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T Kelly Patent 7, 493, 733 Air Sealing With Spray Foam for Energy Efficiency

Making the roof a thermos bottle

Air sealing a metal deck with slow rise adhesive foam while installing roof insulation and spraying standard urethane spray foam over the top of rigid roof insulation with an optional reinforcing scrim. Improves energy efficiency by eliminating convection air currents in a roof assembly as well as thermal conductivity of fasteners.

This Kelly patent teaches a strategic application of urethane slow rise adhesive spray foam to improve the structural strength of metal deck roof construction. This patented roof application technique also air seals a roof assembly for wind up lift resistance and greater insulation energy efficient at the following construction inter faces.

First: The metal deck joints, screw attachments, and openings in the deck itself are specifically sprayed with slow rise foam to stop air in filtration through the metal deck while rigid roof insulation boards are being adhered to the deck with the same spray foam application.

Second: Spray foam is applied to the building perimeter edge interface; into parapets, adjoining building walls, nailers and edge base attachments for gravel stop, gutters, etc. to stop air infiltration into the roof assembly through these edge treatments.

Third: Spray Foam is applied to the through roof penetrations to air sealed under nailers, curbs and deck to penetration interfaces to stop air infiltration into the roof assembly.

Fourth: Spray Foam is applied across the top surface of the rigid roof insulation boards (preferably polystyrene) to encapsulate the roof insulation boards and top seal abutting perimeter penetration and other roof protrusions. This layer provides a surface fire barrier air seal on the topside of the roof assembly.

This spray foam application technique will stop all top down or bottom up convection air current in a roof assembly. Effectively making the roof a thermos bottle. This application technique increases the installed R value significantly 30 to 70 percent over

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conventional mechanically fastened insulation boards, as well as providing Wind Up Lift Security.

Fifth: The over top of the insulation board spray foam application increases the structural strength of the roof deck by locking all the insulation panels to each other making a monolithic insulated metal roof deck composite similar to plywood. Increasing in strength with multi components all laminated together. When reinforcing mesh is incorporated in the top surface foam, small structural integrity of this composite roof deck is significantly increased similar to changing a 24 gage deck into an 18 gage metal deck.

Sixth: The top layer of foam is also a roof surface water proofing layer if coated with old house paint. The foam becomes a secondary roof if the 2001 single ply waterproofing membrane gets damaged and will not absorb water because of the old paint coating.

Seventh: The optional reinforced mesh provides a Class A rating on steep slopes over 2 inches in 12 inches pitch when incorporated in the lap top surface spray foam layer when used with TPO, PVC and C-EPDM reinforced waterproofing membranes.

Eighth: A special adaption is fabricated for light gage metal buildings where thin metal decks can be strengthened with insulation flute fillers adhered with slow rise foam, and to the deck. A construction sheathing board like OSB is adhered with slow rise foam and lightly fastened with 6 fasteners per 4 x 8 sheet to stabilize the light gage decking and additionally fastened into the structural purlin Z channels one foot on center.

Ninth: Superior insulation performance

This Kelly patented roof assembly technique when tested for energy efficiency at the Canadian National Research Laboratory was found to be 50% or greater in total R Value than roofs with the same amount of insulation conventionally installed with mechanical fasteners with or without deck vapor barrier/air barrier.

Test report summary attached.