

NOTCHING & BORING GUIDE FOR FLOOR JOISTS & STUD WALLS IN CONVENTIONAL LIGHT-FRAME CONSTRUCTION

Notching & Boring Guidelines

Intended for use by residential builders, this WWPA TIP Sheet serves as a guide to code-allowed size and placement of cuts (notching and boring) in floor-joist and stud-wall framing members.

A number of problems can occur if cuts are made through framing members to make room for plumbing or electrical runs, ductwork, or other mechanical elements such as sound or security systems.

Whenever a hole or notch is cut into a member, the structural capacity of the piece is weakened and a portion of the load supported by the cut member must be transferred properly to other joists.

It is best to design and frame a project to accommodate mechanical systems from the outset, as notching and boring should be avoided whenever possible; however, unforeseen circumstances sometimes arise during construction.

If it is necessary to cut into a framing member, the following diagrams provide a guide for doing so in the least destructive manner.

Diagrams comply with the requirements of the three major model building codes: Uniform (UBC), Standard (SBC), and National (BOCA), and the CABO One- & Two-Family Dwelling Code.

FLOOR JOISTS

The following references are to actual, not nominal dimensions. (See Figure 1: *Placement of Cuts in Floor Joists* and Table 1: *Maximum Sizes for Cuts in Floor Joists*.)

Holes: Do not bore holes closer than 2" from joist edges, nor make them larger than 1/3 the depth of the joist.

Notches: Do not make notches in the middle third of the span where the bending forces are greatest.

Notches should be no deeper than 1/6 the depth of the joist. Notches at the end of the joist should be no deeper than 1/4 the depth. Limit the length of notches to 1/3 of the joist's depth.

When a Notch Becomes a Rip

Codes do not address the maximum allowable length of a notch; however, the 1991 *National Design Specification (NDS)* does limit the maximum length of a notch to 1/3 the depth of a member.

It is important to recognize the point at which a notch becomes a rip, such as when floor joists at the entry of a home are ripped down to allow underlayment for a tile floor.

Ripping wide dimension lumber lowers the grade of the material, and is unacceptable under all building codes.

When a sloped surface is necessary, a non-structural member can be ripped to the desired slope and fastened to the structural member in a position above the top edge. Do not rip the structural member.

STUD WALLS

When structural wood members are used vertically to carry loads in compression, the same engineering procedure is used for both studs and columns. However, differences between studs and columns are recognized in the model building codes for conventional light-frame residential construction.

The term "column" describes an individual major structural member subjected to axial compression loads, such as columns in timber-frame or post-and-beam structures.

The term "stud" describes one of the members in a wall assembly or wall system carrying axial compression loads, such as 2x4 studs in stud wall that includes

sheathing or wall board. The difference between columns and studs can be further described in terms of the potential consequences of failure.

Columns function as individual major structural members, consequently failure of a column is likely to result in partial collapse of a structure (or complete collapse in extreme cases due to the domino effect). However, studs function as members in a system. Due to the system effects (load sharing, partial composite action, redundancy, load distribution, etc.), studs are much less likely to fail and result in a total collapse than are columns.

Notching or boring into columns is not recommended and rarely acceptable; however, model codes establish guidelines for allowable notching and boring into studs used in a stud-wall system.

Figures 2 and 3 illustrate the maximum allowable notching and boring of 2x4 studs under all model codes except BOCA. BOCA allows a hole one third the width of the stud in all cases.

Bored holes shall not be located in the same cross section of a stud as a cut or notch.

For additional information on framing (and common framing errors), contact WWPA for reprints of the following articles written by Association field staff.

Field Guide to Common Framing Errors (JLC-2) reprinted from *Journal of Light Construction*: article focuses on most commonly-encountered job-site errors. 6 pgs.

Common Roof-Framing Errors (JLC-3) reprinted from *Journal of Light Construction*: focuses on problems and solutions with trusses, rafters, collar



ties and structural ridges. 4 pgs.

Picture Perfect Framing

(B-1) reprinted from *Builder Magazine*: discusses cantilevers, joist hangers, blocking, notching and boring, cathedral ceilings, and over cutting tapers. 4 pgs.

Article reprints are 75 cents each to cover postage and handling.

Table 1: Maximum Sizes for Cuts in Floor Joists

Joist Size	Max. Hole	Max Notch Depth	Max. End Notch
2x4	none	none	none
2x6	1-1/2"	7/8"	1-3/8"
2x8	2-3/8"	1-1/4"	1-7/8"
2x10	3"	1-1/2"	2-3/8"
2x12	3-3/4"	1-7/8"	2-7/8"

Fig. 1: Placement of Cuts in Floor Joists

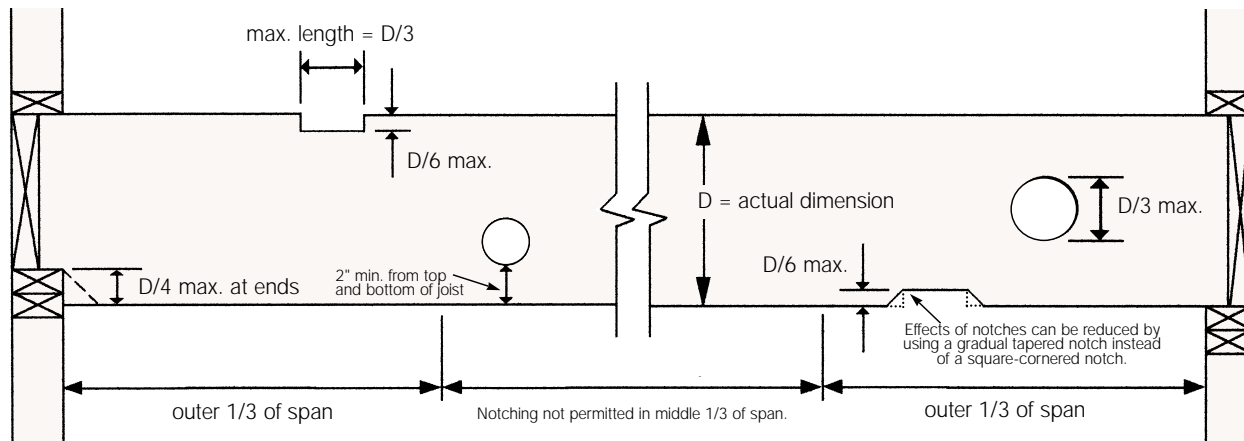


Fig. 2: Notches in 2x4 Studs

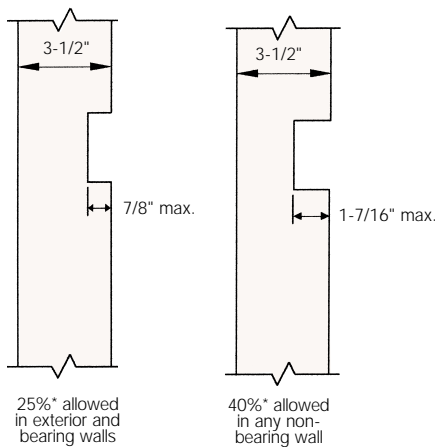
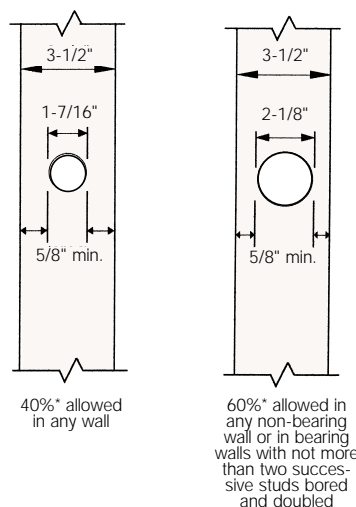


Fig. 3: Bored Holes in 2x4 Studs



Western Wood Products Association
 522 SW Fifth Avenue Suite 400
 Portland, OR 97204-2122
 503/224-3930 Fax: 503/224-3934
 e-mail: info@wwpa.org
 web site: <http://www.wwpa.org>

*Figures 2 and 3 illustrate 25%, 40% and 60% notches or holes in 2x4s (e.g. .25 x 3 1/2" = .875 or 7/8"). These percentages apply to studs of any size.