



To: Department of Building Plan Examiners and Inspectors

From: Judith Frydland  
Commissioner

Date: June 20, 2016

Re: **Roof Requirements**

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The Chicago Building Code is performance based, not prescriptive, regarding roof requirements. The only code requirement is that the roof must keep the building dry, and the code is silent on how to do that. To clarify, this memorandum outlines acceptable practices with regard to roof installation and replacement.

**Definition of terms:**

*DOB: The City of Chicago Department of Buildings*

*ROOF ASSEMBLY:* A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof sheathing or a single component serving as both the roof covering and the roof sheathing. A roof assembly includes the roof sheathing, vapor retarder, substrate or thermal barrier, insulation, vapor retarder and roof covering.

*ROOF COVERING:* The covering applied to the roof sheathing, insulation, or a cover board for weather resistance, fire classification or appearance.

*ROOF COVERING REPLACEMENT:* Where an existing roof covering is removed, exposing insulation or sheathing and a new roof covering installed. This occurs typically in ballasted single ply roof systems, lengthens the life of the insulation in serviceable condition, and is allowed where the energy usage of the building does not increase.

*ROOF SHEATHING:* The flat or sloped surface constructed on top of the exterior walls and other supports of a building for the purpose of enclosing the building below and to support the roof covering and the other elements of the roof construction.

*POSITIVE ROOF DRAINAGE:* The drainage condition in which consideration has been made for all loading deflections of the roof sheathing, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

*ROOF REPAIR:* Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

*ROOF REPLACEMENT:* The process of removing the existing roof covering, repairing any damaged substrate including insulation or sheathing and installing a new roof assembly



**Maximum number of layers on a roof assembly:** Structural components of a roof are designed for the dead load of a single layer of roofing. Given the typical safety multipliers used in design of a roof structure, the City of Chicago allows an additional layer of roofing to be applied over the original roofing material. In other words, the maximum number of roof layers for any type of roof is two - the original layer and one additional layer. A third layer of roofing would only be allowed if accompanied by a structural analysis of the roof structure, signed by a licensed structural engineer, confirming the capacity and the condition of the existing roof structural members to carry additional layers of roofing.

**Asymmetrical loading:** Pitched roofs are designed to carry symmetrical loads. Creating a condition of asymmetrical loading where it did not exist previously is not allowed. If necessary to create such a condition, a report, signed by a licensed structural engineer, confirming the capacity to resist the moment created and condition of the existing structure is required.

**Ice and water shield (ice barrier/water barrier):** The City of Chicago code section 13-196-530 (c) states 'The roof shall be tight and have no defects which admits rain and roof drainage shall be adequate to prevent rain water from causing dampness in the walls.' The code requires that the building be kept dry, but does not specify how to do that.

Due to the winter freeze/thaw cycle in Chicago, the creation of ice dams is a common hazard for roofs. To protect the building and walls against water infiltration from ice forming along the eaves, a barrier consisting of a self-adhering polymer modified bitumen sheet that seals around nail holes shall be used and extended from the lowest edges of all roof surfaces to a point at least 24 inches inside the exterior wall line of the building. Other vulnerable areas such as valleys, ridgeline, and around penetrations shall be protected appropriately as well. For roofs with slopes of a minimum of 8" in 12", apply the ice barrier to extend to a point at least 36" up slope from the lowest edges of all roof surfaces. The ice barrier requirement is not necessary on structures that contain no conditioned space.

When the scope of work is roof replacement versus roof recovering due to the condition of the substrate insulation and/or sheathing, then the scope shall include the removal of all existing layers of roof coverings down to the roof sheathing. Any existing ice barrier membrane may remain in place; however, an additional layer of ice barrier membrane shall be installed over the existing.

**Spaced Sheathing:** roofs originally constructed with wood shingles often have sheathing created from boards that are spaced with gaps to allow the underside of the wood shingles to dry preventing rot. Chicago Municipal Code Sections 15-8-(330-360) and 15-12-(260-310) no longer allow wood shingle roofs. When a new roof assembly is installed, the wood shingles shall be removed and the spaced sheathing replaced. Asphalt or other modern shingle materials require a continuous flat surface upon which to fasten the shingles. Maintaining the gapped sheathing is not acceptable and must be either removed and replaced with plywood roof sheathing, OSB Roof Sheathing, contiguous sheathing boards or the gaps must be filled in to create a smooth and structurally sound substrate.

**Flashing, crickets, saddles, and drip edge:** Provide adequate flashing to prevent moisture from entering the wall and roof through joints, at intersections with parapet walls, and around roof penetrations. Flashing shall be installed at wall and roof intersections and wherever there is a change in roof slope or direction. Metal flashing shall be a minimum of 0.019 inch thick (No. 26 galvanized sheet). Provide a cricket or saddle on the ridge side of any chimney or penetration more than 30 inches wide of sheet metal or of the same material as the roof covering. Skylights are to be flashed in accordance with the manufacturer's instructions.



Provide a drip edge at eaves and rake edges of shingle roofs overlapping segments a minimum of 2 inches. The drip edge shall extend at least ¼ inch below the roof sheathing and extend up the roof deck not less than 2 inches.

Roofing material shall be installed in accordance with the manufacturer's instructions in regards to fasteners, underlayment, and sheathing.

**Constraints on installation of code required amount of R-value on existing buildings:** The energy conservation code acknowledges that existing buildings cannot always meet the requirements of the new construction code. In regards to re-roofing projects, there is language in the code in section C503.1 and R503.1 which allows for accommodation of existing constraints. The City of Chicago has consistently interpreted this to allow for a reduction in the required amount of insulation if the height of the installation would require other elements of the building to be changed where that wasn't part of the scope of work already. This means that parapet heights, equipment curbs, skylight curbs, window sills, door thresholds, and other such elements with flashing into the roof system, are not required to be increased in height solely to provide adequate depth for code required insulation.

The DOB has not required special administrative relief for this situation, just a statement on the application as to the amount of insulation to be provided and a description of the constraint preventing full compliance. The minimum amount of insulation per the state of Illinois amendments is R-3.5 per inch (Chicago may be adopting R-5 per inch). In no case shall the amount of insulation be less than what was there prior to the work. If the occupancy changes and increases the amount of energy used in the space, then the new construction standards apply and this exception is no longer available.



**Residential flat roof insulation above the sheathing:** The model code assumes that residential buildings would not be constructed with a flat roof so the issue of insulation above a deck was not addressed for a residential building in the IECC. This leaves a hole in the code requiring the use of the information the code does provide to determine the amount of insulation required in this situation.

The starting point is R-49 as the code requirement, but there is an alternative compliance path. In the code are U-value alternatives found in Table R402.1.4. There is a value 0.026 for ceiling equivalent U-value. Doing the math ( $R=1/U$ ) comes up with  $R\text{-value} = 1/0.026 = 38.5$ . Therefore, the code supports using R-38.5 continuous insulation above the deck instead of the R 49.