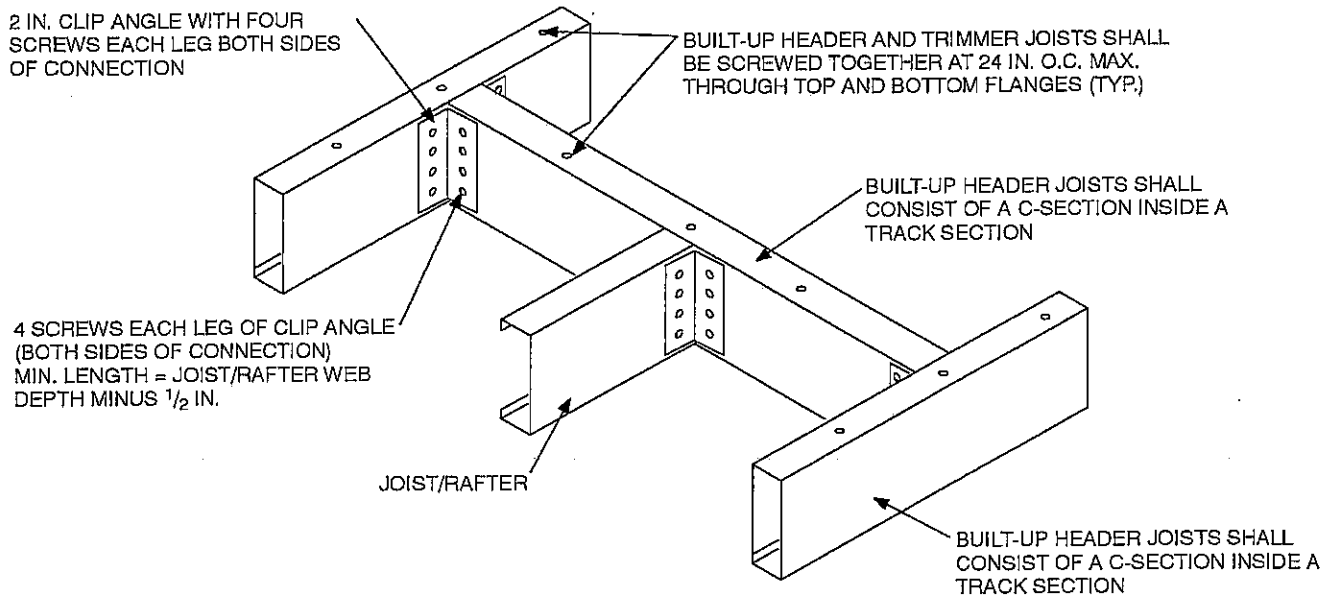

For SI: 1 inch

FIGURE R804.3.10(2)
ROOF OPENING

❖ See the commentary for Section R804.3.10.

R806.4 Conditioned attic assemblies. Unvented conditioned attic assemblies (spaces between the ceiling joists of the top story and the roof rafters) are permitted under the following conditions:

1. No interior vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly.
2. An air-impermeable insulation is applied in direct contact to the underside/interior of the structural roof deck. "Air-impermeable" shall be defined by ASTM E 283.

   Exception: In Zones 2B and 3B, insulation is not required to be air impermeable.
3. In the warm humid locations as defined in Section N1101.2.1:

   3.1. For asphalt roofing shingles: A 1-perm (5.7×10^{-11} kg/s · m² · Pa) or less vapor retarder (determined using Procedure B of ASTM E 96) is placed to the exterior of the structural roof deck; that is, just above the roof structural sheathing.

   3.2. For wood shingles and shakes: a minimum continuous 1/4-inch (6 mm) vented air space separates the shingles/shakes and the roofing felt placed over the structural sheathing.
4. In Zones 3 through 8 as defined in Section N1101.2, sufficient insulation is installed to maintain the monthly average temperature of the condensing surface above 45°F (7°C). The condensing surface is defined as either the structural roof deck or the interior surface of an air-impermeable insulation applied in direct contact with the underside/interior of the structural roof deck. "Air-impermeable" is quantitatively defined by ASTM E 283. For calculation purposes, an interior temperature of 68°F (20°C) is assumed. The exterior temperature is assumed to be the monthly average outside temperature.

❖ This section describes attics where the insulation and air barrier are above instead of below the attic space. Moving the insulation and placing an air-impermeable barrier above the attic moderates attic conditions so they are similar to the conditions of the residential space below. The primary benefit of having the insulation and air barrier above the attic is that ducts and/or HVAC equipment in the attic are not delivering cooled air through a hot summer attic and heated air through a cold winter attic. Another benefit is to eliminate the attic vents that sometimes allow moisture to condense inside the attic, admit rain during extreme weather and possibly admit sparks in fires.

Because this space is inside the building's thermal envelope, the traditional attic ventilation required by Sections R806.1 and R806.2 is not required. It obviously would not make sense to require such ventilation in a living room, so therefore, it can also be excluded from a conditioned attic area. Unvented attics require water/moisture control. Water moves in (or out) of buildings three main ways. The greatest amount of moisture is moved as bulk water (rain or any kind of water flow). Less moisture is moved by moving moist air such as with infiltration. The least amount of moisture is moved by moisture migration through materials. As with any attic, the roof itself is the main barrier for keeping water from entering the attic.

The provisions of this section can be applied to any attic area which is in compliance with this section. The attic is a traditional attic space, with the exception that it need not be ventilated and it will not get as hot or as cold as an attic that is open to the exterior.

It is very important that all of the four listed conditions be reviewed and considered for each building that uses the provisions of this section.

Item 1, which applies to all climate zones, prohibits the installation of a vapor retarder where it is typically installed at the ceiling level (attic floor) of a traditional ventilated attic. This assures that no barrier is installed which would separate the conditioned attic area from the remaining portion of the home. This requirement gives the attic space a limited potential to dry into the space beneath the attic so that small amounts of excess moisture can be removed from the attic. A sheet of polyurethane film or any material with a foil film facing are examples of vapor barriers that are not permitted on the attic floor.

Item 2 is one of the main provisions of this section and is applicable to virtually every climate zone. The requirement for an "air-impermeable" insulation will assure that air and the moisture that it can contain will not pass through the insulation to reach a point where it could condense because of the temperature. This item specifies that air-impermeable insulation be in direct contact with the interior side of the roof deck. Air-impermeable insulation prevents the movement of moist air that comes in as infiltration through the roof into the interior of the attic. For this section, air-impermeable material could be taken as a material that has an air permanence of 0.02 L/s-m^2 (at 75 Pa pressure) or less. Expanding spray foams and insulated sheathing (hard-foam sheathing board) are common types of air-impermeable insulation. When using insulated sheathing, attention to the details of completing the air sealing is required as the sheathing is installed in the roof. Fiberglass and cellulose are common types of air-permeable insulation. Air-impermeable insulation is not required in dry southern climates (2B and 3B) because the air is dryer in these dry climates.

Item 3 contains special requirements which apply to two types of shingle roofs when the home is located in a warm humid location. See Table N1101.2.1 for a list of the counties and territories that are considered as being warm and humid. Asphalt shingles require a vapor retarder between the shingles and the roof decking. Wood shakes and shingles require a vented space under them to allow the wood to dry after it gets wet from rain.

Item 4, which is applicable in the more northern zones, requires sufficient insulation to keep moisture from condensing on the "condensing surface" inside the attic in "average conditions." The insulation works to prevent condensation by keeping the condensing surface above the temperature where condensation will occur. Small amounts of condensation may occasionally occur at more extreme conditions; however, this is not a concern. The condensing surface is the interior side of the roof deck for air-permeable insulation (see item 2 exception for Climate Zones 2B and 3B) and the interior of the insulation for air-impermeable insulation. The condensing surfaces differ because attic air can circulate through air-permeable insulation to contact the roof deck but can get only to the interior of air-impermeable insulation.

Note that the insulation required by item 4 may be more or less than the insulation required for energy efficiency in Chapter 11. If the amount of insulation required by Item 4 varies from the amount specified in Chapter 11, the provisions of Section R102.1 would apply, and the higher insulation value would be required. The insulation provided to comply with item 4 may be considered as contributing to the insulation required in Chapter 11 (See Section N1102.1.1).

It is important to realize that this section cannot be viewed as modifying or eliminating requirements found elsewhere in the code. Examples of sections which still affect these attic areas include Sections R314, R316, R807, R808, N1102.1 and others. Because the insulation typically used with this provision is some type of foam plastic, the requirements of Section R314 must be applied. The provisions of Section R806.4 do not in any way modify or eliminate the requirements for a thermal barrier (Section R314.4) or protection from ignition (Section R314.5.3). See the commentary for Sections R314 and R316 for a complete discussion regarding these requirements and the options available. Ducts in this unvented attic construction would be considered as being inside the building thermal envelope and would not require insulation (Section N1103.2.1).

The provisions of this section consider the attic assembly as a "conditioned" space; there is no requirement for the space to be provided with conditioned air supply. The attic space is considered indirectly conditioned because of omission of the air barrier, insulation at the ceiling and leakage around the attic access opening. Although the IRC does contain a definition for conditioned space, the definition is not directly applicable to "Conditioned attic assemblies" prescribed in this section. The definition is applicable only "for energy purposes" and "for mechanical purposes." An attic assembly complying with Section R806.4 will generally fall within the temperature ranges specified in the definition.

The key concept of this section is to move the thermal envelope (insulation) above the attic, resulting in the attic being in a conditioned (or sometimes semi-conditioned) space. Direct air supply to the attic is not required if the attic floor is not insulated; the attic temperature would be similar to interior conditioned spaces. Ducts and/or HVAC equipment in the attic also help moderate the attic conditions.