Insulating and Sealing Structural Headers - Code Compliance Brief

Overview:

The intent of this brief is to provide code-specific information about insulated headers to help ensure that the measure will be accepted as being in compliance with the code. Providing notes for code officials on how to plan reviews and conduct field inspections can help builders or remodelers with proposed designs and installations and provide jurisdictional officials with information for acceptance. Providing the same information to all interested parties (e.g., code officials, builders, designers, etc.) is expected to result in increased compliance and fewer innovations being questioned at the time of plan review and/or field inspection.

Every house uses load-bearing walls to stabilize the structure and support the weight of the home. In load-bearing exterior walls, structural headers are placed above the frames for windows and doors to carry the load from the building above and transfer it to posts on both sides of the window or door opening. Structural headers are a point of increased heat loss because they are made from solid or laminated framing timbers with no insulation. Since the 2009 versions of the International Energy Conservation Code (IECC) and International Residential Code (IRC) were issued, clarifying language was added specifying that header cavities should be insulated and that the insulation should be at least R-3 per inch. Even though each version of the IECC/IRC codes includes provisions that the building thermal envelope should be durably sealed to limit infiltration and the materials used should allow for differential expansion and contraction, the language in the 2009 version was somewhat vague and did not identify specific components of the building thermal envelope or provide explanations of how these components should be insulated and sealed. The 2012 IECC/IRC added more specific language regarding areas of the building thermal envelope that should be sealed and expanded upon those areas that are now included in the 2015 IECC/IRC. This brief provides an overview of the 2009 through 2015 IRC/IECC code requirements related to air sealing and insulating structural headers.

1“Building Thermal Envelope” is defined as the basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

Plan Review:

Per the IECC/IRC, Section R103.3/R106.3 Examination of documents. The code official/building official must examine or cause to be examined construction documents for code compliance.

This section lists applicable code requirements and details helpful for plan review regarding the provisions to meet the requirement for insulated and sealed structural headers.

- **Construction Documentation.** Review the construction documents for details describing header insulation, installation and construction techniques.
  - 2015 IECC/IRC, Section R103.2/N1101.5 Information on construction documents. Construction documents should include information about the insulation material, its R-values, and air sealing details.

- **Air Leakage and Insulation.** Review the construction documents and that confirm the insulation material, R-value, and air sealing technique meet the applicable code requirements.
  - 2015 IECC/IRC, R402.4./N1102.4. Air leakage. The building thermal envelope should be constructed to limit air leakage.
- **R402.4.1/N1102.4.1 Building thermal envelope.** The sealing methods between dissimilar materials should allow for differential expansion and contraction.

- **R402.4.1.1/N1102.4.1.1 Installation.** The components listed in the Air Barrier and Insulation Installation Table should be installed in accordance with the manufacturer’s instructions and the criteria listed as the applicable method of construction. Below is the General Requirement and one component from the table that is applicable to structural headers.

- **R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**
  - **Air Barrier General Requirements.** A continuous air barrier should be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier should be sealed.
  - **Air Barrier Criteria:**
    - **Walls** – The junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed.
  - **Insulation Installation:**
    - **Walls** – Cavities within corners and headers of frame walls should be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the air barrier.

  2012 IECC/IRC, R402.4/N1102.4 Air leakage. The building thermal envelope should be constructed to limit air leakage.

- **R402.4.1/N1102.4.1 Building thermal envelope.** The sealing methods between dissimilar materials should allow for differential expansion and contraction.

- **R402.4.1.1/N1102.4.1.1 Installation.** The components listed in the Air Barrier and Insulation Installation Table should be installed in accordance with the manufacturer’s instructions and the criteria listed as the applicable method of construction. Below is the only component from the table that is applicable to structural headers.

- **R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**
  - **Walls** – Corners and headers should be insulated and the junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the air barrier.

  2009 IECC/IRC, 402.4.1 Air leakage, Building thermal Envelope

  - The building thermal envelope should be constructed to limit air leakage. The sealing methods between dissimilar materials should allow for differential expansion and contraction. Sources of infiltration should be caulked, gasketed, weather stripped, or otherwise sealed with an air barrier material, suitable film, or solid material. This section does not specifically address areas applicable to structural headers.

Building additions that include a header construction also are subject to the header insulation requirements listed in the IECC/IRC. However, existing wall cavities exposed during construction provided that the cavities are filled with insulation, are exempt from having to meet the provisions of the code.

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2**Continuous air barrier** is defined as a combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

3**Air Barrier** is defined as material(s) assembled and joined together to provide a barrier to air leakage through the building thermal envelope. An air barrier may be a single material or a combination of materials.

4**Building Thermal Envelope** is defined as the basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

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**Field Inspection:**

Per the 2015 IECC, Section R104 Inspections. Construction or work for which a permit is required is subject to inspection. Construction or work is to remain accessible and exposed for inspection purposes until approved. Required inspections include footing and foundation, framing and rough-in work, plumbing rough-in, mechanical rough-in, and final inspection.

Per the 2015 IRC, Section R109 Inspections. The wording is somewhat different in that for onsite construction, from time to time the building official, upon notification from the permit holder or his agent, can make or cause to be made any necessary inspections. Further details are provided for inspections regarding foundation, plumbing, mechanical, gas and electrical, floodplain, frame and masonry, and final inspection. Any additional inspections are at the discretion of the building official.
This section provides details for inspecting to the specific provisions for insulated headers where one or more specific type of inspection per the IECC or IRC may be necessary to confirm compliance. Verifying code compliance for insulated headers would typically be at the framing and rough-in work inspection.

- Confirm that the insulation material meets ratings approved on the construction documents.
- Confirm that insulation has been installed properly so the insulation coverage is continuous and complete. The following websites provide information on insulated header installation:

Technical Validation(s):

This section provides additional information and helpful resources.

- Guide for Insulated Headers: [https://basc.pnnl.gov/resource-guides/insulated-headers][3]