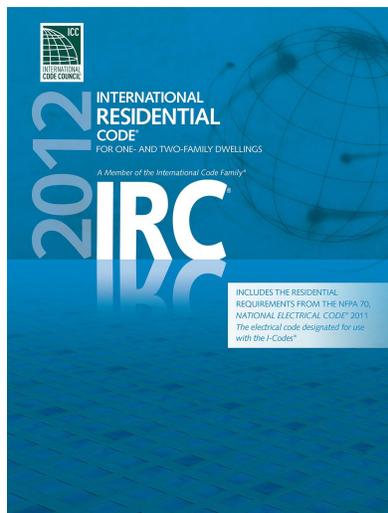




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Builder's Guide for One & Two Family Residential Dwellings



INSPECTIONS DEPARTMENT

817- 427-6300

**24 Hour Inspection Request Line
Facsimile**

**817-427-6333
817-427-6303**

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GENERAL INFORMATION

The purpose of this ***Builder's Guide*** is to aid building contractors and home owners by (1) describing the general requirements for obtaining a building permit, (2) scheduling inspections at the proper stages of construction, and (3) identifying the key elements reviewed by the building inspector during an inspection. This document is not a code book and does not waive or supersede any building code requirements or other ordinances adopted by the city. City of North Richland Hills has adopted the codes listed below. However, amendments are made from time to time and contractors are encouraged to obtain copies of these amendments from a customer service representative at the Permits Desk in city hall. This document is an assistance guide only.

1. International Residential Code, 2012, with local amendments
2. National Electric Code, 2014, with local amendments
3. International Plumbing Code, 2012, with local amendments
4. International Mechanical Code, 2012, with local amendments
5. International Energy Conservation Code, 2009, with NCTCOG amendments
6. International Fuel Gas Code, 2012, with local amendments
7. International Fire Code, 2012, with local amendments

BASIC REQUIREMENTS FOR OBTAINING A BUILDING PERMIT

Prior to obtaining a building permit, the lot (location) is required to be platted as a lot of record and zoned with a residential zoning designation. The zoning district will establish certain requirements such as dwelling size; front, side and rear yard setbacks; rear yard open space requirement; minimum masonry coverage requirements and garage entry location and setbacks. If the lot is platted and zoned, the following submittal is required to apply for a building permit:

1. A completed Building Permit Application.
2. Two scaled and dimensioned site plans showing:
 - a. The building footprint, setback dimensions, drive approach location, retaining wall locations and all easements. Please note: Nearly all residential zones require side entry garages with a minimum of 22'-0" of drive paving measured from the face of the structure to the edge of paving.
 - b. Required landscaping. At least 3-3" caliper trees, selected from the City's approved list must be planted with each new single family home. At least one of the trees must be located in the front yard. List specie on the site plan.
 - c. Existing "protected trees." The site plan must identify all existing "protected trees" on the lot. Show all "protected trees" to be removed. Show all "replacement trees" (see ***Information Bulletin #380*** for additional information). List caliper, specie and height.
3. Two B size scaled and dimensioned floor plans (18" X 24").
4. Scaled and dimensioned elevations showing that the masonry coverage of each exterior elevation is no less than 85% coverage - less doors and windows. The remaining 15% of each elevation may be of cellulose reinforced cement board, provided it is installed at least eight (8') feet above grade. Hardie-type materials are not considered a form of masonry. Note: Planned Developments , TOD & Town Center zoning districts may have different masonry requirements.
5. If the foundation is of a post tension design, provide **one** original foundation letter from an engineer licensed to practice in the State of Texas with the following information:
 - a. Statement that the foundation is designed in accordance with the 2012 Edition of the International Residential Code and the 2012 International Building Code utilizing the specifications of the Post-tensioning Institute,
 - b. Date of soils test, reference number of report of soils test and the laboratory that performed the soils test,
 - c. Reference the building site by legal description and address, and
 - d. Original signature and seal of the designing engineer.

6. If the foundation is **not** a post tension engineered slab, provide 2 sets of scaled and dimensioned foundation plans in accordance with accepted city standards as provided for in the city Code of Ordinances.
7. The applicant must submit a grading plan for review and approval. Grading Plans for individual lots must reflect the grading plan of the subdivision on file with the City. Lots that do not meet the subdivision grading plan must provide an engineered design.
8. Any pertinent information for unusual and other than conventional construction.
9. Additional items as required by the Building Official.

ADDITIONAL INFORMATION RELATING TO THE ISSUANCE OF BUILDING PERMITS

1. When the permit is approved, the applicant will be provided a copy of the lot-grading plan that is on file with the City along with the other "APPROVED" contractor's copies. The contractor must have plans on the job at all times.
2. For post tension foundations, the building contractor will be required to have a set of sealed engineered foundation plans on the construction site when the foundation inspection is requested.
3. Separate permits are required for electrical, plumbing, air conditioning, paving (concrete), fences and lawn irrigation; and may only be issued to appropriately licensed and/or registered contractors. Home owners may do their own plumbing and mechanical work provided they can establish the following: 1) Owner/occupants must occupy the dwelling as their permanent residence; 2) Owner/occupants must obtain appropriate trade permits and inspections; 3) The dwelling must be in livable condition. Owner/Occupant home owners may not install their own electrical work, unless they can fully verify they possess adequate technical knowledge of the electrical code to the Building Official.
4. The general contractor may purchase all of the permits if each subcontractor is validated (see attached **Information Bulletin #103**).
5. It is the City's goal to review one & two family applications in not more than 5 working days. If additional information is requested, a second review period will commence with the receipt of the requested information.

GENERAL ADMINISTRATIVE GUIDELINES

1. Office hours are 8:00 am to 5:00 pm Monday through Friday excluding holidays.
2. The voice recorder number to schedule an inspection is 427-6333. Requests for inspections may be phoned in 24 hours, 7 days a week. Request for inspections are taken off the recorder at 8:00 a.m. daily and will be performed by the end of the workday. Due to the scheduling and routing constraints of the building inspectors, a.m. and p.m. inspection request cannot be guaranteed. Inspections may also be requested online at www.nrhtx.com.
3. In general, at the discretion of the building inspector, a \$38.00 re-inspection fee may be charged when:
 - a. The requested inspection is not ready.
 - b. The building is locked.
 - c. The requested inspection has previously received a red-tag and not corrected.
 - d. Not meeting the requirements outlined in this guide.
 - e. The plans are not available when requested by the inspector.
 - f. Refuse container not provided or utilized.
 - g. Identical deficiencies performed by the same contractor on different projects
 - h. Vital access or equipment is not provided that is necessary to complete the inspection (i.e. pressure gauge, water test riser, ladders, etc.).
4. A second re-inspection fee for repeat items may be assessed at \$73.00. All subsequent re-inspection fees may be assessed at \$122.00.
5. No construction may begin until a building permit has been issued. "Protected trees" may not be removed until a building permit is issued.
6. All "protected trees" must be fenced according to the Tree Preservation ordinance. (**See Information bulletin #380 for additional information**).

CONTRACTORS GUIDE FOR 1 AND 2 FAMILY RESIDENTIAL DWELLINGS

7. The building permit (yellow job site display) must be displayed on the job site at or in front of the building line at all times until after final inspection.
8. Post Tension Foundation Plans (sealed by an engineer) shall be available on the job site if requested by the Inspector when inspections are conducted. It is recommended that the plans be kept in a "PVC" tube or plastic envelope to protect the plans from weather.
9. Temporary heat may be released during extreme cold weather. **See Information Bulletin #503 for procedure.**
10. If a licensed construction debris waste hauler is provided by the builder, refuse may be stored on site in a container not less than 256 cubic feet (8ft x 8ft x 4ft) on the job site at all times. All site-built containers must be equipped with lids or tarps to prevent refuse from blowing out of the container. The general contractor is responsible for making sure that all subcontractors place blowing trash in the refuse container. The refuse container must be on the job-site at the plumbing rough stage. Requested inspections will not be performed, and a red-tag will be left with a re-inspection fee if trash is blowing or loose on the job site, on adjacent property or in the street. No inspection will be made until all trash has been properly contained.
11. If a licensed construction debris waste hauler is NOT provided, the builder must contract with the city's solid waste franchisee (Duncan Disposal, 817-317-2450) to provide the storage and removal of construction debris. The use of alternate solid waste providers other than the city's franchisee is prohibited by Ordinance #2688. Requested inspections will not be performed, and a red-tag will be left with a re-inspection fee if a waste hauler other than the city's solid waste franchisee is utilized. No inspection will be made until the "bandit" container(s) is removed.
12. No concrete or plumbing rough inspections will be made if it is raining or too wet. **All inspections missed due to rainy weather must be recalled.**
13. No concrete inspections will be made unless the temperature is 35 degrees or above and rising. Concrete that is poured and subject to freezing conditions within 72 hours following the pour, must be protected from freezing.
14. Do not lay brick unless the temperature is 35 degrees or above and rising.
15. Inspection tags will be left for each inspection called. **Please** call the IVR system (817) 427-6314 or go to www.nrhtx.com to check the status of an inspection.
16. Inspectors are available from 8:00 a.m. to approximately 8:30 a.m. and from approximately 4:00 p.m. to 4:30 p.m. daily to respond to questions concerning inspections.

INSPECTIONS REQUIRED

This **Contractor's Guide** describes each required inspection in detail. Items listed are those of conventional construction requirements as required by code. Items considered as **unconventional construction items** are listed, however, the specifics are covered elsewhere in this guide. Not all items reviewed by a building inspector may necessarily be listed in these descriptions. Items not included in these inspection descriptions may be found in the codes and ordinances adopted by the City.

The **Information Bulletins** attached to this **Contractor's Guide**, will provide additional information to the contractor regarding specific items.

The following is a list of the **minimum** on-site inspections required for all new one & two family residential dwellings. Not all of the listed inspections will apply to additions and alterations to existing one and two family dwellings. Other inspections may be needed as determined by the Building Official or as specific job-site conditions dictate.

1. Rough Plumbing
2. Foundation
3. 2nds (Framing, rough electric, plumbing top-out, a/c rough-in, wall ties)
4. Insulation
5. Drive Approach, Driveway and Sidewalks
6. Final

TEMPORARY ELECTRICAL POLE INSPECTION

Scheduling: This inspection may be performed at any time after the building permit has been issued.

General Inspection Items:

1. Pole is located on lot for which the permit is issued.
2. "Protected Trees" must be fenced.
3. Pole complies with guidelines set forth by Oncor Electric regarding height, burial depth, and bracing (see attached illustrations)
4. All 15- and 20-amp 120-volt receptacles are G.F.C.I. protected.
5. Temporary service is properly grounded.
6. No uncovered or open blanks in the breaker panel.
7. Minimum clearances for overhead service drops.

FORM BOARD SURVEY SUBMITTAL

Scheduling: A **Form Board Survey** must be submitted for review before scheduling a plumbing rough inspection.

General Submittal Items:

1. **Form Board Survey** has been prepared by a registered professional engineer or a registered surveyor.
2. **Form Board Survey** indicates the foundation elevation above curb in inches at the center of the lot (15 inches minimum).
3. **Form Board Survey** indicates the actual finished pad elevation.
4. **Form Board Survey** indicates the finished floor elevation.
5. **Form Board Survey** indicates all set back lines established by zoning (front yard, side yards, rear yard and side entry garage setback).

PLEASE NOTE: As identified by the plans examiner, some finished foundation elevations are required to be 1.5 feet above the 100-year base flood elevation. This documented proof will be required after the foundation is poured with the submittal of the FEMA **Finished Floor Elevation Certificate**. However, the contractor will need to document this elevation is established prior to pour.

6. **Form Board Survey** will be reviewed for the items listed. If deficiencies exist, no plumbing rough inspection will be performed. Building contractor will be notified by phone.

ROUGH PLUMBING INSPECTION

Scheduling: After submittal and review of the **Form Board Survey** and installation of plumbing below slab or below the first floor. This inspection may also include the sewer, water and gas relays. For clarity the items are specified below.

General Inspection Items:

1. All loose and blowing trash/debris is placed in the refuse container.
2. "Protected Trees" must be fenced.
3. The footprint of the foundation provided on the **Form Board Survey** is compared to existing conditions (pad elevations, building setbacks).
4. Visual determination ability of lot grading as compared to the grading plan and/or or grading requirements (**see Information Bulletin #450**).
5. Items required with **Form Board Survey** are verified.

SEWER, DRAIN, WASTE AND VENT PIPING:

1. Sewer yard line is a minimum of 3 inches in diameter.
2. Sewer tap connection to city main is visible.
3. All sewer piping is subject to a water or air test (5-foot head of water or a minimum of 5 pounds of air pressure).
4. Sewer piping and fittings are aligned, bedded and sloped to drain at 1/4 inch per foot.
5. All 90-degree elbows must be long radius fittings.
6. Two-way clean out is installed on sewer line within two feet of the foundation.
7. If PVC piping is used, all pipe and fittings must be properly attached using an approved glue and primer.
8. Check trap arms for maximum allowed lengths (max trap arm for 2" piping is 60"). Traps and tub-boxes must be supported to prevent any dislocation during the pouring of the slab.
9. Only listed closet bends may be used for W/C bends.
10. Clean out is installed in the sewer line for each change of direction if the total aggregate change exceeds 135 degrees.
11. Island sink is roughed per illustration (see Appendix Page A3).
12. All sewer pipe, water pipe and vent pipe is properly supported, hung or bedded.
13. Drainage piping may only cross foundation beams perpendicularly. Drainage piping may not run in and parallel to any concrete beams.

WATER SERVICE AND DISTRIBUTION PIPING:

1. Water service line from the meter to the foundation is a minimum 3/4-inch line of approved material.
2. Water service line is at least 12" deep (measured to the top of the line).
3. Water piping is pressurized to 50 psig with air pressure or is charged and holding city water pressure for test.
4. One water shut-off valve is required for the building. Shut-off valve will be located in a water box with gravel in bottom and valve exposed for easy access by homeowner.
5. No water pipe fitting or connection is located within or under the slab foundation.
6. Water lines may not be crimped.
7. No more than 3 fixtures may be serviced by a single 1/2-inch water line.
8. All water piping is protected or sleeved where it crosses other water piping and where it penetrates through concrete.
9. All copper water piping within or under the foundation is not less than type "L" copper.
10. Female PVC fittings in water lines are prohibited.
11. All hose bibs must be equipped with non-removable atmospheric vacuum breakers.
12. Water piping installed in the slab at exterior locations shall be insulated.

GAS RELAYS:

1. Minimum cover depth - 18 inches for plastic line.
2. Gas stop is required at outside of buildings when more than one building on lot is supplied with gas.
3. Pressure test of **at least** 10 psig is required for 15 minutes. Pressure gauge must be of the diaphragm type and may not be scaled more than 30 psig.
4. Tracer wire of at least 18 Ga. must run with and be attached to non-metallic underground piping. Tracer wire must be continuous and terminate above grade at both ends.
5. Only anodeless risers may be used to connect to underground plastic gas piping.

FOUNDATION INSPECTION (ON GRADE CONCRETE SLAB)

Scheduling: This inspection is scheduled after approval of the rough plumbing inspection and before placing any concrete within the forms of the foundation.

General Inspection Items:

1. All loose and blowing trash / debris is placed in the refuse container.
2. "Protected Trees" must be fenced.
3. Visual determination ability of lot grading as compared to the grading plan and/or or grading requirements (**see Information Bulletin #450**)
4. All plumbing, electrical or mechanical system located under or penetrating through the foundation is protected and has been previously inspected and approved.
5. The foundation is consistent with the approved foundation plan (dimensions, slab thickness, location of beams, beam depth and width, reinforcing steel, post tension cables, chairs, vapor barrier, or any other special requirements listed by designing engineer).
6. Brick ledge is in place where indicated on plans.
7. Pipes and conduits do not run parallel and within a beam unless specifically engineered and approved.
8. Conduit or pipe located within the slab is not larger in outside dimension than one third the overall thickness of the slab, wall or beam in which it is embedded.
9. All beams are dug into undisturbed soil a minimum of 12 inches for single story structures and 18 Inches for two story structures; or, per the design engineer's requirements. Any foundations placed on fill will require additional information from the design engineer (soil compaction testing and results, required piers, etc.). All additional design requirements due to the foundation being placed on fill will require the documentation filed prior to the foundation inspection. If the design engineer requires piers, the piers will also require inspection.
10. Form boards are adequate to prevent concrete from spilling out of foundation limits.
11. If there is no underground metallic water piping, a 1/2-inch steel reinforcing bar or a #4 bare copper conductor at least 20 feet in length is required in the concrete footing. All connections to the grounding electrode conductor must be made with approved connectors.
12. For non-engineered slabs, see **Information Bulletin #301**.

ROOF DECK INSPECTION (ROOF SHEATHING)

This is no longer a required inspection. However, the inspector may periodically perform drop in inspections. Installation per code is required as follows:

1. All plywood, pressed board, OSB, or particleboard type sheathing used as decking must be listed for the use and be rated for the applicable rafter spacing.
2. All edges and ends are in moderate contact. Horizontal edges are separated by spacers.
3. All end joints are staggered and occur over supporting members unless approved end-matched lumber is used, in which case each piece shall bear in accordance with its listing.
4. See nailing schedule in Appendix Page A8-A9.

SECONDS INSPECTION

Scheduling: The seconds inspection may be requested after the contractor has completed all framing, electrical rough, mechanical rough, plumbing top out, wall ties and the installation of the factory built fireplace.

General Inspection Items: The items listed above have been separated for clarity. Refer to the individual inspection description below for the specifics of the inspection. The framing inspection will be the last part of the seconds inspection performed.

1. All loose and blowing trash / debris is placed in the refuse container.
2. "Protected Trees" must be fenced.

Rough Electrical Inspection:

1. Electrical outlets are installed along all the walls at least 6 feet from every opening and at least 12 feet between each receptacle along unbroken wall space. Any wall space exceeding 2 feet requires a receptacle. Room dividers such as bar counters shall be counted as wall space.
2. Electrical outlets shall be installed for kitchen counter so that no counter space is more than 24 inches from the receptacle. At least one receptacle shall be required for counter spaces 12 inches or greater. Provide at least two small appliance circuits in the kitchen/dining area. Provide at least one receptacle for island counter spaces with a long dimension of 24 inches or greater and a short dimension of 12 inches or greater. Provide at least one receptacle at each peninsula counter space with a long dimension of 24 inches or greater and a short dimension of 12 inches or greater. A peninsula countertop is measured from the connecting edge.
3. Provide a receptacle, adjacent to each lavatory. Such receptacles must be protected by a 20-amp breaker and may have no other outlets on the circuit (with the exception of other lavatory receptacles).
4. Provide at least one switch controlled lighting outlet in each habitable room; in bathrooms, hallways, stairways, attached garages, and detached garages with electric power; and at the exterior side of outdoor entrances or exits. A vehicle door in a garage shall not be considered as an outdoor entrance or exit. Lighting outlets installed in interior stairways shall be controlled by a wall switch when the difference between floor levels is six steps or more.
5. Provide at least one receptacle in attached garages and detached garages provided with electric power.
6. Provide at least one outdoor receptacle (must be GFCI protected) in the front and the rear of the dwelling not more than 6 feet 6 inches above the ground.
7. Receptacles installed in garages at "grade level" must be GFCI protected. A dedicated circuit may be provided for a freezer (without GFCI protection) provided the receptacle is a single receptacle.
8. Dishwasher and disposal must be on separate circuits (motor loads).
9. Smoke detectors required for each sleeping room and in hallways common to rooms used for sleeping. In two story houses, a smoke detector is required to be located at the center of the top of the stairs. At least one smoke detector must be provided at each floor level regardless of the presence of sleeping rooms.
10. All attic areas must have a light controlled by a switch at the attic entrance. If A/C equipment or water heater is located in the attic, a service receptacle must be located within 25 feet of the equipment.
11. Wire to oven and dryer is a minimum 10/3 w/ ground, washer and kitchen appliances a minimum 12/2 w/ ground and all other light and receptacle circuits a minimum 14/2 w/ ground unless otherwise indicated.
12. Electrical panel is installed with a nipple installed through the wall to accept the meter base at a height between 4 and 6 feet above grade level.
14. Panel is grounded to the underground metal water piping and to a driven grounding rod. If there is no underground metal water piping, a 1/2 inch steel bar or a #4 copper conductor at least 20 feet in length is required in the concrete footing (see foundation inspection).
15. All wire is properly supported, installed without excessive twisting, kinking or straining, and is stapled within 12 inches of the box (not required at the electrical panel).
16. Nail guards are required if holes are bored within 1 1/4 inch of the edge of the wood member.
17. Exhaust fans must be roughed in.
18. All circuits are to be AFCI protected as required by the electrical code

Plumbing Top-Out Inspection:

Scheduling: This inspection is performed before the approval of the framing inspection and may be scheduled with the seconds.

General Inspection Items:

Gas Piping & Appliance:

1. All gas lines are hung, strapped and/or supported and not in a strain condition. All blocking material must be secured -not loosely stacked.
2. Gas hot water heater may not be installed in a closet, bedroom or a bathroom or in a closet where access must be gained through a closet, bedroom or a bathroom. All water heaters (gas & electric) located in garages, or receiving combustion air from garages, must be located so that any source of ignition (spark or glow/thermostats and elements) is located at least 18 inches above the garage

- floor. Check the T & P drain line for minimum $\frac{3}{4}$ -inch line to slope toward the outside to turn down. When turned down, the line must terminate between 6 and 24 inches from the grade.
3. Gas fired furnaces and gas fired water heaters that are located in confined spaces must be provided with combustion air from outside or from a vented attic. One half of the required combustion air opening must be located within 12 inches of the bottom of the confined space. One half of the required combustion air opening must be located within the top 12 inches of the confined space. Combustion air ducts that extend into the attic must extend at least 6 inches above the joist and/or insulation. Neither end of ducts, which terminate in an attic, shall be screened.
 4. Gas piping for fire place starters must also be installed. An approved cut-off valve must be installed within 4 feet of the outlet.
 5. Certain decorative appliances will require a gas stop external to the appliance. Gas stops for decorative appliances may not be accessed through panels / doors in the firebox.
 6. All gas piping must extend into the space or room where the appliance will be installed and then be capped.
 7. Flue piping for gas fired water heaters must extend vertically at least 5 feet above the draft hood. Check clearances above the roof or adjacent vertical walls (see Appendix page A6). Check for adequate clearances from windows. Flue piping must be at least 1 inch from any combustible material.
 8. All water heaters installed in attics must be accessible by a stairway or pull-down steps. Passageways to water heaters shall have a solid continuous flooring not less than 24 inches wide from the stairs to the water heater. An unobstructed working space at least 30 deep and 36 inches wide shall be provided in front of each water heater. Water heaters installed in attics must have a switch controlled light at or near the water heater. The light shall be controlled by a switch located adjacent to the access opening. Water heaters in areas where water can cause damage (including attics) shall be provided with a watertight pan of corrosion resistant materials installed beneath the water heater. The pan shall be provided with a minimum $\frac{3}{4}$ inch drain to the outside to a conspicuous place. Attic water heaters shall have additional support where ceiling joists are spanned to the limit.
 9. For specific inspection criteria for lighting resistant CSST gas piping, see **Information Bulletin #321**

Drainage, Waste & Vent Piping:

1. Washing machine trap is at least 6 but no more than 18 inches above the floor. The standpipe is at least 18 but no more than 30 inches above the trap.
2. Island sinks are piped with looped vents per illustration (see Appendix page A3). (Drain line will be marked at rough). Air admittance valves are not permitted in new construction.
3. All **site built** shower pans are filled with water to test the pan and the fittings connecting to the shower pans (see Appendix page A4). All drain piping on the second floor including tubs and showers are filled with water.
4. All tub boxes on the first floor are sealed with concrete or grouted to prevent the entry of termites.
5. Wet venting is not permitted. Continuous venting may be permitted for second floor installations due to structural conditions. The flat-vented fixture (W/C) must be scrubbed by a minor fixture (lavatory).
6. All fixtures must be vented through the roof.
7. The combined size of all vents through the roof must be at least the same size as the sewer line.
8. Drain, waste and vent piping is protected with nail guards.
9. Holes, cutting and notching of framing members is performed correctly (see appendix page A10 & A11).

Water Distribution Piping:

1. All water supply piping in exterior walls and in attics must be properly insulated with an approved material. Walls between the house and the garage are considered exterior walls.
2. All water piping is subject to air pressure of 50 psig or city water pressure.
3. All hose bibs shall be equipped with atmospheric vacuum breakers.

4. Water piping shall be protected with nail guards where water piping is within 1 1/4" of edge of framing.
5. Water piping shall be secured with straps, hangars or other blocking materials.

Heating, Air Conditioning & Mechanical Rough Inspection:

Scheduling: This inspection is performed before the approval of the framing inspection and is scheduled with the seconds.

General Inspection Items:

1. Indoor equipment and associated duct, piping and drains are installed.
2. Air conditioning condensate drains must go to a permanently wet trap. Secondary drain installations must drain to a conspicuous place such as over a door or window.
3. All gas-fired heaters must be provided with combustion air supplied by ducts if located in a confined space. All flue piping for gas fired heaters must not be located nearer than 1 inch to combustible materials. Flue piping must terminate in an approved and listed cap above the roof of adjacent vertical surfaces. See Appendix page A6 for heights. Flue piping may not terminate near operable windows or doors.
4. All equipment located with an attic space must be located within 20 feet of the access opening. There must be an opening sufficient to remove the largest piece of equipment but not less than 30 inches by 30 inches. There must be a walkway not less than 24 inches wide from the point of attic access to the unit. There must be a working/service platform in front of the unit on the entire firebox/control side not less than 24 inches deep. There must be a light and an electrical outlet at or near the equipment. The light must be controlled by a switch located at the point of attic access.
5. All ductwork and plenums are supported or hung. Flex duct may be installed resting on framing members. If flex duct is hung, it must be supported at 4-foot intervals. The flex duct may sag no more than 1/2 inch per foot between the supports. The minimum amount of duct necessary shall be utilized. Excessive flex ducts creating unnecessary bends shall be removed. When flex duct is bent, the center line of the radius shall be no less than one duct diameter and may not be constricted or compressed. Holes or tears in the vapor barrier must be repaired. If the internal core is penetrated the duct must be replaced. Vertical ducts shall be supported at 6-foot intervals minimum.
6. Dryer vents shall be at least 4 inches in diameter or of equal cross section area. Dryer vents shall terminate on the outside of the building and shall be equipped with a backdraft damper. Dryer vents may not discharge at a soffit vent. Dryer vents shall not be connected or installed with sheet metal screws or other fasteners which will obstruct the flow. The maximum length of any dryer exhaust vent shall be 25 feet with no more than two bends. When extra bends are installed, the maximum length of the duct shall be reduced 2 1/2 feet for each 45-degree bend and 5 feet for each 90-degree bend after the first two bends, measured in the direction of airflow. Flexible dryer duct may not be installed within walls.
7. Bathroom exhaust vents must discharge to the exterior of the building and may not discharge into ventilated attics or soffits. Exhaust ducts shall be equipped with backdraft dampers. Factory built fireplaces must be installed in accordance with manufacturer's specifications. Metal chimneys shall be separated from combustible materials in accordance with their listing. Factory built chimneys must terminate at least 2 feet above any part of the building within ten feet. (Manufactures installation instructions must be on job site for review.)

Jacuzzi Tub

This inspection is required as part of the seconds inspections even though it is understood that the tub will not be set until later. This is not a separate inspection.

At the time of the seconds inspections, the following items are checked.

1. Electrical circuit for tub is roughed in.

- Bond wire for pump motor is bonded to water piping.

Although the following items are not required to be inspected, the inspector may periodically perform drop inspections. Installation per code is required.

- Tub box is grouted.
- Pump motor is readily accessible.

Masonry Fireplace Inspection

Scheduling:

This inspection is required prior to the closure of the firebox and before any flue tile is placed. (See attached drawing in Appendix Page A27-A28)

General Inspection Procedure:

- All loose and blowing trash / debris is placed in the refuse container.
- Fireplace and smoke chamber wall thickness as follows:
 - Fireplace wall = 10" common brick, or 8" when firebrick lining is used. Joints in firebrick are ¼ maximum.
 - Smoke chamber edge of shelf = rear wall is 6", front and sidewall is 8".
- Distance from top of fireplace opening to throat is 6"
- Hearth dimensions as follows:

	Fireplace opening less than 6"	Fireplace opening equal to or greater than 6"
Each Side	8"	16"
Front	12"	20"

- The net cross sectional area of the flue of the throat between the firebox and the smoke chamber of the fireplace shall not be less than as follows:

Tile lined Round chimney	Tile lined square or Rectangular chimney	Lined with fire brick or Unlined
1/12 of fireplace	1/10 of fireplace	1/8 of fireplace
Opening min. of 50 sq. inches	Opening min. of 50 sq. inches	Opening min. of 135 sq. inches

- Damper is located with in throat, not less than No. 12 gauge steel, and, when fully open, the damper opening is not less than 90 degrees of the required area listed in # 5 above.
- Maximum length of gas piping for starters from the operating valve is 4 feet. All such piping must be embedded or surrounded by not less than 2" of masonry.
- See Appendix page A29-A30.

Framing Inspection:

Scheduling: This inspection is the last part of the seconds inspection and should be performed after all framing, fire blocking and bracing are in place and the fireplace, chimneys and vents are complete. The rough electrical, plumbing top-out, rough heating and air conditioning have been performed as part of the seconds inspection.

General Inspection Items:

1. All bottom plates on exterior walls are of treated or weather resistant wood. The bottom plates are anchored to the foundation with $\frac{1}{2}$ steel bolts embedded at least 7 inches into the slab. The bottom plates shall be anchored within 12 inches of the end of the plate, be spaced at 6 feet intervals, and contain a minimum of 2 bolts per piece of lumber. The places where the bottom plate is eliminated to accommodate plumbing pipes is considered an end for purposes of this section. A properly sized nut and washer shall be used on each bolt. Walls between the house and the garage are considered outside walls.
2. Interior bottom plates must be of treated wood if the slab is not separated from the earth with an impervious moisture barrier. Interior bottom plates may be shot to the foundation with power fasteners with the same spacing as required in #1 above; however, in no case may the spacing be less than the manufacturer's recommendations.
3. All exterior load bearing walls with masonry veneer attached shall be framed at 16 inches on centers. All first floor walls of two story structures must be framed at 16 inches on center.
4. All joist and rafter spans are subject to the span tables found in the 2000 International Residential Code.
5. Check for over cutting, notching or boring of framing members (see Appendix page A10 & A11).
6. All exterior walls shall contain a braced wall panel (wind bracing) within 12 feet of each corner and spaced no greater than 25 feet on center.
7. Where plumbing, heating, or other pipes are placed in or partly in a partition (necessitating the cutting of soles or plates), a metal tie not less than 16 gage thickness and 1-1/2 inches wide must be fastened to the plate across and to each side of the opening with not less than six 16 penny nails.
8. Fire blocking required as follows;
 - a. In concealed spaces of stud walls and partitions, including furred spaces, at the ceiling and floor level.
 - b. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, cove ceiling, etc,
 - c. In concealed spaces between stair stringers at the top and bottom of the run, and
 - d. At openings around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor level, with noncombustible materials.

NOTE: except for "d" above, fire blocking shall be 2 inches of nominal lumber, two layers of 1-inch nominal lumber with broken lap joints, or one thickness of 22/32-inch plywood with joints backed by 22/32-inch plywood or one thickness of $\frac{3}{4}$ -inch Type 2-M particleboard with joints backed by $\frac{3}{4}$ -inch Type 2-M particleboard.
9. Where electrical wiring has been placed within a bored or notched framing member and is within 1 $\frac{1}{4}$ inches of the nearest edge of the member, (a metal tie not less than $\frac{1}{8}$ -inch thick and 1 $\frac{1}{2}$ -inch wide shall be fastened to the plate across and to each side of the opening with not less than four 16 penny nails.)
10. All exterior wall sheathing must be protected with an approved vapor barrier (i.e. tyvek, #15 felt).

Roof & Ceiling Framing:

1. Rafters shall be framed directly opposite each other at the ridge. There shall be a ridge board at least 1-inch nominal thickness at all ridges and not less in depth than the cut end of the rafter. At all valleys and hips there shall be a single valley or hip rafter not less than 2-inch nominal thickness and not less in depth than the cut end of the rafter.
2. Purlins shall be the same size as the rafter but never less than a 2x6. The maximum span of a 2x6 purlin shall be 4 feet. Struts supporting purlins may not be less than 2x4. Struts greater than 8 feet in length shall be braced (teed). The minimum slope of any strut shall not be less than 45 degrees from the horizontal. Purlins and struts must bear on load bearing walls or approved beams where the beams deflection will not affect ceiling framing members or finish materials (Doubled up ceiling joists are inadequate).
3. Openings in roofs shall be framed so that trimmer and header rafters are doubled, or of lumber of **equivalent** cross-section, when the span of the header exceeds 4 feet. The ends of header rafters shall be supported by framing anchors or rafter hangers unless bearing on a beam, partition or wall.

4. Draft stopping must be provided when there is usable space above and below the concealed space of a floor-ceiling assembly so that the concealed area does not exceed 1000 square feet.

Floor Framing:

1. Joists shall bear 1-½ inches on wood or 3 inches on masonry.
2. Joists shall be supported laterally at ends by solid blocking unless nailed to as header, band or rim joist. Solid blocking shall be not less than 2 inches in thickness and the full depth of the joists.
3. Notches on the ends of joists shall not exceed one-fourth the joist depth. Holes bored in joist shall not be with in 2 inches of the top or bottom of the joist and the diameter of any such hole shall not exceed one-third the depth of the joist. Notches in the top or bottom of joist shall not exceed one-sixth the depth and shall not be located in the middle third of the span.
4. Joist framing from opposite sides of a beam, girder or partition shall be lapped at least 3-inches.
5. Trimmer and header joists shall be doubled, or of lumber of equivalent cross section, when the span of the header exceeds 4 feet. The ends of header joists shall be supported by framing anchors or joist hangers unless bearing on a beam, partition or wall. Tail joists over 12 feet long shall be supported at header by framing anchors or on ledger strips not less than 2 inches by 2 inches.
6. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth. Joists under and parallel to bearing partitions shall be doubled
7. Floor joist shall be blocked in accordance with the building code when 2 X 12 or larger lumber is utilized.

Wall Tie Inspection

This is not a separate inspection but will be performed with the framing inspection. Installation per code is required as follows:

General Inspection Procedure:

1. Wall ties shall be nailed to framing members spaced no more than 16 inches on center. Wall ties shall be spaced so as to support no more than 3 square feet of wall area. On each stud, the first wall tie is placed at 9 inches and each subsequent wall tie is placed at 18 inch intervals. An 8-foot wall will have no less than 5 wall ties per stud.
2. Framing members must be covered with a weather resistive sheathing.
3. Anchor ties are to be of corrosive resistant sheet metal, minimum 22 gauge with a minimum width of ¾ inch. Wire anchor ties shall be a minimum of No. 9 gauge.
4. All primary exterior wall elevations shall be covered with 85% masonry coverage, less door and window openings. No non-masonry materials maybe located less than 8 feet above grade.

INSULATION INSPECTION:

Insulation in normally enclosed cavities (e.g. walls, cathedral ceilings, framed floors) will be inspected before drywall is installed. Both insulation R-values and installation practices are inspected. Window U-values are also be checked. Please note that all spray foam insulation in attics must be coated with a 15-minute ignition barrier; and, in some cases, may require a thermal barrier.

DRY WALL INSPECTION

This inspection is not a required inspection. However, inspectors may periodically perform drop in inspections. Installation per code is required as follows:

1. Gypsum wallboard is properly nailed or screwed with the correct spacing pattern. See appendix page A31.
2. The fastener head shall not fracture the face paper of the gypsum wallboard.
3. All edges and ends of gypsum wallboard shall terminate on framing members, except those edges and ends which are perpendicular to framing members.
4. All edges and ends shall be in moderate contact.

5. Useable space under stairs (bathrooms, closets, etc.) shall be protected by one layer of type 5/8" "X" gypsum or two layers of 1/2" non-rated gypsum.
6. Water resistance gypsum board shall be used in tub and/or shower enclosures. Walls in tub and/or shower enclosures shall be covered with green rock to a height of 70" above drain inlet.
7. If gypsum is used as a backing for tile in tub, shower or water closet enclosures (beyond limits of #7 above), the gypsum must be greenrock. If greenrock is applied to ceilings, it must be applied to framing spaced a maximum of 12" on center.
8. At least one layer of minimum 1/2" gypsum between the garage and the house (vertical and horizontal as necessary). At final, all joints must be taped and bedded.

DRIVE APPROACH INSPECTION

Scheduling:

This inspection is required after excavation is complete and the form boards, steel reinforcement and expansion joints are in place, but prior to the placement of any concrete material. New drive approaches must be horizontally cut in accordance the the Public Works Design Manual. General Inspection Procedure:

1. All loose and blowing trash / debris is placed in the refuse container.
2. "Protected Trees" are fenced.
3. Location of the approach matches City's design criteria. See 12P from Public Works Design Manual for residential drive approach requirements.
4. All approaches must be constructed per the Public Works Design Manual. Figures 12P or 14P (see Appendix page A24 & A25).
5. Minimum width is 12 feet measured at the property line. Maximum width shall not exceed 20 feet.
6. All curbs must be horizontally cut per Public Works design manual.
7. When sidewalks are installed as an integral part of the approach, the sidewalk portion slopes from the property line to the street at 1/4 inch per foot. The remainder of the approach slopes to the established flow line.
8. Curb inlets or aprons may not be cut to construct drive approaches.
9. Water meters and manholes may not be located in drive approaches.
10. Reinforcing steel is minimum #3 rebar.
11. Steel is placed on chairs and 1 inch of cushion sand is used.
12. Required 3/4 inch lip at the face of curb is formed with a 1"x4" nominal board and not a 2"x4".
13. Expansion joints are required at the property line and at junctures of sidewalks and approaches.

DRIVEWAY INSPECTION – PRIVATE PROPERTY

Scheduling:

This inspection is performed after excavations are complete and any required form boards, cushion sand and steel reinforcement, if applicable, are in place, but prior to the placement of any concrete materials.

General Inspection Procedure:

1. All loose and blowing trash / debris is placed in the refuse container.
2. "Protected Trees" are fenced.
3. Half-inch expansion joint is installed between the driveway and the drive approach and between any foundations.
4. If the driveway / walkway will be used for the control of drainage, then the driveway / walkway must have sufficient grade to facilitate the approved grading plan for the lot. When necessary to control water flow, a curb may be required on one or both sides of the driveway / walkway. Swales constructed within the concrete may also be required for the control of water flow.

5. No driveway / walkway shall be constructed at an elevation which conflicts with the approved grading plan of the lot.

SIDEWALK INSPECTION –PUBLIC RIGHT OF WAY

Scheduling:

This inspection may be requested by the contractor any time after the stake out inspection is approved, but must be done prior to the approval of the final inspection and before any sidewalk concrete is poured.

General Inspection Procedure:

1. All loose and blowing trash / debris is placed in the refuse container.
2. "Protected Trees" are fenced.
3. All reinforcing steel is #3 deformed bars placed 18 inches on center each way and is placed on chairs.
4. Sidewalk is 4 feet wide and 4 inches thick.
5. One inch of cushion sand is in place.
6. Sidewalk is located adjacent to and abutting the front property line and within the city right-of-way.
7. Sidewalk is graded on a 1/4 inch per footfall toward the curb from the edge of the sidewalk along the property line.
8. Water meters and manholes may not be located in sidewalks.
9. TU junction boxes may be located in sidewalks. There must be six (6) or more inches of concrete width between the edge of the junction box and outer edge of the sidewalk. Where less than six (6) inches of sidewalk width would exist between the junction box and the either edge of the sidewalk before adjustment, the forms for the sidewalk will be adjusted so that the sidewalk gently aligns with the edge of the TU junction box.

UTILITY PRE-RELEASE / GAS

UTILITY PRE-RELEASE / ELECTRICAL

Scheduling:

This inspection is made prior to the final inspection after all (or most) of the electrical installation is trimmed-out and the exposure to live parts is minimized. **A final inspection is still required prior to occupancy.** However early release of the electricity will provide the builder with time to check-out appliances and equipment prior to customer occupancy.

General Inspection Procedure:

1. Service panel is trimmed-out and covers are off for inspection. Cover must be in sight of panel for quick installation.
2. All lighting, switches and electrical equipment is trimmed-out and wired.
Exception: For appliances that are not yet installed, all conductors must be installed in covered boxes, even if temporary.
3. All disconnects for heating and cooling equipment are installed.
4. House must be identified with permanent address numbers.
5. No other inspections may be combined with this inspection.

Gas System

1. The piping must pass a pressure test of at least 10 psig with no perceptible drop in at least 15 minutes. The maximum gauge scale is 30 psig.

FINAL INSPECTION-APPROVED FOR OCCUPANCY

Scheduling:

This is the last inspection to be made after the structure is complete and ready for occupancy. It is performed after the city's approval to release electrical and before the residents occupy the structure.

General Inspection Procedure:

1. All construction debris has been removed from the lot and adjoining lots.
2. "Protected Trees" are fenced.
3. All required "new" trees and/or "replacement" trees are planted.
4. Street is clear of all construction debris and dirt.
5. All exterior concrete work is completed.
6. Address is properly posted on the structure.
7. Water meter boxes are set to grade and the components within the meter boxes comply with Public Works Design Manual Figure 4W (see Appendix page A26) – Mailboxes cannot be placed on or near a water meter.
8. Lot is graded in accordance with city grading standards and the approved grading plan.
9. Exterior masonry veneer is equipped with weep holes spaced at 30 inches on center.
10. All exterior electrical outlets are G.F.C.I. protected and have weatherproof covers.
11. Hot water T&P drain lines are 4 to 6 inches above final grade and pointed down using a 90-degree fitting.
12. Sewer cleanouts fitted with caps and are positioned at grade.
13. Water line to house has cut-off valve exposed in cut-off box with gravel bottom.
14. Chimney is terminated at least 2' above any part of the roof or building within 10 feet of the chimney.
15. A/C compressor has a disconnect within 50 feet and within sight of the unit.
16. PVC vents penetrating the roof are painted.
17. All penetrations through the exterior walls are sealed.
18. All appliances inside which are not of the cord and plug type are set and correctly connected to the electrical system.
19. All plumbing fixtures are installed to hot and cold water supply and to the drainage system.
20. Hot water heater is installed and equipped with shut-off valves. The T&P relief valve operates and the drain line is not reduced and drains downward to the outside. T&P outlet must terminate between 6" and 24" above grade.
21. All garage receptacles are G.F.C.I. protected, except those receptacles, which serve appliances occupying dedicated space and which are cord and plug connected. Such dedicated receptacles shall be single receptacle.
22. All bedroom and interior electrical circuits are protected with combination A.F.C.I.'s.
23. All bathroom receptacles are G.F.C.I. protected.
24. All receptacles within 6 feet of the kitchen and utility sinks are G.F.C.I. protected.
25. Main electrical panel is properly labeled, and does not have blanks left open in the faceplate.
26. All electrical fixtures are suited and approved for the use intended and no open or exposed wiring.
27. All smoke detectors are hard wired on the house circuit and installed in all required locations.
28. If the central air conditioner / heater unit is installed within the attic, it is located within 20 feet of an attic access door, is provided with a light operated by a switch located at the attic access, has a minimum 24 inch solid catwalk to the unit, has a minimum 30 inch by 30 inch floor work area at the unit, is properly wired and is provided with a electric disconnect at the unit.
29. All doors, which open from a living area of the home into the garage, are a minimum solid core without windows or lights.
30. Fireplace hearth, hearth extensions are of proper dimensions. (See Seconds)

31. No combustible material shall be placed within 6" of fireplace opening. No combustible material within 12" of the fireplace opening shall project more than 1/8" for every 1" of clearance from the opening.
32. If an irrigation system is installed, provide a signed original of the "Backflow Prevention Test Assembly" as required by TNRCC. (See Informational Bulletin #471, attached)
33. Provide a copy of the original foundation stress letter with the original signature of the engineer.
34. Provide a Final Grade Survey, prepared by a registered surveyor using actual elevations.
35. Provide Maintenance Bond if the curb cuts were not prepared with a horizontal cut.

OTHER THAN CONVENTIONAL CONSTRUCTION

Building codes are historically prescriptive documents. When you construct a building out of wood, the code gives you specific instructions on how the walls, floors, roofs, etc. are to be assembled. The code also addresses the quality of the wood involved through the use of grade stamps. There is a section of the building code that states:

"The provisions of this code are not intended to prevent the use of any material or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency."

In order to provide for an effective and efficient means of evaluating products, the **International Code Conference (ICC)** has established a subsidiary organization for this purpose. This organization, **ICC Evaluation Services, Inc.** established acceptance criteria and publishes findings in *Evaluation Reports* (ICC ER reports). The city has most of these reports on file and can easily obtain reports not on file. These reports are updated monthly. The reports cover a wide category of listing and include, but are not limited to, the following topics:

- Fasteners (adhesives, concrete & masonry anchors, staples & nails, wood hangers & framing anchors, etc.)
- Fireplaces
- Flashing
- Weather Resistive Barriers
- Ducts
- Dwelling Construction (Roof, wall & floor panels, Sandwich panels)
- Gas Logs
- Gas Vents
- Siding and Exterior Wall Covering
- Sheathing Panels
- Roof Covering
- Exterior Insulation and Finish Systems

For items of other than conventional construction that are utilized in the construction of a new one & two family dwelling, the building inspectors will require the items to be identified with an ER Report. It will behoove the contractors to make the city aware of other than conventional construction items so that the ER Reports may be reviewed and the contractor may be advised of any unique inspections or specifics regarding construction. Several items that have been introduced and are identified with an ER Report are TGI Joists, OSB Sheathing, EIFS Exterior Wall Covering and CSST Gas Piping. The city may develop **Information Bulletins** for some of these items to assist the builders in any conditions of acceptance.

MISCELLANEOUS RESIDENTIAL CODE INFORMATION

This code has been mandated by the State of Texas and applies to One and Two Family Dwelling only. The following particular construction requirements exist under this code and must be observed by the builder:

Soil Conditions

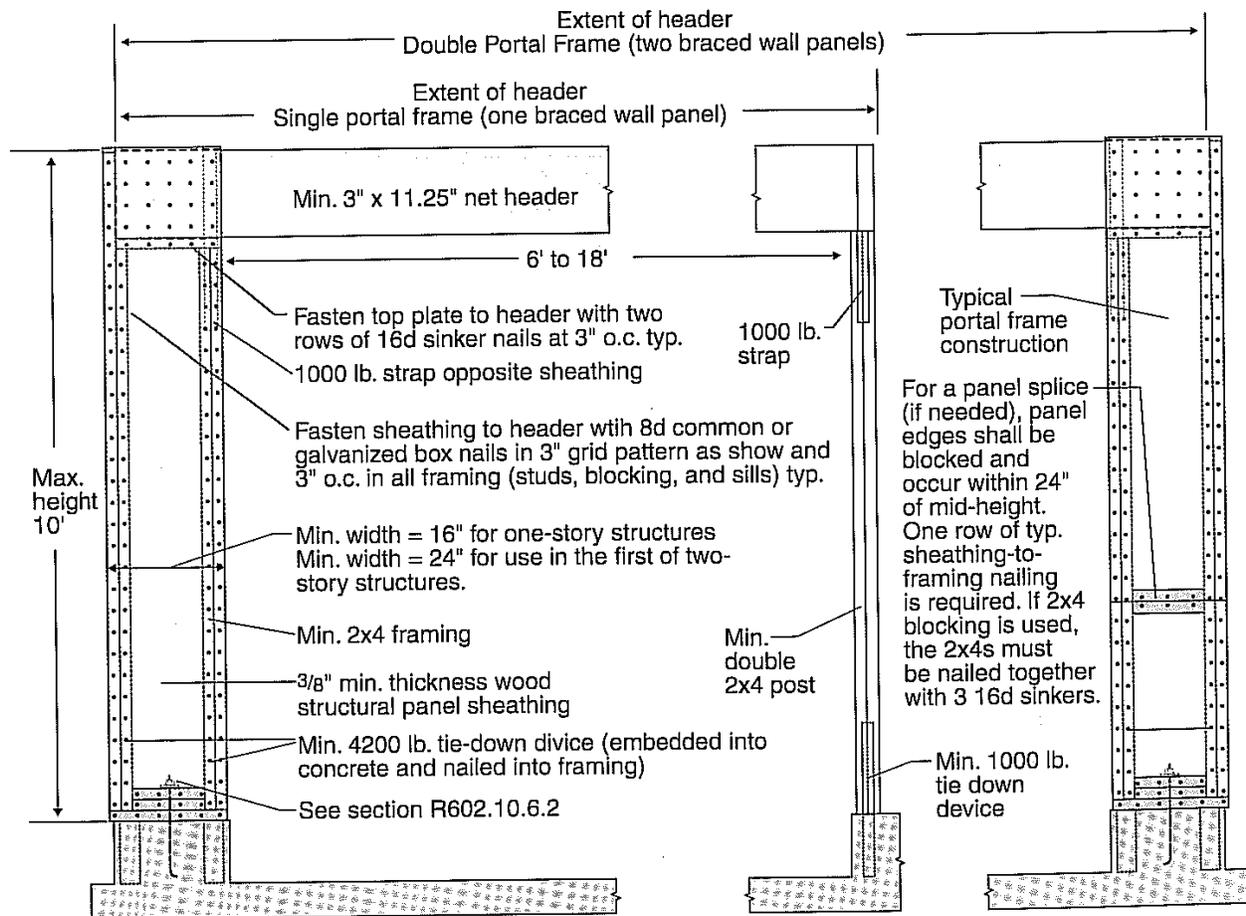
- ❖ In areas likely to have expansive, compressible, shifting or other unknown soil characteristics, the building official may require additional soil testing.
- ❖ If chemical treatment of the earth or a baiting system is provided, documentation must be received by the building inspector

Foundation

- ❖ Foundation anchorage requires ½" bolts.
- ❖ Pipes passing through concrete or masonry walls and floors must be protected from damage and corrosion by wrapping the pipes with material protective materials no less than 0.025 inches thick. Pipes through footings or masonry walls must be protected with a relieving arch or a sleeve at least 2 pipe sizes larger than the pipe passing through.

Framing

- ❖ Maximum rise in a residential stair has changed from 8 inches to 7-3/4 inches. Minimum tread depth in a residential stair has changed from 9 inches to 10 inches.
- ❖ Handrails are now required at stairs with 4 or more rises.
- ❖ Truss design drawings are required and must be available to the inspector upon request.
- ❖ Trussed roofs with headroom exceeding 42 inches height and 24 inches in width must be designed for attic storage. Truss manufactures must include the additional live load in their truss designs
- ❖ Use of rafter ties has been further clarified to be located in the bottom 1/3 of the roof where ceiling joists are perpendicular to the rafters. Collar ties (located in the upper third of the roof) are not intended to serve as rafter ties.
- ❖ Trusses must be fastened to top plates using approved metal connectors and cannot be toe-nailed.
- ❖ A cricket must be provided where a chimney wider than thirty inches intersects the plane of a roof per table 1003.20. The height of the cricket varies depending on the pitch of the roof and the width of the chimney. For example: A 6:12 roof pitch would require a cricket height equal to 1/4th the width of the chimney; and a 6:12 roof would require a cricket height equal to 1/3rd the width of the chimney.
- ❖ Exterior walls with ceilings taller than 10 feet will have to follow table R602.3.1. Exterior walls of a single story home with ceilings taller than 14 feet will be required to use 2 X 6 studs. Two story homes with ceilings taller than 12 feet will be required to use 2 X 6 studs. Stud spacing is also affected depending on the height of the wall. Please note that a pony wall extension set on top of a 10 foot stud wall does not meet this requirement.
- ❖ A new Alternate Braced Wall Panel method has been added to the code for garage portals and other openings. This method does not require the house to be 100% wood sheathed. See requirements below:



- ❖ Prescriptive tables for headers have changed. These tables are more restrictive than past code versions and include provisions for additional jack studs supporting headers and beams. Header and girder wood members may be no less than #2 grade.
- ❖ Wind bracing of walls has changed. Provisions have been added to allow bracing of wall panels to begin within 12 feet of a corner. Most residential buildings will require a brace (or panel) within 12 feet of each corner and every 25 feet of length. When using wood structural panel sheathing as the means of providing the required wall bracing, the panel must be a minimum of 4 feet in width. **Windows and/or other openings may not be let into these panels without an engineer's design.** Exterior walls with excessive glazing and directional changes will be directly affected by this requirement.
- ❖ One hour fire ratings are required on exterior walls when located less than 5'-0" from a property line
- ❖ An additional inspection will be required for fire-resistance-rated construction. This inspection must take place when fire rated walls are required between dwelling units; or due to proximity to property lines. An inspection is required after each layer of gypsum wall board is in place but before joints are taped and mudded.
- ❖ Rafter span tables have been modified to account for span reductions when ceiling joists are attached to, and supported by, the rafters. Rafter spans are also reduced in conditions where rafter-ties are required (i.e. when rafters are perpendicular to the ceiling joists).
- ❖ Two prescriptive methods of addressing brick-on-wood have been included in the code that will prevent the builder from obtaining an engineer's design. Plan exam will be attempting to identify these cases before permits are issued in order for the builder to determine which method will be utilized prior to construction. Please refer to appendix pages A44 and A45 of the Guide for additional information.
- ❖ Not all brick veneered eyebrow-type arches are self-supporting. Their structural capabilities vary depending on the degree of the arch, amount and weight of the brick located above the arch, and the

amount of abutting wall located on both ends of the arch. Masonry eyebrow-type arches over openings must be supported by a steel lintel in accordance with section R703.7.3 of the 2006 IRC. However, if good masonry practices are followed, a lintel may be omitted in the following conditions:

1. Arch span does not exceed 6 feet
 2. A minimum of 16 inches of masonry wall must be installed adjacent to the arch ends in order to transfer the thrust load
 3. The rise of the arch must exceed 1 inch per 1 foot of span (not to exceed 6 feet). For example, a 5-ft arch span must have a minimum rise of 5 inches at the peak of the arch.
 4. Arches that frame into a column(s), such as at an entryway, are not permitted unless designed by a structural engineer.
- ❖ All framing members, including studs, which are less than 8 inches above the adjacent grade, must be of treated wood
 - ❖ Bores, notches and cuts of the bottom plates must be field treated with a termiticide that is readily identifiable by the inspector
 - ❖ Exterior foam sheathing cannot be used unless the bottom edge is located at least 6 inches above grade

Windows

- ❖ Residential windows, wired glass is prohibited
- ❖ Windows located at least 36 inches above stairs and landings are no longer required to be safety glazed (formerly 60 inches)
- ❖ Windows must be installed and flushed in accordance to the manufactures installation instructions. Self-flashing windows without supplemental flashing cannot be approved unless the installation instructions specifically allow it - this isn't very likely, so please read your installation instructions carefully. Installation instructions for each window must be provided to the inspector at the Seconds inspection.
- ❖ Glazing in walls located within 60 inches of a swimming pool, spa or hot tub must be of safety glazing. This may cause some houses to replace existing windows based on the location of the swimming pool.

Energy

- ❖ Batt insulation may not be installed in attics with the kraft facing exposed.
- ❖ Attics are allowed to be unventilated when the following is provided:
 1. No attic floor vapor barriers
 2. Air-impermeable insulation is applied to the underside of the roof deck (i.e. closed cell foam insulation)
 3. 1 perm or less vapor barrier is applied to the top side of the roof decking
- ❖ Building paper or other approved moisture barrier (i.e. tyvek) materials are required on all wood framed homes.

- ❖ The energy provisions regulate the amount of insulation required in attics, walls, between and under floor spaces. This provision also impacts windows, doors, HVAC efficiency ratings. All windows that do not face within 45 degrees of true north must have a Solar Heat Gain Coefficient of 0.32 or less. Solar shades may not be used to enhance a window's SHGC to gain compliance.
- ❖ Residential plans, when submitted, will be required to provide an energy code worksheet. You can find a checklist for energy efficiency and calculations on the Internet. This is a free site provided by the U. S. Dept. of Energy. You may download this checklist and it will be acceptable to the City for submittal once all calculations prove compliance. The web address is: www.energycodes.gov, or you can call **1-800-270-CODE (2633)**.

- ❖ An insulation inspection is required after your Seconds inspection and prior to the installation of wallboard. This inspection includes vapor/draft control caulking/sealing of exterior air leaks and the use of draft protected I.C. rated recessed lighting cans as well. Please be aware that "House Wrap", siding, or other similar materials cannot be installed prior to the insulation inspection unless steps are taken to make panel bracing accessible for inspection. This may involve folding back 4 feet of building paper at each corner, and/or omitting siding.

Mechanical

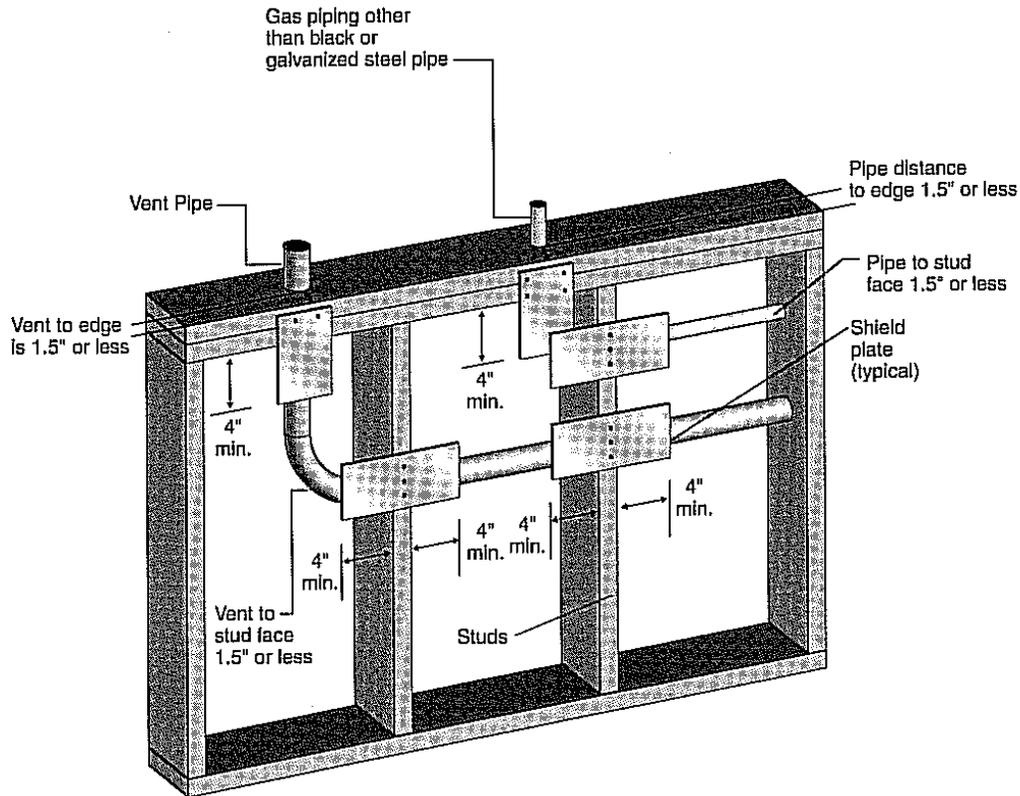
- ❖ Bathroom ventilation will be required to vent directly to the outside if an openable window of not less than 3 square feet (one-half of the area must be openable) is not provided. Individual water closet compartments that are separated from the rest of the bathroom by a door must contain their own vent. Vent ducts may not terminate in an attic, soffit or ridge vent.
- ❖ Smoke detectors for renovation projects are now required in all bedrooms (new and existing) regardless of cost of valuation. Existing bedrooms that are not a part of the alteration/remodeling project do not have to be hardwired and interconnected if work is not taking place in those areas.
- ❖ There is also a provision to prohibit un-vented gas heaters with an exception to heaters equipped with an oxygen-depletion-sensitive-safety-shutoff-system. Heaters may not be allowed to be used as the sole heat source.
- ❖ Fireplaces must be equipped with an exterior air supply to assure proper fuel combustion. The intake of the air supply cannot be located higher than the firebox.
- ❖ A single combustion air duct may be utilized for gas-fired appliances located in 1 and 2 family dwellings, provided the equipment has the proper clearances and a large duct is installed.

Electrical

- ❖ Combination arc fault breakers required in all rooms. Note: Combination arc-fault breakers must be factory labeled and easily identified in the panel.
- ❖ Light and switching required at top and bottom of stairs with six or more rises
- ❖ Requirement for GFI outlets within 6 feet of a laundry tub regardless of whether a working surface is provided.
- ❖ Allows for lower load calculations when heat pumps are installed in residences.
- ❖ Prohibits the use of sheet metal screws to connect grounding devices to electrical enclosures.
- ❖ Pipe guard strips are no longer permitted to protect wiring passing through floors. In these scenarios, rigid conduit or other approved methods must be utilized and extend a minimum of 6 inches above the floor.
- ❖ Amperage deduction is now required in romex wiring when more than 2 cable assemblies penetrate the same boring of a wood framing member.
- ❖ 1-1/2 inches of clearance required beneath NMC cable and the bottom of roof decking.

Plumbing

- ❖ Protection of gas and vent piping in walls has changed (see drawing):



- ❖ Drilling and notching of studs: some applications will require 2"X6" walls instead of 2"X4" to provide for 2" drain/lines, vent /stacks.
- ❖ Top and bottom plates containing plumbing must utilize nail guards that extend a minimum of 2 inches above bottom plates and top plates.
- ❖ Tub and shower walls require the use of cement board, fiber-cement board, or glass mat gypsum backer as substrate for ceramic tile showers and tubs. Gypsum "Green Board" is prohibited.
- ❖ Handheld hose sprayers installed as an accessory to a garden, hydromassage bathtub, or possibly a water closet, must be equipped with appropriate backflow protection.
- ❖ Water heaters must be provided with a pan (with drain). Drains must be connected to an approved indirect waste receptor or extend to the exterior of the building and terminate not less than 6 inches (nor more than 24 inches) above the adjacent ground surface. When water heaters are installed in attic areas and accessed through a door from the interior, the door must be solid, weather stripped, and self-closing.
- ❖ For other than steel gas piping, exposed pipe must be identified with a yellow label marked "Gas". The marking must be spaced at 5'-0" intervals.
- ❖ Both ends of medium pressure gas lines must be identified with a tag that states the following: "Warning – 1/2 to 5 psi gas pressure – Do Not Remove"
- ❖ All risers connecting underground plastic gas piping and tubing shall be anodeless.
- ❖ Showers, bathtub and whirlpool bathtub valves must be limited to a maximum temperature of 120 degrees F by a water temperature limiting device.
- ❖ Minimum building sewer size may now be 3 inches in diameter provided it serves no more than 36 drain fixture units (d.f.u.'s) when on an 1/8th inch slope; and 42 d.f.u.'s when on a 1/4th inch slope.

Miscellaneous

- ❖ Basements must have at least one emergency egress opening regardless if the area is considered a habitable space. Doesn't apply to basements less than 200 SF that only house mechanical equipment
- ❖ Emergency escape windows may be installed beneath decks if a minimum of 36 inches of clearance is provided.
- ❖ A landing is no longer required at the top of the stairs leading to a garage provided the door does not swing over the stair
- ❖ Retaining walls taller than 24 inches may not be constructed of wood.
- ❖ Retaining walls taller than 36 inches must be designed by an engineer and incorporate 1.5 safety factor against lateral sliding and overturning
- ❖ Residential ramps, when installed must meet a 1:12 maximum slope. Elevated ramps exceeding 30 inches in height must meet the same requirements as guardrails.
- ❖ 5/8 inch gypsum board must be used on ceilings when joists are spaced on 24 inch center unless ½ inch sag-resistant gypsum board is utilized.

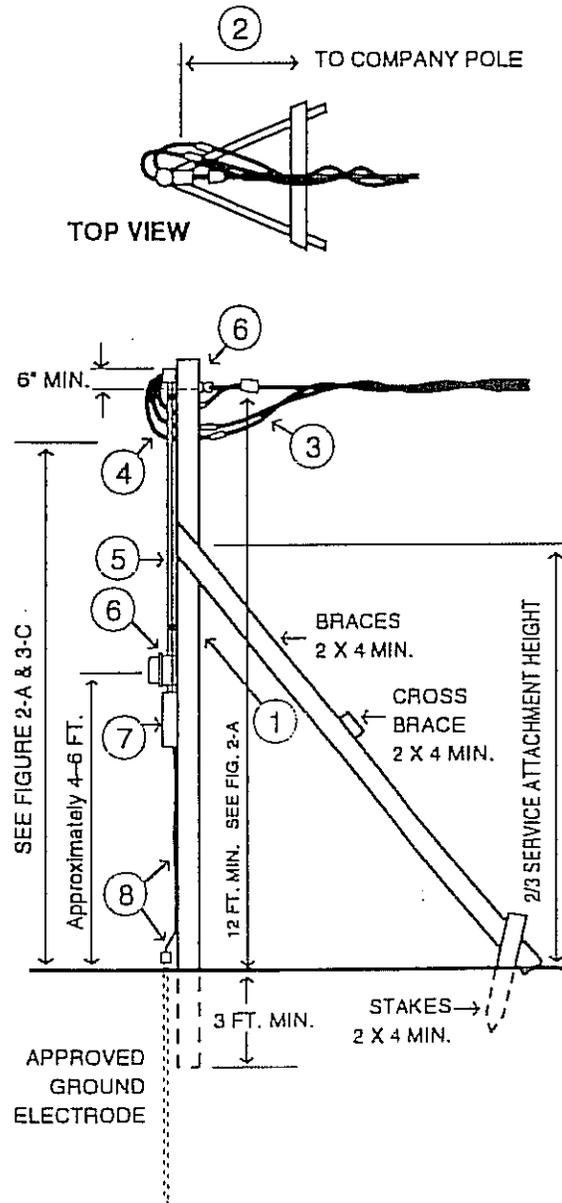
APPENDIX

TEMPORARY SERVICE POLE FROM OVERHEAD SECONDARY

FIGURE A

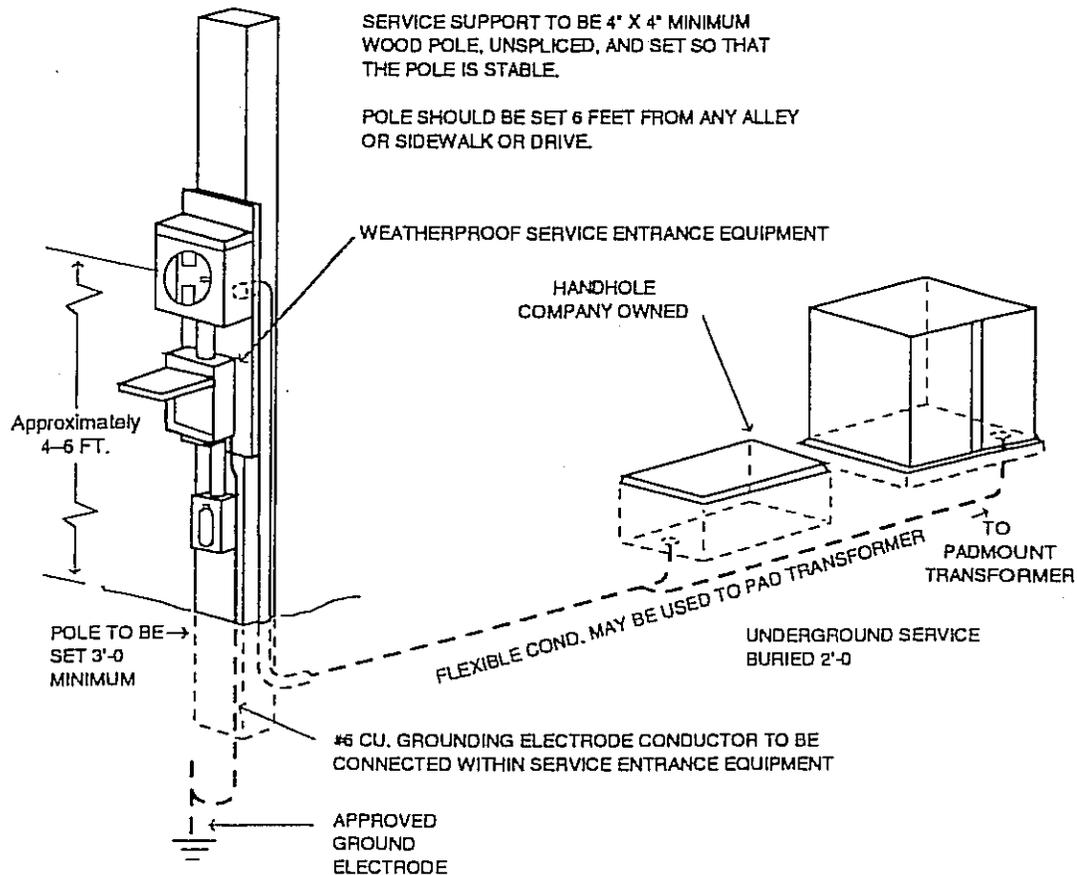
NOTES:

1. Temporary service pole provided and installed by Customer. Pole must provide sufficient height for the service drop to meet minimum clearances given in Figure 2-A, 12 ft. minimum. Pole to be minimum of 4" x 4" x 16 ft. unspliced or 5" minimum diameter creosote pole.
2. Service pole must be within maximum distance as specified on Figure 3-C. Reduced distance may be required for larger services to maintain minimum clearances.
3. Service drop (conductors, service grips and service connectors) owned and installed by Company.
4. Service entrance conductors provided and installed by Customer. Conductors of 24" minimum or length required by local ordinance to extend outside service head for connection to service drop. Minimum #8 copper or #6 aluminum conductor with phase conductors to be black insulation, neutral conductor to be white or bare.
5. Service head and raceway provided and installed by Customer to protect service entrance conductors. Two conduit straps minimum.
6. Service attachment and meter socket installed by Customer.
7. Weatherproof service switch or breaker panel provided and installed by Customer.
8. Customer's grounding electrode conductor (#6 Cu min.) shall originate in the service entrance equipment and extend to an approved ground electrode. The grounding electrode conductor shall not terminate within the meter socket. Company reserves the right to refuse installation of service contingent upon inspection of Customer's grounding connections.
9. All other materials provided and installed by the customer.
10. Customer shall not allow pole to be moved or tampered with as long as Company's service conductors are attached.



TEMPORARY SERVICE POLE FROM UNDERGROUND SECONDARY

FIGURE B



NOTE:

Customer shall not allow pole to be moved or tampered with as long as Company's service wires are attached.

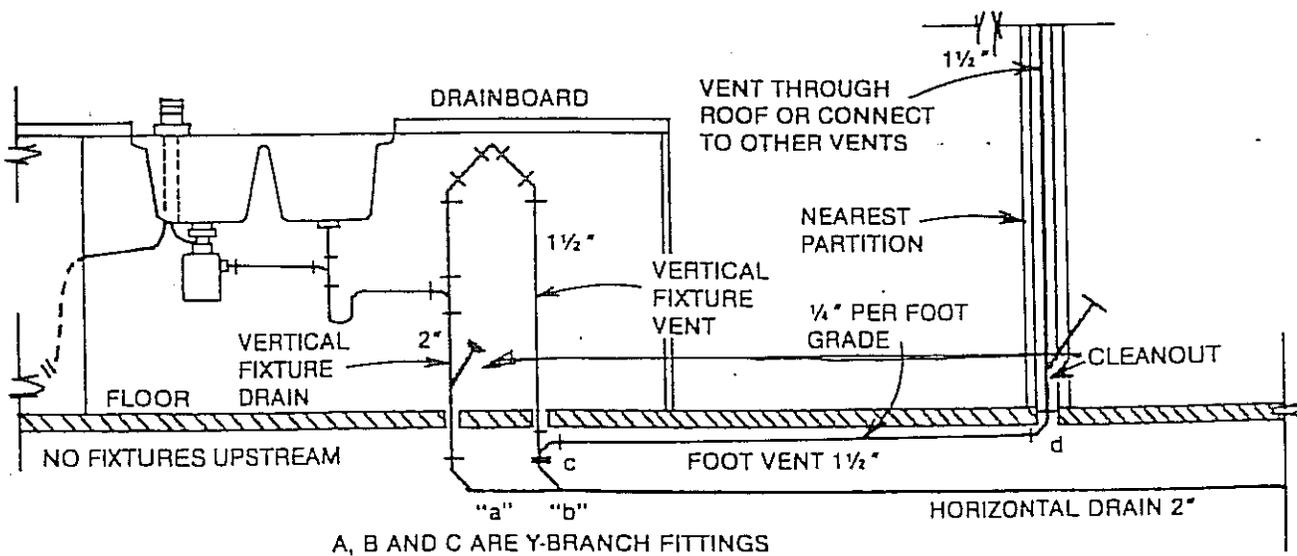
Service entrance equipment and pole will be provided, installed and maintained by the Customer. Customer shall install meter socket. Conduit and wire will be furnished by Customer or his agent from line meter terminals to the point of connections at the transformer pad. Customer will trench within 2'-0" of transformer pad, pedestal or handhole. Company will make final trenching and connections. Customer's wiring from line terminals of meter socket to connections at service pedestal, handhole or pad transformer must be protected by metal conduit, flexible or rigid in all areas exposed above ground.

Customer's grounding electrode conductor shall originate from service entrance equipment and shall not terminate in Company meter socket. Customer's grounding electrode conductor shall be #6 cu. minimum and connected to an approved ground electrode (pole butt wrap is not an approved ground electrode). Company may check Customer's ground before installing electric service.

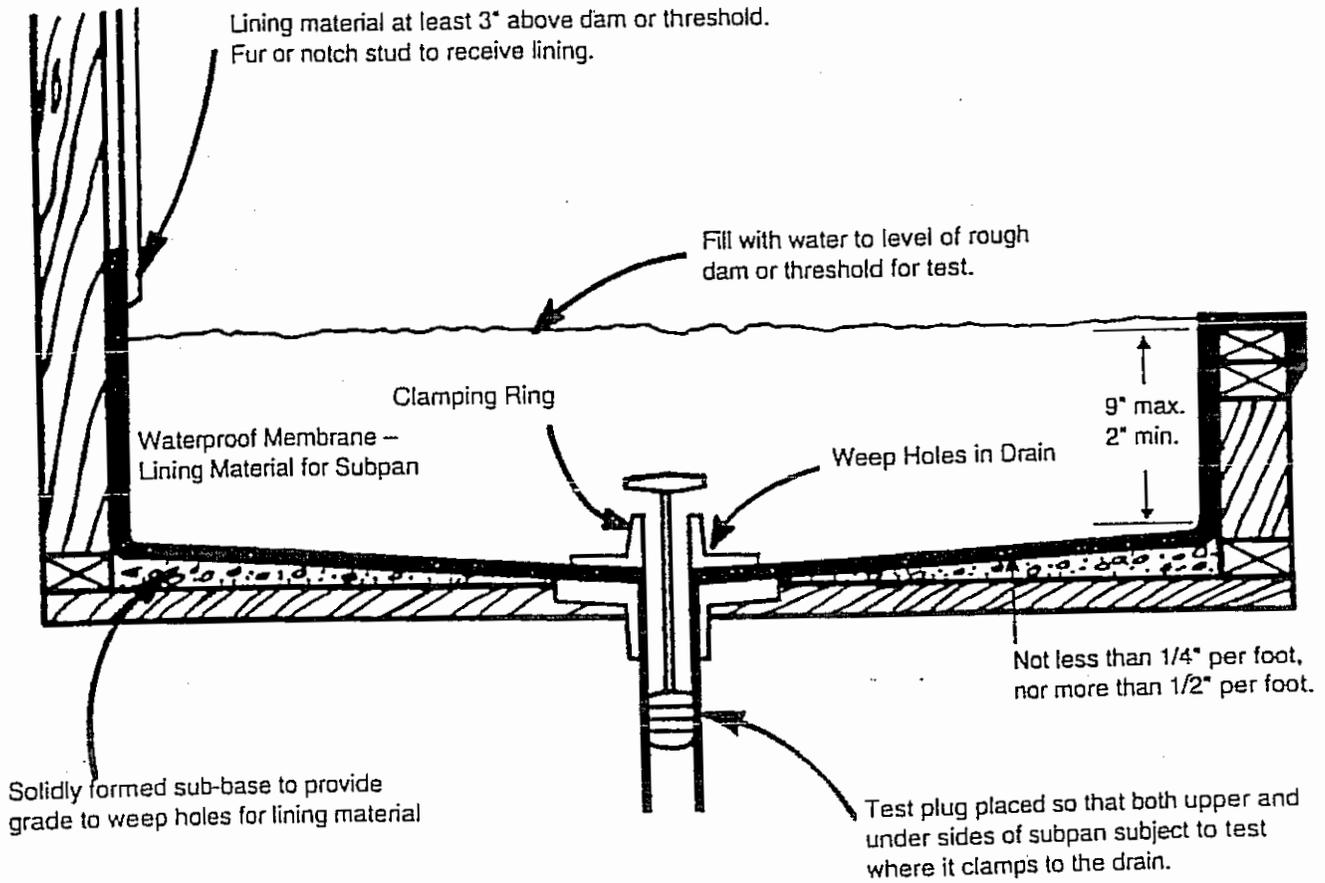
SPECIAL VENTING FOR ISLAND FIXTURES

Traps for island sinks and similar equipment shall be roughed in above the floor and may be vented by extending the vent as high as possible, but not less than drain board height. The vent is then returned downward and connected to the horizontal sink drain immediately downstream from the vertical fixture drain. Figure 6-16 illustrates the construction of the completed island venting system.

The returned vent shall be connected to the horizontal drain through a wye branch fitting, (see "b" in Fig. 6-15) and shall in addition be provided with a foot vent taken off the vertical fixture vent by means of a wye branch fitting immediately below the floor. This foot vent extends to the nearest partition and then through the roof to the open air, or may be connected to other vents at a point not less than six (6) inches (152.4 mm) above the flood level rim of the fixture served. (See Fig. 6-15) In slab on grade foundations, an accessible cleanout shall also be installed in the vertical fixture drain.



SHOWER PAN TEST



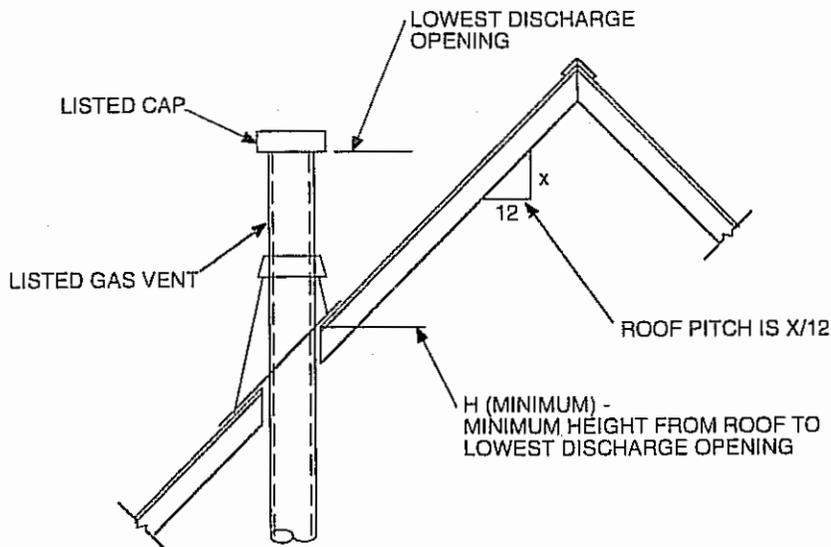
Test Procedure for a Site Constructed Shower Receptor

CLEARANCE OF FLUE VENTS ABOVE ROOFS

Gas vents 12 inches in size or smaller with listed caps may terminate in accordance with the table below, provided that such vents are at least 8 feet from a vertical wall or similar obstruction.

All other gas vents must terminate at least 2 feet above the highest point where they pass through the roof and at least 2 feet higher than any portion of a building within 10 feet. 2000 IRC Sec. G2426.6.5

ROOF SLOPE	Min height from roof to lowest discharge opening Feet-Inches
Flat to 6/12	1 - 0
6/12 to 7/12	1 - 3
Over 7/12 to 8/12	1 - 6
Over 8/12 to 9/12	2 - 0
Over 9/12 to 10/12	2 - 6
Over 10/12 to 11/12	3 - 3
Over 11/12 to 12/12	4 - 0
Over 12/12 to 14/12	5 - 0
Over 14/12 to 16/12	6 - 0
Over 16/12 to 18/12	7 - 0
Over 18/12 to 20/12	7 - 6
Over 20/12 to 21/12	8 - 8



SIZE OF COMBUSTION - AIR OPENINGS OR DUCTS

COLUMN I		COLUMN II	
Buildings of Ordinary Tightness		Buildings of Unusually Tight Construction ²	
Condition	Size of Openings or Ducts	Condition	Size of Openings or Ducts
Appliance in unconfined space:	May rely on infiltration alone.	Appliance in unconfined ² space: Obtain combustion air from outdoors or from space freely communicating with outdoors.	Provide two openings, each having 1 sq. in. per 5,000 Btu/h input. Ducts admitting outdoor air may be connected to the cold-air return.
Appliance in confined ⁴ space: 1. All air from inside building.	Provide two openings into enclosure each having one square inch per 1000 Btu/h input freely communicating with other unconfined interior spaces. Minimum 100 sq. in. each opening. ³	Appliance in confined ⁴ space: Obtain combustion air from outdoors or from space freely communicating with outdoors.	1. Provide two vertical ducts or plenums; 1 sq. in. per 4,000 Btu/h input each duct or plenum. 2. Provide two horizontal ducts or plenums; 1 sq. in. per 2,000 Btu/h input each duct or plenum.

COLUMN I		COLUMN II	
Buildings of Ordinary Tightness		Buildings of Unusually Tight Construction ²	
Condition	Size of Openings or Ducts	Condition	Size of Openings or Ducts
2. Part of air from inside building.	Provide two openings into enclosure ³ from other freely communicating unconfined ² interior spaces each having an area of 100 sq. in. plus one duct or plenum opening to outdoors having an area of 1 sq. in. per 5,000 Btu/h input rating. The outdoor duct or plenum opening may be connected to the cold-air return.		3. Provide two openings in an exterior wall of the enclosure; each opening 1 sq. in. per 4,000 Btu/h input. 4. Provide one ceiling opening to ventilated attic and one vertical duct to attic; each opening 1 sq. in. per 4,000 Btu/h input.
3. All air from outdoors. Obtain from outdoors or from space freely communicating with outdoors.	Use any of the methods listed for confined space in unusually tight construction as indicated in Column II.		5. Provide one opening in enclosure ceiling to ventilated attic and one opening in enclosure floor to ventilated crawl space; each opening 1 sq. in. per 4,000 Btu/h input.

- 1.) One opening shall be located within the upper 12 inches of the enclosure and one opening shall be located within the lower 12 inches of the enclosure.
- 2.) **UNUSUALLY TIGHT CONSTRUCTION** is construction where:
 - a.) Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of one perm or less with any openings gasketed or sealed, and
 - b.) Weather-stripping on openable windows and doors, and
 - c.) Caulking or sealants are applied to areas such as joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels and at penetrations for plumbing, electrical and gas lines and at other openings.
- 3.) When the total input rating of appliances in enclosure exceeds 100,000 Btu/h, the area of each opening into the enclosure shall be increased 1 square inch for each 1,000 btu/h over 100,000.
- 4.) **CONFINED SPACE** is a room or space having a volume less than 50 cubic feet per 1000 Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space.
UNCONFINED SPACE is a room or space having a volume equal to at least 50 cubic feet per 100 Btu/h of the aggregate input rating of all fuel-burning appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through opening not furnished with doors, are considered a part of the unconfined space.

**TABLE R602.3(1)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS**

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a,b,c,d}	SPACING OF FASTENERS
Joist to sill or girder, toe nail	3-8d	—
1" x 6" subfloor or less to each joist, face nail	2-8d 2 staples, 1 ³ / ₄	— —
2" subfloor to joist or girder, blind and face nail	2-16d	—
Sole plate to joist or blocking, face nail	16d	16" o.c.
Top or sole plate to stud, end nail	2-16d	—
Stud to sole plate, toe nail	3-8d or 2-16d	—
Double studs, face nail	10d	24" o.c.
Double top plates, face nail	10d	24" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d	16" o.c.
Double top plates, minimum 48-inch offset of end joints, face nail in lapped area	8-16d	—
Blocking between joists or rafters to top plate, toe nail	3-8d	—
Rim joist to top plate, toe nail	8d	6" o.c.
Top plates, laps at corners and intersections, face nail	2-10d	—
Built-up header, two pieces with 1/2" spacer	16d	16" o.c. along each edge
Continued header, two pieces	16d	16" o.c. along each edge
Ceiling joists to plate, toe nail	3-8d	—
Continuous header to stud, toe nail	4-8d	—
Ceiling joist, laps over partitions, face nail	3-10d	—
Ceiling joist to parallel rafters, face nail	3-10d	—
Rafter to plate, toe nail	2-16d	—
1" brace to each stud and plate, face nail	2-8d 2 staples, 1 ³ / ₄	— —
1" x 6" sheathing to each bearing, face nail	2-8d 2 staples, 1 ³ / ₄	— —
1" x 8" sheathing to each bearing, face nail	2-8d 3 staples, 1 ³ / ₄	— —
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d 4 staples, 1 ³ / ₄	— —
Built-up corner studs	10d	24" o.c.
Built-up girders and beams, 2-inch lumber layers	10d	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
2" planks	2-16d	At each bearing
Roof rafters to ridge, valley or hip rafters: toe nail	4-16d	—
face nail	3-16d	—
Rafter ties to rafters, face	3-8d	—
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing		
5/16-1/2	6d common nail (subfloor, wall) 8d common nail (roof) ^f	6 12 ^g
19/32 -1	8d common nail	6 12 ^g
1 1/8-1 1/4	10d common nail or 8d deformed nail	6 12

(continued)

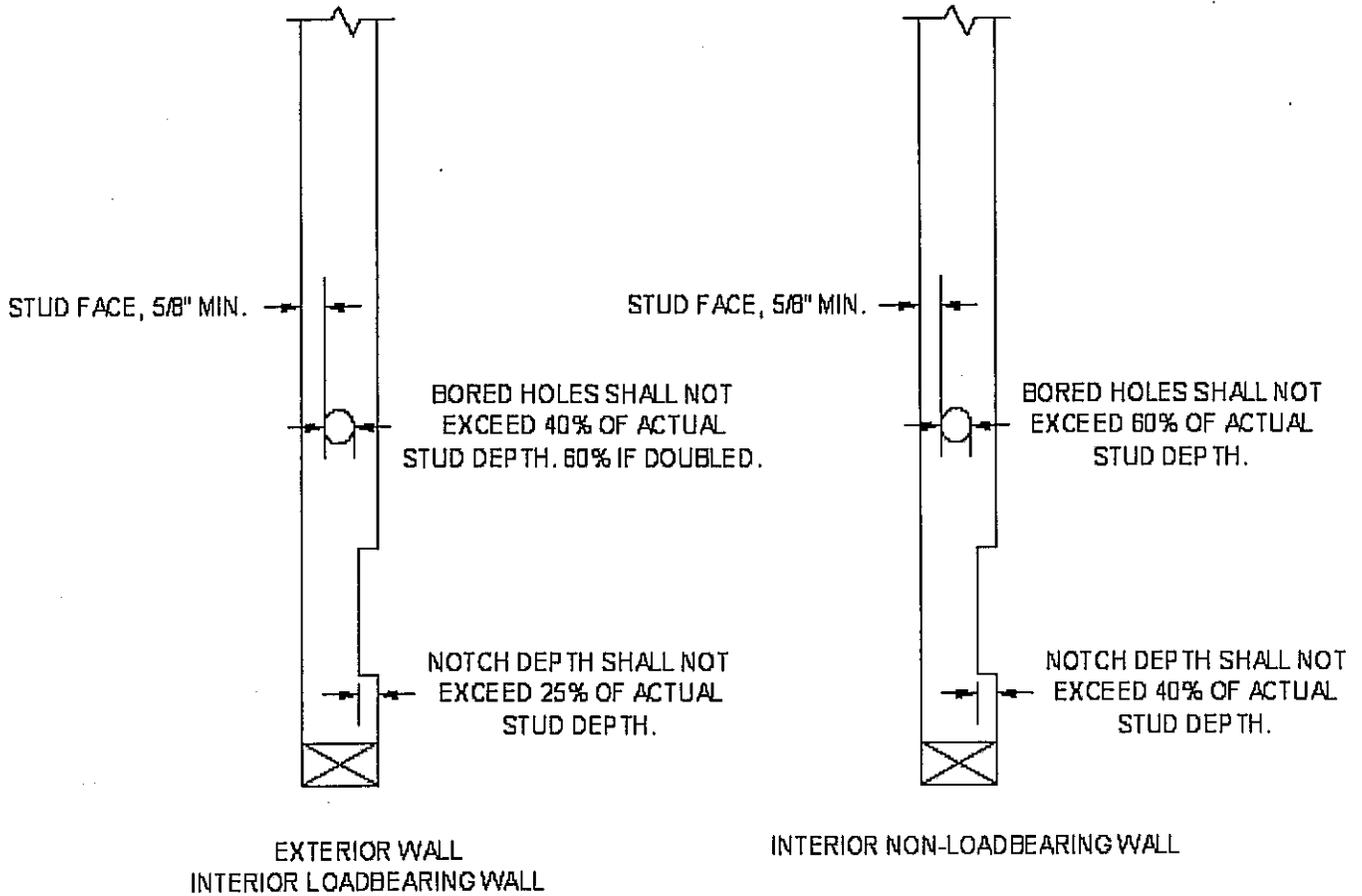
**TABLE R602.3(1)—continued
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS**

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER ^{b,c,d,e}	SPACING OF FASTENERS	
		Edges (inches) ^f	Intermediate supports ^{g,h} (inches)
Other wall sheathingⁿ			
1/2" regular cellulosic fiberboardsheathing	1 1/2 galvanized roofing nail 6d common nail staple 16 ga., 1 1/2 long	3	6
1/2 structural cellulosic fiberboard sheathing	1 1/2 galvanized roofing nail 8d common nail staple 16 ga., 1 1/2 long	3	6
25/32 structural cellulosic fiberboard sheathing	1 3/4 galvanized roofing nail 8d common nail staple 16 ga., 1 3/4 long	3	6
1/2 gypsum sheathing	1 1/2 galvanized roofing nail; 6d common nail; staple galvanized, 1 1/2 long; 1 1/4 screws, Type W or S	4	8
5/8 gypsum sheathing	1 3/4 galvanized roofing nail; 8d common nail; staple galvanized, 1 5/8 long; 1 5/8 screws, Type W or S	4	8
Wood structural panels, combination subfloor underlayment to framing			
3/4 and less	6d deformed nail or 8d common nail	6	12
7/8-1	8d common nail or 8d deformed nail	6	12
1 1/8-1 1/4	10d common nail or 8d deformed nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 1.609 km/h.

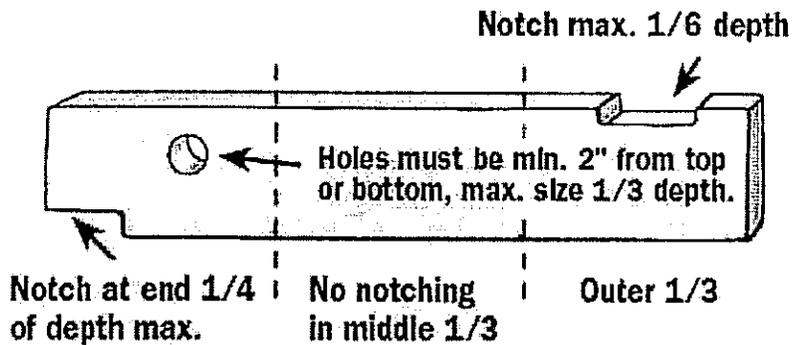
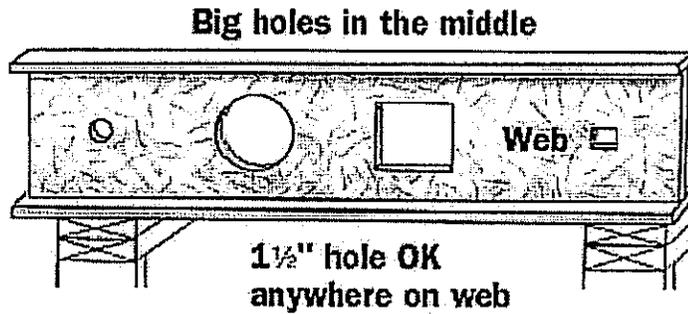
- a. All nails are smooth-common, box or deformed shanks except where otherwise stated.
- b. Staples are 16 gage wire and have a minimum 7/16-inch on diameter crown width.
- c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- d. Four-foot-by-8-foot or 4-foot-by-9-foot panels shall be applied vertically.
- e. Spacing of fasteners not included in this table shall be based on Table R602.3(1).
- f. For regions having basic wind speed of 110 mph or greater, 8d deformed nails shall be used for attaching plywood and wood structural panel roof sheathing to framing within minimum 48-inch distance from gable end walls, if mean roof height is more than 25 feet, up to 35 feet maximum.
- g. For regions having basic wind speed of 100 mph or less, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 80 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.
- h. Gypsum sheathing shall conform to ASTM C 79 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to either AHA 194.1 or ASTM C 208.
- i. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and at all roof plane perimeters. Blocking of roof or floor sheathing panel edges perpendicular to the framing members shall not be required except at intersection of adjacent roof planes. Floor and roof perimeter shall be supported by framing members or solid blocking.

NOTCHING AND BORING OF STUDS

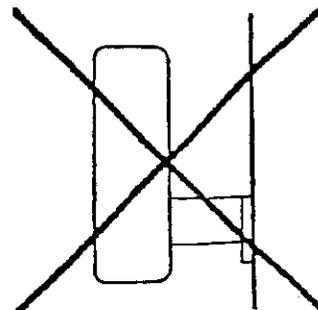
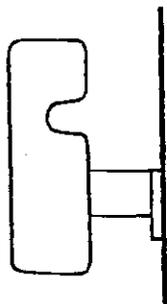
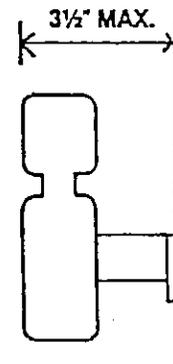
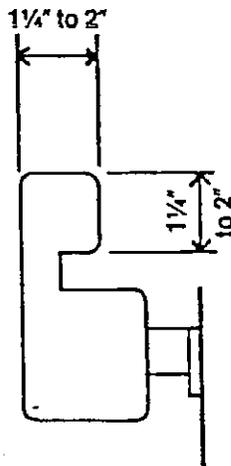
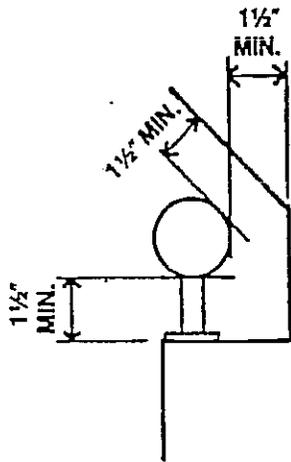
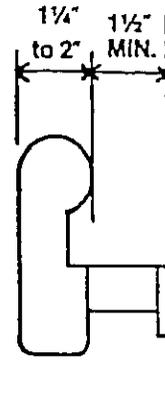
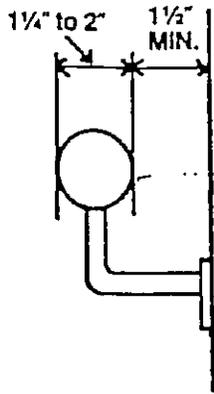
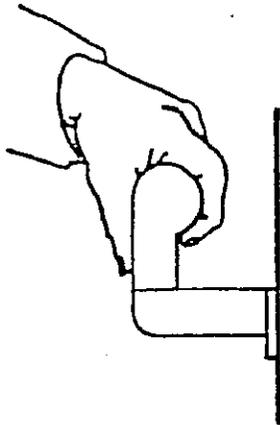


NOTCHING AND BORINGS OF FLOOR JOISTS

Notches on the ends of floor joists shall not exceed $\frac{1}{4}$ the joist depth. Bored holes shall not be within 2 inches of the top and bottom of the floor joist and the diameter of the hole shall not exceed $\frac{1}{3}$ the depth. Notches in the top or bottom of the floor joist shall not exceed $\frac{1}{6}$ the depth and shall not be located in the middle $\frac{1}{3}$ of the joist span.



ACCEPTABLE HANDRAIL DETAILS



NOT
ACCEPTABLE

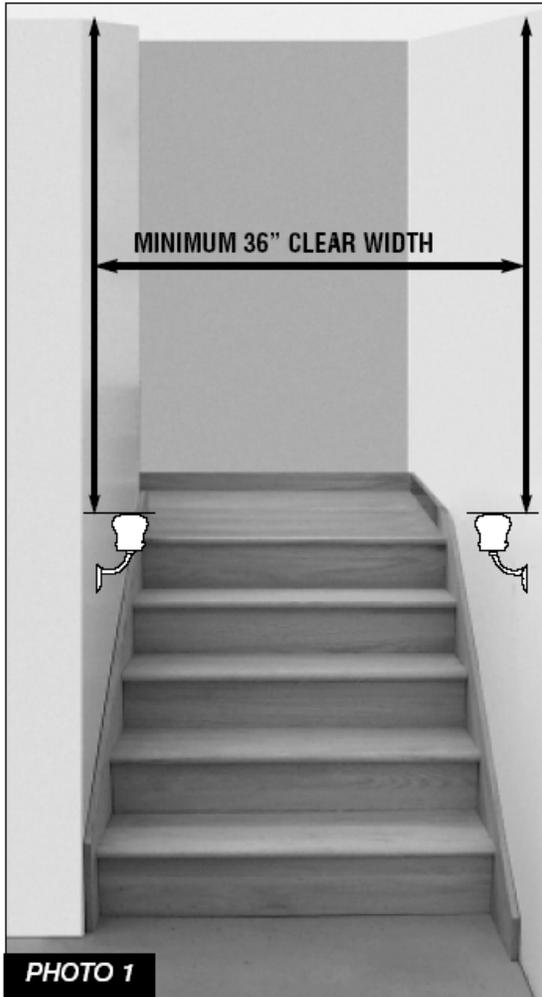
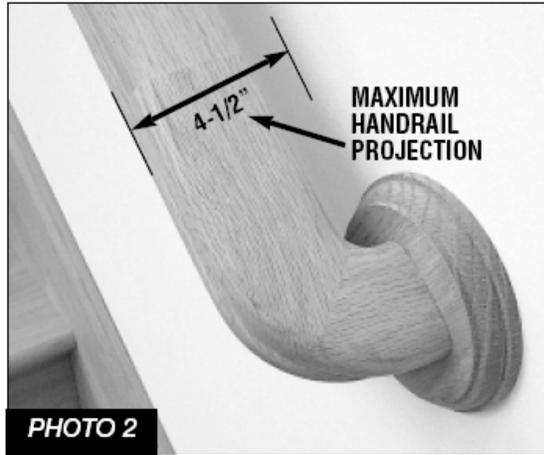
STAIR REQUIREMENTS

SECTION R314 STAIRWAYS

R314.1 Width.

Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. PHOTO 1. Handrails shall not project more than 4.5 inches (114 mm) on either side of the stairway PHOTO 2, and the minimum clear width of the stairway at and below the handrail height, including treads and landings, shall not be less than 31.5 inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are provided on both sides. PHOTO 3.

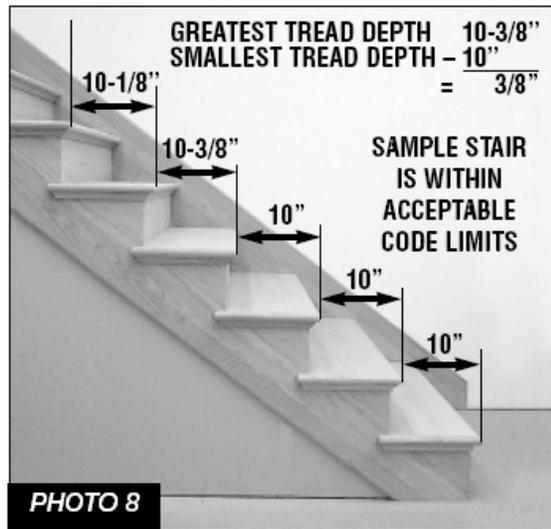
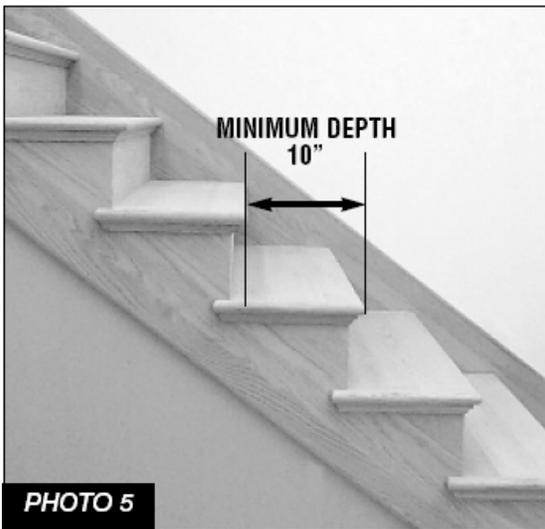
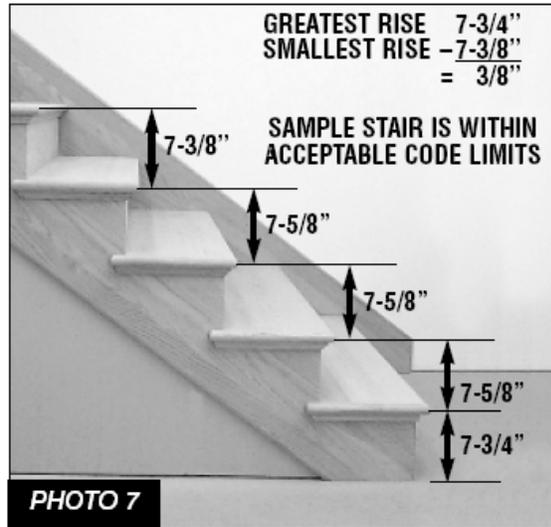
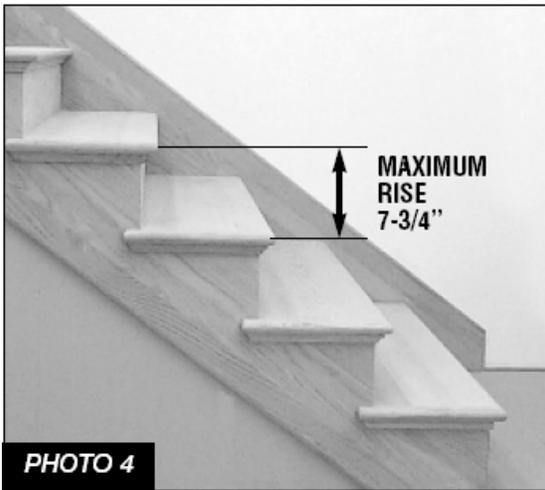
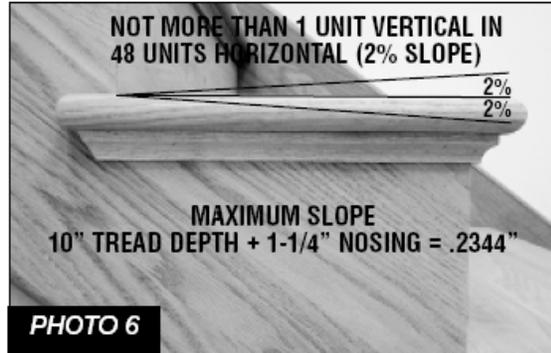
Exception: The width of spiral stairways shall be in accordance with Section R314.5.



STAIR REQUIREMENTS (cont.)

R314.2 Treads and risers.

The maximum riser height shall be 7-3/4 inches (196 mm) and the minimum tread depth shall be 10 inches (254 mm). The riser height shall be measured vertically between leading edges of the adjacent treads. PHOTO 4. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. PHOTO 5. The walking surface of treads and landings of a stairway shall be sloped no steeper than one unit vertical in 48 units horizontal (2 percent slope). PHOTO 6. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). PHOTO 7. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). PHOTO 8.

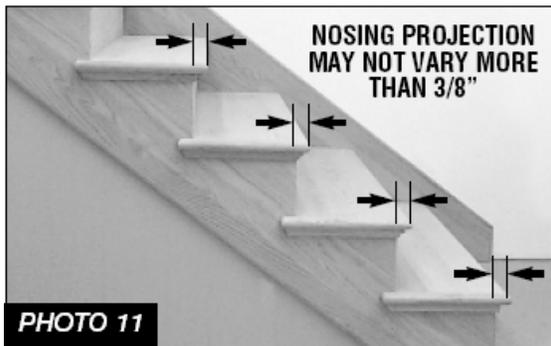
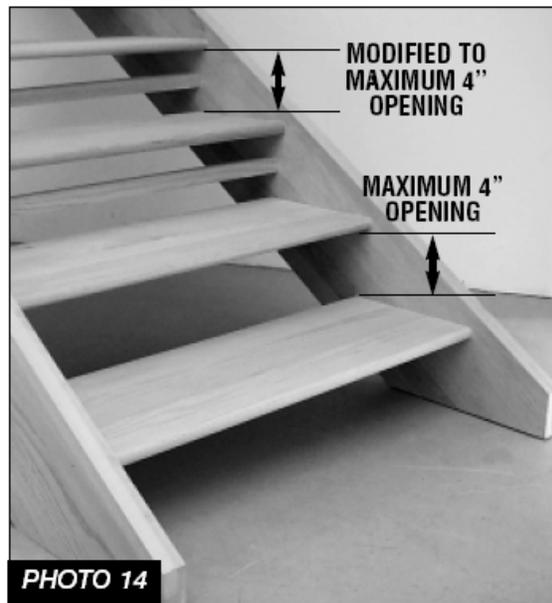
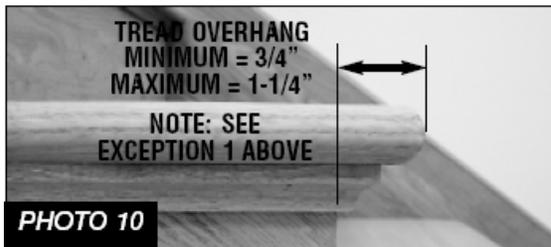
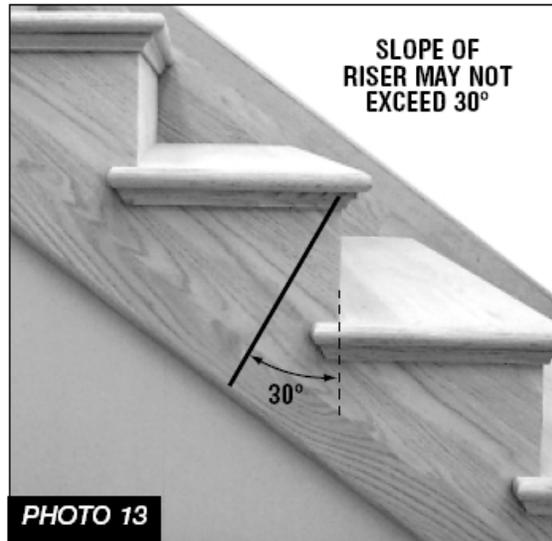
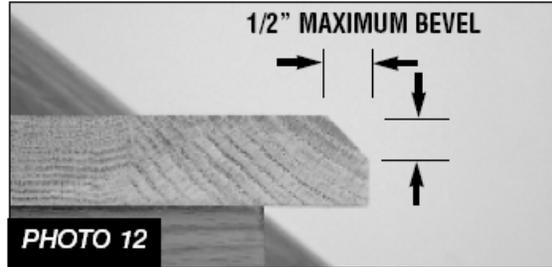
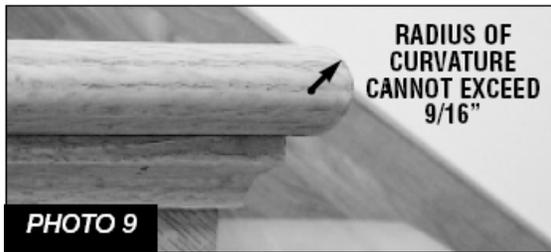


STAIR REQUIREMENTS (cont.)

R314.2.1 Profile.

The radius of curvature at the leading edge of the tread shall be no greater than 9/16 inch (14.3 mm). PHOTO 9. A nosing not less than 3/4 inch (19.1 mm) but not more than 1-1/4 inches (32 mm) shall be provided on stairways with solid risers. PHOTO 10. The greatest nosing projection shall not exceed the smallest nosing projection by more than 3/8 inch (9.5 mm) between two stories, including the nosing at the level of floors and landings. PHOTO 11. Beveling of nosing shall not exceed 1/2 inch (12.7 mm). PHOTO 12. Risers shall be vertical or sloped from the underside of the leading edge of the tread above at an angle not more than 30 degrees from the vertical. PHOTO 13. Open risers are permitted, provided that the opening between treads does not permit the passage of a 4-inch-diameter (102 mm) sphere. PHOTO 14.

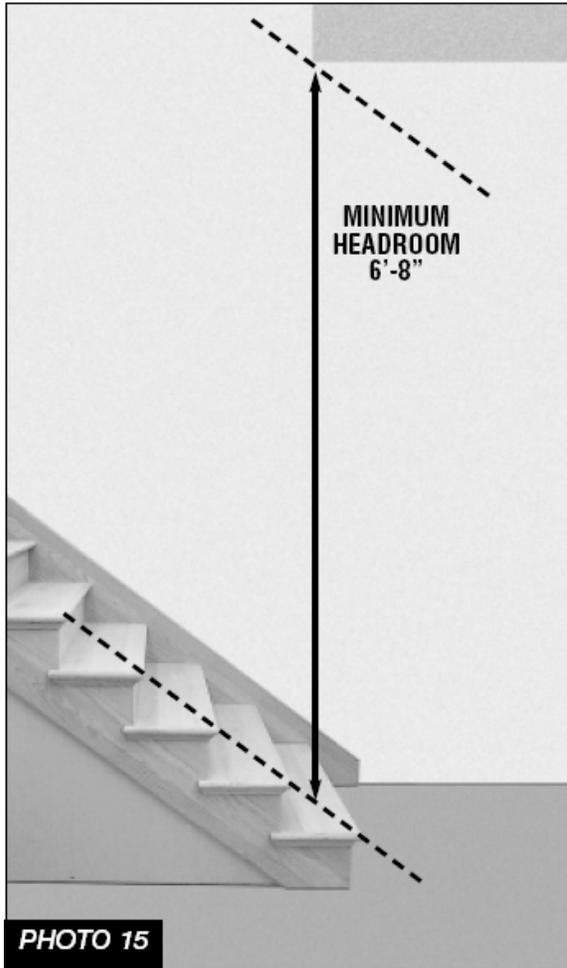
- Exceptions:*
1. A nosing is not required where the tread depth is a minimum of 11 inches (279 mm).
 2. The opening between adjacent treads is not limited on stairs with a total rise of 30 inches (762 mm) or less.



STAIR REQUIREMENTS (cont.)

R314.3 Headroom.

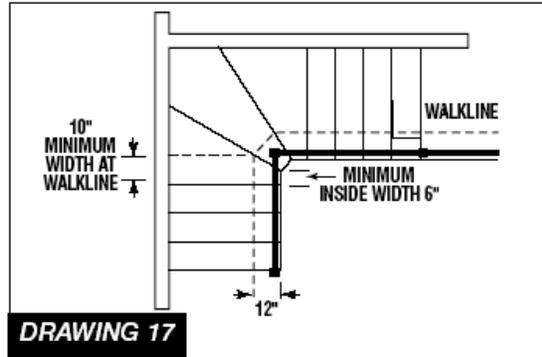
The minimum headroom in all parts of the stairway shall not be less than 6 feet, 8 inches (2032 mm) measured vertically from the sloped plane adjoining the tread nosing, PHOTO 15, or from the floor surface of the landing or platform, PHOTO 16.



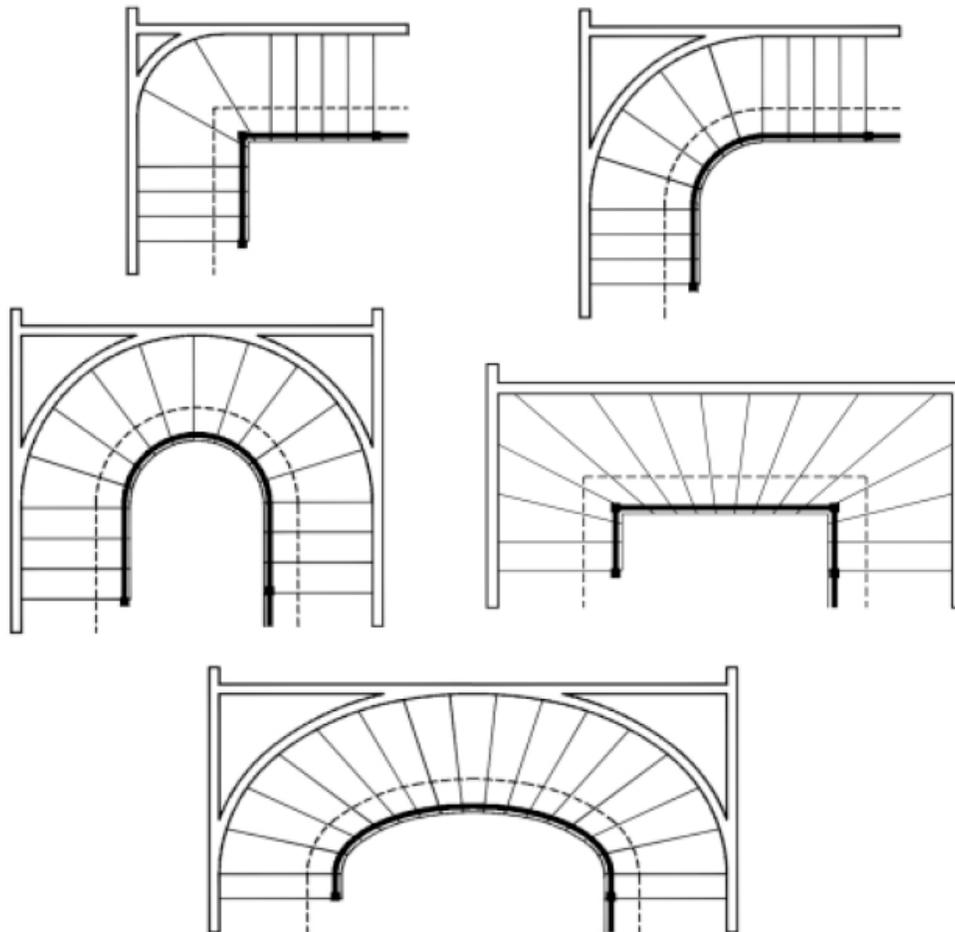
STAIR REQUIREMENTS (cont.)

R314.4 Winders.

Winders are permitted, provided that the width of the tread at a point not more than 12 inches (305 mm) from the side where the treads are narrower is not less than 10 inches (254 mm) and the minimum width of any tread is not less than 6 inches (152 mm). The continuous handrail required by Section R315.1 shall be located on the side where the tread is narrower. **DRAWING 17.**



ALTERNATE WINDER DESIGNS



STAIR REQUIREMENTS (cont.)

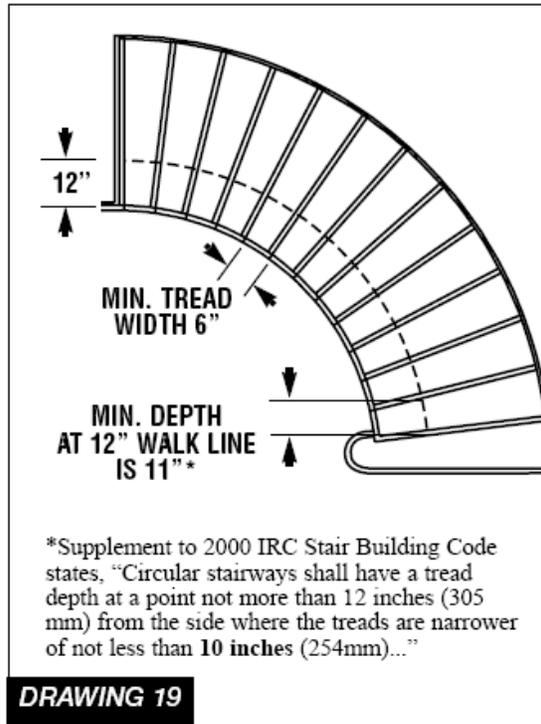
R314.5 Spiral Stairs.

Spiral stairways are permitted, provided the minimum width shall be 26 inches (660 mm) with each tread having a 7-1/2 inch (190 mm) minimum tread width at 12 inches (305 mm) from the narrow edge. All treads shall be identical, and the rise shall be no more than 9-1/2 inches (241 mm). A minimum headroom of 6 feet, 6 inches (1982 mm) shall be provided. PHOTO 18.



R314.6 Circular Stairways.

Circular stairways shall have a tread depth at a point no more than 12 inches (305 mm) from the side where the treads are narrower of not less than 11 inches (279 mm) and the minimum depth of any tread shall not be less than 6 inches (152 mm). Tread depth at any walking line, measured a consistent distance from a side of the stairway, shall be uniform as specified in Section 314.2. DRAWING 19.



R314.7 Illumination.

All stairs shall be provided with illumination in accordance with Section R303.4.

R314.8 Under stair protection.

Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2" (12.7-mm) gypsum board.

R314.9 Bulkhead enclosure stairways.

Stairways serving bulkhead enclosures not part of the required building egress and providing access from the outside grade level to the basement shall be exempt from the requirements of Sections R312, R314 and R315 when the maximum height from the basement finished floor level to grade adjacent to the stairway is covered by a bulkhead enclosure with hinged doors or other approved means.

STAIR REQUIREMENTS (cont.)

SECTION R315 HANDRAILS

R315.1 Handrails.

Handrails having minimum and maximum heights of 34 inches and 38 inches (864 mm and 965 mm), respectively, measured vertically from the nosing of the treads, shall be provided on at least one side of stairways. PHOTO 20. All required handrails shall be continuous the full length of the stairs with two or more risers from a point directly above the top riser of a flight to a point directly above the lowest riser of the flight. PHOTO 21. Ends shall be returned or shall terminate in newel posts or safety terminals. PHOTO 22. Handrails adjacent to a wall shall have a space of not less than 1.5 inches (38 mm) between the wall and the handrail. PHOTO 23.



PHOTO 20



PHOTO 21



PHOTO 22

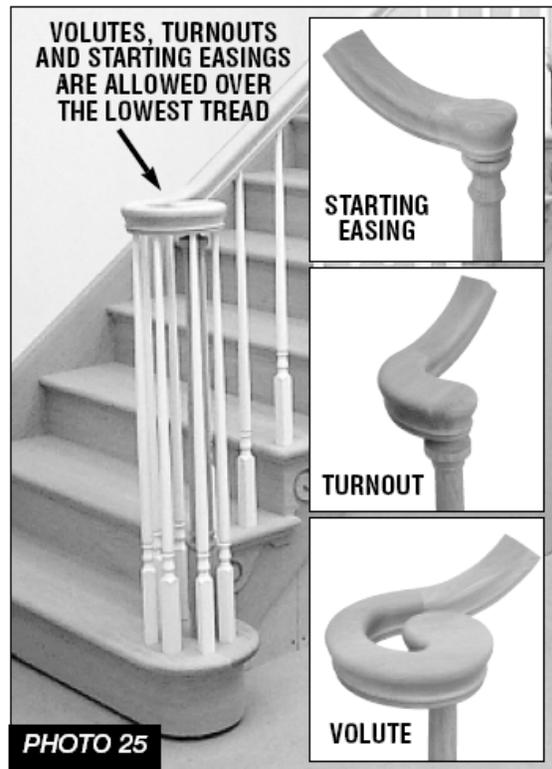
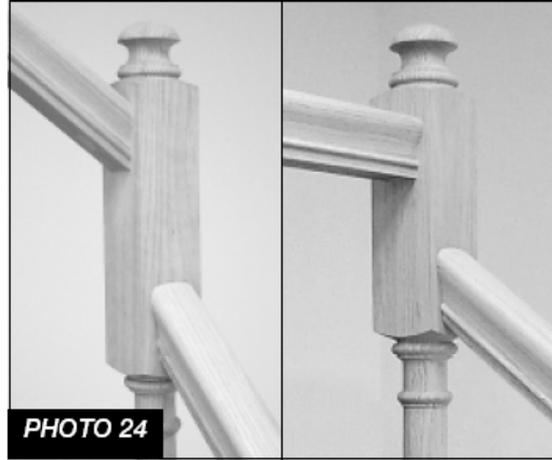


PHOTO 23

Exceptions: 1. Handrails shall be permitted to be interrupted by a newel post at a turn. PHOTO 24.

2. The use of a volute, turnout or starting easing shall be allowed over the lowest tread. PHOTO 25.

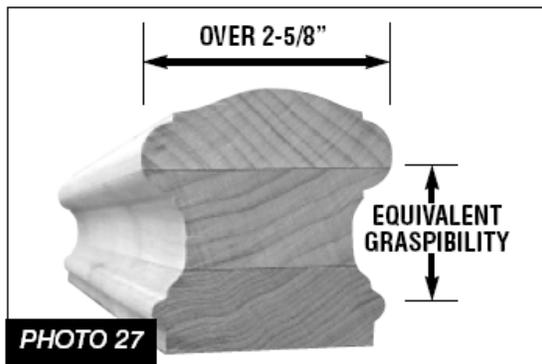
HANDRAIL MAY BE INTERRUPTED BY A NEWEL



STAIR REQUIREMENTS (cont.)

R315.2 Handrail grip size.

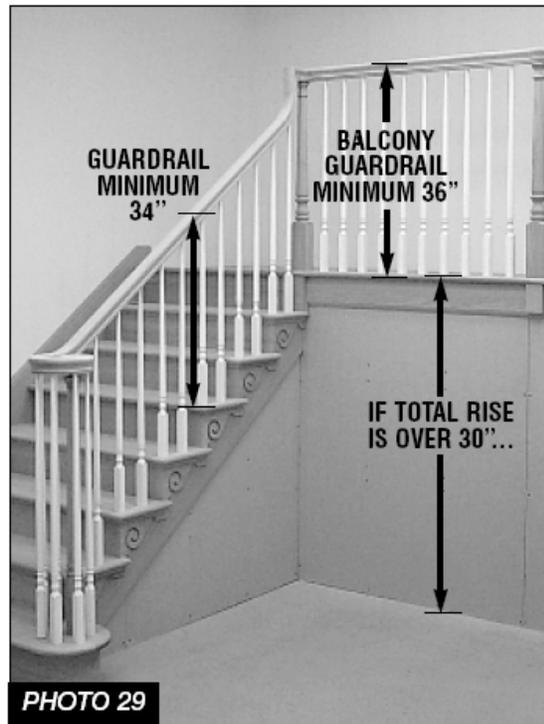
The handgrip portion of handrails shall have a circular cross section of 1-1/4 inches (32 mm) minimum to 2-5/8 inches (67 mm) maximum. PHOTO 26. Other handrail shapes that provide an equivalent grasping surface are permissible. PHOTO 27. Edges shall have a minimum radius of 1/8 inch (3.2 mm). PHOTO 28.



SECTION R316 GUARDS

R316.1 Guards required.

Porches, balconies or raised floor surfaces located more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 36 inches (914 mm) in height. Open sides of stairs with a total rise of more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 34 inches (864 mm) in height measured vertically from the nosing of the treads. PHOTO 29.



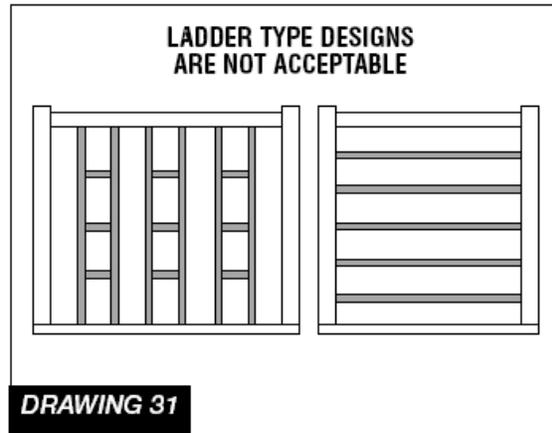
STAIR REQUIREMENTS (cont.)

R316.2 Guard opening limitations.

Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches (102 mm) in diameter. PHOTO 30.

Required guards shall not be constructed with horizontal rails or other ornamental patterns that results in a ladder effect. DRAWING 31.

Exception: The triangular openings formed by the riser, tread and bottom rail of a guard at the open side of a stairway are permitted to be of such a size that a sphere 6 inches (152 mm) cannot pass through. PHOTO 32.



Span Tables for Lintels Supporting Masonry & Headers Located Over Openings in Walls

GIRDER SPANS^a AND HEADER SPANS^a FOR EXTERIOR BEARING WALLS

(Maximum header spans for douglas fir-larch, hem-fir, southern pine and spruce-pine-fir^b and required number of jack studs)

HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) ^e													
		30						50							
		Building width ^c (feet)													
		20		26		36		20		26		36			
Span		NJ ^d		Span		NJ ^d		Span		NJ ^d		Span		NJ ^d	
Roof and ceiling	2-2x4	3-6	1	3-2	1	2-10	1	3-2	1	2-9	1	2-6	1		
	2-2x6	5-5	1	4-8	1	4-2	1	4-8	1	4-1	1	3-8	2		
	2-2x8	6-10	1	5-11	2	5-4	2	5-11	2	5-2	2	4-7	2		
	2-2x10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5-7	2		
	2-2x12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6	2		
	3-2x8	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9	2		
	3-2x10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7-0	2		
	3-2x12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8-2	2		
	4-2x8	7-0	1	6-1	2	5-5	2	6-1	2	5-3	2	4-8	2		
	4-2x10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2	2		
4-2x12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5	2			
Roof, ceiling and one center-bearing floor	2-2x4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2-2	1		
	2-2x6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3-3	2		
	2-2x8	5-9	2	5-0	2	4-6	2	5-2	2	4-6	2	4-1	2		
	2-2x10	7-0	2	6-2	2	5-6	2	6-4	2	5-6	2	5-0	2		
	2-2x12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5-9	3		
	3-2x8	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5-1	2		
	3-2x10	8-9	2	7-8	2	6-11	2	7-11	2	6-11	2	6-3	2		
	3-2x12	10-2	2	8-11	2	8-0	2	9-2	2	8-0	2	7-3	2		
	4-2x8	5-10	2	5-2	2	4-8	2	5-3	2	4-7	2	4-2	2		
	4-2x10	10-1	1	8-10	2	8-0	2	9-1	2	8-0	2	7-2	2		
4-2x12	11-9	2	10-3	2	9-3	2	10-7	2	9-3	2	8-4	2			
Roof, ceiling and one clear span floor	2-2x4	2-8	1	2-4	1	2-1	1	2-7	1	2-3	1	2-0	1		
	2-2x6	3-11	1	3-5	2	3-0	2	3-10	2	3-4	2	3-0	2		
	2-2x8	5-0	2	4-4	2	3-10	2	4-10	2	4-2	2	3-9	2		
	2-2x10	6-1	2	5-3	2	4-8	2	5-11	2	5-1	2	4-7	3		
	2-2x12	7-1	2	6-1	3	5-5	3	6-10	2	5-11	3	5-4	3		
	3-2x8	6-3	2	5-5	2	4-10	2	6-1	2	5-3	2	4-8	2		
	3-2x10	7-7	2	6-7	2	5-11	2	7-5	2	6-5	2	5-9	2		
	3-2x12	8-10	2	7-8	2	6-10	2	8-7	2	7-5	2	6-8	2		
	4-2x8	5-1	2	4-5	2	3-11	2	4-11	2	4-3	2	3-10	2		
	4-2x10	8-9	2	7-7	2	6-10	2	8-7	2	7-5	2	6-7	2		
4-2x12	10-2	2	8-10	2	7-11	2	9-11	2	8-7	2	7-8	2			
Roof, ceiling and two center-bearing floors	2-2x4	2-7	1	2-3	1	2-0	1	2-6	1	2-2	1	1-11	1		
	2-2x6	3-9	2	3-3	2	2-11	2	3-8	2	3-2	2	2-10	2		
	2-2x8	4-9	2	4-2	2	3-9	2	4-7	2	4-0	2	3-8	2		
	2-2x10	5-9	2	5-1	2	4-7	3	5-8	2	4-11	2	4-5	3		
	2-2x12	6-8	2	5-10	3	5-3	3	6-6	2	5-9	3	5-2	3		
	3-2x8	5-11	2	5-2	2	4-8	2	5-9	2	5-1	2	4-7	2		
	3-2x10	7-3	2	6-4	2	5-8	2	7-1	2	6-2	2	5-7	2		
	3-2x12	8-5	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	3		
	4-2x8	4-10	2	4-3	2	3-10	2	4-9	2	4-2	2	3-9	2		
	4-2x10	8-4	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	2		
4-2x12	9-8	2	8-6	2	7-8	2	9-5	2	8-3	2	7-5	2			

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

- a. Spans are given in feet and inches.
- b. Tabulated values assume #2 grade lumber.
- c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- d. NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the header are permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.
- e. Use 30 psf ground snow load for cases in which ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

Span Tables for Lintels Supporting Masonry & Headers Located Over Openings in Walls (Cont.)

TABLE R703.7.1
ALLOWABLE SPANS FOR LINTELS SUPPORTING MASONRY VENEER^{a,b,c}

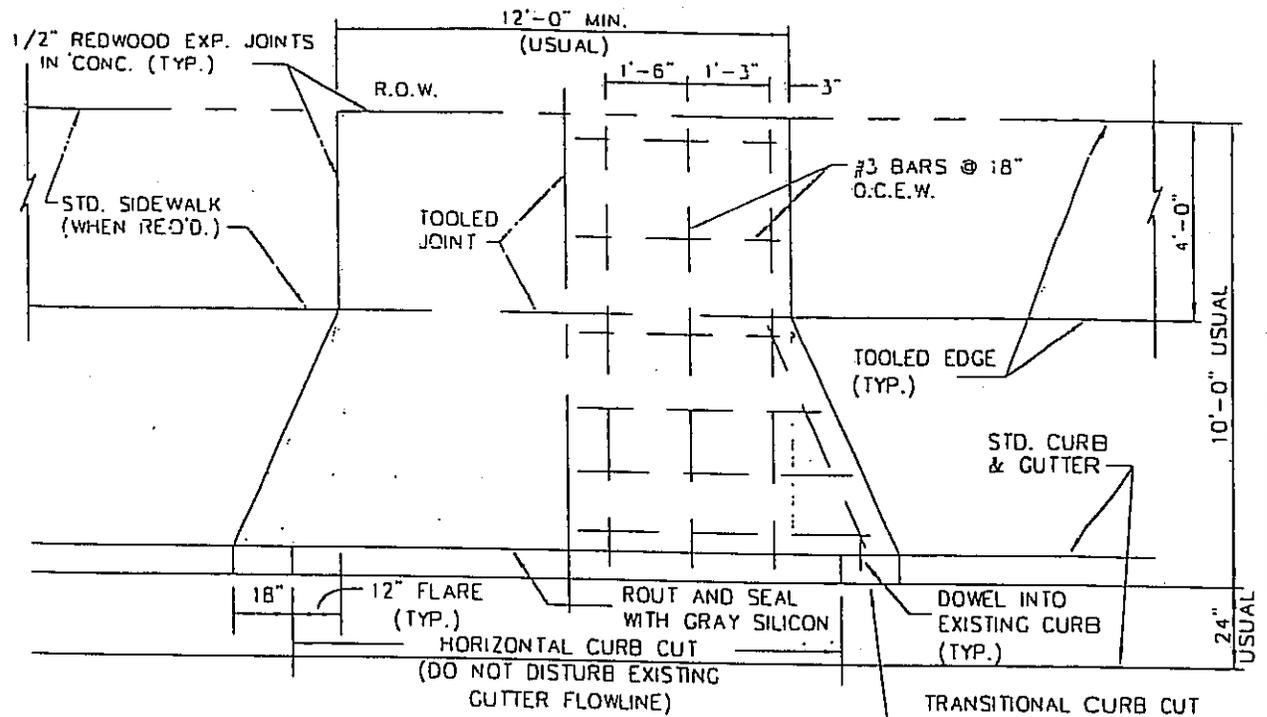
SIZE OF STEEL ANGLE ^{a,c} (Inches)	NO STORY ABOVE	ONE STORY ABOVE	TWO STORIES ABOVE	NO. OF 1/2" OR EQUIVALENT REINFORCING BARS ^c
3 × 3 × 1/4	6'-0"	3'-6"	3'-0"	1
4 × 3 × 1/4	8'-0"	5'-0"	3'-0"	1
6 × 3 1/2 × 1/4	14'-0"	8'-0"	3'-6"	2
2-6 × 3 1/2 × 1/4	20'-0"	11'-0"	5'-0"	4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Long leg of the angle shall be placed in a vertical position.

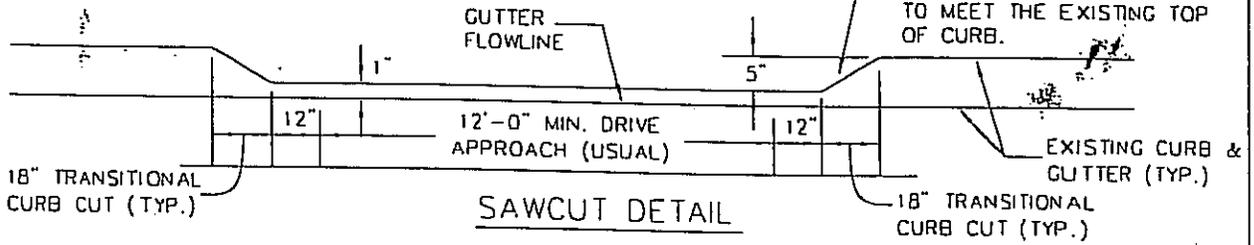
b. Depth of reinforced lintels shall not be less than 8 inches and all cells of hollow masonry lintels shall be grouted solid. Reinforcing bars shall extend not less than 8 inches into the support.

c. Steel members indicated are adequate typical examples; other steel members meeting structural design requirements may be used.

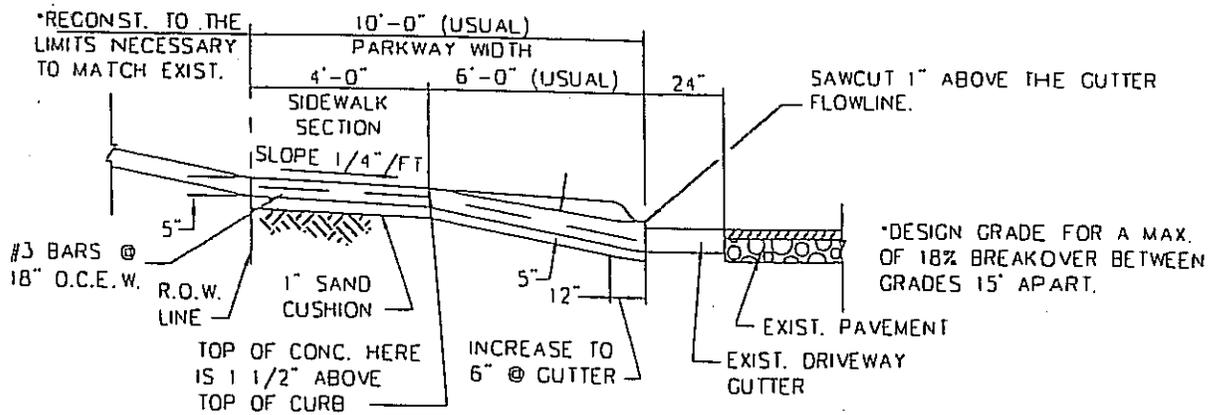


NOTE: EXISTING CURB SHALL NOT BE CUT UNTIL DRIVEWAY IS FORMED.

PLAN



SAWCUT DETAIL



SECTION

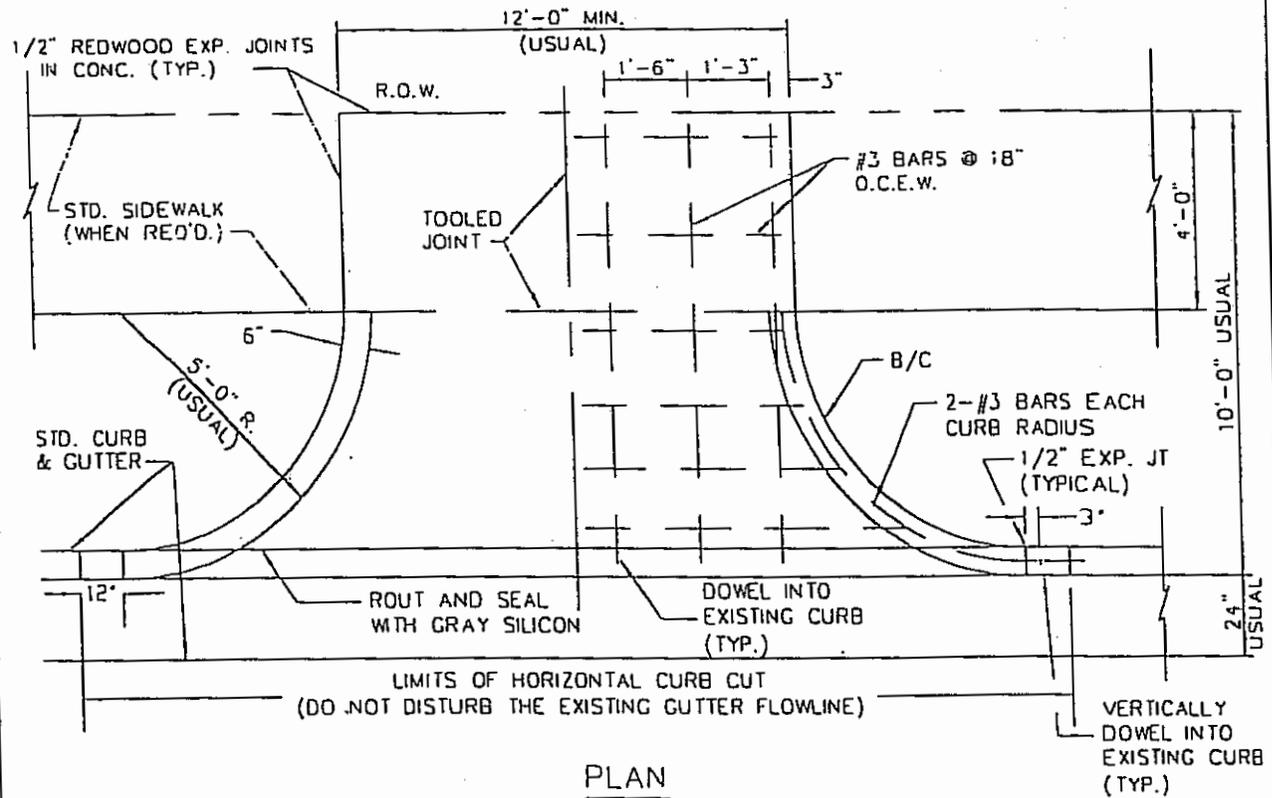
NOTES:

1. A HORIZONTAL CURB CUT IS REQUIRED FOR ALL DRIVE APPROACHES ONTO EXISTING STREETS. THE CURB CUT SHALL BE 1" ABOVE THE GUTTER FLOWLINE.
2. ALL EXPOSED EDGES SHALL BE GROUND TO A 1/4" RADIUS.
3. MINIMUM THICKNESS OF DRIVEWAY IS 5". USE 3000 PSI COMPRESSIVE STRENGTH CONCRETE WITH 5" MAXIMUM SLUMP.
4. CONCRETE TO BE POURED WITHIN 48 HOURS FROM THE TIME THE CURB IS SAWCUT.
5. PARKWAY, SIDEWALK, AND DRIVEWAY SIDEWALK SECTION WILL ALL HAVE A 1/4" PER FOOT SLOPE DOWN IN THE DIRECTION OF THE TOP OF CURB.
6. SEE FIGURE 4P FOR EXPANSION JOINT DETAIL.

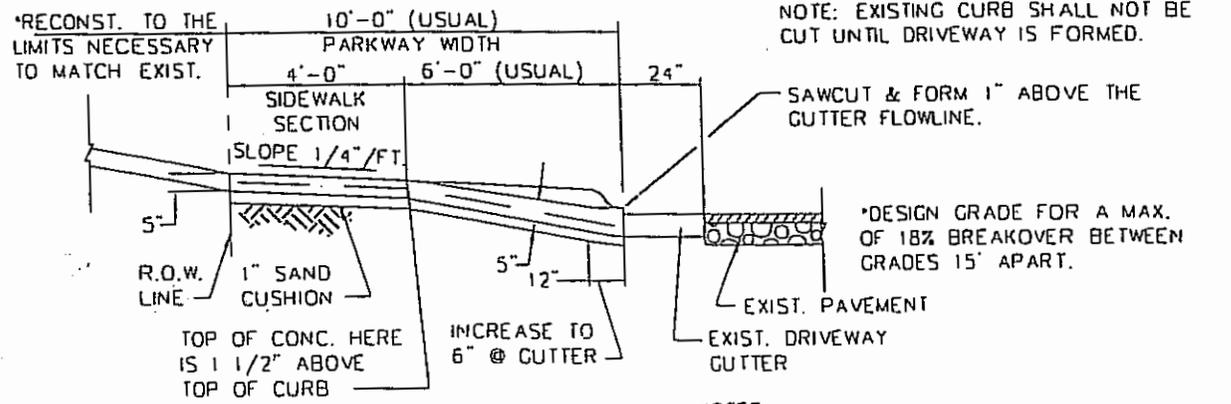
RESIDENTIAL DRIVE DETAILS

NORTH
RICHLAND
HILLS

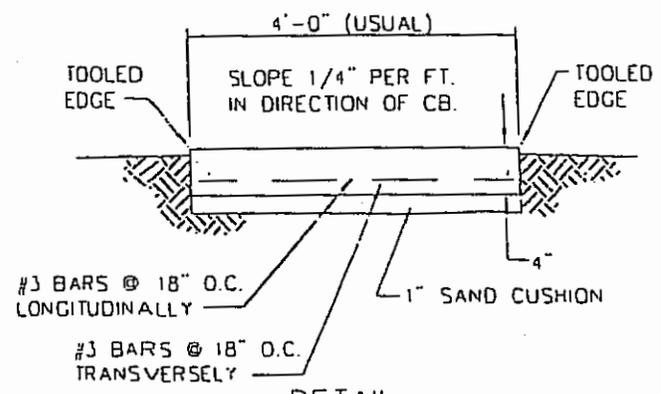
R 01-16-2006 FIGURE 11P-1



PLAN



SECTION



DETAIL
STANDARD SIDEWALK

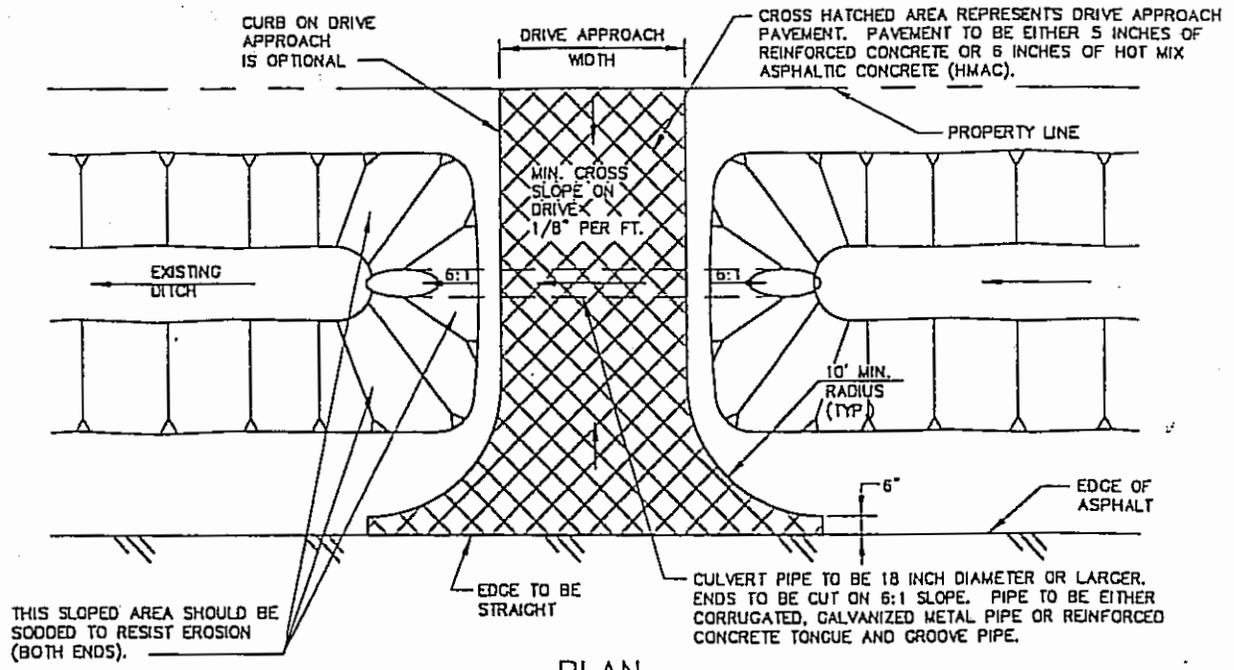
NOTE: EXISTING CURB SHALL NOT BE CUT UNTIL DRIVEWAY IS FORMED.

- NOTES:
1. A HORIZONTAL CURB CUT IS REQUIRED FOR ALL DRIVE APPROACHES ONTO EXISTING STREETS. THE EXISTING CURB CUT SHALL BE 1" ABOVE THE GUTTER FLOWLINE.
 2. ALL EXPOSED EDGES SHALL BE GROUNDED TO A 1/4" RADIUS.
 3. MINIMUM THICKNESS OF DRIVEWAY IS 5". USE 3000 PSI COMPRESSIVE STRENGTH CONCRETE WITH 5" MAXIMUM SLUMP.
 4. CONCRETE TO BE POURED WITHIN 48 HOURS FROM THE TIME THE CURB & GUTTER IS SAWCUT.
 5. PARKWAY, SIDEWALK, AND DRIVEWAY SIDEWALK SECTION WILL ALL HAVE A 1/4" PER FOOT SLOPE DOWN IN THE DIRECTION OF THE TOP OF CURB.
 6. SEE FIGURE 4P FOR EXPANSION JOINT DETAIL.

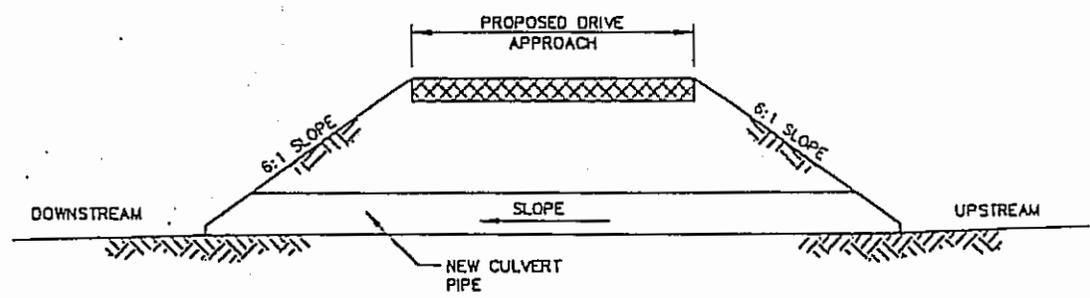
RESIDENTIAL DRIVE DETAILS

NORTH
RICHLAND
HILLS

R 01-16-2006 FIGURE 11P-2

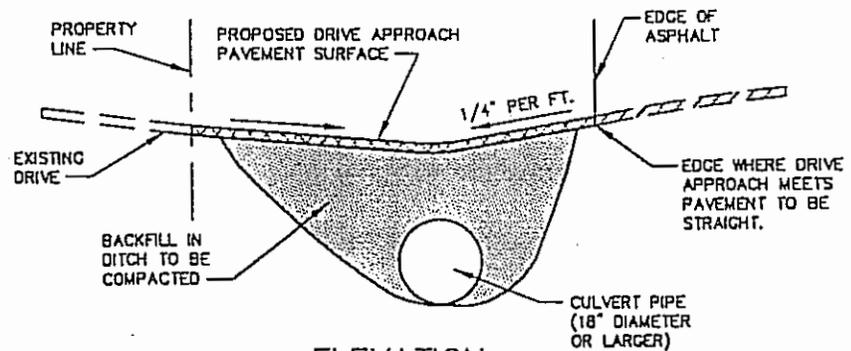


PLAN



NOTE: UPSTREAM AND DOWNSTREAM GRADING IN ROADWAY DITCH IS PROPERTY OWNER'S RESPONSIBILITY DURING DRIVE APPROACH INSTALLATION.

PROFILE



ELEVATION

- NOTES:**
1. ALL CULVERT PIPE TO BE NEW (NOT PREVIOUSLY USED).
 2. DIAMETER OF CULVERT PIPE TO BE DETERMINED BY THE PUBLIC WORKS DEPARTMENT.
 3. FUTURE MAINTENANCE OF THE DRIVE APPROACH AND CULVERT PIPE IS THE PROPERTY OWNER'S RESPONSIBILITY.
 4. ALL DITCH GRADING UPSTREAM AND DOWNSTREAM OF THE PROPOSED DRIVEWAY CULVERT IS THE PROPERTY OWNER'S RESPONSIBILITY.

DRIVE WITH CULVERT DETAILS

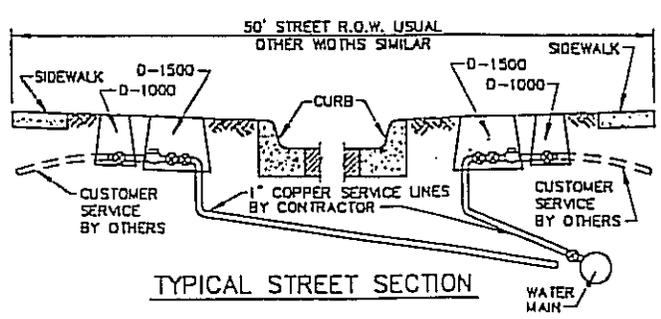
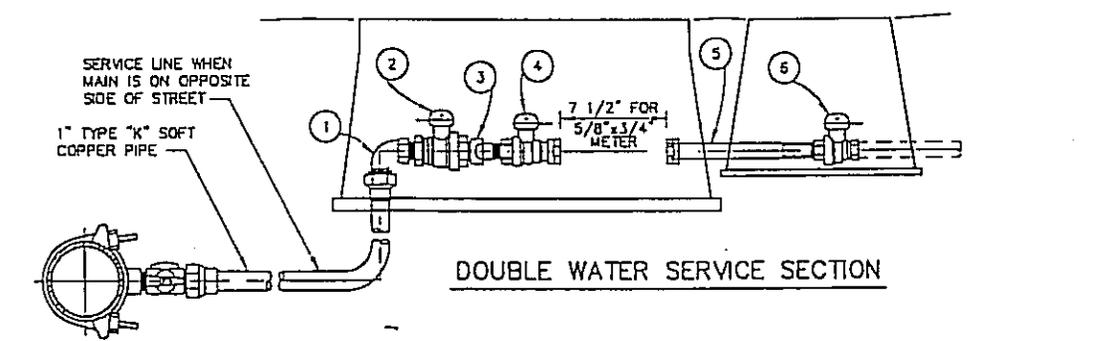
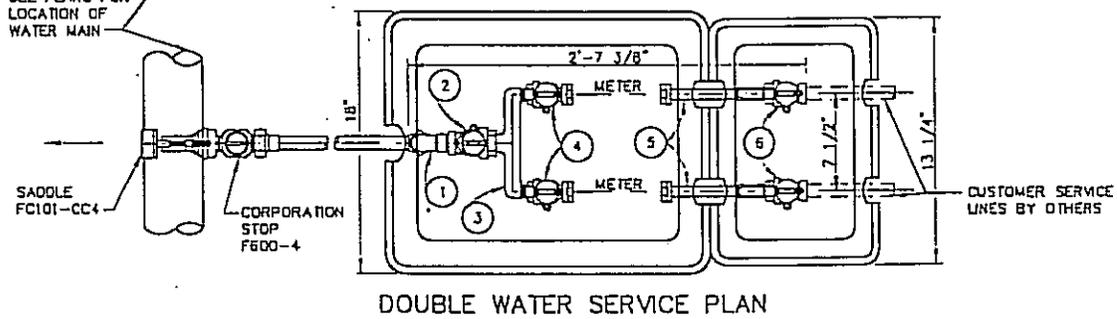
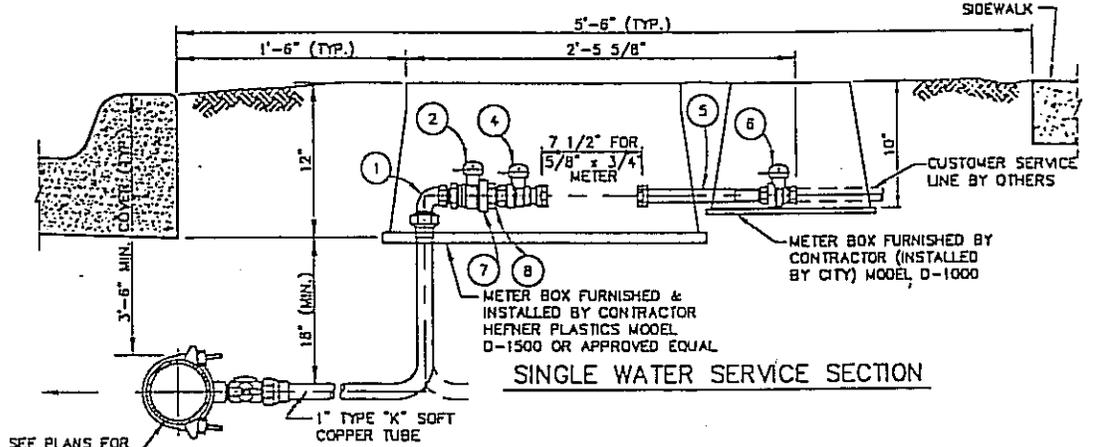
**NORTH
RICHLAND
HILLS**

6-8-94 FIGURE 14P

ITEM NO.	QUANTITY		SIZE	DESCRIPTION	PART NUMBER	
	SINGLE	DOUBLE			FORD	MUELLER
1.	1	1	1"	90° BRASS ELBOW, FLARE COPPER X M.I.P., (QTR. BEND)	L-2B-44	330 H 15530
2.	1	1	1"	BALLVALVE CB. STOP, F.I.P. X F.I.P.	B11-444WR	330 B 20200
3.	1	1	1"x3/4"x7 1/2"	U-BRANCH	U88-43	H 15362
4.	1	2	3/4"	BALLVALVE CB. STOP, F.I.P. X METER YOLK	B13-322W B13-322W	250 B 24351-3
5.	1	2	3/4"x8 1/2"	METER COUPLING BALLVALVE CB. STOP, F.I.P. X F.I.P.	C38-23-8.5	215 H 10890-99029
6.	1	2	3/4"	BALLVALVE CB. STOP, F.I.P. X F.I.P.	B11-333WR	250 B 20200-3
7.	1		1"x3/4"	BRASS REDUCER BUSHING (REDUCING SPUD MIP X MIP)	-	502464
8.	1		3/4"	ALL THREAD BRASS NIPPLE	-	-

NOTES:

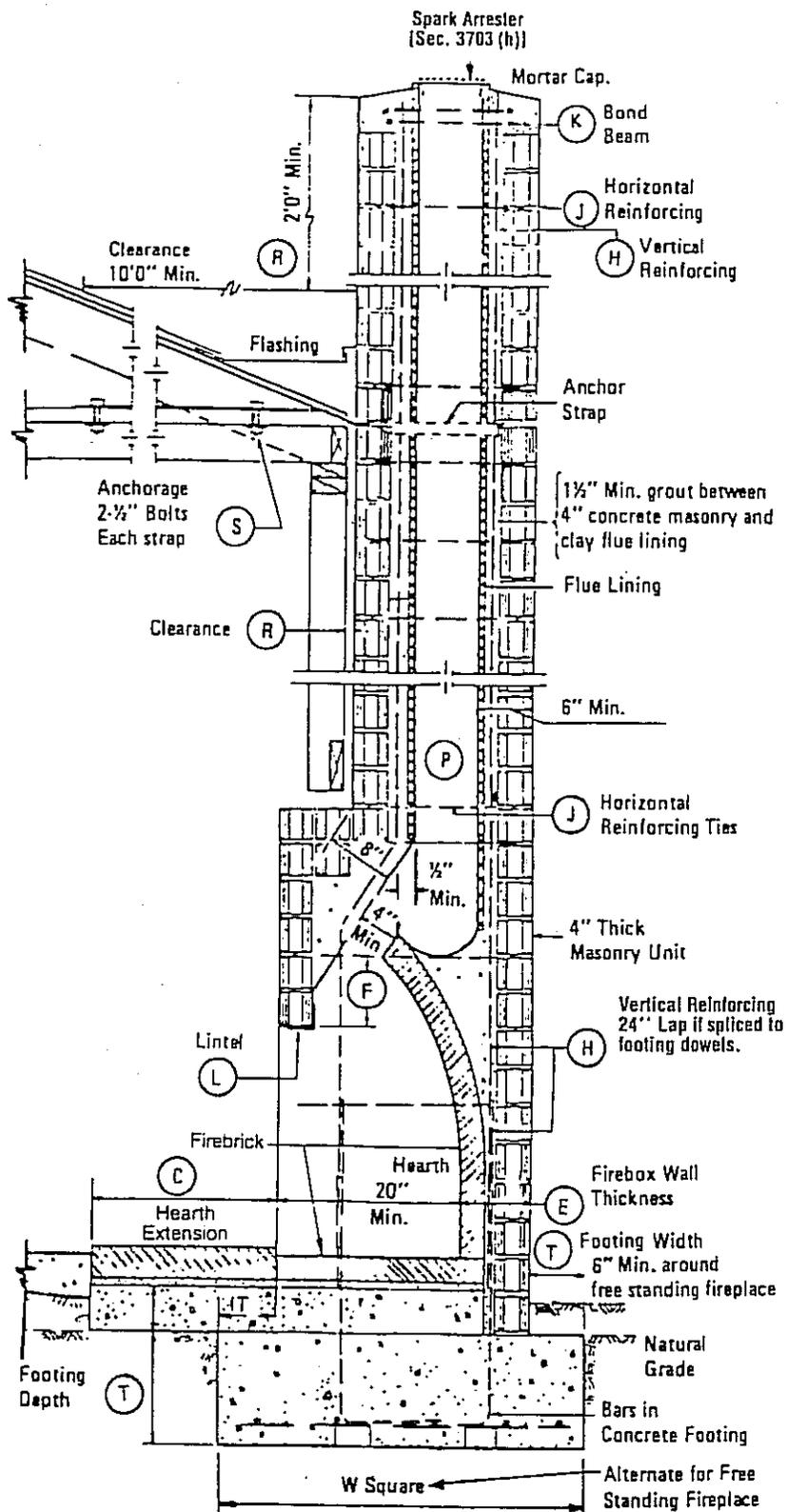
- IF SERVICE IS INSTALLED AHEAD OF CURB AND GUTTER, CUT AND SHAPE PIPE TO FIT POSITION SHOWN BUT BEND DOWN ABOUT 5 INCHES TO MINIMIZE CHANCES OF DAMAGE DURING CONSTRUCTION OF CURB AND GUTTER. SERVICE LINE COVER MINIMUM 24 INCHES, UNDER STREET SUBGRADE AND MINIMUM 12 INCHES UNDER BOTTOM OF CURB AND GUTTER.
- CONTRACTOR FURNISHES ALL PARTS LISTED AT HIS EXPENSE. ALL ITEMS SHALL BE INSTALLED BY CONTRACTOR EXCEPT ITEMS 5 AND 6 WHICH WILL BE INSTALLED BY CITY FORCES.



WATER SERVICE CONNECTION DETAILS
SINGLE AND DOUBLE

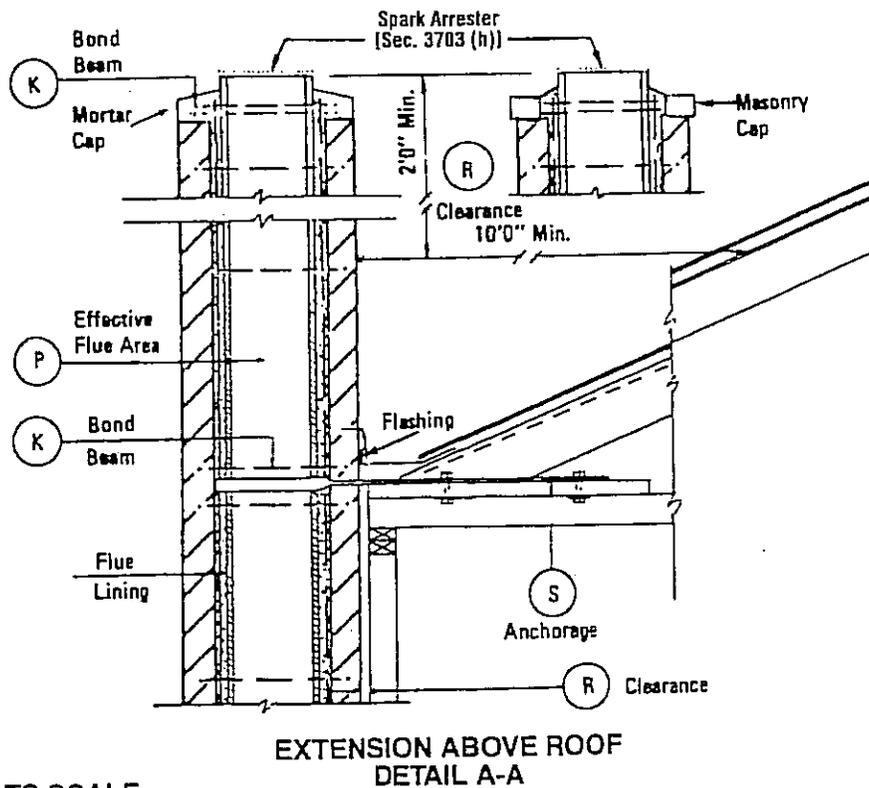
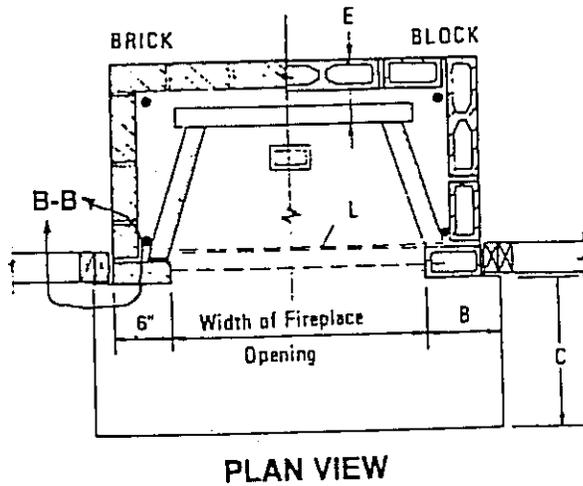
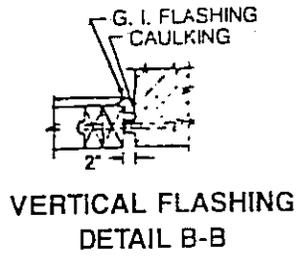
**NORTH
RICHLAND
HILLS**

REV. 11-08-93 FIGURE 4W



NOT TO SCALE

BRICK FIREBOX AND CHIMNEY—
SECTIONAL SIDE VIEW ON CONCRETE SLAB
TYPICAL MASONRY FIREPLACE



NOT TO SCALE

TYPICAL MASONRY FIREPLACE
FIGURE NO. 5—(Continued)

U.B.C. REQUIREMENTS FOR MASONRY FIREPLACES

ITEM	LETTER*	UNIFORM BUILDING CODE REQUIREMENTS
Hearth slab thickness	A	4"
Hearth extension (each side of opening)	B	8" fireplace opening < 6 sq. ft. 12" fireplace opening ≥ 6 sq. ft.
Hearth extension (front of opening)	C	16" fireplace opening < 6 sq. ft. 20" fireplace opening ≥ 6 sq. ft.
Hearth slab reinforcing	D	Reinforced to carry its own weight and all imposed loads.
Thickness of wall of firebox	E	10" common brick or 8" where a firebrick lining is used. Joints in firebrick 1/4" max.
Distance from top of opening to throat	F	6"
Smoke chamber edge of shelf	G	
Rear wall—thickness Front and sidewall—thickness		6" 8"
Chimney Vertical reinforcing	H	Four No. 4 full-length bars for chimney up to 40" wide. Add two No. 4 bars for each additional 40" or fraction of width or each additional flue.
Horizontal reinforcing	J	1/4" ties at 18" and two ties at each bend in vertical steel.
Bond beams	K	No specified requirements.
Fireplace lintel	L	Noncombustible material.
Walls with flue lining	M	Brick with grout around lining, 4" min. from flue lining to outside face of chimney.
Walls with unlined flue	N	8" solid masonry.
Distances between adjacent flues		4"
Effective flue area (based on area of fireplace opening)	P	Round lining—1/12 or 50 sq. in. min. Rectangular lining—1/10 or 64 sq. in. min. Unlined or lined with firebrick—1/8 or 100 sq. in. min.
Clearances Wood frame Combustible material Above roof	R	2" (See Figure No. 8) 6" min. to fireplace opening. 12" from opening when material projecting more than 1/8 for each 1". 2' at 10' (See U.B.C. Table No. 37-B.)

(Continued)

U.B.C. REQUIREMENTS FOR MASONRY FIREPLACE—(Continued)

Anchorage Strap Number Embedment into chimney Fasten to Bolts	S	$\frac{3}{16}$ " x 1" 2 12" hooked around outer bar w/6" ext. 2" x 4" ties crossing a min. of 4 joists Two $\frac{1}{2}$ " diameter
Footing Thickness Width	T	12" min. 6" each side of fireplace wall

NOTE: *See Figure No. 5 for letter references.
 Steel reinforcement shown is required in Seismic Zones Nos. 2, 3 and 4.
 See "Chimneys, Fireplaces and Barbecues" for additional information.

**TABLE R702.3.5
MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD**

THICKNESS OF GYPSUM BOARD (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBERS (inches o.c.)	MAXIMUM SPACING OF FASTENERS (inches)		SIZE OF NAILS FOR APPLICATION TO WOOD FRAMING ^c
				Nails ^a	Screws ^b	
Application without adhesive						
3/8	Ceiling ^d	Perpendicular	16	7	12	13 gage, 1 1/4" long, 19/64" head; 0.098 diameter, 1 1/4" long, annular-ringed; or 4d cooler nail, 0.080" diameter, 1 3/8" long, 7/32" head.
	Wall	Either direction	16	8	16	
1/2	Ceiling	Either direction	16	7	12	13 gage, 1 3/8" long, 19/64" head; 0.098 diameter, 1 1/4" long, annular-ringed; 5d cooler nail, 0.086 diameter, 1 5/8" long, 15/64" head; or gypsum board nail, 0.086 diameter, 1 5/8" long, 9/32" head.
	Ceiling ^d	Perpendicular	24	7	12	
	Wall	Either direction	24	8	12	
5/8	Wall	Either direction	16	8	16	13 gage, 1 5/8" long, 19/64" head; 0.098 diameter, 1 3/8" long, annular-ringed; 6d cooler nail, 0.092 diameter, 1 7/8" long, 1/4" head; or gypsum board nail, 0.0915 diameter, 1 7/8" long, 19/64" head.
	Ceiling	Either direction	16	7	12	
	Ceiling	Perpendicular	24	7	12	
	Wall	Either direction	24	8	12	
3/8	Ceiling ^d	Perpendicular	16	16	16	Same as above for 3/8" gypsum board
	Wall	Either direction	16	16	24	
1/2 or 5/8	Ceiling	Either direction	16	16	16	Same as above for 1/2" and 5/8" gypsum board, respectively
	Ceiling ^d	Perpendicular	24	12	16	
	Wall	Either direction	24	16	24	
two 3/8 layers	Ceiling	Perpendicular	16	16	16	Base ply nailed as above for 1/2" gypsum board; face ply installed with adhesive
	Wall	Either direction	24	24	24	

For SI: 1 inch = 25.4 mm.

- For application without adhesive, a pair of nails spaced not less than 2 inches apart or more than 2 1/2 inches apart may be used with the pair of nails spaced 12 inches on center.
- Screws shall be Type S or W per ASTM C 1002 and shall be sufficiently long to penetrate wood framing not less than 5/8 inch and metal framing not less than 3/8 inch.
- Where metal framing is used with a clinching design to receive nails by two edges of metal, the nails shall be not less than 5/8 inch longer than the gypsum board thickness and shall have ringed shanks. Where the metal framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be 5d, 13 1/2 gage, 1 5/8 inches long, 15/64-inch head for 1/2-inch gypsum board; and 6d, 13 gage, 1 7/8 inches long, 15/64-inch head for 5/8-inch gypsum board.
- Three-eighths-inch-thick single-ply gypsum board shall not be used on a ceiling where a water-based textured finish is to be applied, or where it will be required to support insulation above a ceiling. On ceiling applications to receive a water-based texture material, either hand or spray applied, the gypsum board shall be applied perpendicular to framing. When applying a water-based texture material, the minimum gypsum board thickness shall be increased from 3/8 inch to 1/2 inch for 16-inch on center framing, and from 1/2 inch to 5/8 inch for 24-inch on center framing or 1/2-inch sag-resistant gypsum ceiling board shall be used.

CEILING JOISTS

TABLE R802.4(1)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)

CEILING JOIST SPACING (Inches)	SPECIE AND GRADE	DEAD LOAD = 5 psf			
		2x4	2x6	2x8	2x10
		Maximum ceiling joist spans			
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	13-2	20-8	Note ^a	Note ^a
	Douglas fir-larch #1	12-8	19-11	Note ^a	Note ^a
	Douglas fir-larch #2	12-5	19-6	25-8	Note ^a
	Douglas fir-larch #3	10-10	15-10	20-1	24-6
	Hem-fir SS	12-5	19-6	25-8	Note ^a
	Hem-fir #1	12-2	19-1	25-2	Note ^a
	Hem-fir #2	11-7	18-2	24-0	Note ^a
	Hem-fir #3	10-10	15-10	20-1	24-6
	Southern pine SS	12-11	20-3	Note ^a	Note ^a
	Southern pine #1	12-8	19-11	Note ^a	Note ^a
	Southern pine #2	12-5	19-6	25-8	Note ^a
	Southern pine #3	11-6	17-0	21-8	25-7
	Spruce-pine-fir SS	12-2	19-1	25-2	Note ^a
	Spruce-pine-fir #1	11-10	18-8	24-7	Note ^a
	Spruce-pine-fir #2	11-10	18-8	24-7	Note ^a
Spruce-pine-fir #3	10-10	15-10	20-1	24-6	
16	Douglas fir-larch SS	11-11	18-9	24-8	Note ^a
	Douglas fir-larch #1	11-6	18-1	23-10	Note ^a
	Douglas fir-larch #2	11-3	17-8	23-0	Note ^a
	Douglas fir-larch #3	9-5	13-9	17-5	21-3
	Hem-fir SS	11-3	17-8	23-4	Note ^a
	Hem-fir #1	11-0	17-4	22-10	Note ^a
	Hem-fir #2	10-6	16-6	21-9	Note ^a
	Hem-fir #3	9-5	13-9	17-5	21-3
	Southern pine SS	11-9	18-5	24-3	Note ^a
	Southern pine #1	11-6	18-1	23-1	Note ^a
	Southern pine #2	11-3	17-8	23-4	Note ^a
	Southern pine #3	10-0	14-9	18-9	22-2
	Spruce-pine-fir SS	11-0	17-4	22-10	Note ^a
	Spruce-pine-fir #1	10-9	16-11	22-4	Note ^a
	Spruce-pine-fir #2	10-9	16-11	22-4	Note ^a
Spruce-pine-fir #3	9-5	13-9	17-5	21-3	
19.2	Douglas fir-larch SS	11-3	17-8	23-3	Note ^a
	Douglas fir-larch #1	10-10	17-0	22-5	Note ^a
	Douglas fir-larch #2	10-7	16-7	21-0	25-8
	Douglas fir-larch #3	8-7	12-6	15-10	19-5
	Hem-fir SS	10-7	16-8	21-11	Note ^a
	Hem-fir #1	10-4	16-4	21-6	Note ^a
	Hem-fir #2	9-11	15-7	20-6	25-3
	Hem-fir #3	8-7	12-6	15-10	19-5
	Southern -pine SS	11-0	17-4	22-10	Note ^a
	Southern pine #1	10-10	17-0	22-5	Note ^a
	Southern pine #2	10-7	16-8	21-11	Note ^a
	Southern pine #3	9-1	13-6	17-2	20-3
	Spruce-pine-fir SS	10-4	16-4	21-6	Note ^a
	Spruce-pine-fir #1	10-2	15-11	21-0	25-8
	Spruce-pine-fir #2	10-2	15-11	21-0	25-8
Spruce-pine-fir #3	8-7	12-6	15-10	19-5	

(continued)

CEILING JOISTS (cont.)

TABLE R802.4(1)—continued
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
 (Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)

CEILING JOIST SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 5 psf			
		2x4	2x6	2x8	2x10
		Maximum ceiling joist spans			
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	10-5	16-4	21-7	Note ^a
	Douglas fir-larch #1	10-0	15-9	20-1	24-6
	Douglas fir-larch #2	9-10	14-10	18-9	22-11
	Douglas fir-larch #3	7-8	11-2	14-2	17-4
	Hem-fir SS	9-10	15-6	20-5	Note ^a
	Hem-fir #1	9-8	15-2	19-7	23-11
	Hem-fir #2	9-2	14-5	18-6	22-7
	Hem-fir #3	7-8	11-2	14-2	17-4
	Southern pine SS	10-3	16-1	21-2	Note ^a
	Southern pine #1	10-0	15-9	20-10	Note ^a
	Southern pine #2	9-10	15-6	20-1	23-11
	Southern pine #3	8-2	12-0	15-4	18-1
	Spruce-pine-fir SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir #1	9-5	14-9	18-9	22-11
	Spruce-pine-fir #2	9-5	14-9	18-9	22-11
Spruce-pine-fir #3	7-8	11-2	14-2	17-4	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

a. Check sources for availability of lumber in lengths greater than 20 feet.

CEILING JOISTS (cont.)

TABLE R802.4(2)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics with limited storage, live load = 10 psf, L/Δ = 240)

CEILING JOIST SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf			
		2x4	2x6	2x8	2x10
		Maximum ceiling joist spans			
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	10-5	16-4	21-7	Note ^a
	Douglas fir-larch #1	10-0	15-9	20-1	24-6
	Douglas fir-larch #2	9-10	14-10	18-9	22-11
	Douglas fir-larch #3	7-8	11-2	14-2	17-4
	Hem-fir SS	9-10	15-6	20-5	Note ^a
	Hem-fir #1	9-8	15-2	19-7	23-11
	Hem-fir #2	9-2	14-5	18-6	22-7
	Hem-fir #3	7-8	11-2	14-2	17-4
	Southern pine SS	10-3	16-1	21-2	Note ^a
	Southern pine #1	10-0	15-9	20-10	Note ^a
	Southern pine #2	9-10	15-6	20-1	23-11
	Southern pine #3	8-2	12-0	15-4	18-1
	Spruce-pine-fir SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir #1	9-5	14-9	18-9	22-11
	Spruce-pine-fir #2	9-5	14-9	18-9	22-11
Spruce-pine-fir #3	7-8	11-2	14-2	17-4	
16	Douglas fir-larch SS	9-6	14-11	19-7	25-0
	Douglas fir-larch #1	9-1	13-9	17-5	21-3
	Douglas fir-larch #2	8-9	12-10	16-3	19-10
	Douglas fir-larch #3	6-8	9-8	12-4	15-0
	Hem-fir SS	8-11	14-1	18-6	23-8
	Hem-fir #1	8-9	13-5	16-10	20-8
	Hem-fir #2	8-4	12-8	16-0	19-7
	Hem-fir #3	6-8	9-8	12-4	15-0
	Southern pine SS	9-4	14-7	19-3	24-7
	Southern pine #1	9-1	14-4	18-11	23-1
	Southern pine #2	8-11	13-6	17-5	20-9
	Southern pine #3	7-1	10-5	13-3	15-8
	Spruce-pine-fir SS	8-9	13-9	18-1	23-1
	Spruce-pine-fir #1	8-7	12-10	16-3	19-10
	Spruce-pine-fir #2	8-7	12-10	16-3	19-10
Spruce-pine-fir #3	6-8	9-8	12-4	15-0	
19.2	Douglas fir-larch SS	8-11	14-0	18-5	23-4
	Douglas fir-larch #1	8-7	12-6	15-10	19-5
	Douglas fir-larch #2	8-0	11-9	14-10	18-2
	Douglas fir-larch #3	6-1	8-10	11-3	13-8
	Hem-fir SS	8-5	13-3	17-5	22-3
	Hem-fir #1	8-3	12-3	15-6	18-11
	Hem-fir #2	7-10	11-7	14-8	17-10
	Hem-fir #3	6-1	8-10	11-3	13-8
	Southern pine SS	8-9	13-9	18-1	23-1
	Southern pine #1	8-7	13-6	17-9	21-1
	Southern pine #2	8-5	12-3	15-10	18-11
	Southern pine #3	6-5	9-6	12-1	14-4
	Spruce-pine-fir SS	8-3	12-11	17-1	21-8
	Spruce-pine-fir #1	8-0	11-9	14-10	18-2
	Spruce-pine-fir #2	8-0	11-9	14-10	18-2
Spruce-pine-fir #3	6-1	8-10	11-3	13-8	

(continued)

CEILING JOISTS (cont.)

TABLE R802.4(2)—continued
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics with limited storage, live load = 10 psf, L/Δ = 240)

CEILING JOIST SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf			
		2x4	2x6	2x8	2x10
		Maximum Ceiling Joist Spans			
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	8-3	13-0	17-1	20-11
	Douglas fir-larch #1	7-8	11-2	14-2	17-4
	Douglas fir-larch #2	7-2	10-6	13-3	16-3
	Douglas fir-larch #3	5-5	7-11	10-0	12-3
	Hem-fir SS	7-10	12-3	16-2	20-6
	Hem-fir #1	7-6	10-11	13-10	16-11
	Hem-fir #2	7-1	10-4	13-1	16-0
	Hem-fir #3	5-5	7-11	10-0	12-3
	Southern pine SS	8-1	12-9	16-10	21-6
	Southern pine #1	8-0	12-6	15-10	18-10
	Southern pine #2	7-8	11-0	14-2	16-11
	Southern pine #3	5-9	8-6	10-10	12-10
	Spruce-pine-fir SS	7-8	12-0	15-10	19-5
	Spruce-pine-fir #1	7-2	10-6	13-3	16-3
	Spruce-pine-fir #2	7-2	10-6	13-3	16-3
Spruce-pine-fir #3	5-5	7-11	10-0	12-3	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

a. Check sources for availability of lumber in lengths greater than 20 feet.

RAFTERS

TABLE R802.5.1(1)
RAFTER SPANS FOR COMMON LUMBER SPECIES
 (Roof live load=20 psf, ceiling not attached to rafters, L/Δ=180)

RAFTER SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans ^a									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	11-6	18-0	23-9	Note ^b	Note ^b	11-6	18-0	23-5	Note ^b	Note ^b
	Douglas fir-larch #1	11-1	17-4	22-5	Note ^b	Note ^b	10-6	15-4	19-5	23-9	Note ^b
	Douglas fir-larch #2	10-10	16-7	21-0	25-8	Note ^b	9-10	14-4	18-2	22-3	25-9
	Douglas fir-larch #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Hem-fir SS	10-10	17-0	22-5	Note ^b	Note ^b	10-10	17-0	22-5	Note ^b	Note ^b
	Hem-fir #1	10-7	16-8	21-10	Note ^b	Note ^b	10-3	14-11	18-11	23-2	Note ^b
	Hem-fir #2	10-1	15-11	20-8	25-3	Note ^b	9-8	14-2	17-11	21-11	25-5
	Hem-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern pine SS	11-3	17-8	23-4	Note ^b	Note ^b	11-3	17-8	23-4	Note ^b	Note ^b
	Southern pine #1	11-1	17-4	22-11	Note ^b	Note ^b	11-1	17-3	21-9	25-10	Note ^b
	Southern pine #2	10-10	17-0	22-5	Note ^b	Note ^b	10-6	15-1	19-5	23-2	Note ^b
	Southern pine #3	9-1	13-6	17-2	20-3	24-1	7-11	11-8	14-10	17-6	20-11
	Spruce-pine-fir SS	10-7	16-8	21-11	Note ^b	Note ^b	10-7	16-8	21-9	Note ^b	Note ^b
	Spruce-pine-fir #1	10-4	16-3	21-0	25-8	Note ^b	9-10	14-4	18-2	22-3	25-9
	Spruce-pine-fir #2	10-4	16-3	21-0	25-8	Note ^b	9-10	14-4	18-2	22-3	25-9
Spruce-pine-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6	
16	Douglas fir-larch SS	10-5	16-4	21-7	Note ^b	Note ^b	10-5	16-0	20-3	24-9	Note ^b
	Douglas fir-larch #1	10-0	15-4	19-5	23-9	Note ^b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch #2	9-10	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Douglas fir-larch #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Hem-fir SS	9-10	15-6	20-5	Note ^b	Note ^b	9-10	15-6	19-11	24-4	Note ^b
	Hem-fir #1	9-8	14-11	18-11	23-2	Note ^b	8-10	12-11	16-5	20-0	23-3
	Hem-fir #2	9-2	14-2	17-11	21-11	25-5	8-5	12-3	15-6	18-11	22-0
	Hem-fir #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern pine SS	10-3	16-1	21-2	Note ^b	Note ^b	10-3	16-1	21-2	Note ^b	Note ^b
	Southern pine #1	10-0	15-9	20-10	25-10	Note ^b	10-0	15-0	18-10	22-4	Note ^b
	Southern pine #2	9-10	15-1	19-5	23-2	Note ^b	9-1	13-0	16-10	20-1	23-7
	Southern pine #3	7-11	11-8	14-10	17-6	20-11	6-10	10-1	12-10	15-2	18-1
	Spruce-pine-fir SS	9-8	15-2	19-11	25-5	Note ^b	9-8	14-10	18-10	23-0	Note ^b
	Spruce-pine-fir #1	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir #2	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
Spruce-pine-fir #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10	
19.2	Douglas fir-larch SS	9-10	15-5	20-4	25-11	Note ^b	9-10	14-7	18-6	22-7	Note ^b
	Douglas fir-larch #1	9-5	14-0	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas fir-larch #2	8-11	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Douglas fir-larch #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Hem-fir SS	9-3	14-7	19-2	24-6	Note ^b	9-3	14-4	18-2	22-3	25-9
	Hem-fir #1	9-1	13-8	17-4	21-1	24-6	8-1	11-10	15-0	18-4	21-3
	Hem-fir #2	8-8	12-11	16-4	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-fir #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern pine SS	9-8	15-2	19-11	25-5	Note ^b	9-8	15-2	19-11	25-5	Note ^b
	Southern pine #1	9-5	14-10	19-7	23-7	Note ^b	9-3	13-8	17-2	20-5	24-4
	Southern pine #2	9-3	13-9	17-9	21-2	24-10	8-4	11-11	15-4	18-4	21-6
	Southern pine #3	7-3	10-8	13-7	16-0	19-1	6-3	9-3	11-9	13-10	16-6
	Spruce-pine-fir SS	9-1	14-3	18-9	23-11	Note ^b	9-1	13-7	17-2	21-0	24-4
	Spruce-pine-fir #1	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir #2	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
Spruce-pine-fir #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5	

(continued)

RAFTERS (Cont.)

TABLE R802.5.1(1)—continued
RAFTER SPANS FOR COMMON LUMBER SPECIES
 (Roof live load=20 psf, ceiling not attached to rafters, L/Δ=180)

RAFTER SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans ^a									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	9-1	14-4	18-10	23-4	23-4	8-11	13-1	16-7	20-3	23-5
	Douglas fir-larch #1	8-7	12-6	15-10	19-5	19-5	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch #2	8-0	11-9	14-10	18-2	18-2	6-11	10-2	12-10	15-8	18-3
	Douglas fir-larch #3	6-1	8-10	11-3	13-8	13-8	5-3	7-8	9-9	11-10	13-9
	Hem-fir SS	8-7	13-6	17-10	22-9	22-9	8-7	12-10	16-3	19-10	23-0
	Hem-fir #1	8-4	12-3	15-6	18-11	18-11	7-3	10-7	13-5	16-4	19-0
	Hem-fir #2	7-11	11-7	14-8	17-10	17-10	6-10	10-0	12-8	15-6	17-11
	Hem-fir #3	6-1	8-10	11-3	13-8	13-8	5-3	7-8	9-9	11-10	13-9
	Southern pine SS	8-11	14-1	18-6	23-8	23-8	8-11	14-1	18-6	22-11	Note ^b
	Southern pine #1	8-9	13-9	17-9	21-1	21-1	8-3	12-3	15-4	18-3	21-9
	Southern pine #2	8-7	12-3	15-10	18-11	18-11	7-5	10-8	13-9	16-5	19-3
	Southern pine #3	6-5	9-6	12-1	14-4	14-4	5-7	8-3	10-6	12-5	14-9
	Spruce-pine-fir SS	8-5	13-3	17-5	21-8	21-8	8-4	12-2	15-4	18-9	21-9
	Spruce-pine-fir #1	8-0	11-9	14-10	18-2	18-2	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir #2	8-0	11-9	14-10	18-2	18-2	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir #3	6-1	8-10	11-3	13-8	13-8	5-3	7-8	9-9	11-10	13-9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

H_C/H_R	Rafter Span Adjustment Factor
2/3 or greater	0.50
1/2	0.58
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 and less	1.00

where: H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Check sources for availability of lumber in lengths greater than 20 feet.

RAFTERS (Cont.)

TABLE R802.5.1(2)
RAFTER SPANS FOR COMMON LUMBER SPECIES
 (Roof live load=20 psf, ceiling attached to rafters, L/Δ=240)

RAFTER SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans ^a									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	10-5	16-4	21-7	Note ^b	Note ^b	10-5	16-4	21-7	Note ^b	Note ^b
	Douglas fir-larch #1	10-0	15-9	20-10	Note ^b	Note ^b	10-0	15-4	19-5	23-9	Note ^b
	Douglas fir-larch #2	9-10	15-6	20-5	25-8	Note ^b	9-10	14-4	18-2	22-3	25-9
	Douglas fir-larch #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Hem-fir SS	9-10	15-6	20-5	Note ^b	Note ^b	9-10	15-6	20-5	Note ^b	Note ^b
	Hem-fir #1	9-8	15-2	19-11	25-5	Note ^b	9-8	14-11	18-11	23-2	Note ^b
	Hem-fir #2	9-2	14-5	19-0	24-3	Note ^b	9-2	14-2	17-11	21-11	25-5
	Hem-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern pine SS	10-3	16-1	21-2	Note ^b	Note ^b	10-3	16-1	21-2	Note ^b	Note ^b
	Southern pine #1	10-0	15-9	20-10	Note ^b	Note ^b	10-0	15-9	20-10	25-10	Note ^b
	Southern pine #2	9-10	15-6	20-5	Note ^b	Note ^b	9-10	15-1	19-5	23-2	Note ^b
	Southern pine #3	9-1	13-6	17-2	20-3	24-1	7-11	11-8	14-10	17-6	20-11
	Spruce-pine-fir SS	9-8	15-2	19-11	25-5	Note ^b	9-8	15-2	19-11	25-5	Note ^b
	Spruce-pine-fir #1	9-5	14-9	19-6	24-10	Note ^b	9-5	14-4	18-2	22-3	25-9
Spruce-pine-fir #2	9-5	14-9	19-6	24-10	Note ^b	9-5	14-4	18-2	22-3	25-9	
Spruce-pine-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6	
16	Douglas fir-larch SS	9-6	14-11	19-7	25-0	Note ^b	9-6	14-11	19-7	24-9	Note ^b
	Douglas fir-larch #1	9-1	14-4	18-11	23-9	Note ^b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch #2	8-11	14-1	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Douglas fir-larch #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Hem-fir SS	8-11	14-1	18-6	23-8	Note ^b	8-11	14-1	18-6	23-8	Note ^b
	Hem-fir #1	8-9	13-9	18-1	23-1	Note ^b	8-9	12-11	16-5	20-0	23-3
	Hem-fir #2	8-4	13-1	17-3	21-11	25-5	8-4	12-3	15-6	18-11	22-0
	Hem-fir #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern pine SS	9-4	14-7	19-3	24-7	Note ^b	9-4	14-7	19-3	24-7	Note ^b
	Southern pine #1	9-1	14-4	18-11	24-1	Note ^b	9-1	14-4	18-10	22-4	Note ^b
	Southern pine #2	8-11	14-1	18-6	23-2	Note ^b	8-11	13-0	16-10	20-1	23-7
	Southern pine #3	7-11	11-8	14-10	17-6	20-11	6-10	10-1	12-10	15-2	18-1
	Spruce-pine-fir SS	8-9	13-9	18-1	23-1	Note ^b	8-9	13-9	18-1	23-0	Note ^b
	Spruce-pine-fir #1	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
Spruce-pine-fir #2	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4	
Spruce-pine-fir #3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10	
19.2	Douglas fir-larch SS	8-11	14-0	18-5	23-7	Note ^b	8-11	14-0	18-5	22-7	Note ^b
	Douglas fir-larch #1	8-7	13-6	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas fir-larch #2	8-5	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Douglas fir-larch #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Hem-fir SS	8-5	13-3	17-5	22-3	Note ^b	8-5	13-3	17-5	22-3	25-9
	Hem-fir #1	8-3	12-11	17-1	21-1	24-6	8-1	11-10	15-0	18-4	21-3
	Hem-fir #2	7-10	12-4	16-3	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-fir #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern pine SS	8-9	13-9	18-1	23-1	Note ^b	8-9	13-9	18-1	23-1	Note ^b
	Southern pine #1	8-7	13-6	17-9	22-8	Note ^b	8-7	13-6	17-2	20-5	24-4
	Southern pine #2	8-5	13-3	17-5	21-2	24-10	8-4	11-11	15-4	18-4	21-6
	Southern pine #3	7-3	10-8	13-7	16-0	19-1	6-3	9-3	11-9	13-10	16-6
	Spruce-pine-fir SS	8-3	12-11	17-1	21-9	Note ^b	8-3	12-11	17-1	21-0	24-4
	Spruce-pine-fir #1	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
Spruce-pine-fir #2	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4	
Spruce-pine-fir #3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5	

(continued)

RAFTERS (Cont.)

TABLE R802.5.1(2)—continued
RAFTER SPANS FOR COMMON LUMBER SPECIES
 (Roof live load=20 psf, ceiling attached to rafters, $L/\Delta=240$)

RAFTER SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans ^a									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	8-3	13-0	17-2	21-10	Note ^b	8-3	13-0	16-7	20-3	23-5
	Douglas fir-larch #1	8-0	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch #2	7-10	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Douglas fir-larch #3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Hem-fir SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-10	23-0
	Hem-fir #1	7-8	12-0	15-6	18-11	21-11	7-3	10-7	13-5	16-4	19-0
	Hem-fir #2	7-3	11-5	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-fir #3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern pine SS	8-1	12-9	16-10	21-6	Note ^b	8-1	12-9	16-10	21-6	Note ^b
	Southern pine #1	8-0	12-6	16-6	21-1	25-2	8-0	12-3	15-4	18-3	21-9
	Southern pine #2	7-10	12-3	15-10	18-11	22-2	7-5	10-8	13-9	16-5	19-3
	Southern pine #3	6-5	9-6	12-1	14-4	17-1	5-7	8-3	10-6	12-5	14-9
	Spruce-pine-fir SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-4	18-9	21-9
	Spruce-pine-fir #1	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir #2	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
Spruce-pine-fir #3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

H_C/H_R	Rafter Span Adjustment Factor
2/3 or greater	0.50
1/2	0.58
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 and less	1.00

where: H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Check sources for availability of lumber in lengths greater than 20 feet.

FLOOR JOISTS

TABLE R502.3.1(1)
FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES
(Residential sleeping areas, live load=30 psf, L/A=360)

JOIST SPACING (inches)			DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
			Maximum floor joist spans							
SPECIE AND GRADE			(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)
12	Douglas fir-larch	SS	12-6	16-6	21-0	25-7	12-6	16-6	21-0	25-7
	Douglas fir-larch	#1	12-0	15-10	20-3	24-8	12-0	15-7	19-0	22-0
	Douglas fir-larch	#2	11-10	15-7	19-10	23-0	11-6	14-7	17-9	20-7
	Douglas fir-larch	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Hem-fir	SS	11-10	15-7	19-10	24-2	11-10	15-7	19-10	24-2
	Hem-fir	#1	11-7	15-3	19-5	23-7	11-7	15-2	18-6	21-6
	Hem-fir	#2	11-0	14-6	18-6	22-6	11-0	14-4	17-6	20-4
	Hem-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Southern pine	SS	12-3	16-2	20-8	25-1	12-3	16-2	20-8	25-1
	Southern pine	#1	12-0	15-10	20-3	24-8	12-0	15-10	20-3	24-8
	Southern pine	#2	11-10	15-7	19-10	18-8	11-10	15-7	18-7	21-9
	Southern pine	#3	10-5	13-3	15-8	18-8	9-4	11-11	14-0	16-8
	Spruce-pine-fir	SS	11-7	15-3	19-5	23-7	11-7	15-3	19-5	23-7
	Spruce-pine-fir	#1	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#2	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
16	Douglas fir-larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-0
	Douglas fir-larch	#1	10-11	14-5	18-5	21-4	10-8	13-6	16-5	19-1
	Douglas fir-larch	#2	10-9	14-1	17-2	19-11	9-11	12-7	15-5	17-10
	Douglas fir-larch	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
	Hem-fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-fir	#1	10-6	13-10	17-8	20-9	10-4	13-1	16-0	18-7
	Hem-fir	#2	10-0	13-2	16-10	19-8	9-10	12-5	15-2	17-7
	Hem-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
	Southern pine	SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern pine	#1	10-11	14-5	18-5	22-5	10-11	14-5	17-11	21-4
	Southern pine	#2	10-9	14-2	18-0	21-1	10-5	13-6	16-1	18-10
	Southern pine	#3	9-0	11-6	13-7	16-2	8-1	10-3	12-2	14-6
	Spruce-pine-fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-4
	Spruce-pine-fir	#1	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-pine-fir	#2	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-pine-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
19.2	Douglas fir-larch	SS	10-8	14-1	18-0	21-10	10-8	14-1	18-0	21-0
	Douglas fir-larch	#1	10-4	13-7	16-9	19-6	9-8	12-4	15-0	17-5
	Douglas fir-larch	#2	10-1	12-10	15-8	18-3	9-1	11-6	14-1	16-3
	Douglas fir-larch	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4
	Hem-fir	SS	10-1	13-4	17-0	20-8	10-1	13-4	17-0	20-7
	Hem-fir	#1	9-10	13-0	16-4	19-0	9-6	12-0	14-8	17-0
	Hem-fir	#2	9-5	12-5	15-6	17-1	8-11	11-4	13-10	16-1
	Hem-fir	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4
	Southern pine	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Southern pine	#1	10-4	13-7	17-4	21-1	10-4	13-7	16-4	19-6
	Southern pine	#2	10-1	13-4	16-5	19-3	9-6	12-4	14-8	17-2
	Southern pine	#3	8-3	10-6	12-5	14-9	7-4	9-5	11-1	13-2
	Spruce-pine-fir	SS	9-10	13-0	16-7	20-2	9-10	13-0	16-7	19-6
	Spruce-pine-fir	#1	9-8	12-9	15-8	18-3	9-1	11-6	14-1	16-3
	Spruce-pine-fir	#2	9-8	12-9	15-8	18-3	9-1	11-6	14-1	16-3
	Spruce-pine-fir	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4
24	Douglas fir-larch	SS	9-11	13-1	16-8	20-3	9-11	13-1	16-2	18-9
	Douglas fir-larch	#1	9-7	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Douglas fir-larch	#2	9-1	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Douglas fir-larch	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0
	Hem-fir	SS	9-4	12-4	15-9	19-2	9-4	12-4	15-9	18-5
	Hem-fir	#1	9-2	12-0	14-8	17-0	8-6	10-9	13-1	15-2
	Hem-fir	#2	8-9	11-4	13-10	16-1	8-0	10-2	12-5	14-4
	Hem-fir	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0
	Southern pine	SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Southern pine	#1	9-7	12-7	16-1	19-6	9-7	12-4	14-7	17-5
	Southern pine	#2	9-4	12-4	14-8	17-2	8-6	11-0	13-1	15-5
	Southern pine	#3	7-4	9-5	11-1	13-2	6-7	8-5	9-11	11-10
	Spruce-pine-fir	SS	9-2	12-1	15-5	18-9	9-2	12-1	15-0	17-5
	Spruce-pine-fir	#1	8-11	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Spruce-pine-fir	#2	8-11	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Spruce-pine-fir	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

NOTE: Check sources for availability of lumber in lengths greater than 20 feet.

FLOOR JOISTS (Cont.)

TABLE R502.3.1(2)

FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES (Residential living areas, live load=40 psf, L/Δ=360)

JOIST SPACING (inches)	SPECIE AND GRADE	DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
		2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
		Maximum floor joist spans							
		(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)
12	Douglas fir-larch SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-3
	Douglas fir-larch #1	10-11	14-5	18-5	22-0	10-11	14-2	17-4	20-1
	Douglas fir-larch #2	10-9	14-2	17-9	20-7	10-6	13-3	16-3	18-10
	Douglas fir-larch #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Hem-fir SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-fir #1	10-6	13-10	17-8	21-6	10-6	13-10	16-11	19-7
	Hem-fir #2	10-0	13-2	16-10	20-4	10-0	13-1	16-0	18-6
	Hem-fir #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Southern pine SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern pine #1	10-11	14-5	18-5	22-5	10-11	14-5	18-5	22-5
	Southern pine #2	10-9	14-2	18-0	21-9	10-9	14-2	16-11	19-10
	Southern pine #3	9-4	11-11	14-0	16-8	8-6	10-10	12-10	15-3
	Spruce-pine-fir SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Spruce-pine-fir #1	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir #2	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
16	Douglas fir-larch SS	10-4	13-7	17-4	21-1	10-4	13-7	17-4	21-0
	Douglas fir-larch #1	9-11	13-1	16-5	19-1	9-8	12-4	15-0	17-5
	Douglas fir-larch #2	9-9	12-7	15-5	17-10	9-1	11-6	14-1	16-3
	Douglas fir-larch #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Hem-fir SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Hem-fir #1	9-6	12-7	16-0	18-7	9-6	12-0	14-8	17-0
	Hem-fir #2	9-1	12-0	15-2	17-7	8-11	11-4	13-10	16-1
	Hem-fir #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Southern pine SS	10-2	13-4	17-0	20-9	10-2	13-4	17-0	20-9
	Southern pine #1	9-11	13-1	16-9	20-4	9-11	13-1	16-4	19-6
	Southern pine #2	9-9	12-10	16-1	18-10	9-6	12-4	14-8	17-2
	Southern pine #3	8-1	10-3	12-2	14-6	7-4	9-5	11-1	13-2
	Spruce-pine-fir SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Spruce-pine-fir #1	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir #2	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
19.2	Douglas fir-larch SS	9-8	12-10	16-4	19-10	9-8	12-10	16-4	19-2
	Douglas fir-larch #1	9-4	12-4	15-0	17-5	8-10	11-3	13-8	15-11
	Douglas fir-larch #2	9-1	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Douglas fir-larch #3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Hem-fir SS	9-2	12-1	15-5	18-9	9-2	12-1	15-5	18-9
	Hem-fir #1	9-0	11-10	14-8	17-0	8-8	10-11	13-4	15-6
	Hem-fir #2	8-7	11-3	13-10	16-1	8-2	10-4	12-8	14-8
	Hem-fir #3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Southern pine SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Southern pine #1	9-4	12-4	15-9	19-2	9-4	12-4	14-11	17-9
	Southern pine #2	9-2	12-1	14-8	17-2	8-8	11-3	13-5	15-8
	Southern pine #3	7-4	9-5	11-1	13-2	6-9	8-7	10-1	12-1
	Spruce-pine-fir SS	9-0	11-10	15-1	18-4	9-0	11-10	15-1	17-9
	Spruce-pine-fir #1	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-pine-fir #2	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-pine-fir #3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
24	Douglas fir-larch SS	9-0	11-11	15-2	18-5	9-0	11-11	14-9	17-1
	Douglas fir-larch #1	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Douglas fir-larch #2	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Douglas fir-larch #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1
	Hem-fir SS	8-6	11-3	14-4	17-5	8-6	11-3	14-4	16-10 ^a
	Hem-fir #1	8-4	10-9	13-1	15-2	7-9	9-9	11-11	13-10
	Hem-fir #2	7-11	10-2	12-5	14-4	7-4	9-3	11-4	13-1
	Hem-fir #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1
	Southern pine SS	8-10	11-8	14-11	18-1	8-10	11-8	14-11	18-1
	Southern pine #1	8-8	11-5	14-7	17-5	8-8	11-3	13-4	15-11
	Southern pine #2	8-6	11-0	13-1	15-5	7-9	10-0	12-0	14-0
	Southern pine #3	6-7	8-5	9-11	11-10	6-0	7-8	9-1	10-9
	Spruce-pine-fir SS	8-4	11-0	14-0	17-0	8-4	11-0	13-8	15-11
	Spruce-pine-fir #1	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-pine-fir #2	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-pine-fir #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1

For SI: 1 inch = 25.4 mm, 1 foot = 308.4 mm, 1 pound per square foot = 0.0479 kN/m.

a. Check sources for availability of lumber in lengths greater than 20 feet.

b. End bearing length shall be increased to 2 inches.

FLOOR JOISTS (Cont.)

TABLE R502.5(1)

GIRDER SPANS^a AND HEADER SPANS^a FOR EXTERIOR BEARING WALLS

(Maximum header spans for douglas fir-larch, hem-fir, southern pine and spruce-pine-fir^b and required number of jack studs)

HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) ^a											
		30						50					
		Building width ^c (feet)											
		20		28		36		20		28		36	
Span	NJ ^d	Span	NJ ^d	Span	NJ ^d	Span	NJ ^d	Span	NJ ^d	Span	NJ ^d		
Roof and ceiling	2-2x4	3-6	1	3-2	1	2-10	1	3-2	1	2-9	1	2-6	1
	2-2x6	5-5	1	4-8	1	4-2	1	4-8	1	4-1	1	3-8	2
	2-2x8	6-10	1	5-11	2	5-4	2	5-11	2	5-2	2	4-7	2
	2-2x10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5-7	2
	2-2x12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6	2
	3-2x8	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9	2
	3-2x10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7-0	2
	3-2x12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8-2	2
	4-2x8	7-0	1	6-1	2	5-5	2	6-1	2	5-3	2	4-8	2
	4-2x10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2	2
4-2x12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5	2	
Roof, ceiling and one center-bearing floor	2-2x4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2-2	1
	2-2x6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3-3	2
	2-2x8	5-9	2	5-0	2	4-6	2	5-2	2	4-6	2	4-1	2
	2-2x10	7-0	2	6-2	2	5-6	2	6-4	2	5-6	2	5-0	2
	2-2x12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5-9	3
	3-2x8	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5-1	2
	3-2x10	8-9	2	7-8	2	6-11	2	7-11	2	6-11	2	6-3	2
	3-2x12	10-2	2	8-11	2	8-0	2	9-2	2	8-0	2	7-3	2
	4-2x8	5-10	2	5-2	2	4-8	2	5-3	2	4-7	2	4-2	2
	4-2x10	10-1	1	8-10	2	8-0	2	9-1	2	8-0	2	7-2	2
4-2x12	11-9	2	10-3	2	9-3	2	10-7	2	9-3	2	8-4	2	
Roof, ceiling and one clear span floor	2-2x4	2-8	1	2-4	1	2-1	1	2-7	1	2-3	1	2-0	1
	2-2x6	3-11	1	3-5	2	3-0	2	3-10	2	3-4	2	3-0	2
	2-2x8	5-0	2	4-4	2	3-10	2	4-10	2	4-2	2	3-9	2
	2-2x10	6-1	2	5-3	2	4-8	2	5-11	2	5-1	2	4-7	3
	2-2x12	7-1	2	6-1	3	5-5	3	6-10	2	5-11	3	5-4	3
	3-2x8	6-3	2	5-5	2	4-10	2	6-1	2	5-3	2	4-8	2
	3-2x10	7-7	2	6-7	2	5-11	2	7-5	2	6-5	2	5-9	2
	3-2x12	8-10	2	7-8	2	6-10	2	8-7	2	7-5	2	6-8	2
	4-2x8	5-1	2	4-5	2	3-11	2	4-11	2	4-3	2	3-10	2
	4-2x10	8-9	2	7-7	2	6-10	2	8-7	2	7-5	2	6-7	2
4-2x12	10-2	2	8-10	2	7-11	2	9-11	2	8-7	2	7-8	2	
Roof, ceiling and two center-bearing floors	2-2x4	2-7	1	2-3	1	2-0	1	2-6	1	2-2	1	1-11	1
	2-2x6	3-9	2	3-3	2	2-11	2	3-8	2	3-2	2	2-10	2
	2-2x8	4-9	2	4-2	2	3-9	2	4-7	2	4-0	2	3-8	2
	2-2x10	5-9	2	5-1	2	4-7	3	5-8	2	4-11	2	4-5	3
	2-2x12	6-8	2	5-10	3	5-3	3	6-6	2	5-9	3	5-2	3
	3-2x8	5-11	2	5-2	2	4-8	2	5-9	2	5-1	2	4-7	2
	3-2x10	7-3	2	6-4	2	5-8	2	7-1	2	6-2	2	5-7	2
	3-2x12	8-5	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	3
	4-2x8	4-10	2	4-3	2	3-10	2	4-9	2	4-2	2	3-9	2
	4-2x10	8-4	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	2
4-2x12	9-8	2	8-6	2	7-8	2	9-5	2	8-3	2	7-5	2	

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

a. Spans are given in feet and inches.

b. Tabulated values assume #2 grade lumber.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the header are permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Use 30 psf ground snow load for cases in which ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

FLOOR JOISTS (Cont.)

TABLE R502.5(2)
GIRDER SPANS^a AND HEADER SPANS^a FOR INTERIOR BEARING WALLS
 (Maximum header spans for douglas fir-larch, hem-fir, southern pine and spruce-pine-fir^b and required number of jack studs)

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING WIDTH ^c (feet)					
		20		28		36	
		Span	NJ ^d	Span	NJ ^d	Span	NJ ^d
One floor only	2-2x4	3-1	1	2-8	1	2-5	1
	2-2x6	4-6	1	3-11	1	3-6	1
	2-2x8	5-9	1	5-0	2	4-5	2
	2-2x10	7-0	2	6-1	2	5-5	2
	2-2x12	8-1	2	7-0	2	6-3	2
	3-2x8	7-2	1	6-3	1	5-7	2
	3-2x10	8-9	1	7-7	2	6-9	2
	3-2x12	10-2	2	8-10	2	7-10	2
	4-2x8	5-10	1	5-1	2	4-6	2
	4-2x10	10-1	1	8-9	1	7-10	2
	4-2x12	11-9	1	10-2	2	9-1	2
Two floors	2-2x4	2-2	1	1-10	1	1-7	1
	2-2x6	3-2	2	2-9	2	2-5	2
	2-2x8	4-1	2	3-6	2	3-2	2
	2-2x10	4-11	2	4-3	2	3-10	3
	2-2x12	5-9	2	5-0	3	4-5	3
	3-2x8	5-1	2	4-5	2	3-11	2
	3-2x10	6-2	2	5-4	2	4-10	2
	3-2x12	7-2	2	6-3	2	5-7	3
	4-2x8	4-2	2	3-7	2	3-2	2
	4-2x10	7-2	2	6-2	2	5-6	2
	4-2x12	8-4	2	7-2	2	6-5	2

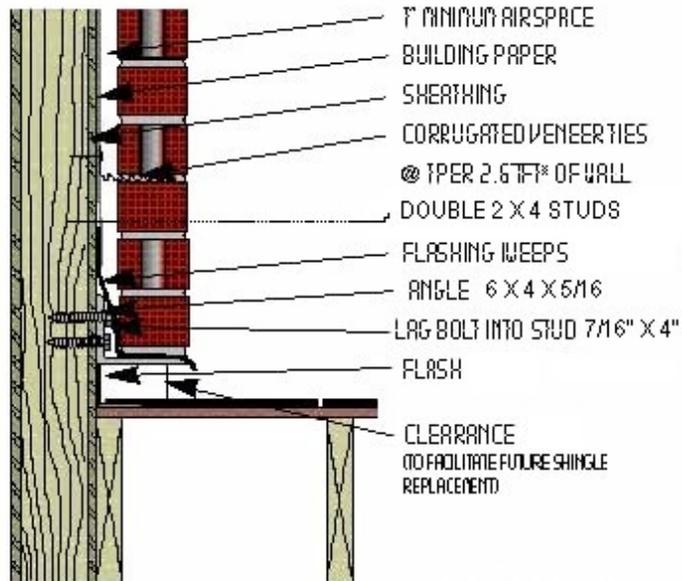
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Spans are given in feet and inches.
- b. Tabulated values assume #2 grade lumber.
- c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- d. NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the headers are permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

BRICK ON WOOD

- Angle carries the weight of the masonry and transfers load to the doubled studs

Cannot be used over open spans with cathedral type ceilings

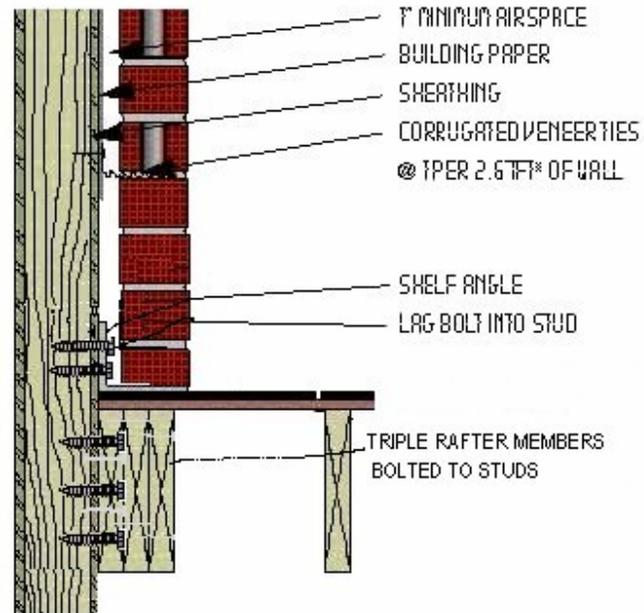


R703.7.2.1 Support by steel angle. A minimum 6 inches by 4 inches by 5/16 inch (152 mm by 102 mm by 8 mm) steel angle, with the long leg placed vertically, shall be anchored to double 2 inches by 4 inches (51 mm by 102 mm) wood studs at a maximum on center spacing of 16 inches (406 mm). Anchorage of the steel angle at every double stud spacing shall be a minimum of two 7/16 inch (11.1 mm) diameter by 4 inches (102 mm) lag screws. The steel angle shall have a minimum clearance to underlying construction of 1/16 inch (1.6 mm). A minimum of two-thirds the width of the masonry veneer thickness shall bear on the steel angle. Flashing and weep holes shall be located in the masonry veneer wythe in accordance with Figure RR703.7.1. The maximum height of masonry veneer above the steel angle support shall be 12 feet, 8 inches (3861 mm). The maximum slope of the roof construction shall be not more than 7:12. The air space separating the masonry veneer from the wood backing shall be in accordance with R703.7.4 and R703.7.4.2.

BRICK ON WOOD (Cont.)

- Tripled rafters carry the weight of the masonry and transfers load to the studs.

Cannot be used over open spans with cathedral type ceilings.

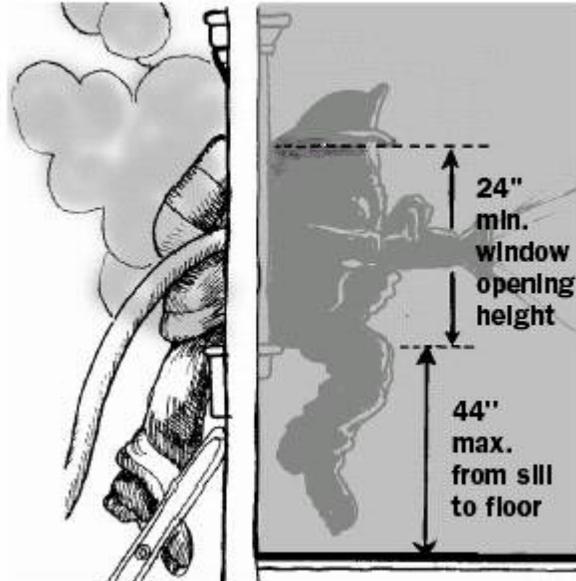


R703.7.2.2 Support by roof construction. A steel angle shall be placed directly on top of the roof construction. The roof supporting construction for the steel angle shall consist of a minimum of three 2-inch by 6-inch (51 mm by 152 mm) wood members. The wood member abutting the vertical wall stud construction shall be anchored with a minimum of three 5/8-inch (15.9 mm) diameter by 5-inch (127 mm) lag screws to every wood stud spacing. Each additional roof member shall be anchored by the use of two 10d nails at every wood stud spacing. A minimum of two-thirds the width of the masonry veneer thickness shall bear on the steel angle. Flashing and weep holes shall be located in the masonry veneer wythe in accordance with Figure RR703.7.1. The maximum height of the masonry veneer above the steel angle support shall be 12 feet, 8 inches (3861 mm). The maximum slope of the roof construction shall be not more than 7:12. The air space separating the masonry veneer from the wood backing shall be in accordance with R703.7.4 and R703.7.4.2.

Emergency Egress

Bedroom Window Egress

The second exit required in a bedroom is usually a window. The dimensions of the openings are to ensure the residents an escape route, but equally important, they are designed to allow a firefighter with a backpack to enter. The opening must be at least 24" high and at least 20" wide, with a net area of at least 5.0 sq.ft. for windows located on the first floor and 5.7sq.ft for windows located on other floors. The window sill must not be higher than 44" above the floor. Basement windows require a window well that is at least 3 feet in width and depth and may required a permanent ladder if the window well is more than 44" deep.



Safety Glazing

Safety Glazing is required in the following hazardous locations. The following shall be considered specific hazardous locations for the purposes of glazing:

1. Glazing in side-hinged doors except jalousies.
2. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bifold closet door assemblies.
3. Glazing in storm doors.
4. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any part of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface.
5. Glazing, in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24-inch (610 mm) arc of the door in a closed position and whose bottom edge is less than 60 inches (1524 mm) above the floor or walking surface.
6. Glazing in an individual fixed or operable panels that meets all of the following conditions:
 - 6.1. Exposed area of an individual pane greater than 9 square feet (0.836 m²).
 - 6.2. Bottom edge less than 18 inches (457 mm) above the floor.

- 6.3. Top edge greater than 36 inches (914 mm) above the floor.
- 6.4. One or more walking surfaces within 36 inches(914 mm) horizontally of the glazing.
- 7. All glazing in railings regardless of an area or height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.
- 8. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where the bottom edge of the pool or spa side is less than 60 inches (1524 mm) above a walking surface and within 60 inches (1524 mm) horizontally of the water's edge. This shall apply to single glazing and all panes in multiple glazing.
- 9. Glazing in walls enclosing stairway landings or within 60 inches (1524 mm) of the top and bottom of stairways where the bottom edge of the glass is less than 60 inches (1524 mm) above the walking surface.

