

**Quality in Construction (QIC)**  
In-Person and Microsoft Teams Meeting  
**August 17, 2022**  
9:00 am - 12:00 pm

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Attendees: *\*Attended in-person*

- Ann McGauran, OSA\*
- Chris Byerly, OSA\*
- Alan Robertson, OSA\*
- Andrew Beeler, OSA
- Stokey Bourque, OSA
- Jennifer Murphy, STREAM
- Brian Wilson, STREAM
- Austin Oakes, UT
- Michelle Crowder, UT
- Benjamin Luttrell, UT
- Marc Brunner, APSU
- Philip Zoch, APSU
- Bill Waits, MTSU
- Jim Cobb, TTU
- Laura Bailey, ETSU
- Chuck Milam, ETSU
- Tony Poteet, UM
- Mark Longfellow, UM
- Patti Miller, THEC
- Paul Marshall, THEC
- Jim Prillaman, ACEC
- Kurt Boyd, ACEC
- Kasey Anderson, ACEC\*
- John Kenny, ACEC\*
- Greg Campbell, AIA
- Trey Wheeler, AIA\*
- Rich McNeil, AIA\*
- Bryan Hay, ABC\*
- Scott Wilson, Carlisle\*
- Todd Bagwell, Firestone
- Ashley Barth, TNT
- Sonny McKellar, TNT
- Adam Lenhart, TNT
- Chris Bainbridge, SFMO\*
- Grace Rogers, AGC
- John Gromos, AGC\*
- Jason Madeiros, AGC
- Tom Lampe, AGC
- Marty Gibbs, AGC

Discussion:

- I. A role call was conducted, and each attendee identified themselves by name and the organization that they represent.
- II. Roofing Industry - Status Update
  1. Scott Wilson provided a presentation titled *Carlisle Market Update: State of Tennessee Presentation*. (See Attached)
  2. Todd Bagwell provided a presentation titled *The Single-Ply Revolution: Advancing Attachments and Enhancements for Selection, Installation and Durability*. (See Attached)
- III. Building Code Adoption, Chris Bainbridge, SFMO, (See Attached)
  1. Chris Bainbridge noted that the SFMO has begun stakeholder discussions as part of the code adoption process. Chris noted that the SFMO has reached out to the TN Fire Inspectors Association, the Tennessee Building Officials Association, AGC, the Tennessee Fire Chiefs Association, OSA, AIA and other stakeholders and through discussions with these stakeholders, established that working to adopt the 2021 IBC code is preferable. Chris indicated that he is currently reviewing questions and comments provided by stakeholders. Chris noted that next steps involve establishing the rule-making process including filing the rules, conducting hearings, and moving into final adoption upon review by the government operations committee.
  2. Chris noted that storm shelter requirements is a current issue under consideration and still in discussion amongst the stakeholders.

3. Chris stated that a current issue is high-rise mass timber buildings stating that the National Association of State Fire Marshals Office is formally against the allowance of high-rise mass timber buildings noting that the technology needs more vetting especially as it relates to occupant safety and the safety of emergency responders.
4. Chris stated that the SFMO is considering a measure of oversight for exempt jurisdictions due to some jurisdictions lessening the provision of their codes. Chris concluded his presentation of the code adoption process including primary issues and welcomed questions.
  - a. Kasey Anderson asked if new legislation would be required prior to moving to the 2021 code and the rule-making process.
    - i. Chris Bainbridge stated that new legislation would not be required prior the rule-making process.
  - b. Kasey Anderson asked if new legislation would be required for the SFMO to increase oversight for exempt municipalities.
    - i. Chris responded that the SFMO is already granted the authority via rules and statute. A revision to the specificity of the rules is under consideration to provide for improved oversight.
  - c. Trey Wheeler noted that he appreciated that the SFMO is considering addressing oversight for exempt municipalities given that multi-family housing developments have been permitted under IRC and not stamped by architectural registrants.
    - i. Chris responded that such circumstances are part of why an expanded authority by the SFMO for exempt jurisdictions is under consideration.
5. There were no additional questions. Chris Bainbridge thanked the attendees and concluded his code adoption update.

#### IV. CM/GC – Self Performed Work – Ann McGauran (OSA)

1. Ann McGauran noted the unprecedented number of State projects that are coming forward requiring CM/GC contracts. Ann clarified that regarding CM/GC contracts, that the 3% rule, regarding self-performed work, is not a statute or policy requirement and can be evaluated on a per project basis. Ann asked the attendees for their current perspectives regarding the 3% threshold per the CM/GC contract.
  - a. Bryan Hay responded that given that he had considered the 3% to be appropriate since the contract does allow for negotiation when appropriate.
  - b. John Gromos stated the 3% threshold was appropriate in the past but that given the labor shortages and other challenges facing contractors, he believes it would be appropriate to raise the percentage level and maintain the opportunity to negotiate upward as needed. John noted that this would allow contractors to be more flexible and self-perform work if that was deemed to be more efficient.
  - c. Austin Oakes noted that he has seen situations where it was beneficial to projects to allow for an increase in self-performed work. Austin further noted that it is important to establish processes and procedures that ensure that a measure of competitiveness is maintained and that it should be demonstrable that allowances for increased, self-performed work is in the best interest of the State.
  - d. Tony Poteet stated that he has experienced situations where CM/GC's have stated that they would appreciate the opportunity to self-perform more work specifically in the concrete trades. Tony questioned if it would be possible for contractors to bid on portions of the work during trade bidding.
    - i. Ann McGauran noted that she has seen circumstances where a CM has submitted a bid on portion of the work to the owner or architect prior to other trades and that all bids are subsequently opened by others to ensure fairness and competitiveness.

- e. Tom Lampe recommended that it may be beneficial to revisit the rationale to establish the 3% rule and how the context of the current market conditions may impact that threshold. Tom further noted that he believes there is potential equitable value for all stakeholders where increasing the threshold is under consideration.
- f. Alan Robertson stated that a key consideration, when GC's self-perform, is that procedures are in place that provide the State with a level of confidence that competition is being provided.
- g. John Gromos stated that where GC's are seeking to self-perform smaller portions of work that may be incremental throughout project lifecycle such as equipment pads or curb and gutter, that it may be beneficial for GC's to reconsider how they distinguish these smaller concrete packages during bidding, noting that a measure of foresight on this type of work can be beneficial toward increased efficiency.
- h. John continued that it would be beneficial for the State to consider an increase in the 3% threshold as a means to address smaller scopes of work that, when combined, exceed 3% adding that where the scope of self-performed work may approach 10% or more, a separate mechanism may be required.
- i. Alan Robertson agreed that construction sequencing may be improved by allowing for an increase in 3% given the challenges that CM's experience regarding mobilizing trades for small portions of the work that are critical to maintaining the project schedule.
- j. Ann McGauran noted that the CM contracts for General Services and Higher Education are different. Ann stated that it was her understanding that the CM contract for Higher Education does allow for a negotiated increase in the 3% threshold but the CM contract for General Services does not allow for such modification. Ann invited Patti Miller and Jennifer Murphy or Brian Wilson to comment on their respective contract structures.
  - i. Patti Miller noted that she appreciates the value of the different perspectives being discussed and that Higher Education would be open to continued discussion and potential modification to their CM contract should it be desirable.
    - a. Ann McGauran recognized the value of Higher Education's internal team and noted that beyond the preliminary discussion amongst the QIC attendees in this meeting, she would welcome Higher Education's input on any future discussions regarding CM contracts.
  - ii. Brian Wilson noted that there is current discussion regarding the General Services CM contract and specifically if the 3% is appropriate given the current market conditions. Brian questioned that if not, could it be increased or simply eliminated and made negotiable based on the time of procurement, location, and other project-specific factors. Brian added that with these considerations, it is important to be mindful of maintaining competitiveness and the general impact industry wide.
- k. Ann McGauran summarized the discussion noting that it would be helpful to reach consensus amongst how CM/GC and self-performed work is articulated in both the Higher Education and General Services GC contracts.
- l. Ann noted that there has been recent discussion regarding differences in the contracts relating to when the GMP is set.
  - i. Tom Lampe noted that the most recent STREAM contract that he had reviewed was unique in that there was language that describes how the GMP is established. Tom stated that he appreciated how this attached language encourages strong collaboration amongst the owner, the designer, and the CM/GC.

- ii. Ann McGauran asked Brian Wilson when STREAM last updated their CM contract.
  - a. Brian Wilson noted that he believed the contract was modified prior to the mega site project.
- iii. Ann McGauran stated that toward the State-wide goal of establishing a measure of uniformity across all SPA's, that when a contract modification is being considered, it should be part of a broader discussion amongst to all interested parties.
- iv. Brian Wilson stated on the CM projects, STREAM is seeking a budget from the contractors to establish the GMP. Brian noted that there has been confusion on past projects regarding contingency. Brian stated that it is understood that this contingency may increase throughout design and that the primary goal is for STREAM to be provided with an estimated budget at various points during design if early packages need to be released in order to proceed with the work.
- m. Ann McGauran noted that continued discussions and collaboration regarding CM/GC contracts will be beneficial toward a comprehensive understanding amongst stakeholders regarding expectations.

V. HPBr, BIM and Team Evaluations – Chris Byerly (OSA)

- 1. Chris Byerly noted that tracking sheets for 2021 substantially completed projects have been provided to SPA's and that current estimates indicate that about 70% of HPBr documentation is on file with OSA.
- 2. Chris stated that project team evaluation documents are getting close to a quantity that will enable OSA to move in the direction of publishing a more comprehensive scoring profile via a team evaluation workbook. Chris added that QIC members will be updated on this progress.
- 3. Chris reminded SPA's to provide any BIM-related questions or updates during the project update period of the day's meeting agenda. There were no questions or comments relating to the agenda items addressed by Chris.

VI. Construction Industry Market Update – John Gromos (AGC) and Bryan Hay (ABC), (See attached)

- 1. John Gromos noted that prior to the meeting, the July AGC Inflation Report was provided to OSA for immediate distribution to the attendees of the QIC meeting.
  - a. Ann McGauran stated that OSA would distribute this report to the attendees.
- 2. John stated that Middle and West Tennessee will likely see increased pressure on labor due to high project volume in these regions.
- 3. John noted that representative contractors have indicated strategies such as early design packages and warehousing strategies to circumvent critical path disruption associated with supply chain constraints for both equipment and materials.
- 4. Bryan Hay noted modest increases in architectural billings to date.
- 5. Bryan cited declines in structural steel and other steel product costs.
- 6. Bryan noted suspended ceiling price increases, extended door/hardware lead times including electronic-related hardware such as access control systems.
- 7. Bryan stated that elevator and other conveying system lead times are expected to continue to increase throughout 2022.
- 8. Citing a recent example where a drywall crew had walked off a job in order to respond to a higher paying project, Trey Wheeler asked GC representatives what is expected in the near term regarding unskilled labor availability.
  - a. John Gromos stated that in his experience the greater challenge lies with skilled labor availability but that strategies including off-site, modular system assembly

might be considered given that the labor shortages, both skilled and unskilled, are anticipated to continue to worsen.

- VII. SPA Projects Update – Brian Wilson (STREAM)
  - 1. Brian Wilson stated that STREAM has \$1.1 billion in the budget for 124 projects coming forward including Forestry, State Parks and Military including multiple re-roof projects. Brian stated the Multi Agency Law Enforcement Training Academy project is continuing. Brian noted that there are four Tennessee Highway Patrol District headquarters coming forward. Brian stated that the Legislative Plaza and State Capitol renovations projects are proceeding.
  - 2. Ann McGauran noted that at the request of the Legislature, STREAM is bringing projects forward in portions and advised potential designers and contractors to be mindful of this.
  
- VIII. SPA Projects Update – Michelle Crowder (UT)
  - 1. Michelle Crowder stated that UT is currently working through numerous designer selections. Michelle noted that there will be a greater amount of CM/GC RFP's being issued as well.
  
- IX. SPA Projects Update – Tony Poteet (UoM)
  - 1. Tony Poteet stated that UoM recently released the CM/GC contract for the STEM project noting that additional contingency was provided to cover potential escalation for electrical and roofing.
  - 2. Tony stated that the Music Center was reaching completion and that UoM has received bids for their baseball renovation project.
  - 3. Tony noted that there are numerous new capital maintenance projects where designer contracts are being finalized.
  
- X. SPA Projects Update – Marc Bruner (APSU)
  - 1. Marc Brunner stated that the HVAC rehabilitation of the Dunn Center currently underway.
  - 2. Marc noted that two new projects are circulating for design contracts currently including the Kimbro Student Success renovation and the Welcome Center project which is converting an existing auto dealership into an admissions building. Marc added that the Health Professions Building is proceeding with design development.
  - 3. Marc stated that APSU has about 22 smaller projects that are currently being scoped.
  
- XI. SPA Projects Update – Bill Waits (MTSU)
  - 1. Bill Waits stated that the Applied Engineering Building has a CM/GC contractor and that trade bids for the site package are expected in January 2023.
  - 2. Bill noted that the MTSU Aerospace Campus designer RFQs have been received and following land acquisition, designer selection will be brought forward.
  - 3. Bill stated that the Kirksey Old Main building and Rutledge Hall renovations are proceeding and will be CM/GC projects.
  - 4. Bill indicated that there are about a dozen ongoing maintenance projects.
  
- XII. SPA Projects Update – Jim Cobb (TTU)
  - 1. Jim Cobb stated that a RFQ has been posted for Johnson Hall renovation and Foster Hall demolition.
  - 2. Jim noted that an RFQ will be posted today for the Advanced Construction and Manufacturing Engineering Building.

3. Jim stated that the designer has been selected for the stadium project and that a RFP for a CM/GM will follow within the next few weeks. Jim stated that RFPs for the Foster Hall, Johnson Hall and Engineering Building projects will be posted soon.

XIII. SPA Projects Update – Laura Bailey (ETSU)

1. ETSU did not have a representative at the meeting at the time of SPA Project Updates.

XIV. Closing Remarks

1. Alan Robertson thanked the attendees for their continued input on the future meeting agendas.
2. Alan noted that the next meeting will be both in-person and virtual.
3. Ann McGauran thanked the QIC members for their attendance and valued discussion.

Action Items:

- John Gromos and Bryan Hay to provide Construction Market Update (See Attached)
- Ann McGauran will be working with Patti Miller and Brian Wilson regarding CM/GC contract discussion.

Next Meeting: November 16th, 2022  
Ed Jones Auditorium at Ellington Ag Campus / Virtual - MS Teams



# The Single-Ply [R]evolution:

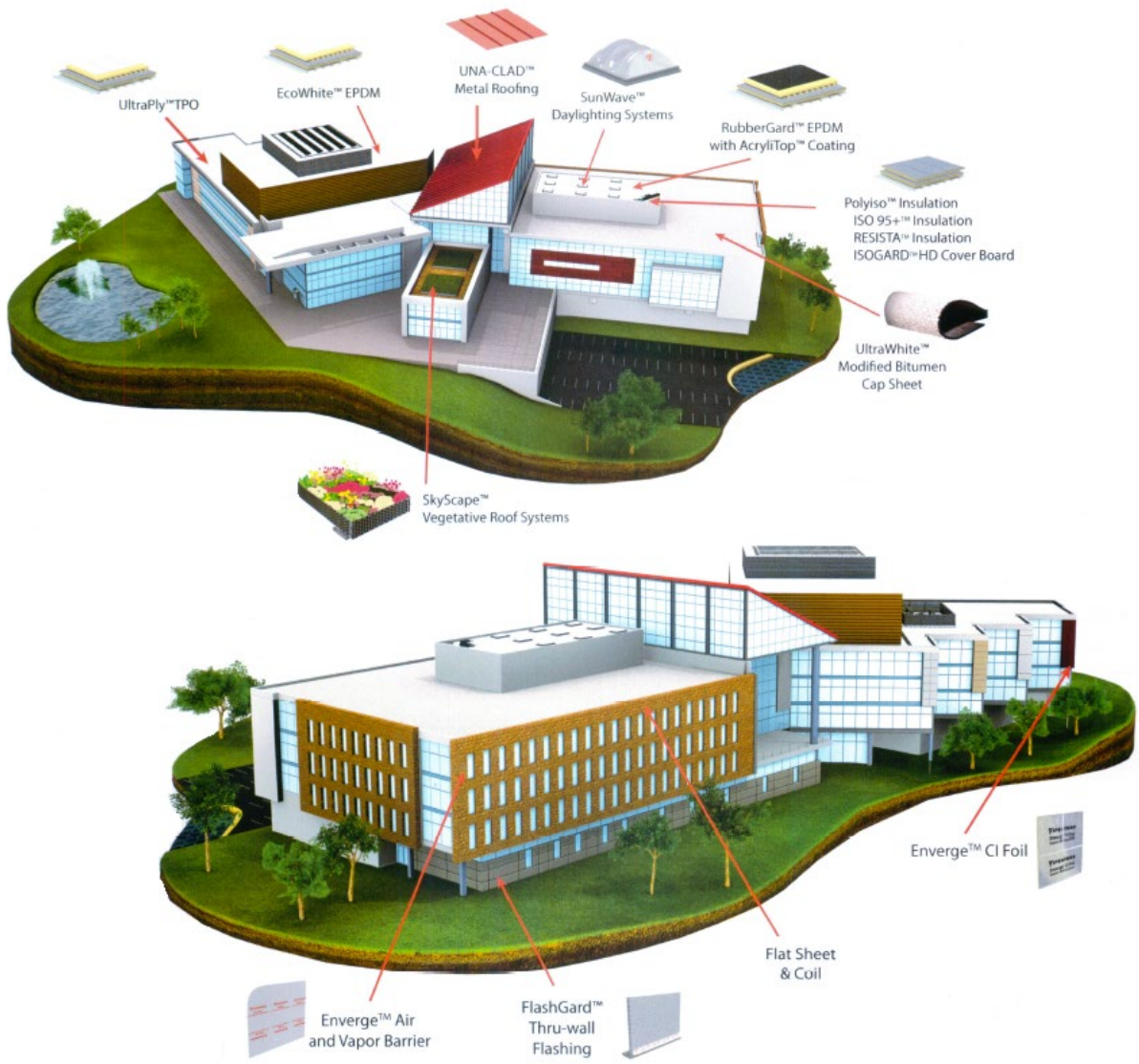
Advancing Attachments and Enhancements for  
Selection, Installation and Durability

**Firestone**  
**BUILDING PRODUCTS**

Course: RFG1plyRev 1LU|HSW 2016

# Firestone

## BUILDING PRODUCTS





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Credit(s) earned on completion of this course will be reported to AIA CES for AIA members.

Certificates of Completion for both AIA members and non-AIA members will be available on-line approximately 6-8 weeks after the program.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



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# Presentation Topics

- **Roofing Types and Trends**
  - **Attachment Types**
    - **Ballasted**
    - **Fasteners and Plates**
    - **Adhesives**
  - **Codes and Standards**
  - **VOC Restrictions**
  - **Insulation - Types and Layouts**
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# Roofing Industry Types

- **Built-up Roofing**

[BUR]

- Coal Tar
- Asphalt

- **Modified Bitumen Roofing**

[MOD BIT]

- APP
- SBS

- **Single Ply Roofing**

- Thermoset [Rubber]
  - EPDM
    - Taped
- Thermoplastic
  - TPO
  - PVC (KEE)
    - Weld
- Reinforcement
- FleeceBACK

- **Metal Panel Roofing**

- Architectural
- Structural
- Thru Fastened

- **Hot Rubberized Asphalt**

- **Polyurethane Foam [PUF]**

- **Coatings**

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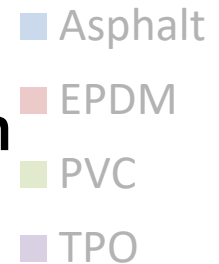
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# Roofing Industry Trends

## EPDM

Market 1990's

- EPDM roofing systems grew rapidly in the early 1980's
  - Ballasted (low cost alternative)
  - Mechanically Attached
  - Fully Adhered
- EPDM systems have made numerous advances in technology and quality
  - Seam tapes and perimeter base tie-ins
  - Uncured flashings
  - System enhancements
  - Improved warranties



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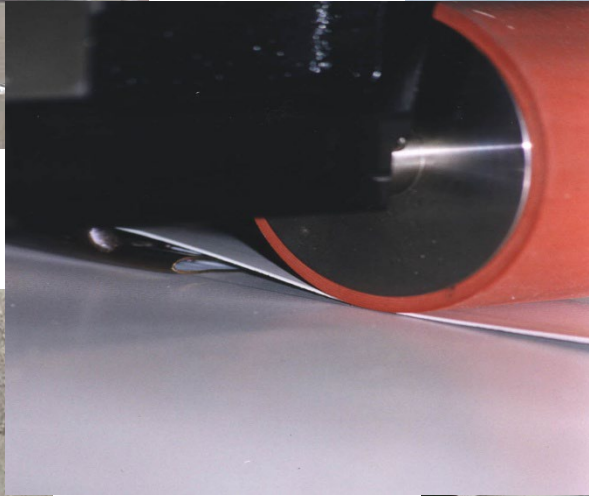
# Roofing Industry Trends

## THERMOPLASTICS

Market 2005

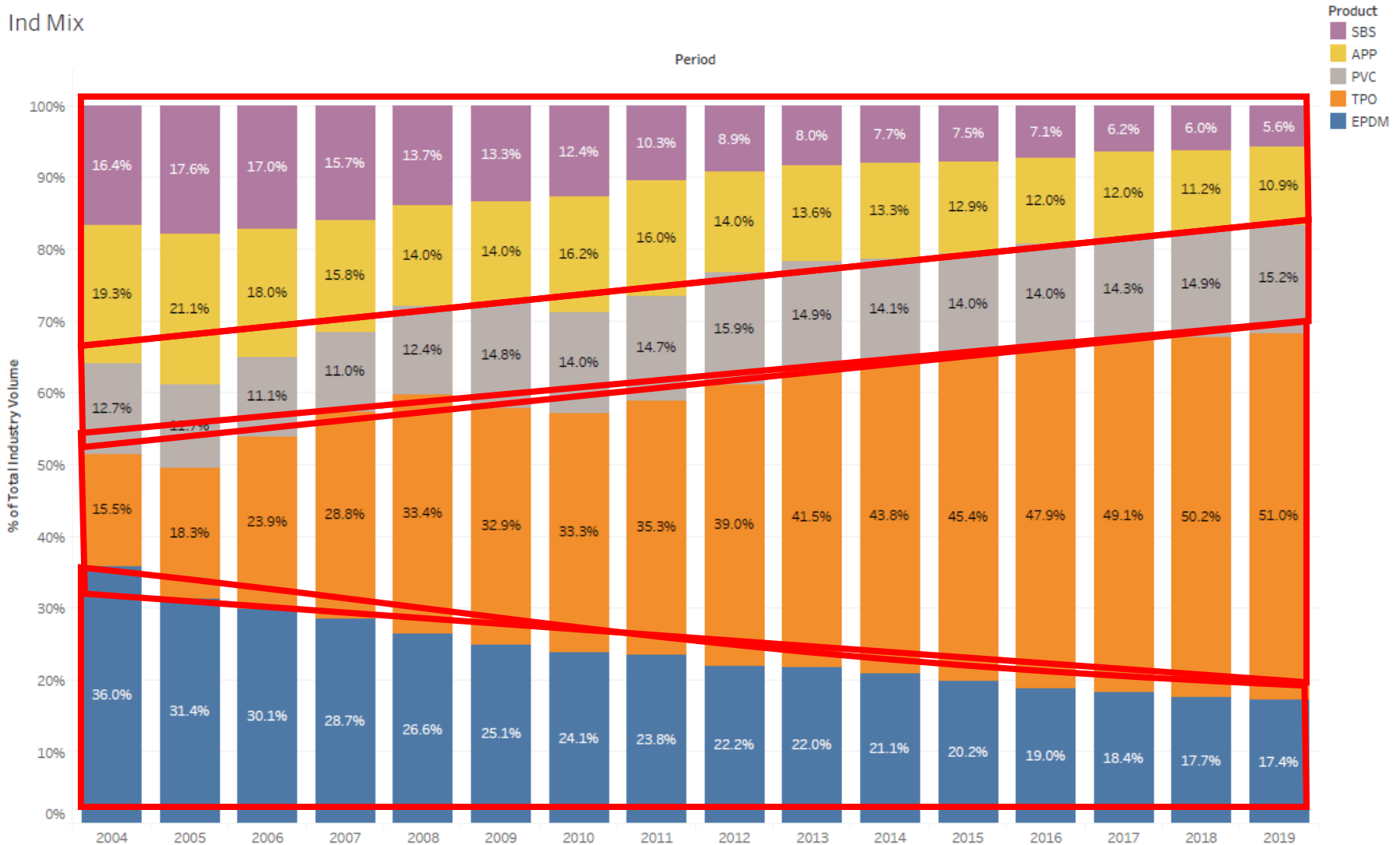
- Thermoplastic membranes have accelerated the last 10+ years
  - TPO and PVC now make up over 50% of low slope roof installations in the US
  - TPO market share particularly has grown 20% in the last 10 years and has over 50% of the market share
- Thermoplastics were adopted earliest in southern climates, but the trend has taken hold in all climates
  - Reinforced membrane with welded seams
  - Highly reflective surface
  - LEED Credit





# Commercial Roofing 15 Year Trend

Ind Mix



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# [R]evolution

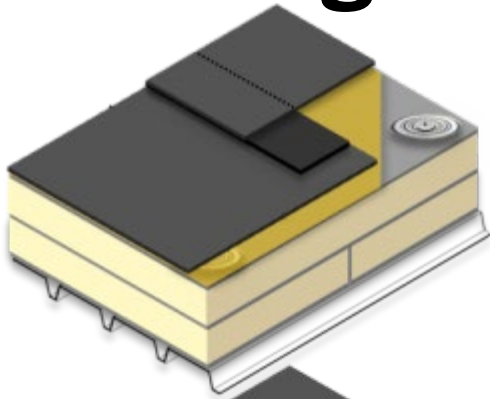
The Single-Ply [R]evolution

## **Attachment Types**



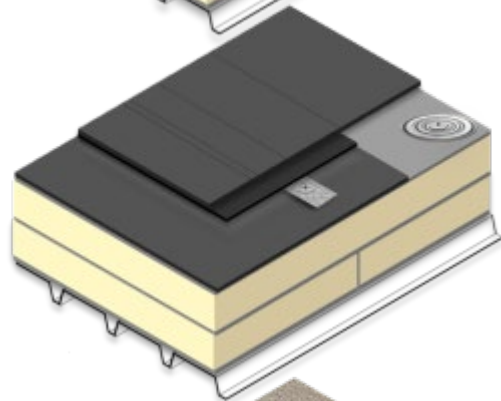
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# Single-Attachment Methods



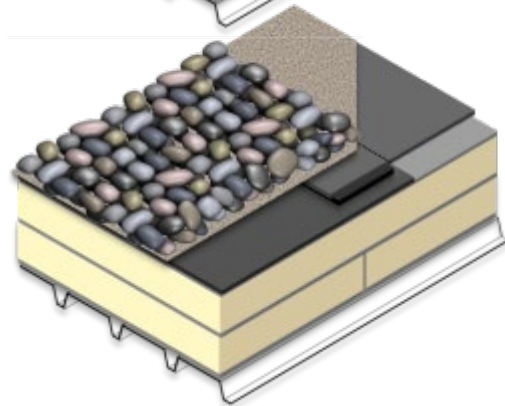
## Fully Adhered

- Any Single-Ply Membrane that is attached to the rigid roof insulation with a variety of liquid or other adhesive types



## Mechanically Fastened

- Any Single-Ply Membrane that is attached through rigid roof insulation into the structural roof deck



## Ballasted

- Any Single-Ply Membrane that is loosely laid over rigid roof insulation or other suitable, prepared substrate and held down with smooth stone or concrete pavers.
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# Ballasted EPDM Systems

- **Advantages**

- Able to use large panels of EPDM (50'x200')
  - Minimize seams
- Low installation cost
- Cool roof option / Sustainability

- **Challenges**

- Concerns in high wind areas
  - Dependence on ballast to secure placement
  - Difficult to identify leak sources
  - Available ballast stone
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# Mechanically Attached Systems

- **Advantages**

- Design Flexibility
  - In seam [linear attachment]
  - Induction weld bonding [non-linear attachment]
- Lower installation cost
- Limited Temperature Restrictions

- **Challenges**

- Fasteners penetrate through thermal, vapor and air barriers
    - Can result in NO thermal break from roof surface to deck
  - “Sheet Flutter”:
    - Stress on Membrane, Seam Securement & Deck
    - Flutter Sound
  - Importance of Accepted Pull-Out Values
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# Mechanically Fastened



Screws – Steel & Wood Decks



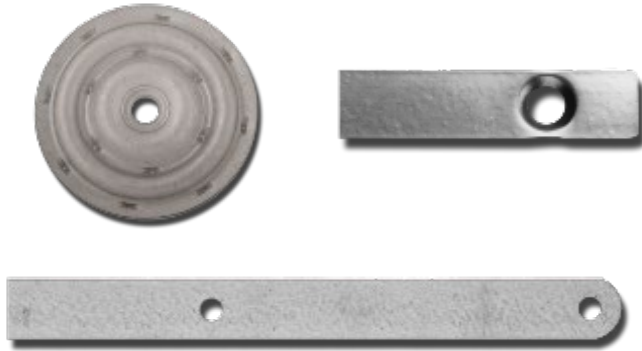
Spikes - Concrete Decks



Specialty – LWC/LWIC & Cementitious Wood Fiber Decks



## Specialized Fasteners for Specific Deck Types/Code Requirements



Membrane Stress Plates & Metal or Polymer Batten Strips for Specific Fasteners

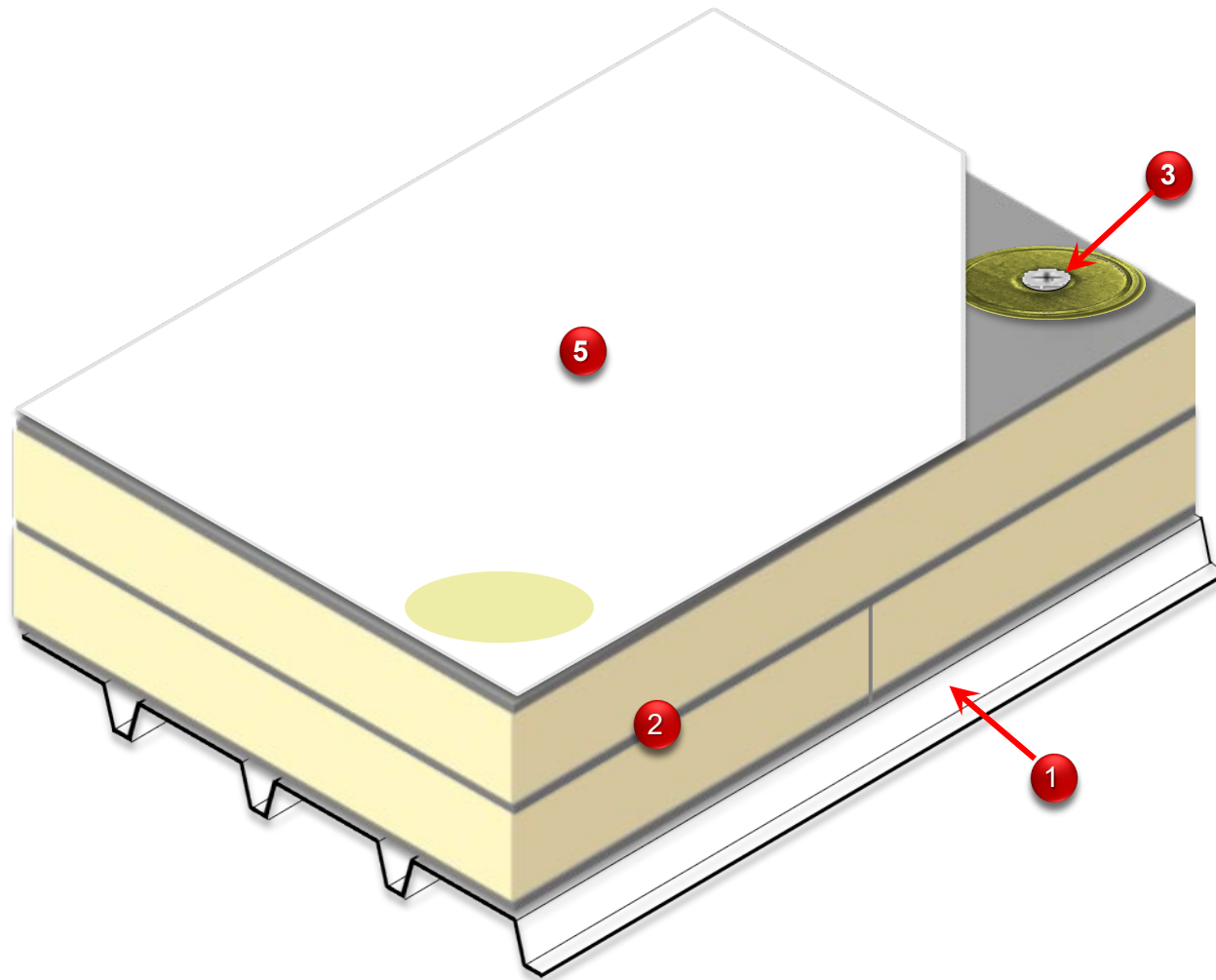


Most Screw/Plate Combinations are specifically matched for Codes



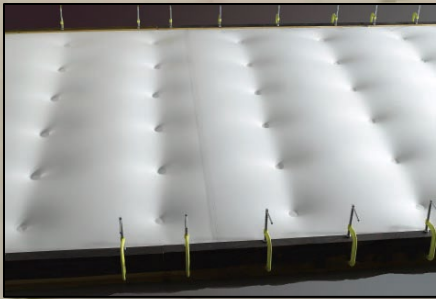
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# Induction Welded Thermoplastic



- 1 Roof Deck
- 2 Roof Insulation – Multiple Payers
- 3 Fasteners & Special 3” Plates to Mfr Specs
- 4 Thermoplastic Membrane, Loose Laid
- 5 Induction Weld through Membrane to Special 3” Plate

# Latest Mechanically Attached Thermoplastic Induction Welded System



- Insulation is attached at prescribed grid intervals
- Membrane is rolled out over the Insulation
- Bonding Unit is placed over each Insulation Plate
- Membrane is bonded to the Plate and Cooling Clamps are placed over each Weld until cooled



**Bonding Unit &  
Cooling Clamps**



**Specially Coated  
Insulation Plates**



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# Fully Adhered Membrane

## Advantages

- Fully secured membrane
- Generally best appearance
- Strong performance history
- Acceptance as an air barrier

## Challenges

- Cold weather applications
- Air quality standards drive increased regulations to reduce Volatile Organic Compound [VOC] levels in adhesives

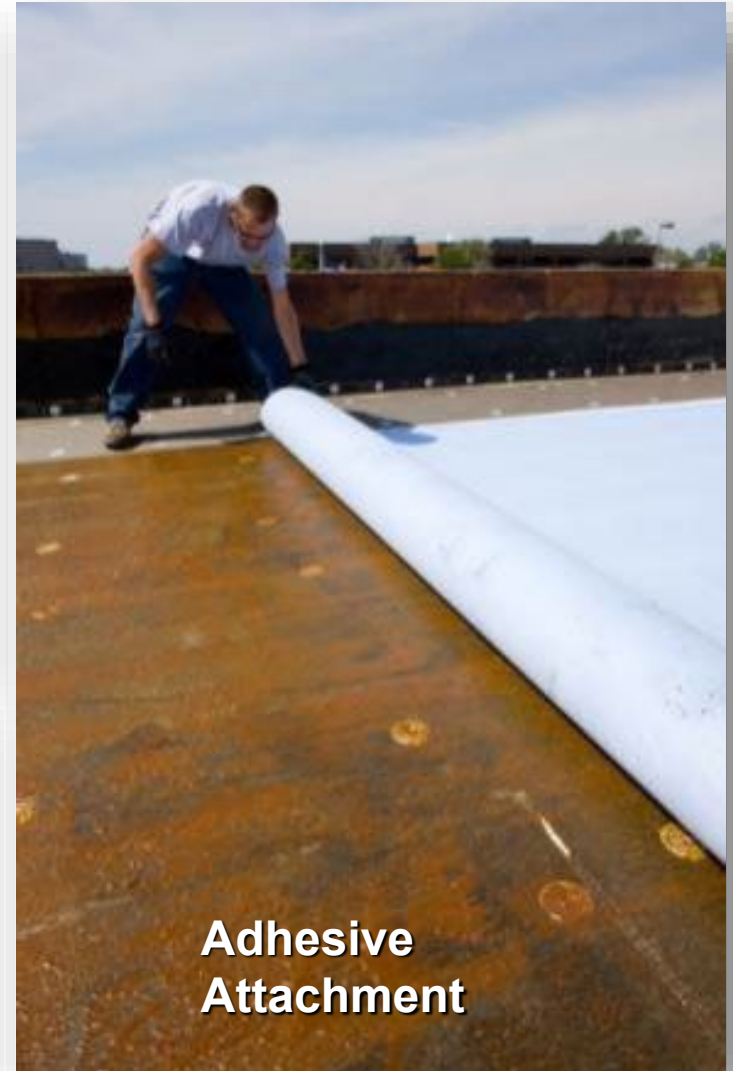


# Fully Adhered Membrane White EPDM





# Fully Adhered Membrane Fleeceback



# Fully Adhered Membrane Fleeceback TPO

Membrane MUST be rolled in with a weighted roller thoroughly

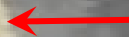


Membrane is rolled after being laid into the Adhesive

Selvage Edge for Seaming



Beads of Low-Rise Urethane Foam Adhesive



# Latest Fully Adhered System

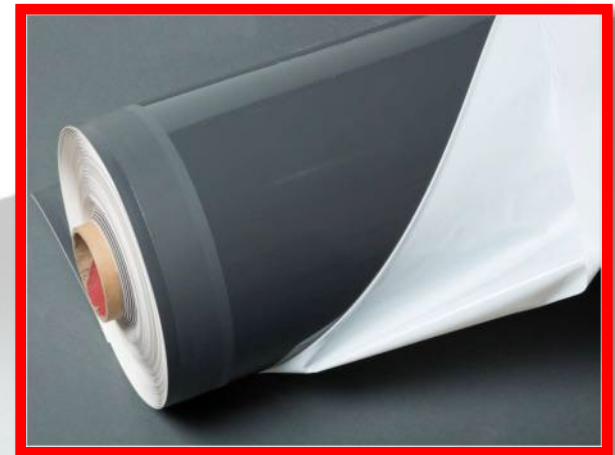
Self-Adhering Membrane



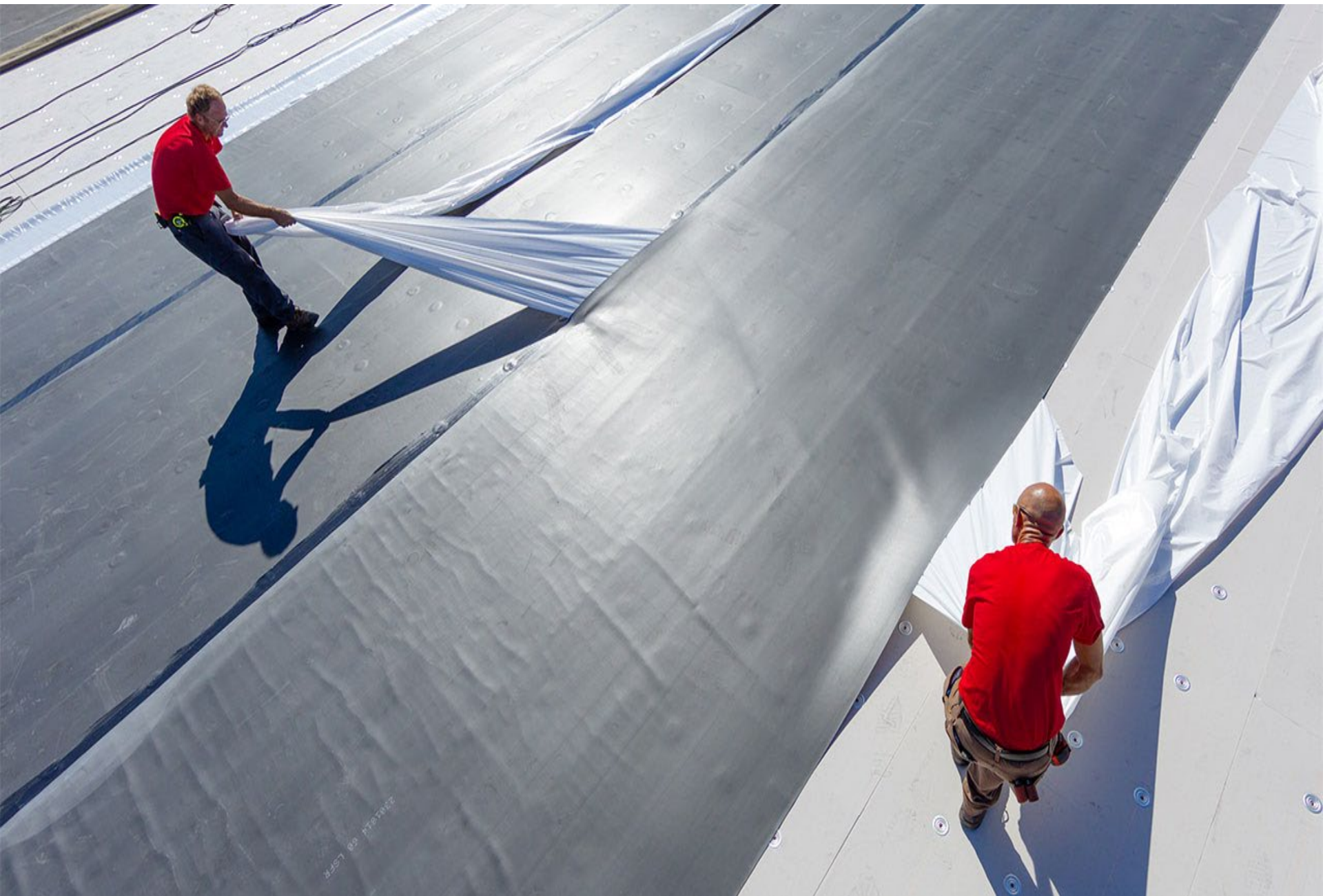
# Latest Fully Adhered System

## Self-Adhering Membrane

- **EPDM and TPO Membranes**
  - NO VOC
  - NO Odor
  - NO Primer
  - NO Flash-off
  - NO Wait Time
- **Single sided application for EPDM and TPO**
  - Great on vertical surfaces
  - 10 ft wide and 5 ft wide rolls
  - Competitive Sq Ft pricing
- **Installation window**  
**20° F [-6° C]**







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# [R]evolution

The Single-Ply [R]evolution

## **Volatile Organic Compound (VOC) Impact**

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# VOC Restriction Areas



# Single-Ply Membrane Adhesive Options

- **Standard Bonding Adhesives**
  - Reliable
  - Easy to Install
  - Low Cost
- **Low VOC Bonding Adhesives**

*LVOC single ply adhesives, sealants and primers have 250 g/l or less*

  - Aromatic sensitivity
  - Cold weather challenges
  - Difficulty on Vertical Surfaces
  - More expensive
- **Water Based Bonding Adhesives**
  - Tight installation window due to weather variables





# Alternative Low VOC Options

- **Solvent-Free Bonding Adhesive**
  - Polymer Based VOC < 13 g/l
  - Very low to no odor
  - Single sided, wet lay application
  - Temp restriction
  - Expensive
- **Sprayable Single-ply Bonding Adhesive**
  - Quick & Easy Application
  - Fast Drying
  - Low Odor / Low VOC
  - Self Contained Packaging
  - Application to 25 degrees



**Addresses major concerns associated with current LVOC adhesives**

# Solvent-Free Bonding Adhesive



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# [R]evolution

The Single-Ply [R]evolution

## **Insulation - Codes and Standards**

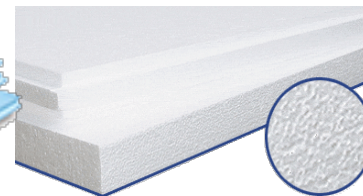
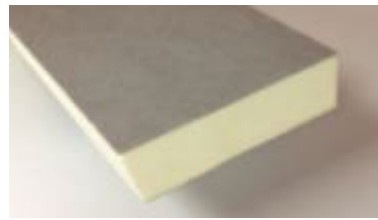
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# Commercial Roofing Insulation

- **Insulation sales are growing faster than the total amount of membrane**
  - Codes have doubled the minimum R-values over the past 10 years
- **Far more common to apply multiple layers of insulation, particularly on new construction jobs**
  - Double layer insulation enhances thermal performance
  - Reduces condensation accumulation above the insulation/under the membrane
- **Average insulation thickness continues to increase**
  - May be attributed to building owners seeking more insulation when reroofing
  - Codes clarify that ASHRAE minimum R-values apply to roof replacements as well as new construction projects.
- **Polyiso remains the clear choice for roofing insulation**
  - Highest R-value/inch
  - Excellent fire resistance properties
  - Light weight
  - Easy to handle, cut and install

# Board Stock Insulation Comparison

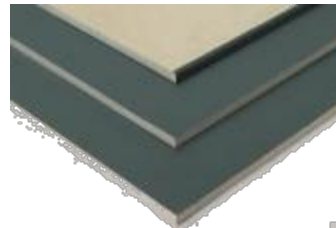
|  | <b>POLY ISO<br/>(Thermoset)</b> | <b>XPS<br/>(Thermoplastic)</b>                    | <b>EPS<br/>(Thermoplastic)</b>                    | <b>Mineral Wool<br/>Fiber</b>                      |
|--|---------------------------------|---|---|--|
| Service temperature                                | 250°<br>will not soften or melt | 165° softening point<br>200° melting point        | 165° softening point<br>200° melting point        | softer than foam plastic<br>board stock insulation |
| Compatibility with<br>solvent based<br>adhesives   | unaffected                      | May cause the product<br>to dissolve with contact | May cause the product<br>to dissolve with contact | unaffected, but porous                             |
| FM 4450 for direct<br>to steel deck<br>application | Pass                            | Fail,<br>thermal barrier required                 | Fail,<br>thermal barrier required                 | Pass   |
| Thermal<br>Performance                             | 5.7R per inch                   | 5R per inch                                       | 4R per inch                                       | Less than 4R per inch                              |
| Fire Performance                                   | typically chars                 | flammable and melts                               | flammable and melts                               | Non Combustible<br>[2000° mfg. temp]               |
| UV exposure  | protected by facers             | becomes dusty                                     | becomes dusty                                     | no effect  |



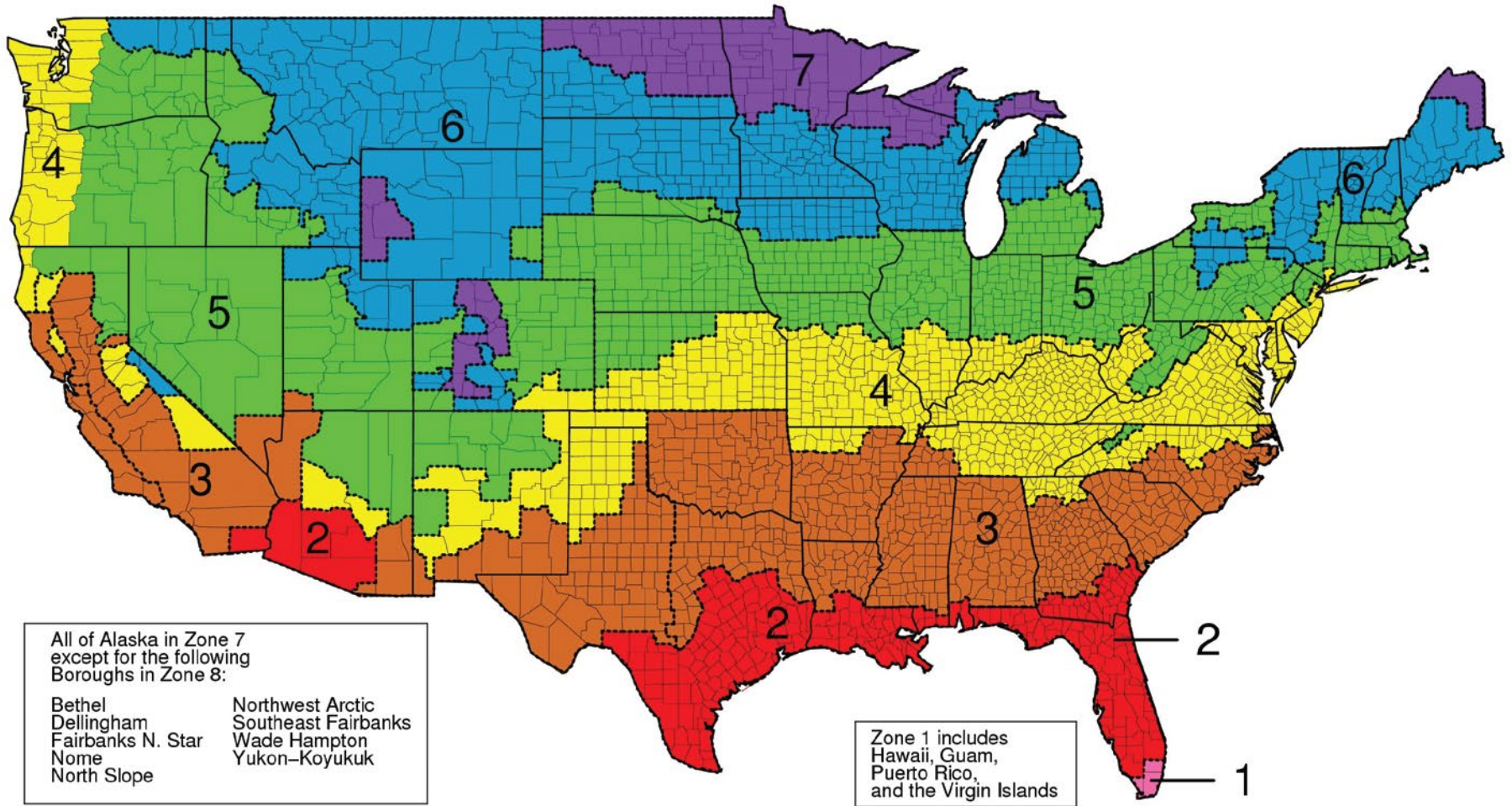


# Cover Board Comparison

|  | <b>HD POLYISO</b>                  | <b>GMGB</b>                      | <b>WOOD FIBER</b>                        |
|--|------------------------------------|----------------------------------|--|
| Composition                                | High Density Polyisocyanurate Foam | Fiberglass Mat Reinforced Gypsum | Wood or Sugarcane Fibers in Resin Binder |
| Compatibility with solvent based adhesives | Unaffected                         | Unaffected                       | Confirm Compatibility                    |
| Common Thickness                           | 1/2"                               | 1/4", 1/2", 5/8"                 | 1/2", 5/8", 3/4"                         |
| Thermal Performance                        | Good / Very Good                   | Poor                             | Poor                                     |
| Fire Performance                           | No Flame / No Smoke                | No Flame / No Smoke              | Combustible                              |
| UV light                                   | Protected by facers                | Becomes dusty                    | Becomes dusty                            |



# Energy Code Compliance



**ASHRAE 90.1 / U.S. Climate Zones**

# Energy Code Compliance

<http://bcap-energy.org/>



- SUNSHOT INITIATIVE
- TOOLS
- NEWS
- CODE STATUS
- ABOUT
- CONTACT US

## State Code Status: Tennessee

### Current Commercial Code

#### 2012 IECC

Adopted 5/6/2016, effective 8/4/2016

The provisions of the 2006 IECC shall continue to apply to the following occupancy classifications as defined by the 2012 IBC:

1. Moderate-hazard factory industrial, Group F-1;
2. Low-hazard factory industrial, Group F-2;
3. Moderate-hazard storage, Group S-1; and
4. Low-hazard storage, Group S-2;

✓ Can use [COMcheck](#) to show compliance.

### Current Residential Code

#### 2009 IECC with amendments

Adopted 11/4/2016; effective 2/2/2017

Amendments to the residential code include:

- Section 402.4.2.1, Testing option has been removed.
- Section 403.2.2, Sealing Mandatory has been removed.
- Table N1102.1, Insulation and Fenestration Requirements by Component, has been amended by adding certain exceptions for log walls.

✓ Can use [REScheck](#) to show compliance.

Both the residential and commercial code are mandatory statewide. All new and renovated buildings and additions constructed within the state must comply with this standard. Local jurisdictions may adopt more stringent codes. Nashville/Davidson County, for example, [has adopted the 2012 IECC](#).



Climate Zones: 3A, 4A

View another state ▾

### Contacts

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### News and Events

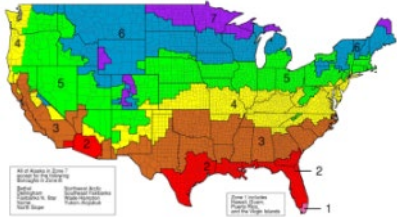
All of your links must be assigned at least to one category to be displayed

### BCAP Resources

[Tennessee 2012 IECC Incremental Cost Analysis True Cost of the 2012 IECC for New Homes in](#)



# Energy Code Compliance



## 2012 IECC

TABLE C402.2 Opaque Thermal Envelope Requirements (Prescriptive)

| CLIMATE ZONE  | 1                      |                        | 2                      |                        | 3                      |                        | 4 EXCEPT MARINE        |                        | 5 AND MARINE 4         |                                  | 6                                |                                  | 7                                |                                  |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|   | All Other              | Group R*               | All Other              | Group R                | All Other              | Group R                | All Other              | Group R                | All Other              | Group R                          | All Other                        | Group R                          | All Other                        | Group R                          |
| <b>Roofs</b>  |                        |                        |                        |                        |                        |                        |                        |                        |                        |                                  |                                  |                                  |                                  |                                  |
| Insulation entirely above deck                            | R-20ci                 | R-20ci                 | R-20ci                 | R-20ci                 | R-20ci                 | R-20ci                 | R-25ci                 | R-25ci                 | R-25ci                 | R-25ci                           | R-30ci                           | R-30ci                           | R-35ci                           | R-35ci                           |
| Metal buildings (with R-5 thermal blocks) <sup>a, b</sup> | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS          | R-19 + R11 LS                    | R-25 + R11 LS                    | R-25 + R11 LS                    | R-30+ R11 LS                     | R-30+ R11 LS                     |
| Attic and other   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-49                             | R-49                             | R-49                             | R-49                             | R-49                             |
| <b>Walls, Above Grade</b>                                 |                        |                        |                        |                        |                        |                        |                        |                        |                        |                                  |                                  |                                  |                                  |                                  |
| Mass  | R-5.7ci                | R-5.7ci                | R-5.7ci                | R-7.6ci                | R-7.6ci                | R-9.5ci                | R-9.5ci                | R-11.4ci               | R-11.4ci               | R-13.3ci                         | R-13.3ci                         | R-15.2ci                         | R-15.2ci                         | R-15.2ci                         |
| Metal building  | R-13+ R-6.5ci          | R-13+ R-6.5ci          | R-13+ R-6.5ci          | R-13+ R-13ci           | R-13+ R-6.5ci          | R-13+ R-13ci           | R-13+ R-13ci           | R-13+ R-13ci           | R-13+ R-13ci           | R-13+ R-13ci                     | R-13+ R-13ci                     | R-13+ R-13ci                     | R-13+ R-13ci                     | R-13+ R-19.5ci                   |
| Metal framed  | R-13 + R-5ci           | R-13 + R-5ci           | R-13 + R-5ci           | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-15.6ci                  |
| Wood framed and other                                     | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci |

Source: 2012 International Energy Conservation Code®

# Energy Code Compliance 2015 IECC (ASHRAE 90.1 - 2013)

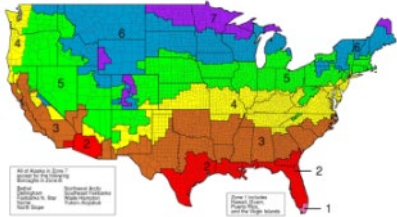


TABLE C402.1.3 Opaque Thermal Envelope Requirements (Prescriptive)

| CLIMATE ZONE                        | 1                      |                        | 2                      |                        | 3                      |                        | 4 EXCEPT MARINE        |                        | 5 AND MARINE 4         |                                  | 6                                |                                  | 7                                |                                  |        |
|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--------|
|                                     | All other              | Group R                | All other              | Group R                | All other              | Group R                | All other              | Group R                | All other              | Group R                          | All other                        | Group R                          | All other                        | Group R                          |        |
| <b>Roofs</b>                        |                        |                        |                        |                        |                        |                        |                        |                        |                        |                                  |                                  |                                  |                                  |                                  |        |
| Insulation entirely above roof deck | R-20ci                 | R-25ci                 | R-25ci                 | R-25ci                 | R-25ci                 | R-25ci                 | R-30ci                 | R-30ci                 | R-30ci                 | R-30ci                           | R-30ci                           | R-30ci                           | R-30ci                           | R-35ci                           | R-35ci |
| Metal buildings <sup>b</sup>        | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS         | R-19 + R-11 LS                   | R-25 + R-11 LS                   | R-25 + R-11 LS                   | R-30 + R-11 LS                   | R-30 + R-11 LS                   |        |
| Attic and other                     | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-38                   | R-49                             | R-49                             | R-49                             | R-49                             | R-49                             |        |
| <b>Walls, above grade</b>           |                        |                        |                        |                        |                        |                        |                        |                        |                        |                                  |                                  |                                  |                                  |                                  |        |
| Mass                                | R-5.7ci <sup>c</sup>   | R-5.7ci <sup>c</sup>   | R-5.7ci <sup>c</sup>   | R-7.6ci                | R-7.6ci                | R-9.5ci                | R-9.5ci                | R-11.4ci               | R-11.4ci               | R-13.3ci                         | R-13.3ci                         | R-15.2ci                         | R-15.2ci                         | R-15.2ci                         |        |
| Metal building                      | R-13 + R-6.5ci         | R-13 + R-6.5ci         | R-13 + R-6.5ci         | R-13 + R-13ci          | R-13 + R-6.5ci         | R-13 + R-13ci          | R-13 + R-13ci          | R-13 + R-13ci          | R-13 + R-13ci          | R-13 + R-13ci                    | R-13 + R-13ci                    | R-13 + R-13ci                    | R-13 + R-13ci                    | R-13 + R-19.5ci                  |        |
| Metal framed                        | R-13 + R-5ci           | R-13 + R-5ci           | R-13 + R-5ci           | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci         | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-7.5ci                   | R-13 + R-15.6ci                  |        |
| Wood framed and other               | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-3.8ci or R-20 | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci | R-13 + R-7.5ci or R-20 + R-3.8ci |        |

<sup>a</sup>Residential (Group R) - places providing accommodations for overnight stay (excluding Institutional). Examples: houses, apartment buildings, hotels, and motels.

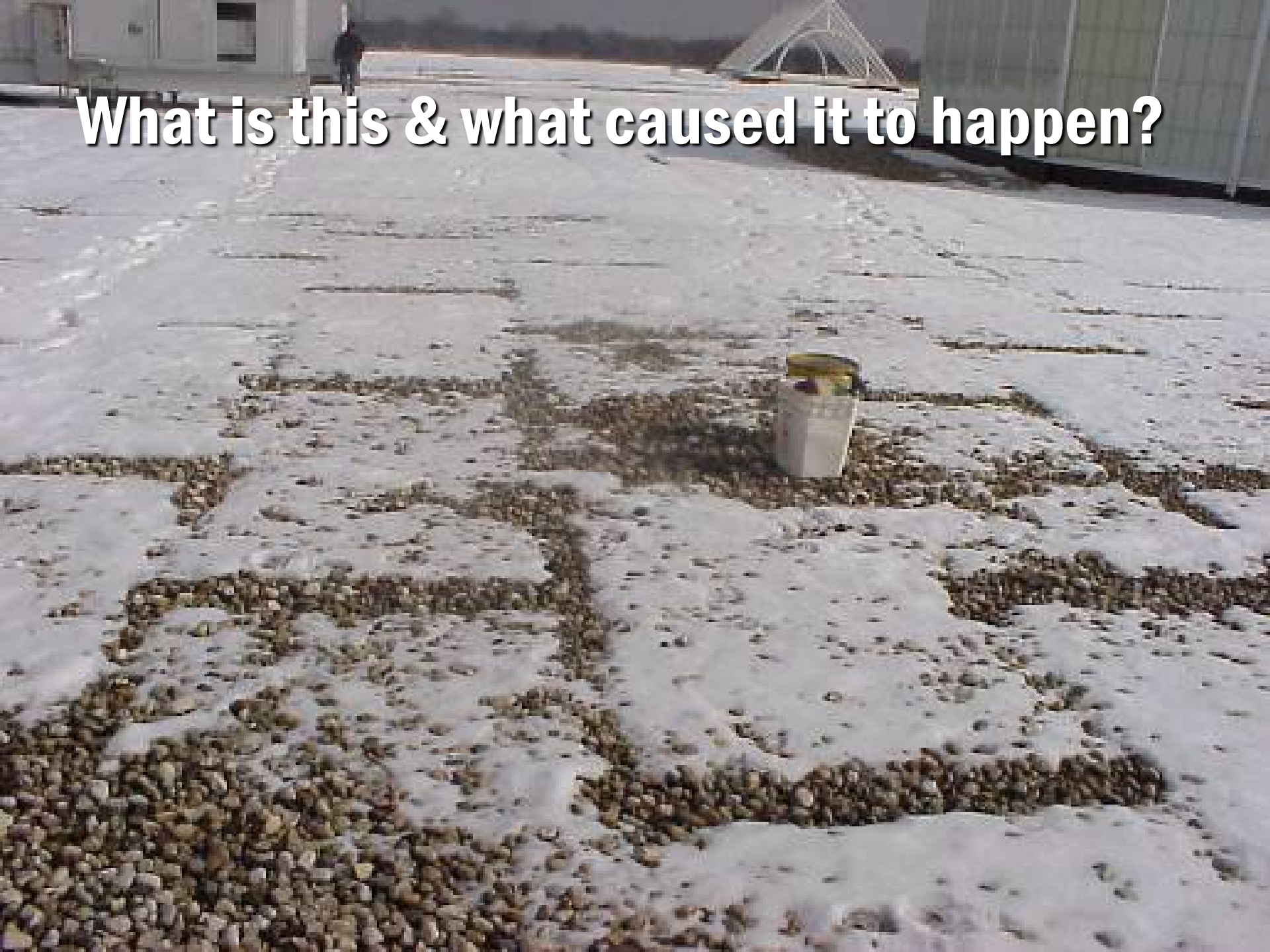
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# [R]evolution

The Single-Ply [R]evolution

## **Roof Insulation Layout**

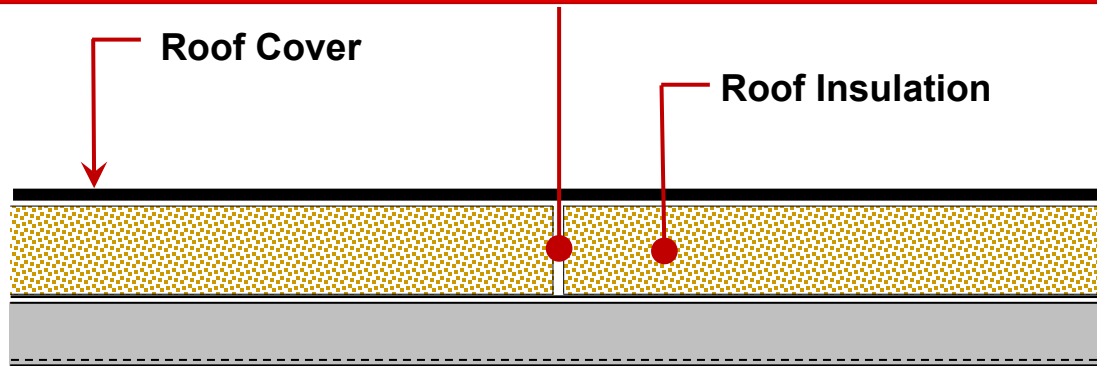
**What is this & what caused it to happen?**



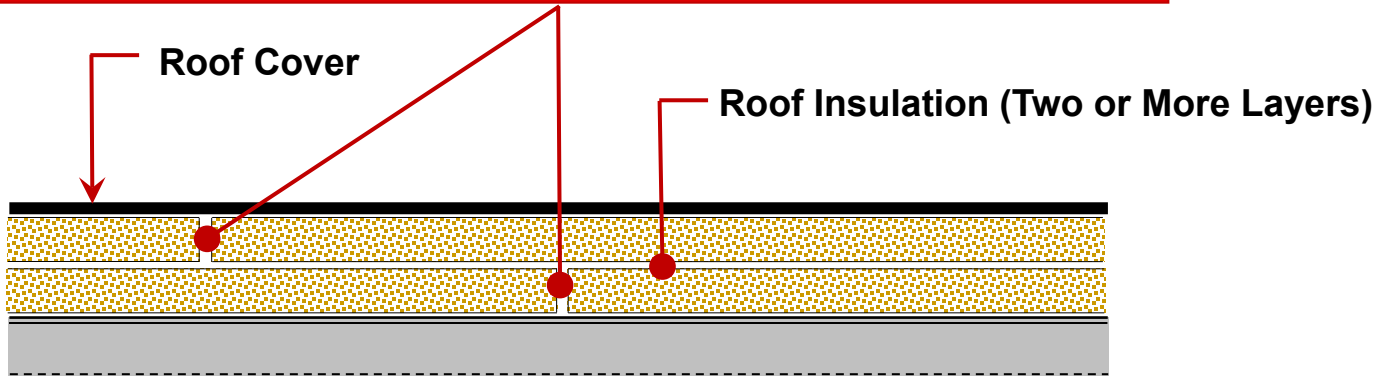
# “Cold” Insulation Joints

What causes them and how to avoid them

Joints in single-layer installations (a.k.a. “Cold Joints”) allow heat gain/loss. This decreases the insulation’s efficiency and can cause condensation if no vapor barrier/retarder is installed.



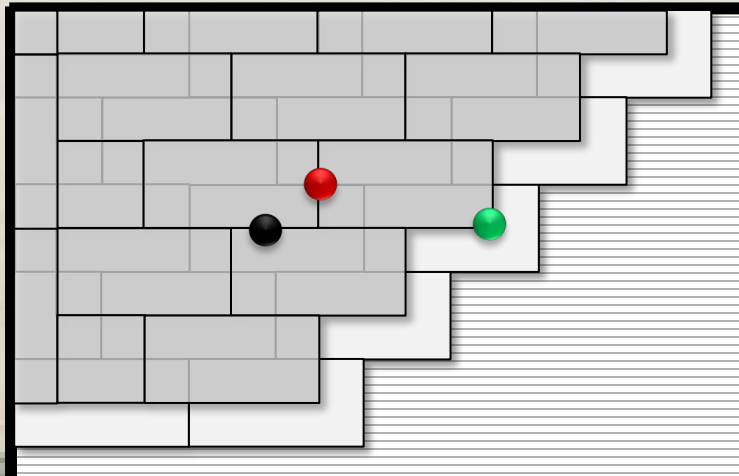
All joints in second layer (and subsequent layers) should be offset at least 6” from all joints in underlying layers.



# Basic Roof Insulation Layout



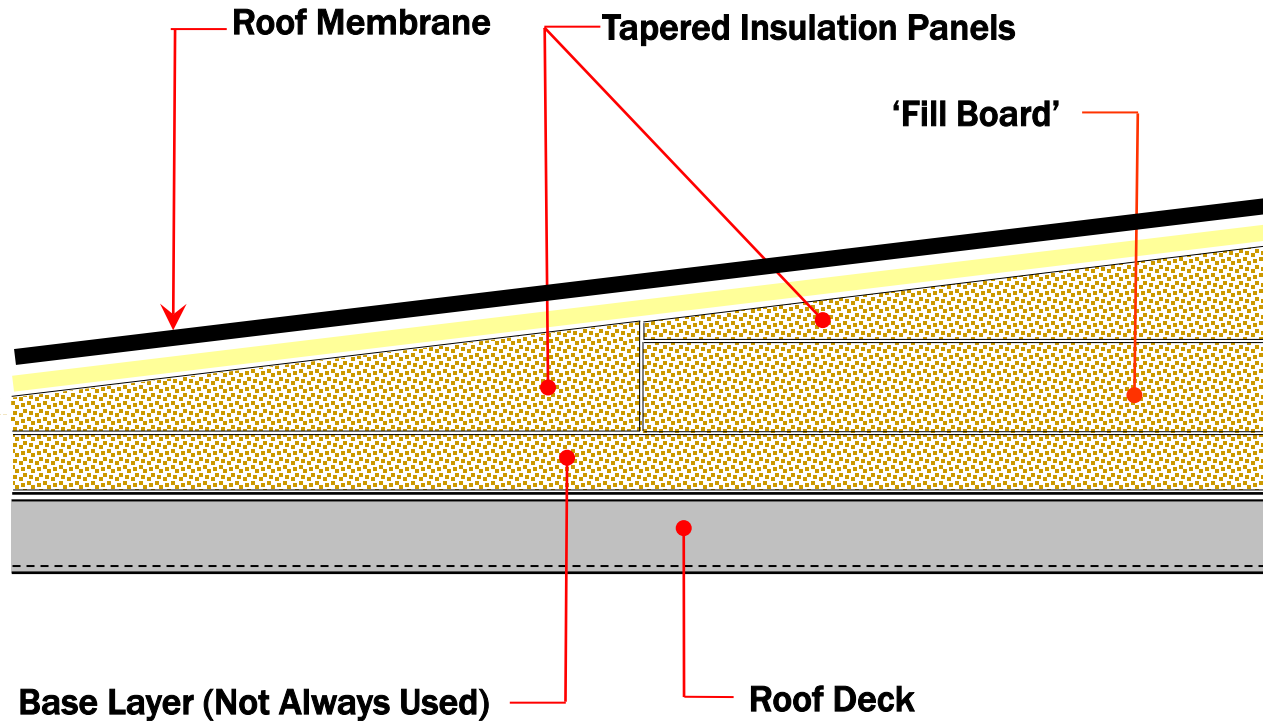
Joints in the Second Layer are Offset from those of the First Layer by 6" min



- Cross joints are staggered
- Long joints are continuous
- Layers are offset

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# Tapered Insulation Systems



**Building Codes have minimum roof slope requirements of 1/4" per foot. Most manufacturers will warrant as low as 1/8" per foot.**

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# [R]evolution

The Single-Ply [R]evolution

## **Useful Resources**



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# Useful Resources



National Roofing Contractors Association

[www.nrca.net](http://www.nrca.net)



Single Ply Roofing Industry

[www.spri.com](http://www.spri.com)



Polyisocyanurate Insulation Manufacturers Assoc.

[www.polyiso.org](http://www.polyiso.org)



EPDM Roofing Association

[www.epdmroofs.org](http://www.epdmroofs.org)



Asphalt Roofing Manufacturers Association

[www.asphaltroofing.org](http://www.asphaltroofing.org)

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# Useful Resources



Firestone Building Products

[www.firestonebpc.com](http://www.firestonebpc.com)



TNT Roofing Products

Todd Bagwell

Ph (629)221-0137

Todd@tntroofingproducts.com

[www.tntroofingproducts.com](http://www.tntroofingproducts.com)

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This concludes The American Institute of Architects  
Continuing Education Systems Course.

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**Thank You  
for Your Interest.**

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# Questions, Comments or Observations?

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# QIC Topics

- 1. Types of roofing applications we provide along with current market condition challenges that might be particular to each.
  - 2. Challenges with roofing system components, i.e.: insulations, fasteners, etc.
  - 3. How is Firestone operating differently during this pandemic in order to provide/bid roofing projects?
  - 4. Recommendations to building owners to navigate this current market?
-

Apex Group  
8-17-22

State of Tennessee  
Presentation

# CARLISLE MARKET UPDATE





## MEMBRANE MATERIAL OUTLOOK

- Standard EPDM – Readily available
- White EPDM is 10-12 weeks out
- FleeceBack is getting better, lead times 6 Weeks
- TPO– Still long lead times 6-8 weeks
- PVC- Reasonable Lead time / 4-6 weeks



## INSULATION MATERIAL OUTLOOK

- Standard Insulation is a struggle with extended lead times. 4-6 weeks
- SecureShield – Shortage of facer material long lead times. 3-5 months
- EPS – Capacity is full. EPS is 6 months out
- Gypsum – Demand and Facer issues continue to cause long lead times. 4-6 months



## ADHESIVE MATERIAL OUTLOOK

- EPDM bonding adhesive is back to normal ordering.
- TPO bonding adhesive is in high demand causing longer lead times. 4-6 weeks
- Low Rise Foam Adhesive – No issues and is readily available
- CavGrip – Adhesive for EPDM and TPO is readily available.
- Carlisle manufactures all its own adhesives



## MATERIAL LEAD TIMES

EPDM- No lead time except for White EPDM

TPO- 6-8 weeks

PVC- 4-6 weeks

Insulation- 4 weeks to 6 months depending on type and thickness

Adhesives- Normal lead times, with the exception of TPO

Screws and Plates- 1-8 months depending upon size

## OWNER RECOMMENDATIONS

- Work with Manufacturer Reps / Use materials that are available quicker than others.
- Keep up with manufacturer production issues. Look at other options other than full tear-offs if Insulation can be salvaged.
- Possible VE options with other types of products.
- Communication is key. This isn't going away anytime soon. Any hiccup in manufacturing or the raw good sector could cause major issues.

## 2 YEAR OUTLOOK

- This trend will continue through 2023
- With the exception of TPO most membranes are available
- Insulation is still a major issue. Carlisle hopes to catch up through this winter and we could see insulation availability increase second qrt 2023
- Screws and Plates will be the last to return to normal. Carlisle believes this could continue to be an issue through 2024.
- Adhesives are not an issue for Carlisle as we manufacture these products. Manufacturers who private label/ use a third-party manufacturing will/may continue to have some difficulty.



QUESTIONS?

Thank You

## **AGC/ABC Insights: QIC Construction Market Update – 8/17/22**

AGC Construction Inflation Alert July 2022 (attached as a PDF) is a great source of information relative to past, present and future inflation data and information. This is a publication of national data - market conditions in Middle TN have experienced inflation at 2-3% higher than national averages, and depending on timing and building type (concrete/steel frame, curtainwall systems, MEP systems) the local impact may be even higher.

Compounding the inflation issues associated with material, equipment and products, the reduced (and forecasted continued reduction of) skilled labor force is contributing to further increases in costs. These increases in labor are expected to only get worse in the future.

In addition to the national AGC industry publication data, four TN-based AGC-member CM/GC's provided the following data regarding inflation they have experienced:

- Previous 12 months (July 2021 - July 2022): range of 12-18%
- Year-to-date (Jan 2022 - July 2022): range of 8-10%
- Forecasted through end-of-year (Aug 2022 - Dec 2022): range of 4-8%
- Forecasted 2023 (Jan 2023 - Dec 2023): range of 8-12%

### **Overview: Sharp, Climbing Cost Escalation Has Likely Peaked**

- ENR Building Cost Index is already up more than 8% through July and is on pace for a 15% increase in 2022, exceeding the 12.5% increase in 2021
- Nonresidential building starts dropped 14 percent in June, reflecting broad-based decline across most market sectors. Year-to-date, nonresidential building construction starts are still 13 percent higher than last year.
- While projects are still moving through the planning process, the velocity has downshifted reflecting uncertainties over how rising interest rates will impact the economy, construction material prices, and ultimately, construction starts.
- Unemployment is at a near 50-year low, but the construction industry is short over 650,000 workers. We are experiencing wage competition between projects in the Nashville market.
- June 2022 construction employment has pushed its peak up to 7.670 million workers with unemployment at nearly an all-time low of 3.7 percent, compared to 6 percent back in March 2022. The industry would likely have added even more jobs in June had it not been for the shortage of available workers.

## Architecture Billings Index

- The June Architecture Billings Index (ABI) score of 53.2 indicates billings continued to grow at a modest pace after a burst of stronger growth in the spring. However, “the future is looking increasingly cloudy” as the inquiries into new projects had the slowest rate of growth since economic recovery began in early 2021. The value of new signed designed contracts also fell to the slowest pace of growth since January 2021 and backlog declined slightly. Business conditions across the country remain mixed, and firms with institutional specialization reported the strongest growth for the first time since before the pandemic.

## Supply Chain Trends and Pricing

**Overview:** The biggest factors impacting projects are long lead-time items, which are up four to six times historical levels, and unpredictable deliveries caused by supply chain disruptions. The categories most affected by long lead items are electrical gear, HVAC equipment, roofing, plumbing and structural steel. As a result, commercial construction schedules and sequences are impacted, which results in a rush of early procurement of material and equipment causing even longer delays and price escalation.

There are some positive signs. In the commodities markets, higher interest rates and prices are expected to cool demand in the coming months. And though material and equipment prices are challenging for construction clients, demand and funding from high tech, healthcare, education and public sectors are expected to sustain a steady flow of projects.

Residential housing will most likely see a slowdown as interest rates increase. Prices for copper, steel and lumber are already dropping and other materials, like drywall and electrical commodities, are seeing a slowdown in price escalations. It is uncertain whether this pricing slowdown will continue.

Two things are abundantly clear: order backlogs and new orders are at historic levels. Manufacturers continue to struggle to keep up with demand due to shortages of input materials and labor. There is very little “slack” in the supply chain and any disruptions, even minor, are having an impact on manufacturers’ ability to deliver.

- **Roofing products** - Roofing supply chains remain constrained due to the busy summer season. All categories of roofing material are experiencing shortages including membranes, insulation board, cover board, adhesives, screws and plates. Constant communication with roofing subcontractors is critical to ensure that material delivery dates stay on target. Polyiso insulation continues to be the most difficult material to acquire with a lead time of more than 50 weeks. Some decreasing lead times are being seen in certain markets. It is expected that after the busy summer roofing season, lead times will stabilize and start to recede slightly.

- **Asphalt** - pricing which typically lags the petroleum industry by several months, is rising as it is also affected by demand. The American Infrastructure Legislation work is likely to keep upward pressure on asphalt pricing for several years given the nature of that work.
- **Concrete** - supplies remain tight and concrete products are on allocation in some markets with demand remaining extremely strong. High demand during winter months did not allow cement manufacturers to build up inventories in anticipation of seasonally high demand during summer months. In addition, cement plant maintenance breaks in the spring further reduced supply. Concrete demand is not wavering, and supply levels of key production materials such as clinker (used to produce cement) have remained low.
- **Structural steel** - Pricing escalation had paused at the end of 2021 and into the start of 2022. However, steel pricing started to escalate once again as war broke out in Ukraine, in part, because of supply disruptions of pig iron from that region. Now pricing is stabilizing again, albeit at an elevated level. Lead times for the toughest steel items to procure, namely bar joists and decking, are also seeing stabilization and are beginning to recede. In general, pricing for steel products is declining. For example, Hot Rolled Coil (HRC) has already declined 36 percent so far in 2022. In addition, steel rebar has declined 19 percent since it peaked in May 2022. It is anticipated that the current stabilized price of structural steel will begin to decline in the coming months.
- **Architectural Interiors** - Some interior materials prices continue to escalate, while others have stabilized. Armstrong has announced a 17% increase on ceiling tiles (effective July 1) and a 15% increase on suspension systems (effective May 9). However, drywall and metal stud pricing has been quiet during the second quarter and there haven't been any increases announced. Rockwool has also announced a 15% increase effective May 16 on all mineral wool products. These products continue to experience very high demand with many being supplied on allocation. Further price escalation is anticipated through the balance of 2022.
- **Doors and Hardware** - Doors and hardware continue to experience extended lead times. More standard hardware lead times are in the four to five week range but as the hardware becomes more specialized, lead times extend significantly. For example, custom finishes can add up to six weeks to standard lead times. Standard doors and frames are experiencing lead times in the 9-12 week range. The most challenging materials continue to be on the electronic access side. Card reader lead times are still unpredictable so a six-month lead time budget is recommended.
- **Appliances** - Demand for appliances remains high. Although there are signs of a slowing housing market, order backlogs are significant. It will take some time for backlogs to diminish and for lead times to reduce. Significant relief is not expected until Q4 2022 with prices continuing to increase. GE Appliance announced a 9 percent increase effective July 18.
- **Elevators, Escalators. Moving Walks** - Continued commodity price escalation and strong demand is expected to drive price increases across all major elevator manufacturers in

the range of 8 to 20 percent for the year ending 2022. Lead times for elevators vary considerably depending on the category; low rise elevators range from 14 to 27 weeks, mid-rise elevators range from 20-27 weeks, high-rise elevators range from 40-48 weeks and freight/service/escalators range from 30-42 weeks.

- **Pipe, Plumbing and Drainage** - With exception to a few items, distributors have been doing a very good job keeping sufficient stock of pipe, valve and fitting material on hand. One exception to available inventory continues to be reinforced concrete (RCP). Earlier this month, Oldcastle issued a letter detailing a supply constraint for welded wire mesh across North America due to a shortage of green rod, labor and transportation issues. Looking out 6-12 months, we are starting to see some signs that pricing will flatten out and some items may come down. In the last 3 months, however, there have been over 240 announced manufacturer price increases averaging between 10-15 percent. PVC pipe avg. prices rose 5% since last quarter. Copper pipe avg. prices declined as copper commodity prices decreased. Carbon steel pipe avg. prices rose 11% since last quarter.
- **HVAC Equipment** - Lead times and price continue to rise across nearly all manufacturers and delivery dates are becoming more unreliable in general. The primary issue is delays in the delivery of components to equipment manufacturers. There are wide ranging supply chain issues but the most common and longest delay is related to ECMs due to semiconductor chip shortages. Lead times of ECMs are running 70 or more weeks at this time. Traditional VFDs are being substituted for ECMs which is driving up VFD lead times. Prices YTD are up 25-30 percent.
- **Electrical Gear** - Lead times for switchgear, switchboards, panelboards and transformers continue to rise as demand hits historic levels driven by semiconductor manufacturing, automotive -EV, crypto currency mining, data center and significant strength in general commercial construction. UL1558 Switchgear, transformers, and unit substation lead times are now at 80 or more weeks as manufacturers book orders through 2025. Driven in large part by data center demand and lack of investment into new factory capacity, manufacturers are not expecting lead times to improve for at least the next 24 to 36 months and are likely to degrade even further.
- **Electrical Commodity Materials (includes lighting fixtures)** – Lead times and pricing for several commodity electrical items are down as a result of lower copper and steel commodity prices in recent weeks. Some manufacturers have invested in additional capacity to reduce lead times. Lead time for specific items, such as 5kV-15kV medium voltage cable are getting better as well, now running 14-20 weeks if they are not in stock (this is down from 20-28 weeks in previous quarter). Steel conduit is also down as much as 10% over the last month. Panel lug lead times for large gauge (250mcm – 1000mcm) are 3-4 weeks, if not in stock and prices are flat. Data center and semiconductor demand as well as automotive EV are driving the market. Resin prices are staying flat, keeping PVC conduit prices stable for now. Lead times are running

about 4-6 weeks for large quantities with smaller quantities typically in stock. With steel dipping down about 10%, cost and lead times for Unistrut has improved.

- **Generators** - Driven by surging demand in several commercial sectors, including data centers and 5G telecommunications, lead times for generators have increased significantly and are now in the range of 48 to 67 weeks. Custom enclosures may add an additional four to six weeks of lead time. Manufacturers are booking orders through 2025 for 1MW gensets and larger for data centers which are looking to accelerate expansion in the next two to three years. Overall, pricing for gensets will be up by nearly 20 percent for 2022.
- **Lab Casework and Fume Hoods** - Although material inputs to lab casework (steel and resins) have stabilized from a pricing point of view, manufacturers are being hit by unforeseen increases. An example of this is the sudden, steep price increase announced by most glass manufacturers in recent weeks (an increase of 40 percent). This significant jump will affect the cost of fume hoods which utilize glass enclosures. Lead times are stable at 18 weeks.
- **Wood Products** – Lumber pricing peaked in March 2022 and has been moving downward ever since. Dimensional lumber is now down 56 percent from the previous peak. Lumber mills are cutting back production in the hopes of stabilizing prices. Lumber pricing is mainly driven by new housing starts which took a big step downward in May. Housing starts peaked at 1.8 million (annual rate) in April, then dropped to 1.5 million in May.
- **Logistics** - The Logistics Managers Index (LMI) tracks key metrics—such as transportation, warehousing and inventory data —collected monthly from industry professionals. A value less than 50 indicates a contracting market, and above 50 indicates a growing market. The LMI for June was 65.0, which indicates that growth is slowing. This number is down significantly from the 76.2 reading in March and is the third consecutive reading that has decreased. Key drivers of the LMI index decrease are warehousing prices, transportation prices and transportation utilization.
- **Transportation** - The market environment remains challenging. Labor shortages continue to impact operations and create delays specifically in the ports and rail. U.S. freight railroads continue to face challenges as labor and chassis shortages are contributing to schedule disruptions. Although fuel surcharges have risen to 50 percent for a less than truckload shipment, there is an indication that trucking capacity will continue to increase, which should provide some relief for transportation prices. Transportation utilization trended downward as well over the past quarter. Even though fuel prices have remained elevated, pricing trends may continue to decrease in the short term. Crude oil prices have retreated from the 14-year high in March and have remained close to \$100 a barrel due to weaker demand, economic slowdown fears and concern of a new wave of lockdowns in China. Transportation utilization decreased and capacity increased. Consumer demand continued to shift as inflationary pressures cut into discretionary spending.



- **Ocean Freight** - While congestion at the ports remains an issue, there is some stabilization. Freightos reports that shipping container pricing is down 50 percent in Q2 for routes from Asia to the West Coast. Rates are just below \$7,500 for a shipping container and prices are currently 14 percent lower year over year. In contrast, routes from Europe to the East Coast are surging and are up 42 percent year over year. Even as pricing continues to drop, long lead times remain an issue. Sea-Intelligence reports that around two thirds of global shipment schedules are late.

### **Remedies/Solutions**

- Every team needs to get deeper into the supply chain. It is not enough to depend on subcontractor and supplier input.
- Contractors should be leveraging relationships with the manufacturers to access delayed materials and equipment – can push to get partial, critical orders on critical path.
- It is not enough to look at overall escalation %, you need to look closer and account for escalation material by material because of the variation between materials.
- A robust procurement strategy is essential – leads times are emphasis.
- Example item in a procurement strategy: Buying large air handlers early and designing around it.
- Cost benefit of escalation clauses – leverage allowances – talk with trade partners about allowances in lieu of trade partner taking all the risk to keep from paying worse-case scenario all the time.
- You can drive escalation into a project by buying too early.
  - o Understand when materials need to be on site.
  - o Make acquisitions just in time where possible.
- Early release packages for long-lead items continues to be a good strategy...consider warehousing strategies (costs associated with this) to ensure schedule.



**AGC**  
THE CONSTRUCTION  
ASSOCIATION

**JULY**

**2022**

# CONSTRUCTION INFLATION ALERT

For more than two years the U.S. construction industry has been buffeted by unprecedented increases in materials costs, supply-chain bottlenecks, and a tight labor market. To help project owners, government officials, and the public understand how these conditions are affecting contractors and their workers, the Associated General Contractors of America (AGC) has posted frequent updates of the Construction Inflation Alert.

Several recent developments have raised the specter of a sharp slowdown or even a recession in the U.S. economy. Inflation is at a 40-year high, sapping consumers' purchasing power despite elevated wage increases. Major stock indexes have declined sharply—a frequent but not foolproof harbinger of recession. A growing number of companies have announced layoffs, although the job market remains vibrant, as indicated by large monthly employment increases, near-record job openings, and a persistently low unemployment rate.

However, a recession is far from certain. Demand for infrastructure, manufacturing, and power construction appears to be strong and likely to strengthen further, perhaps for several years to come. In any case, the cost of construction materials and labor does not generally move in sync with the overall economy. In short, owners should not assume that delaying projects will enable them to avoid volatility and disruptions in construction costs, delivery times, and labor supply, even if the economy slows significantly.

Meanwhile, Russia's ongoing attack on Ukraine and Western sanctions against Russia have disrupted production and transport of dozens of commodities. China's prolonged lockdown of Shanghai and other areas in an attempt to control the spread of covid has also affected production and shipping. New variants of covid, as well as a growing number of people with lingering or recurrent symptoms ("long-haul covid"), add to uncertainty about labor supply.

This version of the Alert is the seventh update since the first edition was posted in March 2021—an indication that the situation remains far from "normal." This document will continue to be revised to keep it timely as conditions affecting demand for construction, labor supply, and materials costs and availability change. Each new version is posted here: <https://www.agc.org/learn/construction-data/agc-construction-inflation-alert>

Please send comments and feedback, along with "Dear Valued Customer" letters or other information about materials costs and supply-chain issues, to AGC of America's chief economist, Ken Simonson, [ken.simonson@agc.org](mailto:ken.simonson@agc.org).

**[www.agc.org](http://www.agc.org)**

# Recent changes in input costs

Previous editions of this guide have highlighted the extreme runup in materials costs that began in early 2020. More recently, prices have moved in divergent directions for different materials. But, on balance, they continue to climb at a much higher rate than the consumer price index.

The extent of these increases is documented by the Bureau of Labor Statistics (BLS). BLS posts producer price indexes (PPIs) around the middle of each month for thousands of products and services (at [www.bls.gov/ppi](http://www.bls.gov/ppi)). Most PPIs are based on the prices that sellers say they charged for a specific item on the 11th day of the preceding month. Producers include manufacturers and fabricators, intermediaries such as steel service centers and distributors, and providers of services ranging from design to trucking.

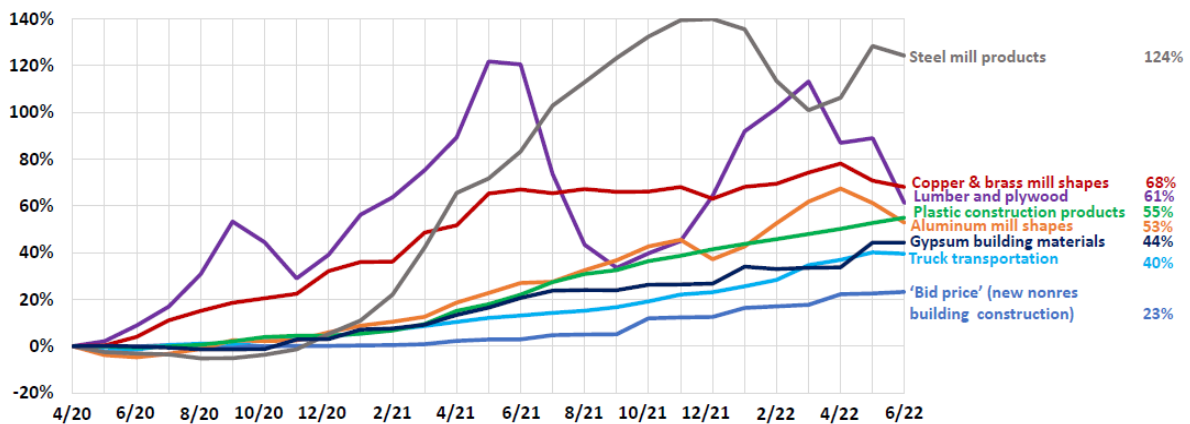
Figure 1 shows the magnitude of the increases for seven widely used categories of construction inputs. From April 2020, the low point for prices of many goods during the early stage of the pandemic, to June 2022, the PPI for steel mill products more than doubled (up 124% in 26 months). There were increases of more than 60% in the indexes for copper and brass mill shapes (up 68%) and lumber and plywood (up 61%). PPIs rose by more than half for plastic construction products (up 55%) and aluminum mill shapes (up 53%). The index for gypsum products increased 44% and the PPI for truck transportation climbed 40%. Numerous other indexes rose by more than the 23% increase in the “bid price” index.

124%

The PPI for steel mill products rose 124% in 26 months

**Figure 1**

**PPIs for construction bid prices and selected inputs**  
cumulative change in PPIs, April 2020-June 2022 (not seasonally adjusted)



Source: Bureau of Labor Statistics, producer price indexes, [www.bls.gov/ppi](http://www.bls.gov/ppi)

# Supply-chain issues

From the first days of the pandemic, availability and delivery times for materials have been never-ending headaches for construction firms. Problems began as early as February 2020, when factories in China and northern Italy were shut down, causing shortages of items as diverse as elevator parts, floor tiles, and kitchen appliances. Two years later, another round of covid-related restrictions in China disrupted production and shipping from that country.

Russia's attack on Ukraine, Western countermeasures against Russia, and diversions or blockages of cargo ships are impeding or cutting off supplies of items as diverse as pig iron used in steelmaking, neon for lasers used in semiconductor manufacturing and other applications, and Ukrainian clay used in producing ceramic tile exported to the U.S. from Italy and Spain. Some of these impacts are far down the supply chain from the actual construction item. For instance, a producer of electrical switchgear reported in May that the time for delivering products from its plant had doubled from 20 weeks to 40, in part because of difficulty acquiring a fire-retardant chemical produced in Europe that goes into a plastic resin used to make the housing for its switchgear.

Adding to these pandemic- and conflict-induced problems, a series of unusual mishaps interfered with output or delivery of numerous goods. The biggest impact for construction came from the severe freeze in Texas in February 2021 that damaged all of the petrochemical plants producing resins for a host of construction plastics. Damage to the electrical grid in Louisiana from Hurricane Ida last September further interfered with the production of some plastics inputs. Some cement plants have incurred unusually long outages, in part because of delays in sourcing replacement parts.

Contractors have also been affected by the much-publicized shortage of computer chips. Not only is the construction industry a major buyer of pickup trucks that are in short supply, but deliveries of construction equipment also have been held up by a lack of semiconductors.

Contractors have reported being quoted exceptionally long lead times and/or allocations (less-than-full shipments, generally tied to previously ordered quantities) for inputs as varied as electrical transformers, traffic signal equipment, highway striping paint, wallboard, insulation, windows, and roofing fasteners. Strong demand, plant outages, and truck driver shortages have meant long delays in completing ready-mix concrete pours in several states in the Southeast and West.

So far, there is little sign that the supply chain will consistently improve before 2023—or even 2024, in the case of some computer chips. While the lead time for some items has shortened, deliveries for many materials remain delayed or unpredictable. In fact, the expiration of labor contracts for West Coast longshore workers and rail workers nationwide could result in new disruptions of shipments later this year.

# Labor supply and cost

Construction employment has bounced back well from the early months of the pandemic. However, construction firms are far short of the number of workers they have been seeking. They have partially closed the gap by getting more overtime from the workers they have, but this cannot continue indefinitely.

The construction industry lost 1.1 million employees from February to April 2020—a 15% decline in just two months. While both residential and nonresidential construction employment rebounded somewhat in May 2020, employment stalled for more than a year after that among nonresidential firms—nonresidential building and specialty trade contractors plus civil and heavy engineering construction firms. During that period, thousands of experienced workers moved into residential construction (homebuilding and remodeling), found jobs in other sectors, or left the workforce completely.

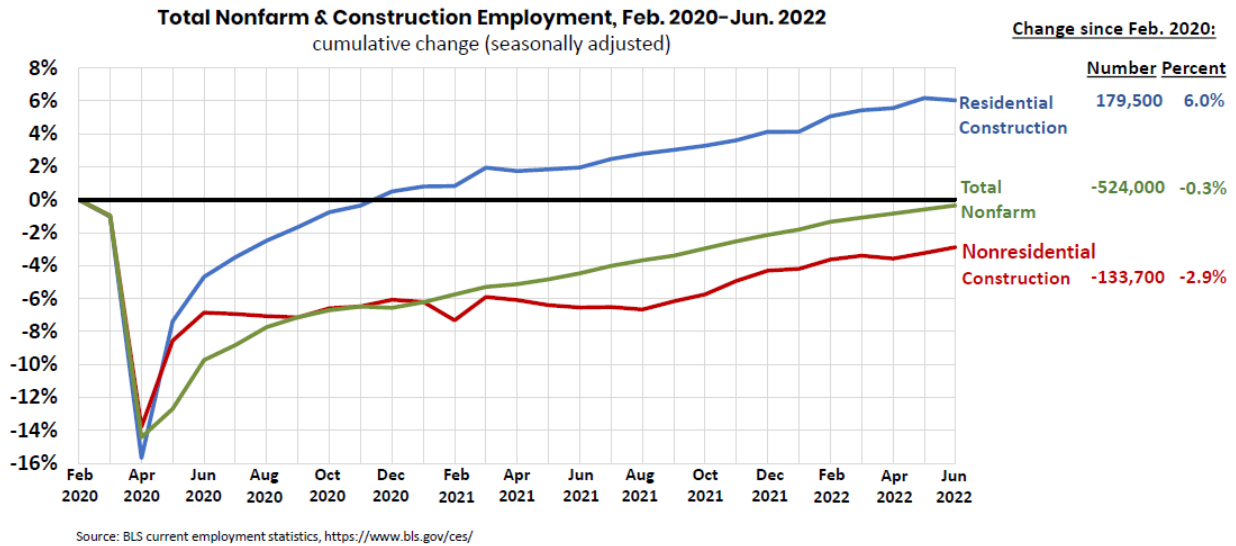
**466,000**

The number of job openings at the end of May, a record for the month



By June 2022, seasonally adjusted construction employment totaled 7,670,000—modestly higher than the 7,624,000 employed in February 2020. But there was a large shift between residential and nonresidential subsectors. Compared to February 2020 levels, residential construction firms had added nearly 180,000 workers, while employment in nonresidential construction was still down 134,000 employees or 2.9%, as shown in Figure 2.

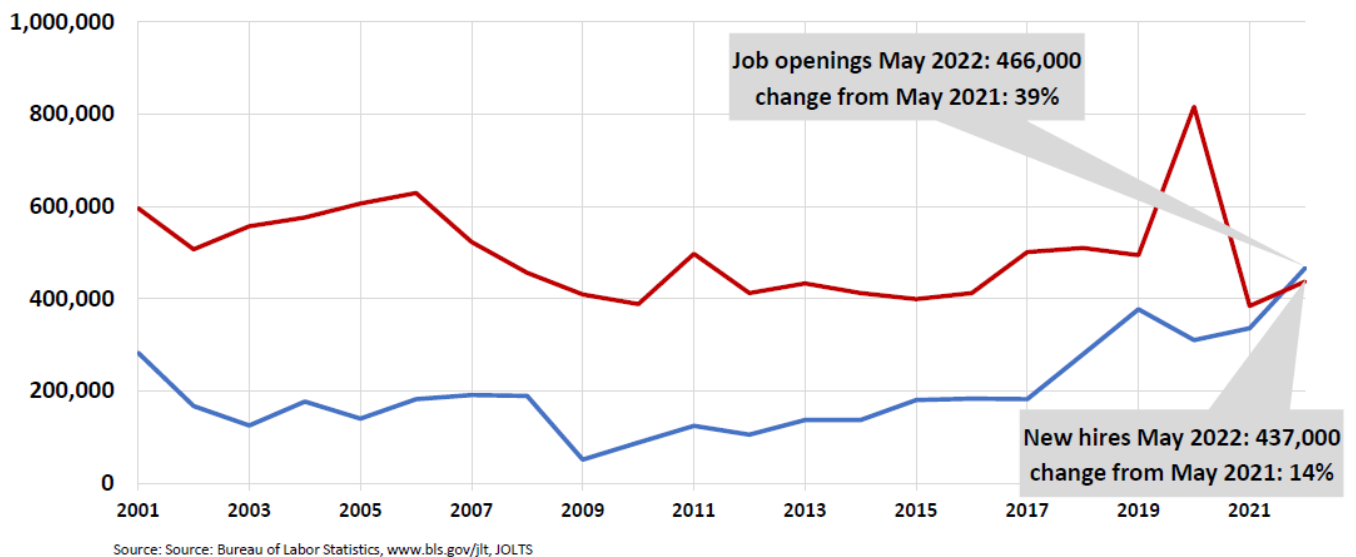
**Figure 2**



There is strong evidence that the construction industry would have added many more workers if they had been available. Job openings in construction at the end of May totaled 466,000 (not seasonally adjusted), a jump of 130,000 or 39% from a year earlier and by far the largest May total in the 22-year history of the data, as shown in Figure 3. In fact, job openings exceeded the 437,000 workers hired in May, implying that construction firms would have hired twice as many workers that month as they were able to, if there had been enough qualified applicants.

**Figure 3**

**Construction job openings exceed hires, set record high for May**  
Job openings and hires, May 2001–May 2022, not seasonally adjusted

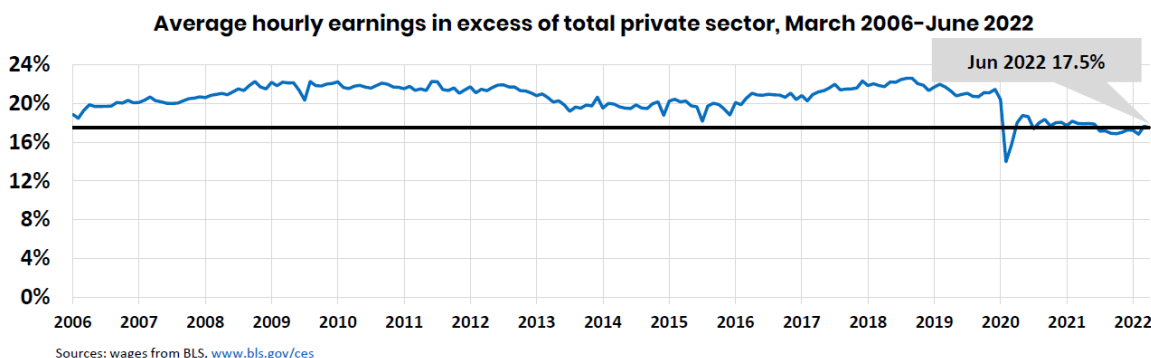


In order to attract, retain, and bring back workers, construction firms are raising pay. Average hourly earnings in construction for “production and nonsupervisory employees”—mainly hourly craft workers—rose 6.0% from June 2021 to June 2022. That compared with increases of 4.0% in the previous 12 months and 2.8% in the 12 months ending in June 2000. Despite the acceleration in wages, construction pay has not risen as fast as in other industries. Historically, as shown in Figure 4, contractors paid a “premium” to attract workers willing to work in the conditions, locations, and hours required for construction. Specifically, average hourly earnings for production workers in construction typically averaged 20% to 23% more than for all private sector employees, up until the onset of the pandemic. This premium shrank to less than 18% since the start of the pandemic as restaurants, warehouses, delivery services, and other industries drastically increased pay. Other sectors were also able to offer greater flexibility regarding hours and worksites, including work from home, that are not possible for construction.

**Figure 4**

**Wage premium for construction has shrunk**

- “Premium” for construction wages relative to total private sector has shrunk from 20-23% pre-pandemic to 17.5% for production & nonsupervisory employees as other sectors boost pay, benefits and offer flexible hours and locations
- Implications: Contractors will have raise pay still more, pay more overtime, invest more in labor-saving software and equipment



These differences imply that construction wages will have to rise even more steeply to restore (and perhaps expand) the pay “premium.” In addition, it is likely that contractors will pay more overtime to make up for the workers they don’t have. They may also turn more to offsite production and onsite drones, robotics, 3-D printers, and other ways of reducing the number or skill level of the workers they employ.

## Changes in bid prices

The extreme runup in so many input costs caused financial hardship for many contractors and subcontractors, especially for those whose purchases are concentrated in materials with extra-steep increases.

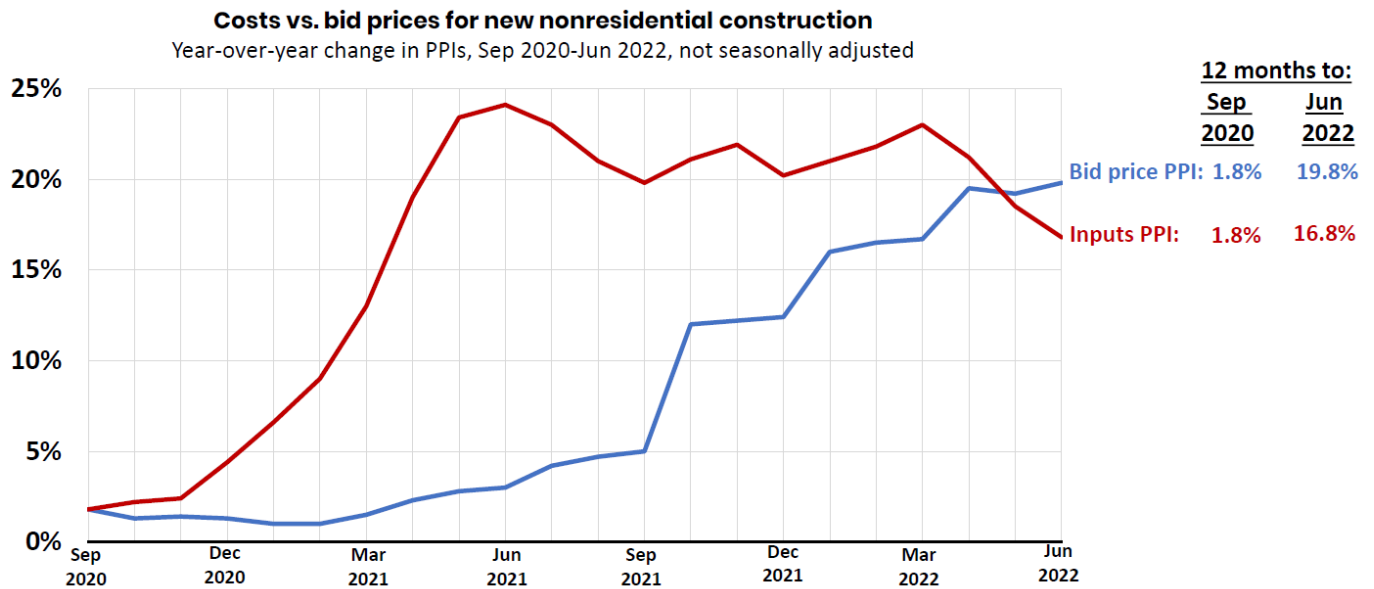
BLS posts several PPIs for new nonresidential construction. Since every construction project is unique, it is not possible to collect prices for identical construction “products” in the same way as for most goods and services. Instead, the agency creates “bid price” PPIs (BLS refers to them as output price indexes) through a two-step process. Each quarter it receives data from construction cost-estimating firms regarding the cost of a package of installed components or “assemblies” of a particular nonresidential building. Every month BLS asks a fixed group of contractors the amount of overhead and profit they would charge to erect that building—the same building that contractor was asked about previously. BLS combines the answers from a set of contractors to create PPIs for new warehouse, school, office, industrial, and healthcare building construction, along with a weighted average of these building types for an overall index for new nonresidential building construction.

BLS also creates PPIs for inputs to construction--weighted averages of the cost of materials and services purchased for every type of project.

As shown in Figure 5, the PPI for bid prices rose at the same rate as the PPI for inputs from September 2019 to September 2020, 1.8% year-over-year. The bid-price PPI continued rising at a modest rate through mid-2021, while the year-over-year change in input prices accelerated to more than 24% by June 2021.

Since mid-2001, the bid-price PPI also has accelerated considerably, as contractors attempt to pass on their rising materials and labor costs. By June 2022, the bid-price index was climbing at a 19.8% year-over-year rate, compared to 16.8% for the PPI for inputs to new nonresidential construction.

**Figure 5**



Source: Bureau of Labor Statistics, producer price indexes, [www.bls.gov/ppi](http://www.bls.gov/ppi)

The bid-price index only indicates the price contractors propose for new starts. On projects for which they had already submitted a bid or begun work, contractors were stuck with paying elevated materials prices that they could not pass on.

## What's next for bid prices?

There is no fixed relationship between input costs and bid prices. For every firm and time period, the relationship depends on specific market conditions and expectations.

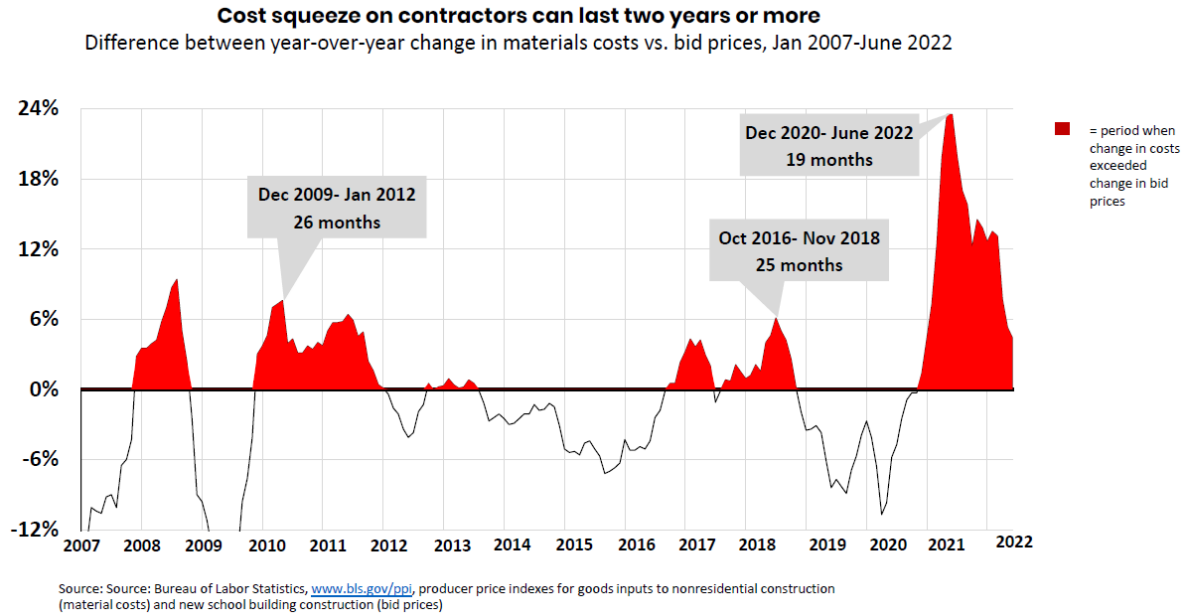
However, it is possible to look at past relationships. Figure 6 shows the difference between the year-over-year change in the PPI for materials costs for goods inputs to construction and the bid-price index for new school construction. The areas in red indicate periods in which the year-over-year change in the PPI for exceeded the bid-price PPI for schools. (Similar patterns exist for the bid-price indexes for new warehouse, office, industrial and healthcare buildings.)

Materials costs outran bid prices for as long as 26 months from late 2009 to early 2012 and for 25 months from late 2016 to late 2018. The current gap hasn't lasted as long but the peak was more than twice as high as in previous episodes, indicating the pain for contractors has been that much more intense.

**26 months**  
The year-over-year change in materials costs may exceed the change in bid prices for 2 years or more



Figure 6



# What can contractors and owners do?

Contractors can provide project owners with timely and credible third-party information about changes in relevant material costs and supply-chain snarls that may impact the cost and completion time for a project that is underway or for which a bid has already been submitted.

Owners can authorize appropriate adjustments to design, completion date, and payments to accommodate or work around these impediments. Nobody welcomes a higher bill, but the alternative of having a contractor go out of business because of impossible costs or timing is likely to be worse for many owners.

For projects that have not been awarded or started, owners should start with realistic expectations about current costs and the likelihood of increases. They should provide potential bidders with accurate and complete design information to enable bidders to prepare bids that minimize the likelihood of unpleasant surprises for either party.

Owners and bidders may want to consider price-adjustment clauses that would protect both parties from unanticipated swings in materials prices. Such contract terms can enable the contractor to include a smaller contingency in its bid, while providing the owner an opportunity to share in any savings from downward price movements (as has occurred recently with lumber, diesel fuel, and some metals prices). The ConsensusDocs set of contract documents ([www.consensusdocs.org](http://www.consensusdocs.org)) is one source of industry-standard model language for such terms. The ConsensusDocs website includes a price escalation resource center (<https://www.consensusdocs.org/price-escalation-clause/>).

The parties may also want to discuss the best timing for ordering materials and components. Buying items earlier than usual can provide protection against cost increases. But purchase before use entails paying sooner for the items; potentially paying for storage, security against theft and damage, and insurance; and the possibility of design changes that make early purchase unwise.

# Conclusion

The construction industry is in the midst of a period of exceptionally steep and fast-rising costs for a variety of materials, compounded by major supply-chain disruptions and difficulty finding enough workers—a combination that threatens the financial health of many contractors. No single solution will resolve the situation, but there are steps that government officials, owners, and contractors can take to lessen the pain.

Federal trade policy officials can act immediately to end tariffs and quotas on imported products and materials. With many U.S. mills and factories already at capacity, bringing in more imports at competitive prices will cool the overheated price spiral and enable many users of products that are in short supply to avoid layoffs and shutdowns.

The federal government can improve the labor supply by allowing employers to sponsor more foreign-born workers to fill positions for which there are not enough qualified applicants. In addition, the federal government should fund and approve more apprenticeship and training programs to enable students and career-switchers to acquire the skills needed for construction trades.

Officials at all levels of government should review all regulations, policies, and enforcement actions that may be unnecessarily driving up costs and slowing importation, domestic production, transport, and delivery of raw materials, components, and finished goods.

Owners need to recognize that fast-changing materials costs and availability require a quick decision regarding bids and requests for changes. For new and planned projects, owners should expect quite different pricing from previous estimates. They may want to consider building in more flexibility regarding design, timing, or cost-sharing.

Contractors need, more than ever, to closely monitor costs and delivery schedules for materials and to communicate information with owners, both before submitting bids and throughout the construction process.

Materials prices do eventually reverse course. Owners and contractors alike will benefit when that happens. Until then, cooperation and communication can help reduce the damage.

## AGC resources

This document will be updated if market conditions warrant. Check for the latest edition at:  
<https://www.agc.org/learn/construction-data/agc-construction-inflation-alert> for the latest edition

The AGC website, [www.agc.org](http://www.agc.org), has a variety of resources available to contractors, owners, and others wanting to know more about the construction industry.

AGC posts tables showing changes in PPIs and national, state, and metro construction employment each month at:  
<https://www.agc.org/learn/construction-data>

AGC's Data DIGest is a weekly one-page summary of economic news relevant to construction. Subscribe at:  
[https://store.agc.org/Store/Store/StoreLayouts/Item\\_Detail.aspx?iProductCode=4401](https://store.agc.org/Store/Store/StoreLayouts/Item_Detail.aspx?iProductCode=4401)  
or email chief economist Ken Simonson at [ken.simonson@agc.org](mailto:ken.simonson@agc.org).

Construction documents are available for viewing and purchase from ConsensusDocs at [www.consensusdocs.org](http://www.consensusdocs.org), including the price escalation resource center, [www.consensusdocs.org/price-escalation-clause/](http://www.consensusdocs.org/price-escalation-clause/)