



- TITLE:** Reuse of Roof Insulation
- DESIGNATION:** RCI-TA-016-2018
- OBJECTIVE:** To provide an informative, technical advisory regarding the reuse of existing roof insulation during the replacement or repair of low-slope roofs on commercial buildings.

BACKGROUND

Billions of square feet of roofing are replaced or repaired every year, and the existing roof insulation is typically removed and disposed into landfills. However, when roofs are recovered or repaired, the existing insulation is typically left in place rather than removed. Roofs are generally replaced when reaching the end of the useful service life or experiencing widespread/uncontrolled water entry. Owners, designers, and contractors may consider reusing the existing roof insulation when replacement of the roof system is performed. As such, RCI recommends members review the following when considering reuse of existing roof insulation on roof replacement projects.

INTERNATIONAL EXISTING BUILDING CODE (IEBC)

The 2015 IEBC, Section 706 Reroofing, 706.3 - Recovering versus Replacement, states:

New roof coverings shall not be installed without first removing all existing layers of roof coverings down to the roof deck and where any of the following conditions occur:

1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.¹
4. An exception for spray polyurethane foam roofing states “the application of a new protective coating over an existing spray polyurethane foam roofing system shall be permitted without tear-off of existing roof coverings.”²

DISCLAIMER

This Technical Advisory is intended to serve only as a general resource and to identify potential issues for consideration by industry professionals. Each person using this Technical Advisory is solely responsible for the evaluation of the Technical Advisory in light of the unique circumstances of any particular situation, must independently determine the applicability of such information, and assumes all risks in connection with the use of such information. The materials contained in this Technical Advisory do not supersede any code, rule, regulation, or legislation and are not intended to represent the standard of care in any jurisdiction.

INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

The 2015 IECC, Chapter 4, states that building thermal envelope assemblies shall meet the required R-value based on the climate zone specified in the IECC.

DISCUSSION

To ensure adequate long-term service life of a new roof assembly, it is vital that:

- The existing roof insulation meet the requirements of the code with regards to trapped moisture in the roof assembly,
- An adequate substrate is provided for the new roof membrane, and
- The roof assembly meets the requirements of the manufacturer.

The most common types of insulation and cover boards found in low-slope roofs include fiberglass, fiberboard, perlite, stone wool, phenolic foam, cellular glass, expanded polystyrene (EPS), extruded polystyrene (XPS), spray polyurethane, gypsum and concrete roof boards, and polyisocyanurate. Many of the roof insulations described have their advantages and disadvantages.

In general, roof insulation material manufacturers stipulate their tested R-value. Polyisocyanurate insulation manufacturers specifically promote using the long-term thermal resistance (LTTR) properties of the material when determining the overall thermal resistance of the roof assembly.

Many factors should be considered during the evaluation of an existing roof assembly to determine the feasibility of reusing the existing insulation during roof replacement. These factors include, but are not limited to, the following:

- Type of existing insulation
- Condition of existing insulation
- Installation method of existing roof assembly (e.g., fully adhered, including the roof insulation, mechanically fastened, loose-laid, etc.)
- Building use
- Extent of water damage to roof assembly (determined from moisture survey)
- Type and condition of the roof deck
- Slope to drain or depressed/deflected areas holding water

There are two approaches to roof insulation reuse that may be considered:

- Roof recovery without complete removal of the roof membrane above the existing insulation, and
- Total removal of the roof membrane above the existing insulation.

The removal of the membrane allows for visual examination of the top layer of insulation or cover board in addition to confirming any roof moisture survey results. In addition to spot removal of damaged insulation and/or cover board, the manufacturer of the new roof system may require that additional procedures are followed to meet the performance requirements of the new system.

Fully adhered membrane roof assemblies create challenging conditions for reusing existing insulation. For example, delamination of the insulation facers or damage to the core of the insulation boards is likely to occur during membrane removal. This is especially true when new materials must be adhered over the existing materials. In addition to a moisture survey to check that the insulation is adequately dry, field testing may be required on the existing roof assembly to ensure appropriate uplift values can be obtained. ANSI-SPRI IA-1, “Standard Field Test Procedure for Determining the Uplift Resistance of Insulation and Insulation Adhesive Combinations over Various Substrates,” is one such test procedure that can be followed for testing the uplift resistance.³ Negative pressure testing per FM Global Property Loss Prevention Data Sheets 1-52, “Field Verification of Roof Wind Uplift Resistance,” is another procedure.⁴ The new system would not otherwise be a tested assembly.

Further, if the proposed new roof assembly is not a tested assembly, the local jurisdiction should be consulted to ensure the onsite testing and results thereof would be acceptable. To meet Factory Mutual (FM Global) requirements, test procedures and roof assemblies should be submitted and evaluated by FM Global. Also consult FM Global for FM Global-insured buildings since they may not approve testing they did not perform.

For roof membrane replacement projects, after the removal of the existing roof membrane, the condition of the existing roof insulation must be investigated. Evident deficiencies to the existing insulation that will impede the functionality of the new roof system and therefore may negate reuse are as follows:

- Delamination of facers
- Damage to facers
- Biological growth on insulation
- Deformed or cupped insulation
- Entrapped moisture
- Crushed, broken, or pulverized insulation

For roof recover projects that do not include the removal of the existing roof membrane, a roof moisture survey is typically required by the manufacturer of the new roof system. The most common standard, non-destructive, test procedures used to identify the presence of moisture beneath a roof membrane are:

- Infrared Imaging: ASTM C1153, *Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging*,⁵
- Nuclear Radioisotopic Thermalization: ANSI/SPRI/RCI NT-1, *Detection and Location of Latent Moisture in Building Roofing Systems by Nuclear Radioisotopic Thermalization*,⁶ and
- Electrical Impedance Scanners: ASTM D7954/D7954M, *Standard Practice for Moisture Surveying of Roofing and Waterproofing Systems Using Non-Destructive Electrical Impedance Scanners*.⁷

All non-destructive test methods require confirming findings by extraction of roof core samples. At that time, the properties and condition of the existing roof substrate materials can be visually observed at the roof core sample areas, provided large enough openings are made. Manufacturers may require a moisture survey, without defining test methods for determining the condition of the roof assembly; one of the three test methods listed above should be considered. High- and low-voltage testing can also be used, but are limited to identifying breaches in a membrane and do not identify the presence of moisture directly under roof membranes.

When considering roof recovery and repairs, RCI Technical Advisory RCI-TA-013, “Removal and Replacement of Roof Substrate Materials Damaged by Moisture,” should be reviewed.⁸

RECOMMENDATION

The purpose of this Technical Advisory is to provide information to RCI members and the industry for consideration during a condition assessment or roof design to determine the feasibility of reusing the existing roof insulation. The reuse of roof insulation should be confirmed and discussed with the manufacturer to ensure all performance requirements are met during construction. The physical properties of the roof substrate and materials may be adversely affected if excessive moisture has existed. Thorough testing using consensus-based standards and methods, along with field testing and evaluation of the materials present, is required to achieve long-term performance. In addition, confirm with the jurisdiction having authority and/or FM Global if any special testing and results thereof will be acceptable.

Reuse of roof insulation may result in cost savings to the project, reducing transportation, materials, demolition, and installation labor. Roof re-cover projects present various long-term performance issues when adequate drainage capacity is not provided, incompatible materials are used, damaged or deteriorated materials are not replaced, and a minimum of ¼-inch per foot or positive slope is not provided. The long-term performance of the roof may be significantly reduced if proper testing and analysis of the existing roof assembly are not performed.

REFERENCES

¹ 2015 International Existing Building Code, Section 706 Reroofing, 706.3 Recovering versus Replacement, p. 33.

² 2015 International Existing Building Code, Section 706 Reroofing, 706.3 Recovering versus Replacement, p. 33.

³ Available from SPRI at:

https://www.spri.org/download/standards_and_technical_reports/current_ansi_spri_standards/ANSI-SPRI-1A-1-2015-Standard-Field-Test-Procedure.pdf.

⁴ Available from FM Global at: <https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

⁵ Available from ASTM International at: <https://www.astm.org/Standards/C1153.htm>.

⁶ Available from SPRI at:

https://www.spri.org/download/standards_and_technical_reports/current_ansi_spri_standards/NT-1-2017-ANSI-SPRI-RCI-Detection-and-Location-of-Latent-Moisture.pdf.

⁷ Available from ASTM International at: <https://www.astm.org/Standards/D7954.htm>.

⁸ Available from RCI at: <http://rci-online.org/wp-content/uploads/TA-013-2017-moisture-damaged-roof-materials.pdf>.