Advanced Framing for Walls and Ceilings

This pamphlet is one in a series that describes residential energy conservation requirements of the Oregon Residential Specialty Code and the Structural Specialty Code for Group R buildings three stories and less in height. Other pamphlets in this series may be obtained from Oregon Dept of Energy at www.oregon.gov/energy/ or local building departments or from Oregon Building Codes Division.

Prescriptive paths that require advanced framing

Several prescriptive paths (3, 4, 5, 6, and 7) in Table N1104.1(1), Prescriptive Compliance Paths for Residential Buildings require advanced framing in walls or ceilings or both. Advanced framing is required if an R-value in Table N1104.1(1) is followed by an "A." Section drawings or written specifications that accompany the plan must indicate advanced framing where required.

Structural requirements in the code limit 2x4 advanced framing to one story homes. Thus, structural requirements preclude use of advanced framed walls in some cases. Walls with 2x6 studs, 24-inch on-center framing may be used for two story buildings.

Firewall construction also requires specific framing details that are not compatible with advanced framing methods.

Check structural and fire wall requirements first. If they are compatible with advanced framing, advanced frame prescriptive paths are options for energy code compliance.

If a prescriptive path is used for code compliance, only the R- and U-factors in that prescriptive path may be used. R- and U-factors in one path may not be mixed with R- and U-factors in other paths. R- and U-factor standards may be exceeded.

Energy code definition of advanced frame walls

Advanced frame walls must have all of the following features:

- 24-inch on center framing
- insulated corners
- insulation in exterior walls behind partition intersections
- insulated headers

Code requires that insulation in corners and partition intersections be equivalent to insulation in the surrounding wall. Headers with voids one inch thick or greater must be filled with rigid insulation that has a minimum R-value of 4.0 per inch.

Depending on the type of truss used in gable end walls, gable end wall headers may be eliminated. If the gable truss is structural, headers in the gable end wall are not needed because loads are transferred to side walls. If the gable truss does not transfer loads to side walls, insulated structural headers are needed in the wall below the truss.

Figures 1, 2, and 3 show ways to insulate corners, partitions and headers.

Siding and sheathing considerations for advanced frame walls

Structural sheathing is rated for 24-inch or 16-inch on-center framing. Ratings are stamped on the sheeting material. For advanced framing, be sure structural sheathing is rated for 24 inches on center.

Advanced frame walls may not be appropriate for every job. Structural considerations must be taken into account. Also, some siding systems work better with conventional framing. Make sure siding and framing

Figure 1:
Insulated corner details

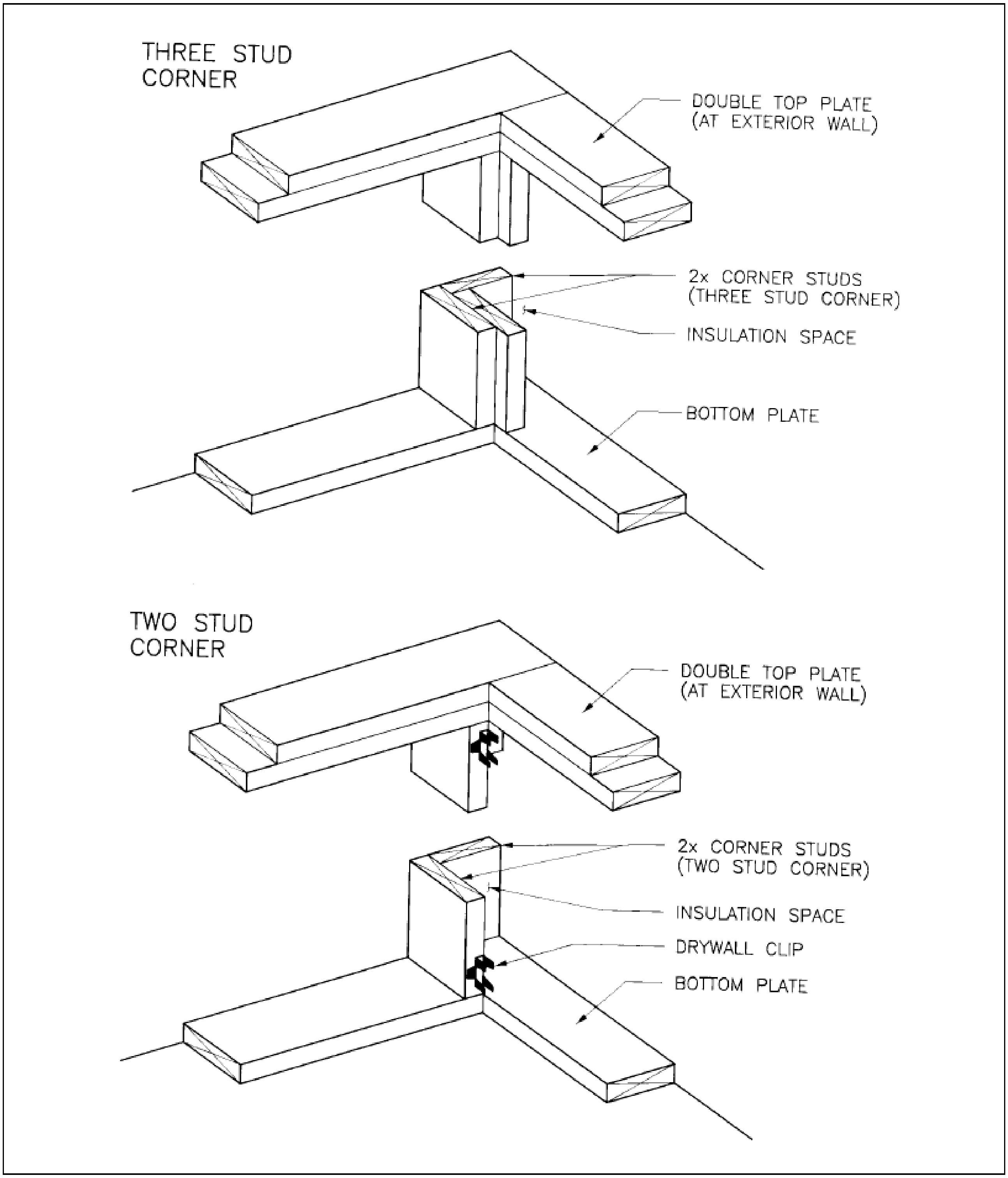


Figure 2:
Insulated partition intersections

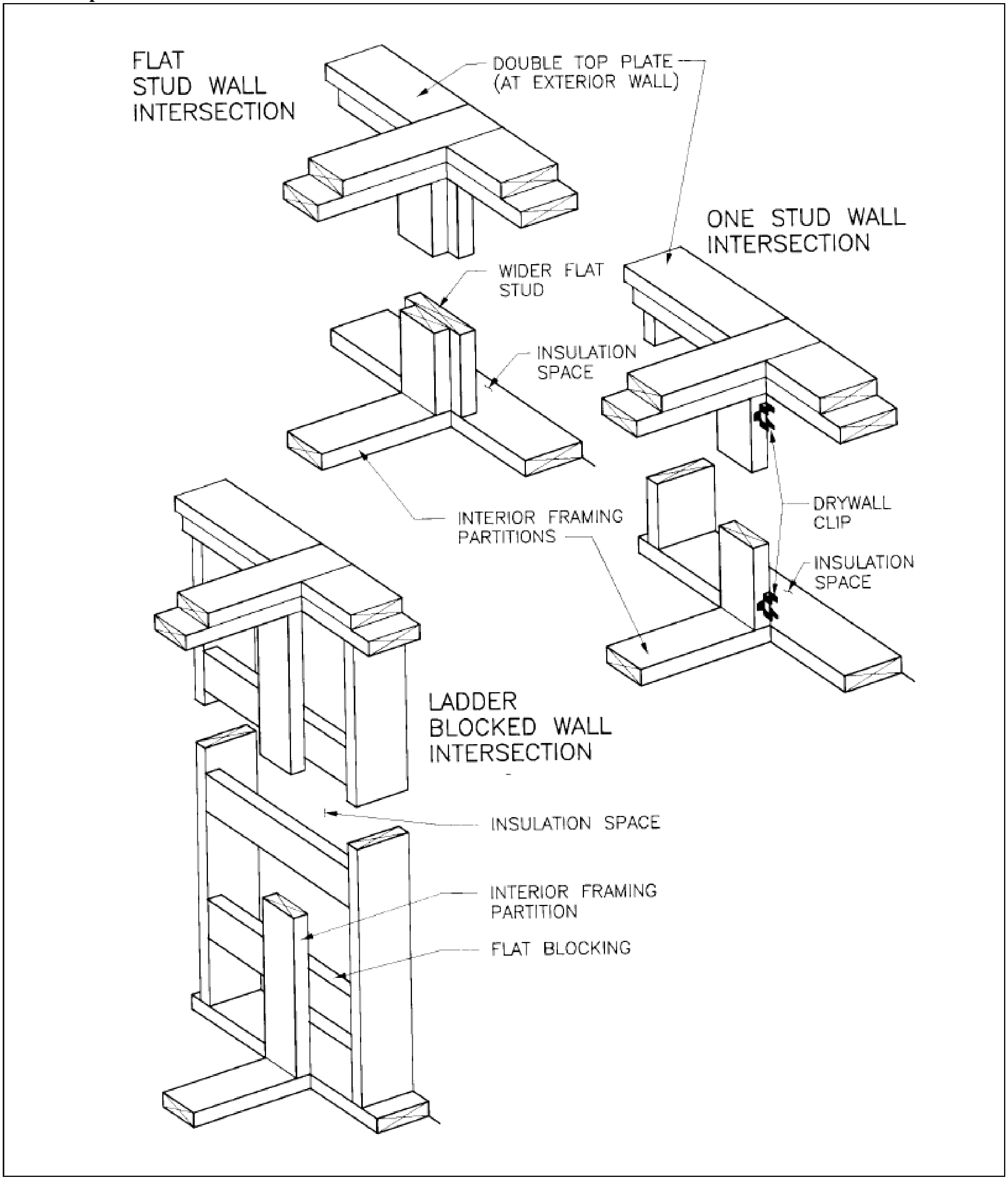
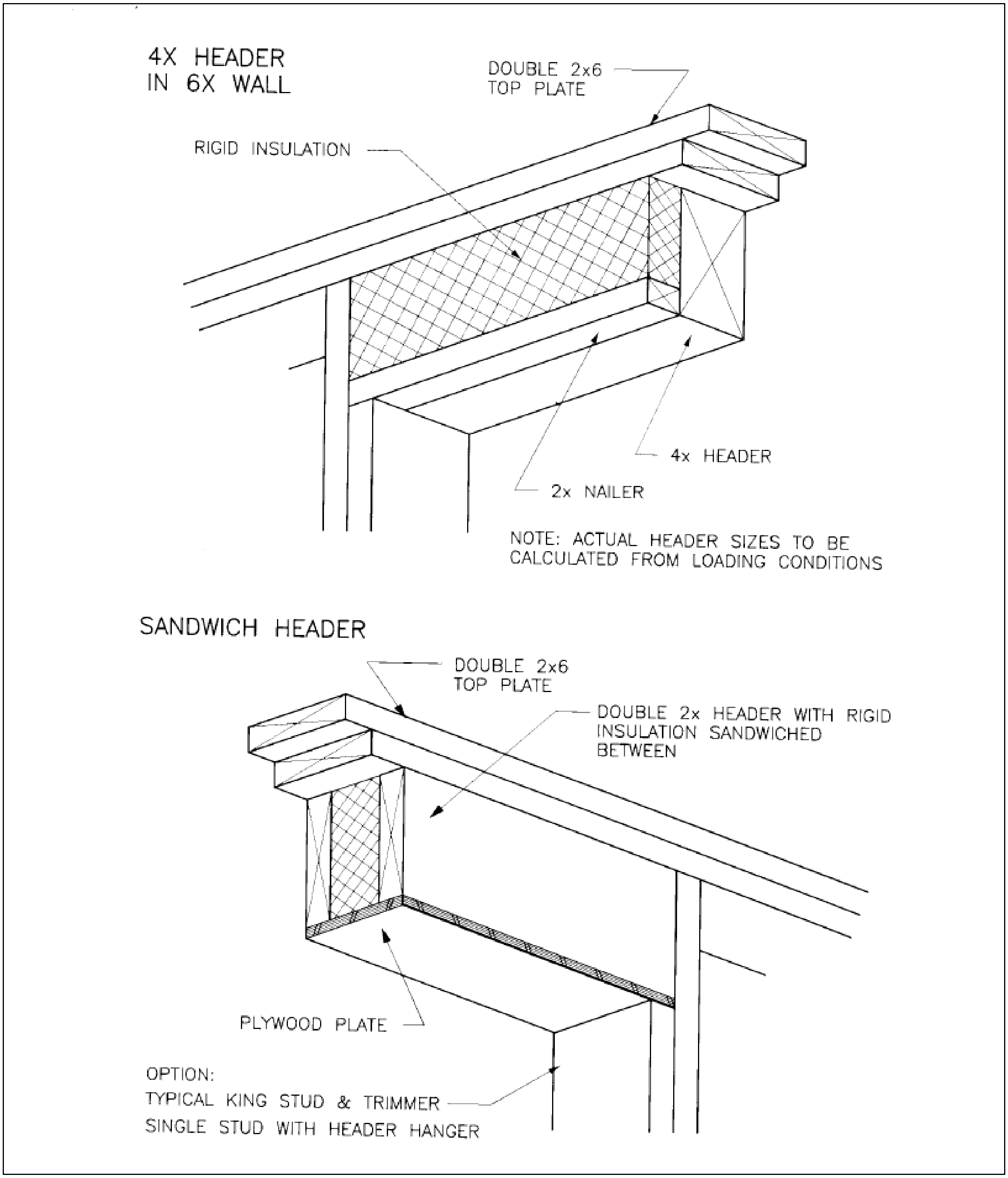


Figure 3:
Insulated header details



systems are compatible before choosing an advanced frame prescriptive path.

Advanced frame R-19 walls as approved alternates to standard R-21 walls

A footnote to Table N1104.1(1) indicates that use of advanced framing with R-19 insulation is considered to be the thermal equivalent and approved alternate to a standard frame with R-21 insulation.

Point loading and advanced frame walls

When 24-inch on-center framing is used in walls, it is good practice, but not a requirement, to lay out the roof so trusses bear directly over wall studs. This is called "point loading" and is illustrated in Figure 4.

Energy code definition of advanced frame ceilings

Advanced frame ceilings are constructed to allow full-depth attic insulation to be installed all the way to the outside wall. Advanced ceiling framing eliminates the three- to four-foot strip at the building perimeter where conventional roof trusses compress attic insulation to zero. This under-insulated strip commonly accounts for 25 percent of ceiling area.

Figure 5 shows ways to get full insulation all the way to the outside wall. Oversized or raised-heel trusses are most commonly used. However, framing techniques such as box ceilings or dropped ceilings also may be used to create space for full-depth ceiling insulation.

Figure 4:
Point loaded trusses

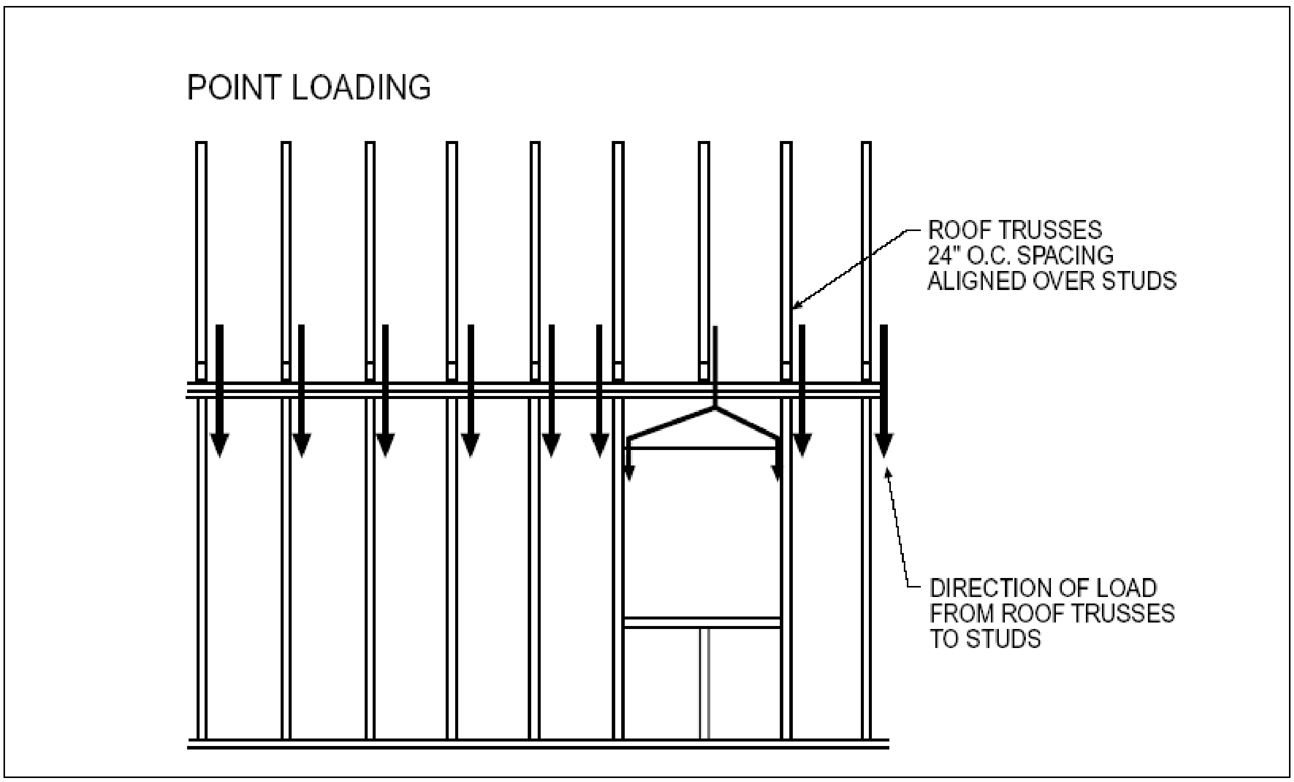


Figure 5:
Standard vs. advanced frame ceilings

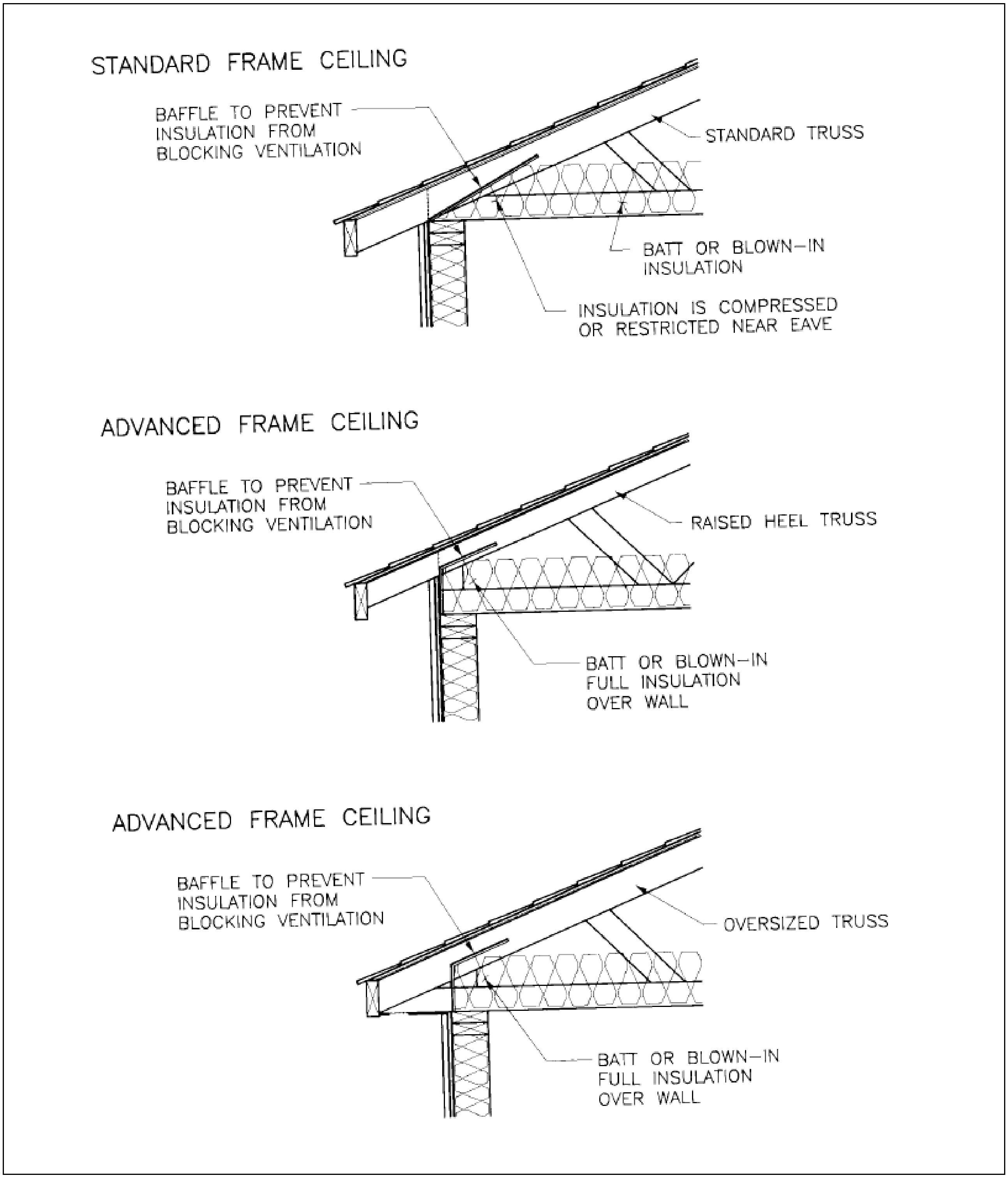
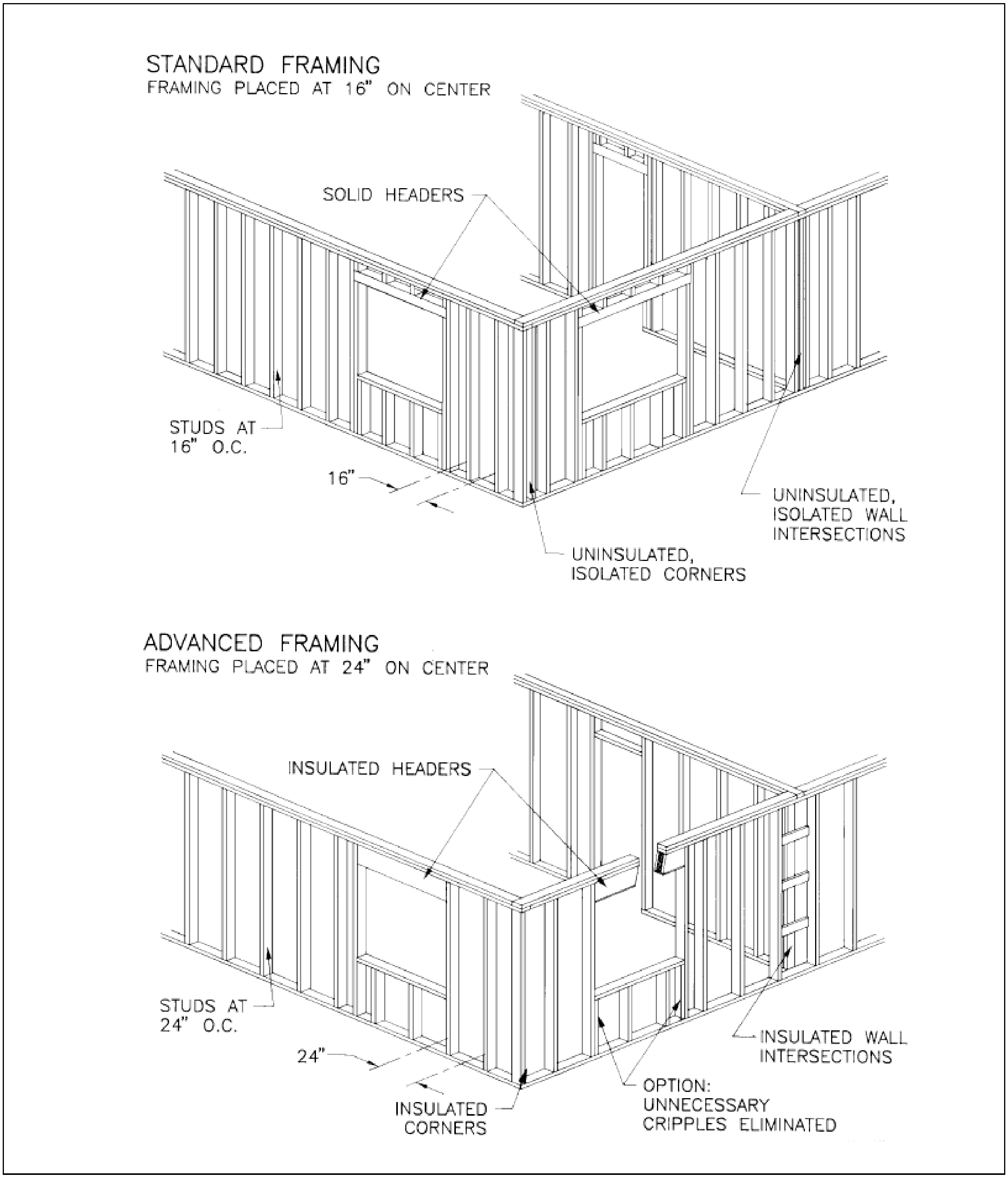


Figure 6:
Standard vs. advanced framed walls



Use of oversized trusses requires installation of a structural block at the bearing point and may require closed-in soffits. Be sure to specify location of the bearing point when ordering oversized trusses. Raised heel trusses increase wall height, thereby affecting siding installation. Advanced frame scissors trusses may be used in vaults, but are not required by code.

How does advanced framing work?

Advanced framing eliminates non-structural wood from the building envelope and replaces it with insulation. Figure 6 shows the difference between standard and advanced wall framing.

Wood has an R-value of about R-1 per inch. Insulation R-values range from R-3.5 to R-8.3 per inch.

Wood creates a path for conductive heat loss, called a "thermal bridge," through the building frame. Reducing thermal bridging by replacing wood with insulation in advanced frame homes improves energy performance.

Computer simulations indicate that homes with advanced framed walls and ceilings use about eight percent less energy for space heat than conventionally framed homes.

Advanced ceiling framing eliminates insulation compression at the ceiling perimeter caused by conventional trusses. Under-insulated perimeters make up a large portion of conventional ceiling area. By allowing space for full-depth ceiling insulation at the ceiling perimeter, advance frame trusses significantly reduce heat loss through the ceiling.

The National Association of Home Builders (NAHB) Research Foundation developed advanced wall framing as a cost-saving measure. NAHB called it “optimal value engineering,” or OVE framing. OVE cost-cutting measures also reduce heat transfer across the building shell.

Information presented in this publication supports the Oregon Residential Specialty Code, or Chapter 13 of the Oregon Structural Specialty Code. This publication does not include all code requirements. Refer to the code and check with your code official for additional requirements. If information in this publication conflicts with code or your local officials, follow requirements of code and your local officials.

For more information about the residential energy code, call the Building Codes Division at (503)378-4133 or the Oregon Dept of Energy (503)378-4040 in Salem or toll-free, 1-800-221-8035.

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