exceed 40% of a single stud width. Any stud may be bored or drilled, provided the diameter of the resulting hole is no more than 60% of the stud width, the edge of the hole is no more than 5/8 inch to the edge of the stud, and the hole is not located in the same section as a cut or notch. Studs located in exterior wall or bearing partitions need not be over 40% and up to 60% shall also be doubled with not more than two successive studs bored. (CRC R602.6)
- Top plate.** Wood stud walls shall be capped with a double top plate installed to provide overlapping at corners and at intersections with other partitions. End joints in double top plates shall be offset at least 24 inches. Joints in plates need not occur over studs. Plates shall be minimum nominal 2 inches thick and have width at least equal to width of studs. (CRC R602.3.2)
- Top plate splices.** Top plate lap splices shall be face-nailed with minimum 8 16d nails on each side of splice. (CRC R602.10.9.1)
- Drilling and notching of top plate.** When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling, or notching of the top plate by more than 50% of its width, a galvanized metal tie not less than 0.054-inch thick and 1-1/2 inches wide shall be fastened across and to the plate at each side of the opening with not less than 8 16d nails having a minimum length of 1-1/2 inches at each side or equivalent. The metal tie must extend minimum 6 inches past the opening. (CRC R602.6.1)
- Cripple walls.** Foundation cripple walls shall be framed of studs not less in size than the stud above. Cripple walls more than 4 feet in height shall have studs sized as required for an additional story. Cripple walls with studs less than 14 inches shall be sheathed on one side at least one side with a wood structural panel fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking. Cripple walls shall be supported on continuous foundations. (CRC R602.9)
- Wall bracing.** Buildings shall be braced in accordance with the methods allowed per CRC R602.10.2 and CRC R602.10.4, and/or CRC R602.10.5.
- Braced wall line spacing.** Spacing between braced wall lines shall not exceed 20 feet or alternate provisions of CRC R602.10.1.3.
- Shear wall cumulative length.** The cumulative length of shear walls within each braced wall line shall meet the provisions of CRC Table R602.10.3(1) for wind loads and CRC Table R602.10.3(2) for seismic loads. (CRC R602.10.3)
- Shear wall spacing.** Shear walls shall be located not more than 25 feet on center. (CRC R602.10.2.2)
- Shear wall offset.** Shear walls may be offset out-of-plane not more than 4 feet from the designated braced wall line and not more than 8 feet from any other offset wall considered part of the same braced wall line. (CRC R602.10.1.2)
- Shear wall location.** Shear walls shall be located at the ends of each braced wall line or meet the provisions of CRC R602.10.2.
- Individual shear wall length.** Shear walls shall meet minimum length requirements of CRC R602.10.6.5.1
- Cripple wall bracing.** Cripple walls shall be braced per CRC R602.10.11.
- Shear wall and diaphragm nailing.** All shear walls, roof diaphragms, and floor diaphragms shall be nailed to supporting construction per CRC Table R602.3(1), (CRC R604.3)
- Shear wall joints.** All vertical joints in shear wall sheathing shall occur over, and be fastened to, common studs. Horizontal joints in shear wall sheathing shall occur over, and be fastened to, 1-1/2-inch-thick blocking. (CRC R602.10.10)
- Framing over openings.** Headers, double joists, or trusses of adequate size to transfer loads to vertical members shall be provided over window and door openings in load-bearing walls and partitions. (CBC 2304.3.2)
- Joists under bearing partitions.** Joists under parallel bearing partitions shall be of adequate size to support the load. Double joists, sized to adequately support the load, that are spaced to permit the installation of piping or vents shall be full-depth solid-blocked with minimum 2-inch nominal lumber spaced at maximum 4 feet on center. Bearing partitions perpendicular to joists shall be offset from supporting girders, walls, or partitions more than the joint depth unless such joists are of sufficient size to carry the additional load. (CRC R502.4)
- Joists above or below shear walls.** Where joists are perpendicular to a shear wall above or below, a rim joint, band joint, or blocking shall be provided along the entire length of the shear walls. Where joists are parallel to a shear wall above or below, a rim joint, end-joist, or other parallel framing shall be provided directly above and/or below the shear wall. Where a parallel framing member cannot be located directly above and/or below the shear wall, full-depth blocking at 16-inch spacing shall be provided between the parallel framing members to each 150 (lb/ft).
- Floor member bearing.** The ends of each floor joist, beam, or girder shall have minimum 1-1/2 inches of bearing on wood or metal and minimum 3 inches of bearing on masonry or concrete except where supported on a 1-inch-by-4-inch ribbed nbsp strap and nailed to the adjoining stud or by the use of approved joist hangers. (CRC R502.6)
- Floor joist lap.** Floor joists framing opposite sides of a bearing support shall lap minimum 3 inches and shall be nailed together with minimum 3 10d face nails. A wood or metal splice with strength equal to or greater than that provided by the lap is permitted. (CRC R502.6.1)
- Floor joist-to-girder support.** Floor joists framing into the side of a wood girder shall be supported by approved framing anchors or on ledger strips minimum nominal 2 inches by 2 inches. (CRC R502.6.2)
- Floor joist lateral restraint.** Floor joists shall be supported laterally at ends and each intermediate support by minimum 2-inch full-depth blocking, by attachment to full-depth header, band joint, or rim joint, to an adjoining stud, or shall be otherwise provided with lateral support to prevent rotation. (CRC R502.7)
- Floor joist bridging.** Floor joists exceeding nominal 2 inches by 12 inches shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1-inch-by-3-inch strip nailed across the bottom of joists perpendicular to joists at maximum 8-foot intervals. (CRC R502.7.1)
- Framing of floor openings.** Openings in floor framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4 feet, the header joist may be a single member the same size as the floor joist. Single trimmer joists may be used to carry a single header joist located within 3 feet of the trimmer joist bearing. When the header joist span exceeds 4 feet, the trimmer joists and 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-to-trimmer-joint connections when the header joist span exceeds 6 feet. Tail joists over 12 feet long shall be supported at the header by framing anchors or on ledger strips minimum 2 inches by 2 inches. (CRC R502.10)
- Girders.** Girders for single-story construction or girders supporting loads from a single floor shall not be less than 4 inches by 8 inches for spans 6 feet and less, provided that girders are spaced not more than 8 feet on center. Other girders shall be designed to support the loads specified in the CBC. Girder end joints shall occur over supports. When a girder is spliced over a support, an adequate tie shall be provided. The ends of beams or girders supported on masonry or concrete shall not have less than 3 inches of bearing. (CBC 2308.7)
- Ridge, hips, and valleys.** Rafter shall be framed to a ridge board, or to each other with a gusset plate as a tie. Ridge boards shall be minimum 1 inch nominal thickness and not less in depth than the cut end of the rafter. At all valleys and hips, there shall be a valley or hip rafter not less than 2-inch nominal thickness and not less in depth than the cut end of the rafter. Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point. Where the roof pitch is less than 3:12 slope (25% gradient), structural members that support rafters and ceiling joists, such as hips, ridges, and valleys, shall be designed as beams. (CRC R502.3)
- Ceiling joist and rafter connections.** Ceiling joists and rafters shall be nailed to each other per CRC Table R602.5.1(9), and the rafter shall be nailed to the wall top plate per CRC Table R602.3(1). Ceiling joists shall be continuous or securely joined per CRC Table R602.5.1(9) where they meet over interior partitions and are nailed to adjacent rafters to provide a continuous tie from rafters to rafters, rafter ties shall be installed. Rafters ties shall be minimum 2 inches wide by 1/2 inches nominal, installed per CRC Table R602.5.1(9), or connections of equivalent capacities shall be provided. Where ceilings joists or rafter ties are not provided, the ridge formed by these rafters shall be supported by a wall or engineer-designed girder. (CRC R602.3.1)
- Ceiling joists lapped.** Ends of ceiling joists shall be lapped minimum 3 inches or butted overbearing partitions or beams and toenailed to the bearing element. Where ceiling joists provide resistance to rafter thrust, lapped joists shall be nailed together per CRC Table R602.3(1) and butted joists shall be tied together in a manner to resist such thrust. (CRC R602.3.1)
- Collar ties.** Collar ties or ridge straps to resist wind uplift shall be connected in the upper third of the attic space. Collar ties shall be a minimum 1 inch by 4 inches nominal and spaced at maximum 4 feet on center. (CRC R602.3.1.4)
- Purlins.** Purlins installed to reduce the span of rafters shall be sized not less than the required size of the rafters they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch nominal braces installed to bearing walls at a minimum 45-degree slope from horizontal. The braces shall be spaced maximum 4 feet on center with a maximum 8-foot unbraced length. (CRC R602.5.1)
- Roofing member bearing.** The ends of each rafter or ceiling joist shall have not less than 1-1/2 inches of bearing on wood or metal and not less than 3 inches of bearing on masonry or concrete. (CRC R602.6)
- Roofing member lateral support.** Roof framing members and ceiling joists with a nominal depth-to-thickness ratio exceeding 5:1 shall be provided with lateral support at points of bearing to prevent rotation. (CRC R602.6)
- Roofing blocking.** Rafters and ceiling joists with a nominal depth-to-thickness ratio exceeding 6:1 shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1-inch-by-3-inch wood strip nailed across the rafters or ceiling joists at maximum 8-foot intervals. (CRC R602.6.1)

E. Wood Framing (Continued)

- Framing of roofceiling openings.** Openings in roof and ceiling framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4 feet, the header joist may be a single member the same size as the ceiling joist or rafter. Single trimmer joists may be used to carry a single header joist located within 3 feet of the trimmer joist bearing. When the header joist span exceeds 4 feet, the trimmer joists and header joist shall be doubled and of sufficient cross-section to support the ceiling joists or rafters framing into the header. Approved hangers shall be used for the header-joist-to-trimmer-joint connections when the header joist span exceeds 6 feet. Tail joists over 12 feet long shall be supported at the header by framing anchors or on ledger strips minimum 2 inches by 2 inches. (CRC R502.10)
- Roof framing above shear walls.** Rafters or roof trusses shall be connected to top plates of shear walls with blocking between the rafters or trusses. (CRC R602.10.8)
- Roof diaphragm under fill framing.** Roof plywood shall be continuous under California fill framing.
- Roof diaphragm at ridges.** Minimum 2-inch nominal blocking required for roof diaphragm nailing at ridges. (CRC R602.10.9)
- Blocking of roof trusses.** Minimum 2-inch nominal blocking required between trusses at ridge lines and at points of bearing at exterior walls.
- Truss clearance.** Minimum 1/2-inch clearance required between top plates of interior non-bearing partitions and bottom chords of trusses.
- Drilling, cutting, and notching of roof/rafter framing.** Notches in solid lumber joists, rafters, blocking, and beams shall not exceed one-sixth the member depth, shall not be longer than one-third the member depth, and shall not be located in the middle one-third of the span. Notches at member ends shall not exceed one-fourth the member depth. The tension side of members 4 inches or greater in nominal thickness shall not be notched except at member ends. The diameter of holes bored into members shall not exceed one-third the member depth. Holes shall not be closer than 2 inches 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 inches to the notch. (CRC R602.10.1)
- Exterior ledgers, decks, balconies, and stairs.** Such elements shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal. (CRC R311.3)
- Fireblocking.** Fireblocking shall be provided in the following locations (CRC R302.11 and CRC R1003.19):
 - In concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows:
 - Vertically at the ceiling and floor levels
 - Horizontally at intervals not exceeding 10 feet
 - At all intersections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, and cove ceilings
 - In concealed spaces between stair stringers at the top and bottom of the run
 - At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion
 - At chimneys and fireplaces per item E.49
 - Corones of a two-family dwelling at the line of dwelling-unit separation

- Fireblocking materials.** Except as otherwise specified in Items E.48 and E.49, fireblocking shall consist of the following materials with the integrity maintained (CRC R302.11.1):
 - Two-inch nominal lumber
 - Two thicknesses of one-inch nominal lumber with broken lap joints
 - One thickness of 23/32-inch wood structural panel with joints backed by 23/32-inch wood structural panel
 - One thickness of 3/4-inch particleboard with joints backed by 3/4-inch particleboard
 - 1/2-inch gypsum board
 - 1/4-inch cement-based millboard
 - Batts or blankets of mineral or glass fiber of approved materials installed in such a manner as to be securely retained in place. Batts or blankets of mineral or glass fiber or other approved non-rigid materials shall be permitted for compliance with the 10-foot-block fireblocking in walls constructed using parallel rows of studs or staggered studs. Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross-section of the wall cavity to a minimum height of 18 inches measured vertically. When piping, conduit, or similar obstructions are encountered, the insulation shall be installed around the obstruction. Loose-fill insulation material shall not be used as a fireblock unless specifically tested in the form of a fire and burner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

- Fireblocking at openings around vents, pipes, ducts, cables, and wires at ceiling and floor level.** Such openings shall be fireblocked with an approved material to resist the free passage of flame and products of combustion. (CRC R302.11)

- Fireblocking of chimneys and fireplaces.** All spaces between chimneys and floors and ceilings through which chimneys pass shall be fireblocked with noncombustible material in walls constructed using parallel rows of studs or staggered studs. Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross-section of the wall cavity to a minimum height of 18 inches measured vertically. When piping, conduit, or similar obstructions are encountered, the insulation shall be installed around the obstruction. Loose-fill insulation material shall not be used as a fireblock unless specifically tested in the form of a fire and burner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

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