Overcoming Objections When Promoting SPF Roofing

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Dimensional Building Consultants, LLC
* Audience Participation

* What roofing system are you commonly selling against?
* Who has *installed or watched* a TPO or PVC single ply membrane installation?
* Who has *torn-off or watched* a TPO or PVC roof be torn off?
* What are common objections to using SPF roofing?
Common objections to using SPF roofing?

Audience Participation

* Durability - doesn’t last very long
* Performance - has to be recoated every 5 yrs.
* Blisters - indicate failure
* Price - TPO is cheaper
* Environmental - want something more environmentally friendly

Overcoming Objections When Promoting SPF Roofing
TPO - Thermoplastic Polyolefin = ± 30% of commercial roofing market
What are the SPF advantages?
Best Recover option
Seamless
No Fasteners
Best System R-Value
Waterproof
Monolithic
Slope-to-drain
Sustainable
Efficient Production
No thermal shorts
Durable
Slip Resistant
Ultimate Cool Roof
Continuous insulation
Jointless
No air movement
Self Flashing
Seamless
No air movement
*Best ReCover/ReRoof option - Tear-off usually not required
Changes in the 2015 International Building Code encourage a SPF reroof solution.
Commercial Building Roof Project

Roof Replacement?

Insulation in cavity?
- Yes
- No

Insulation above deck?
- Yes
- No

Roof Recover?

The project is exempt from IECC provisions

Insulation must comply with IECC provisions

Project is exempt from IECC provisions

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Project is exempt from IECC provisions

Insulation must comply with IECC provisions and may be installed either above or below the sheathing
**IBC & IECC Definitions**

The new Code clarification establishes specific definitions for each major type of roofing activity that may occur on a commercial building;

**Current Code definitions:**

* **Repair** - The reconstruction or renewal of any part of an existing building. See also “Roof Repair.”

* **Alteration** - Any construction or renovation to an existing structure, other than repair or addition that requires a permit.

* **Roof Assembly** - A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and roof deck. A roof assembly includes the roof covering, underlayment, roof deck, insulation, vapor retarder and interior finish.

*IECC* is the 2015 *International Energy Conservation Code* and is published by the International Code Council (ICC).*
Current Code definitions:

* **Reroofing** - The process of recovering or replacing an existing roof covering. See “Roof Recover” and “Roof Replacement.”

* **Roof Recover** - The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

* **Roof Replacement** - The process of removing an existing roof covering, repairing any damaged substrate and installing a new roof covering.

*IECC is the 2015 International Energy Conservation Code and is published by the International Code Council (ICC).*
Recovering versus replacement. New roof coverings shall NOT be installed without first removing all existing layers of roof coverings down to the roof deck where any of the following conditions occur:

* Where existing roof or roof covering is water soaked . . .
* Where the existing roof has two or more applications of any type of roof covering.
Commercial Building Roof Project

Roof Replacement?

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Insulation above deck?

Yes

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Roof Recover?

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Insulation must comply with IECC provisions and may be installed either above or below the sheathing
* Recover option saves landfill -
* The Oak Ridge National Laboratory notes that roofing is one of the largest contributors of solid waste,
*Seamless - no false/weak welds in seams
*Seamless* - no false/weak welds in seams

2,000 ft. of seams per 100 sqs. avg.
*Seamless - no false/weak welds in seams at hand welded seams

1700°F welding temp.
*Seamless - no weak or partially adhered seams - EPDM*
*No Seam Fasteners - Screws are not necessary
* **Fasteners** - In seam fastener only stay watertight with fully welded seams
Single ply billowing between fastener rows

12’ x 24’ wind uplift testing table
* No Fasteners - are necessary to secure SPF to the substrate

What are the SPF advantages?
* Fasteners - Thousands are necessary to secure single ply insulation
* Word of Caution - Fasteners may needed “prepare”/secure the existing roof (substrate)
*No fasteners - to stress and puncture membrane
*No fasteners - No “tenting” by fasteners to stress and puncture membrane

Photos: Dan Varvais
*NO Thermal Shorts from screws/plates & joints - improves R-value
Thermal Shorts from screws/plates & joints - reduces R-value
Graphic by Bayer MaterialScience
Energy Leaks - Gaps at Board Joints and Thermal Shorts in Fasteners and Plates

Photo: Dan Varvais
* Thermal Shorts & Bridging - Air gaps in insulation layer dries gravel roof over joints

Photo: Lyle Hogan, PE, RRC
SPF = NO insulation joints and NO fasteners

* A single layer of insulation will reduce the R-value up to 10 percent

Source: NRCA Professional Roofing 11/2011
A single layer of insulation under TPO will reduce the R-value up to 10 percent.
SPF = NO insulation joints and NO fasteners

*TPO Mechanical fasteners will reduce the R-value up to 8 percent

* 1 layer of insulation - 10%
* Mechanical Fasteners - 8%

Total Loss of R Value - 18%

R20 = R16.4 when deducting 18% loss

Source: NRCA Professional Roofing 11/2011
SPF = NO insulation joints and NO fasteners

- TPO Mechanical fasteners will reduce the R-value up to 8 percent
- 1 layer of insulation - 10%
- Mechanical Fasteners - 8%
- Total Loss of R Value - 18%

R20 = R16.4 when deducting 18% loss

Critical concern in buildings with LEED Certification

Source: NRCA Professional Roofing 11/2011
* Joint-less - water and air doesn’t leak between insulation joints

* Continuous Insulation - where it is most effective - on the roof
*Joint-less* - Joints in insulation under single ply roofs
Slope to Drain - SPF has the best and least expensive solution to add slope to existing roof
* Slope to Drain - Tapered insulation system is complex, difficult to install, and expensive - $2.00 to $4.00 sf.
*No Condensation - Warm interior air won’t condense under the surface
Condensation - Joints through insulation allow warm air flow to cold single ply membrane surface resulting in condensation under membrane.

Photo: Lyle Hogan, PE, RRC
*Best Roof System R-value - Overall average, no air movement or leakage, no thermal shorts*
*Monolithic - Water can’t travel between SPF and substrate -
* Monolithic Insulation - Mechanically fastened insulation cupping due to moisture in the system

Photo: Lyle Hogan, PE, RRC
Monolithic - Water can’t travel between SPF and substrate - Standing water under BUR

Photo: Lyle Hogan, PE, RRC
*Fully Adhered - SPF provides exceptional wind uplift resistance
*“Fully Adhered” - Glue application for insulation provides only partial adhesion under single ply
“Fully Adhered” - Inadequately adhered iso board set in hot asphalt
* “Fully Adhered” - Iso board set in hot asphalt is a problematic installation process
* “Fully Adhered” - Glue application for fully adhered single ply

Works like contact adhesive - both surfaces must be just “tacky” enough to bond together
* “Fully Adhered” - Mech. fastened Iso with Mod. Bit. asphalt membrane blown off

Iso facer bonded better to Mod. Bit. Membrane than to Iso.
LA Super Dome fully adhered EPDM roof with iso facer delaminated from iso board
* Fully Adhered SPF -

* A 2006 NIST report states:

"A number of spray polyurethane foam (SPF) roofing systems were observed … Some of these roofs were estimated to be about 20 years old. With one minor exception, all were found to have sustained Hurricane Katrina extremely well without blow-off of the SPF or damage to flashings."

What are the SPF advantages?
* Fully Adhered SPF -

* SPF’s wind uplift resistance exceeded the capacity of UL’s equipment—validating SPF roofing systems’ excellent wind up-lift resistance.

Source: GreenBuildingSolutions.org
* Most efficient production - more squares watertight per man day
* 200 squares watertight per 5 man crew per day

What are the SPF advantages?
* Most Efficient Production - doesn’t require extra effort to seal roof before a storm
*Slip Resistant - Granules in the surface of the SPF coating provide excellent traction
* Slip Resistance - On a frosty morning nothing is more slippery than TPO or PVC roof membranes
Reflective Durability - Excellent 3 yr. Reflectivity per Cool Roof Rating Council

* Carlisle TPO - 3 yr. reflectivity = 0.70
* Acrylic coating - 3 yr. reflectivity = 0.81*

* Bayer Matl.Science
* Reflectivity - White TPO after 12 months of service
*Self Flashing - SPF quickly waterproofs around penetrations
* Penetration Flashing - Time consuming and tedious
* Waterproof - 90% closed cell content won't allow water through - (i.e. rock covered SPF)

* Punctures into SPF skin won’t cause a leak
Waterproof - Rock over SPF only protects SPF from UV light

Photo: Roger Morrison
Cool Roofing - SPF the Ultimate Cool Roof

* Longest lasting
* Superior 3 yr. Reflectivity - per CRRC
* Best Return on Investment (ROI)
* Renewable

What are the SPF advantages?
Roof Heat Transfer Mechanism

Graphic: PG&E
Effects of Cool Roofing Products on a Building’s Insulation Effectiveness

* Adding insulation to a roof reduces cooling costs from a systems approach for several reasons.
* First, high roof temperatures significantly diminish the roof insulation’s R-value, by as much as 40% to 50%.
* Gaps in the insulation board also reduce the effectiveness of the insulation.
* In addition, high temperatures create thermal shorts, which adds heat flow into the building.
* In the winter, thermal shorts allows heat to escape from the building.
Effects of Cool Roofing Products on a Building’s Insulation Effectiveness

* A California study found that cool roofs provide an average **yearly net savings of almost 50 cents** per square foot.  - EPA website

* High thermal emittance and high solar reflectance combine to keep the roof surface much **cooler by 30°F to 60°F**  - PG&E website

* Cool roofs can typically **reduce AC energy use by 10% to 20%**  - PG&E website
* Common objections to using SPF roofing?

* **Durability** - doesn’t last very long
  * Proven long-term service life

* **Performance** - has to be recoated every 5 yrs.
  * 1960-70’s technology - invalid argument today

* **Blisters** - indicate failure
  * Blisters are not a leak source - easily repaired
Common objections to using SPF roofing?

**Price** - TPO is cheaper

* TPO/1” Iso runs about $3.00 sf. - SPF about $3.10 sf.

**Environmental** - want something more environmentally friendly

* What has less impact on the environment - **tearing off** a roof every 10-15 years or . . .

**Recoating** every 10 to 20 years
Super Dome

One of the biggest single ply failures
In Review - SPF roofing is:

What are the SPF advantages?
Sustainable

- Fully Adhered
- Best Recover option
- Waterproof
- Best System R-Value
- Monolithic
- Efficient Production
- Slope-to-drain
- Slip Resistant
- No Fasteners
- Durable
- No thermal shorts
- Ultimate Cool Roof
- Continuous insulation
- Self Flashing
- No air movement
- Seamless
- Jointless
- No air movement
## TPO - SPF Comparison

### Handout

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Item</td>
<td>TPO Single Ply</td>
<td>Advantage - Disadvantage</td>
<td>Spray Polyurethane Foam - SPF</td>
<td>Advantage - Disadvantage</td>
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<td>3</td>
<td></td>
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<tr>
<td>4</td>
<td>Monolithic - Seamless</td>
<td>installed with 5 ft. or 10 ft. wide rolls of membrane, seams at all penetrations</td>
<td>Disadvantage - thousands of feet of welded seams in the field and seams at all curbs and penetrations</td>
<td></td>
<td>Advantages - no seams</td>
</tr>
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<td>5</td>
<td>Insulation attachment</td>
<td>Insulation is required to separate TPO from old roof</td>
<td>Disadvantage - requires fasteners to attach to deck resulting in holes through BUR in a retrofit application</td>
<td>SPF is sprayed over the existing roof and fully adheres to the surface</td>
<td>Advantages - no fasteners required</td>
</tr>
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<td>6</td>
<td>Membrane attachment</td>
<td>screws used to secure insulation and rows of screws in every seam to hold membrane to deck</td>
<td>Disadvantage - existing built-up roof is punctured with thousands more holes</td>
<td>adhered - no screws necessary</td>
<td>Advantages - no fasteners required</td>
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<td>7</td>
<td>Wind Resistance</td>
<td>mechanically fastened leaving a majority of membrane loose</td>
<td>Disadvantage - billows up as a result of negative and positive wind pressures over and through the building</td>
<td>completely bonded to the substrate, in retrofit, additional fastening of substrate may be necessary</td>
<td>Advantages - no billowing or fluttering, superior wind resistance</td>
</tr>
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<td>8</td>
<td>Waterproof components</td>
<td>The TPO membrane is waterproof</td>
<td>Disadvantage - punctures or failed seams in the TPO will allow water to enter the system</td>
<td>SPF is waterproof</td>
<td>Advantages - SPF does not need a coating to keep water out</td>
</tr>
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<td>9</td>
<td>Energy Efficiency</td>
<td>installed over 4’x4’ or 4’x8’ board insulation, with steel screws and plates</td>
<td>Disadvantage - allows air flow through insulation joints, air flow between TPO &amp; insulation, heat transfer through screws and plates</td>
<td>Only air flow is OVER exterior surface of SPF / coating system</td>
<td>Advantages - no shrinkage in or misaligned iso boards leaving gaps for air flow, no thermal shorts from steel fasteners</td>
</tr>
<tr>
<td>10</td>
<td>The path of water leaks</td>
<td>Open space between the TPO membrane and insulation, and between the insulation and BUR</td>
<td>Disadvantage - If water leaks at a penetration or seam, it travels over the insulation and BUR membrane until it finds a hole in the BUR (likely at one of the thousands of screws) to leak onto the deck and into the building</td>
<td>SPF is 90% closed cell and forms a seal directly the BUR substrate. Leaks only occur at penetrations when foam bond is broken.</td>
<td>Advantages - No water can travel through SPF or over the BUR surface. Existing BUR does not leak at this time greatly reducing the probability of future leaks</td>
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* Overcoming Objections When Promoting SPF Roofing

Special Thanks to:

Dan Varvais
Bayer MaterialSciences

Lyle Hogan, RRC PE
Fincastle Engineering
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End

Thanks for your time

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