NRCA LEGAL RESOURCE CENTER

DECKS to DOCKETS

VIRTUAL LEGAL CONFERENCE

OCT. 13-15

Contractors Beware: Technical Issues Posing Liability Risks to Roofing Contractors

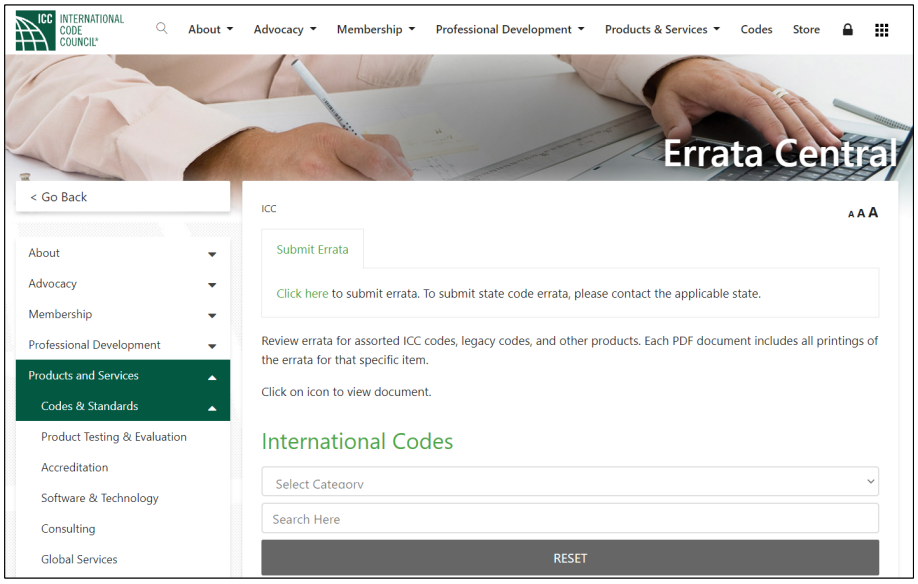
NRCA

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
Rosemont, Illinois

1

Errata to the I-codes

Errata Central: www.iccsafe.org/errata-central



2

A code question…

I have two existing roofs on a building. I understand the code says there is a two-roof maximum limit.

However, can I peel-off the topmost roof layer and install a new roof? In the end, I'd only have two roofs.

Does (2 – 1) + 1 = 2?

3

1511.3 Roof replacement. *Roof replacement* shall include the removal of all existing layers of roof coverings down to the roof deck.

Exception: Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507.

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1512
PHOTOVOLTAIC PANELS AND MODULES

1512.1 Photovoltaic panels and modules. *Photovoltaic panels* and *modules* installed on a roof or as an integral part of a roof assembly shall comply with the requirements of this code and the *International Fire Code*.

existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.

3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1511.4.
4. The application of a new protective roof coating over an existing protective roof coating, metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

1511.3.1.1 Exceptions. A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

1511.4 Roof recovering. Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other *approved* materials securely fastened in place.

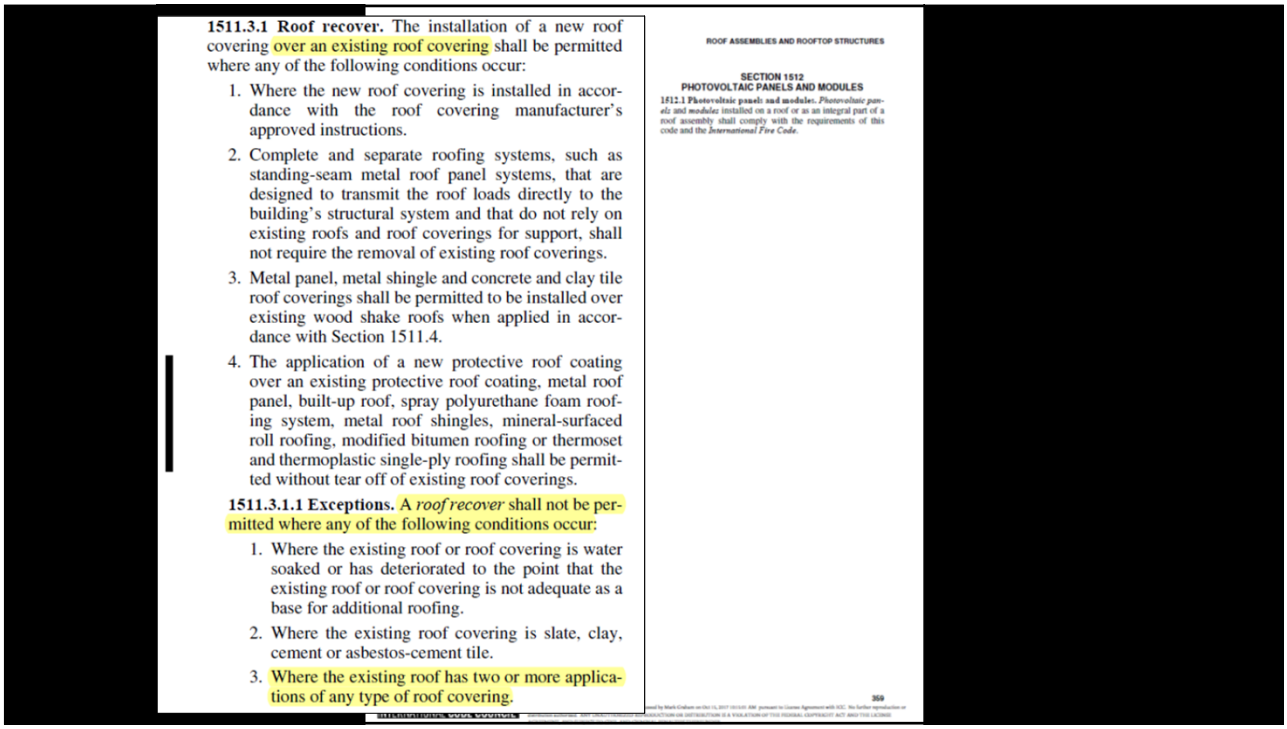
1511.5 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

1511.6 Flashings. Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

2018 INTERNATIONAL BUILDING CODE® 359

INTERNATIONAL CODE COUNCIL

4



1511.3.1 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. Where the new roof covering is installed in accordance with the roof covering manufacturer's approved instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1511.4.
4. The application of a new protective roof coating over an existing protective roof coating, metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

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ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1512
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359

5

So, does (2 – 1) + 1 = 2 in the Code?

No

6


RESEARCH+TECH

Consider alternatives

Code interpretations, modifications and alternatives provide some code compliance flexibility

by Mark S. Graham

Building codes by their nature tend to be relatively restrictive; they limit designs, materials and construction methods to those specifically prescribed in codes and meeting the codes' performance requirements. However, most codes also contain provisions that allow code officials to accept limited, project-specific modifications and alternatives to code requirements.

You should be aware of a code's interpretation, modification and alternative acceptance provisions because these may provide a basis for acceptance of roof system designs and roofing products that do not specifically comply with a code's requirements.

Alternative acceptance

In Chapter 1-Scope and Administration of the *International Building Code,® 2018 Edition*, Section 104-Duties and Powers of Building Official grants a code official the authority to enforce the code, render interpretations and adopt procedures to clarify the code's provisions. Such interpretations and procedures are not intended to waive code requirements.

Section 104.10-Modifications gives a code official authority to

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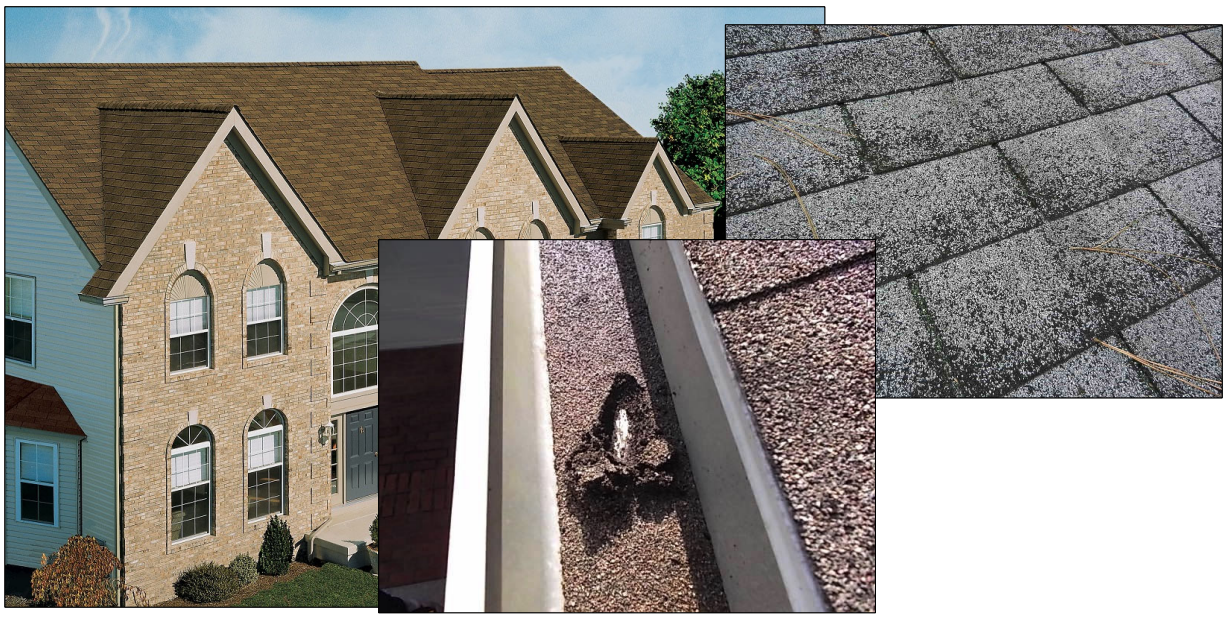
7

Granule loss on asphalt shingle roofs



8


RESEARCH+TECH

Know your steep-slope roof decks

Following plywood and OSB installation guidelines can help ensure a successful roof system performance

by Mark S. Graham

Plywood or oriented strand board structural panel sheathing are integral components of many steep-slope roof assemblies, and proper use of these products can help ensure successfully performing assemblies. If you use or encounter plywood and/or OSB structural panel sheathing roof decks, it is important to be knowledgeable of the applicable code requirements and APA–The Engineered Wood Association and NRCA guidelines applicable to them.

IRC 2018

The International Residential Code® provides specific requirements applicable to plywood and OSB structural panel sheathing used as roof decks for one- and two-family dwellings. In IRC's 2018 edition, specific requirements are provided in Section R803–Roof Sheathing.

IRC 2018 requires wood structural panels conform to the Department of Commerce's PS 1, "Structural Plywood," or PS 2, "Performance Standard for Wood-based Structural-Use Panels," or CSA Group™'s O325, "Construction Sheathing," or O437, "Standards on OSB and Waferboard." PS 1 and O325 generally are recognized to apply to plywood, and PS 2 and O437 apply to OSB.

22 professionalroofing.net DECEMBER/JANUARY 2020-21

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9

Standards for wood structural panels

International Residential Code, 2018 Edition

Plywood:

- U.S. Department of Commerce PS-1, "Structural Plywood"
- CSA Group O325, "Construction Sheathing"

Oriented-strand board (OSB):

- U.S. Department of Commerce PS-2, "Performance Standard for Wood-based Structural-use Panels"
- CSA Group O437, "Standards for OSB and Waferboard"

10

Common, but not referenced in the Code

Plywood and OSB:

- APA-The Engineered Wood Association Standard PRP-108, "Performance Standards and Policies for Structural-Use Panels"

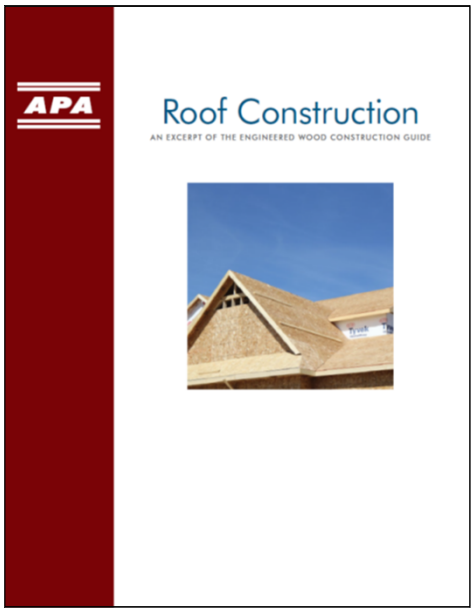
11

Roof sheathing attachment

IRC 2018 Table 602.3(1), Rows 30-32 (minimum attachment):

- Panel edges:
  - 2½-inch-long 8d common nails at 6 inches o.c. at supported panel edges
- Intermediate supports:
  - 2½-inch-long 8d common nails at 12 inches o.c. at intermediate supports

12



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APA Form E30, "Roof Construction"
--Roofing-specific excerpts from APA's *Engineered Wood Construction Guide* (102 pages)

13

Recommendations

Roof sheathing attachment

- **New construction:**
  - Be careful with deck "acceptance".
  - Deck acceptance should be limited to the visual surface and no visual presence of moisture on the surface
- **Reroofing:**
  - Since deck condition and attachment typically cannot be determined until roof covering tear-off, consider unit price or T & M pricing for deck replacement and/or deck re-fastening

14

RESEARCH+TECH

A new standard

Guidelines for synthetic underlayments

by Mark S. Graham

After more than eight years in development, in December 2020 ASTM International published the first U.S. product standard applicable to synthetic, sloop-slope underlayment products. If you are involved with the design or installation of sloop-slope roof systems, I encourage you to become familiar with this standard and begin to use it when specifying and procuring sloop-slope underlayment products.

ASTM D8257

ASTM D8257, "Standard Specification for Mechanically Attached Polymeric Roof Underlayment Used in Sloop Slope Roofing," addresses mechanically attached synthetic underlayment used in sloop-slope roof systems.

The standard defines polymeric underlayment as a sheet material primarily composed of polymers for use as a secondary water-shedding layer on sloop-slope roofs when installed below a primary roof covering.

The standard's objective is to provide a finished product that will be used as a water-shedding underlayment layer for sloop-sloped roofs prior to and after the installation of a primary sloop-slope roof covering.

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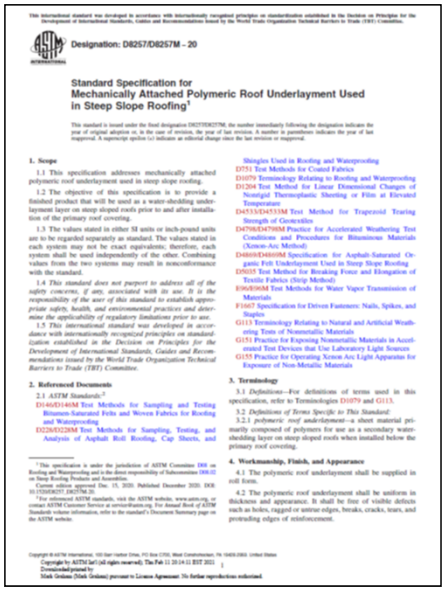
15



Designation: D8257/D8257M - 20

Standard Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing[1]

1. Scope

2. Referenced Documents

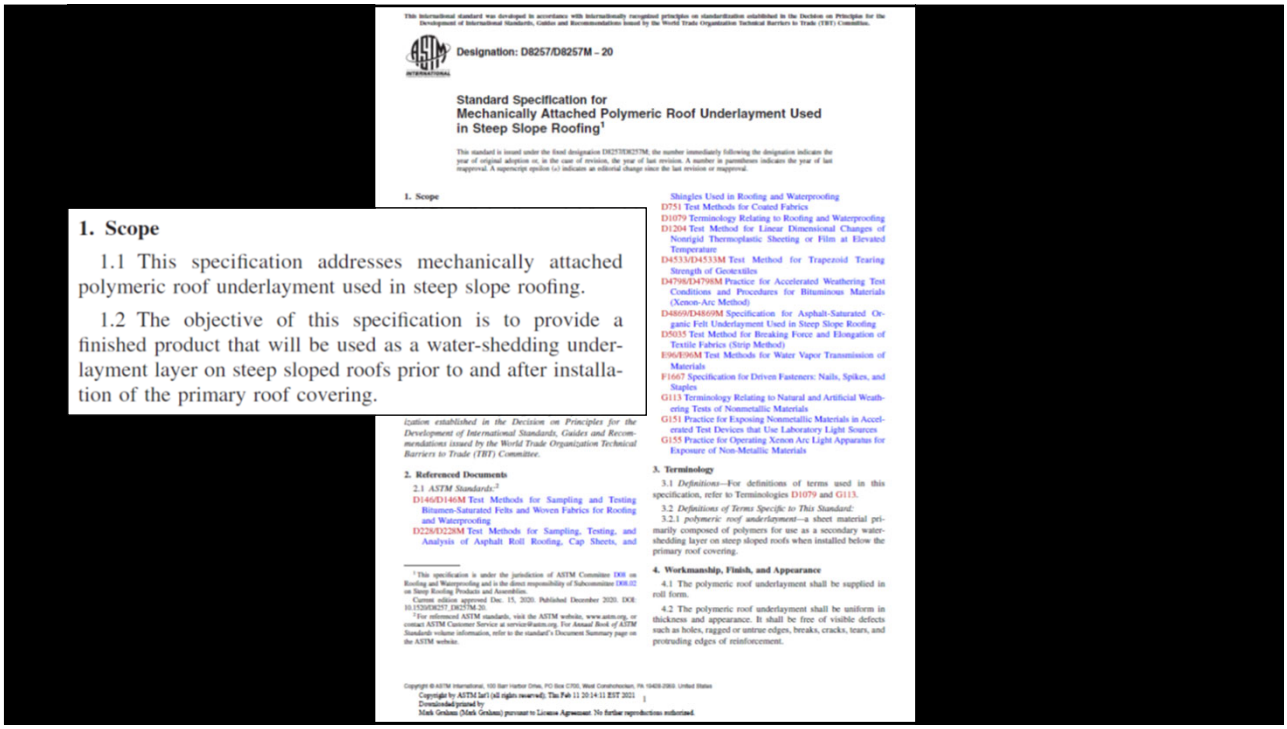
3. Terminology

4. Workmanship, Finish, and Appearance

ASTM D8257, "Standard Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing"

Published in December 2020

16



Designation: D8257/D8257M – 20

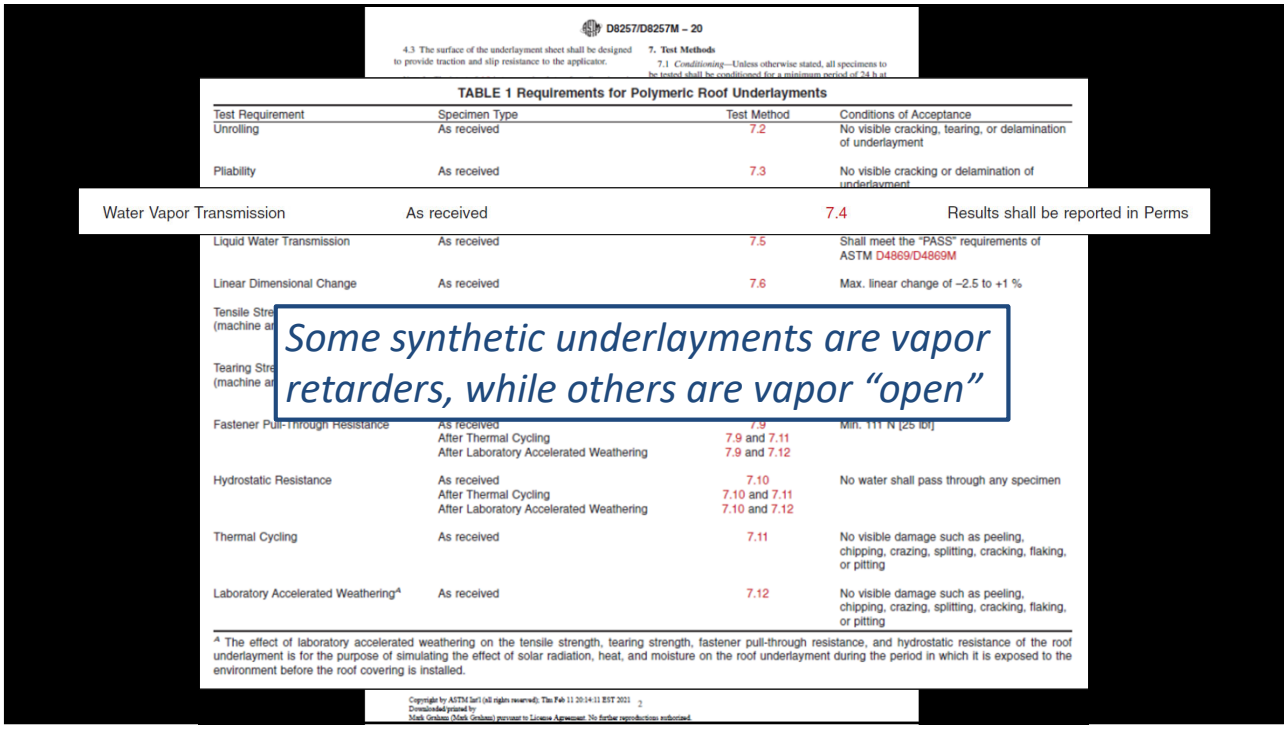
Standard Specification for
Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing[1]

1. Scope

1.1 This specification addresses mechanically attached polymeric roof underlayment used in steep slope roofing.

1.2 The objective of this specification is to provide a finished product that will be used as a water-shedding underlayment layer on steep sloped roofs prior to and after installation of the primary roof covering.

17



D8257/D8257M – 20

TABLE 1 Requirements for Polymeric Roof Underlayments

Test Requirement	Specimen Type	Test Method	Conditions of Acceptance
Unrolling	As received	7.2	No visible cracking, tearing, or delamination of underlayment
Pliability	As received	7.3	No visible cracking or delamination of underlayment
Water Vapor Transmission	As received	7.4	Results shall be reported in Perms
Liquid Water Transmission	As received	7.5	Shall meet the "PASS" requirements of ASTM D4869/D4869M
Linear Dimensional Change	As received	7.6	Max. linear change of –2.5 to +1 %
Tensile Stre (machine ar			
Tearing Stre (machine ar			
Fastener Pull-Through Resistance	As received After Thermal Cycling After Laboratory Accelerated Weathering	7.9 7.9 and 7.11 7.9 and 7.12	Min. 111 N [25 lbf]
Hydrostatic Resistance	As received After Thermal Cycling After Laboratory Accelerated Weathering	7.10 7.10 and 7.11 7.10 and 7.12	No water shall pass through any specimen
Thermal Cycling	As received	7.11	No visible damage such as peeling, chipping, crazing, splitting, cracking, flaking, or pitting
Laboratory Accelerated Weathering[A]	As received	7.12	No visible damage such as peeling, chipping, crazing, splitting, cracking, flaking, or pitting

[A] The effect of laboratory accelerated weathering on the tensile strength, tearing strength, fastener pull-through resistance, and hydrostatic resistance of the roof underlayment is for the purpose of simulating the effect of solar radiation, heat, and moisture on the roof underlayment during the period in which it is exposed to the environment before the roof covering is installed.

Some synthetic underlayments are vapor retarders, while others are vapor "open"

18

Conclusions and recommendations

Synthetic underlayments

- Specify, select and purchase synthetic underlayments based upon ASTM D8257
- Beware of specific products' vapor retarder or vapor "open" characteristics
- ASTM D8257 will first be introduced into IBC 2024 and IRC 2024
  - Until then, code official "acceptance" is still needed

19

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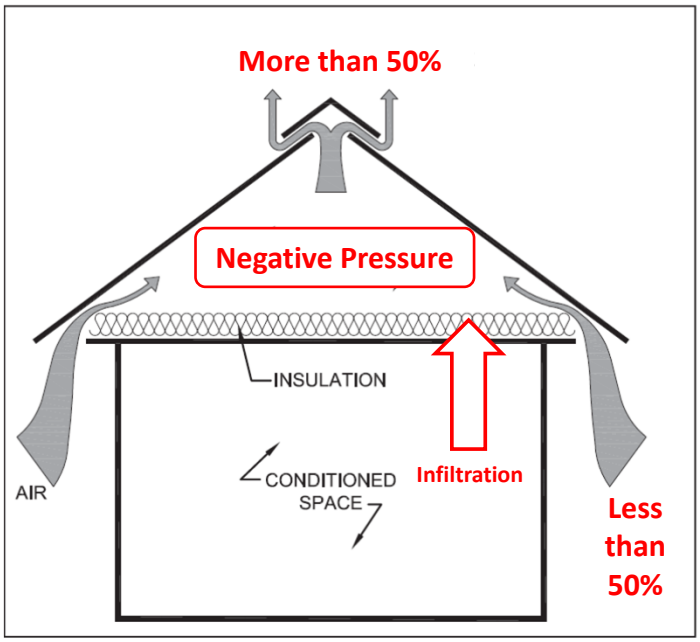
July 2018

20



21

Be careful not to install excess amounts of ridge vents…. It can have undesirable consequences

22

Construction-generated moisture

23

Reflective Roof Coverings: Experience and limited research has shown that non-adhered membrane roof systems with highly reflective roof surfaces can accumulate moisture while in service to a greater extent than roof systems without highly reflective roof surfaces. This phenomenon appears most pronounced in roof systems with only a single layer of rigid board insulation, which results in "thermal shorts" at the board joints through the thickness of the roof system.

A membrane roof system designed without a vapor retarder layer properly placed within the roof system's cross section may function as a "self-drying" roof assembly. That is, it will likely accumulate small amounts of moisture when the direction of moisture vapor flow is from the building's interior to its exterior and release that moisture or "dry down" toward the building's interior when the direction of vapor flow is from the building's exterior to its interior. Additional information regarding self-drying roof assemblies is provided in Section 2.2—Determining the Need for a Vapor Retarder.

In situations where a membrane roof system has a highly reflective roof surface, the membrane and the roof system's other layers will be cooler than a similar roof system without a highly reflective roof surface. As a result, roof systems with highly reflective roof surfaces will likely not dry down as quickly or to the same magnitude as roof systems without highly reflective roof surfaces.

To account for this phenomenon, NRCA recommends designers use a minimum of two layers of insulation in their membrane roof system designs and the two layers be installed with offset joints to minimize air leakage and movement and thermal shorts.

NRCA also suggests roof system designers consider the use of properly placed air retarders as components of roof systems with highly reflective roof surfaces. Additional information regarding air retarders in roof assemblies is provided in Chapter 4—Air Retarders for Roof Assemblies.

1.2 Principles of Moisture Vapor Movement

Phases: Water can exist in three phases: solid (i.e., ice), liquid (i.e., water) and gas (i.e., vapor). The phase in which water exists generally depends on its temperature and pressure. At atmospheric pressure conditions, water is generally:

- In its solid (crystalline) phase at temperatures below its freezing point, which is 32 F
- In its liquid phase between 32 F and 212 F
- In its gas phase at temperatures above its boiling point, which is 212 F

Water commonly moves from its liquid phase to its gas phase by evaporation even when the surrounding ambient temperature is less than the material's boiling point. At temperatures lower than the boiling point, heat energy can be transferred to water molecules and cause them to pass from the liquid phase into the gas phase. When water in its gas phase is cooled, it will lose energy and return to its liquid phase (i.e., condense).

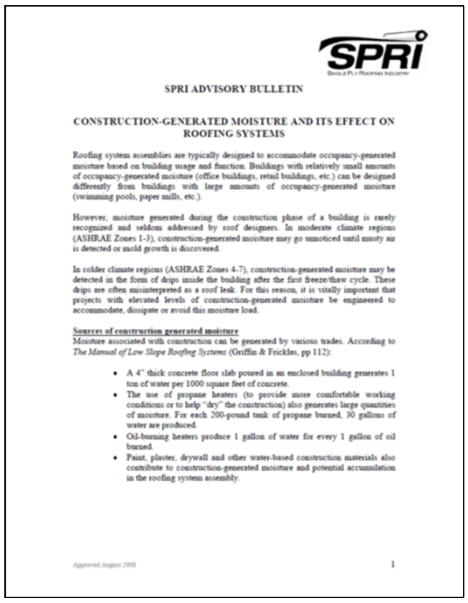
When water passes from its liquid phase to its gas phase in the atmosphere, the water vapor is contained in air and it exerts a pressure that is measurable (i.e., vapor pressure).

Relative Humidity: The amount of water in its gas phase (i.e., moisture vapor) that can be contained within a given volume of air is a function of temperature. This quantity is described by the term "relative humidity," which is sometimes abbreviated RH and expressed as a percentage. Relative humidity is the ratio of the partial pressure of water vapor in an air-water mixture to the maximum—or saturated—water vapor pressure at the same temperature. Partial pressure is the pressure a substance in its gas phase would have if it alone occupied the available volume. When air at a given temperature has a relative humidity of 100 percent, it is said to be saturated; that is, it cannot hold any more water vapor unless its temperature is raised. Warm air can hold a larger quantity of water vapor than cold air.

For example, a given volume of air will have a relative humidity of 100 percent at 60 F (i.e., dry bulb temperature on psychrometric chart). That same volume of air will have a relative humidity of only about 50 percent if the air is heated from 60 F to 80 F. Using the Psychrometric Chart, this relationship temperature versus relative humidity is illustrated in Figure 1-1 (on page 188).

Condensation: When moisture-saturated air is cooled, some of the moisture vapor contained in the air condenses—that is, the moisture vapor returns to its liquid phase. The temperature at which air becomes saturated with moisture vapor and condensation begins to form is referred to as the air's dew-point temperature.

24



SPRI ADVISORY BULLETIN

CONSTRUCTION-GENERATED MOISTURE AND ITS EFFECT ON ROOFING SYSTEMS

Roofing system assemblies are typically designed to accommodate occupancy-generated moisture based on building usage and function. Buildings with relatively small amounts of occupancy-generated moisture (office buildings, retail buildings, etc.) can be designed differently from buildings with large amounts of occupancy-generated moisture (swimming pools, paper mills, etc.).

However, moisture generated during the construction phase of a building is rarely recognized and seldom addressed by roof designers. In moderate climate regions (ASHRAE Zones 1-3), construction-generated moisture may go unnoticed until musty air is detected or mold growth is discovered.

In colder climate regions (ASHRAE Zones 4-7), construction-generated moisture may be detected in the form of drips inside the building after the first freeze/thaw cycle. These drips are often misinterpreted as a roof leak. For this reason, it is vitally important that projects with elevated levels of construction-generated moisture be engineered to accommodate, dissipate or avoid this moisture load.

Sources of construction generated moisture

Moisture associated with construction can be generated by various trades. According to *The Manual of Low Slope Roofing Systems* (Griffin & Fricklas, pp 112):

- A 4" thick concrete floor slab poured in an enclosed building generates 1 ton of water per 1000 square feet of concrete.
- The use of propane heaters (to provide more comfortable working conditions or to help "dry" the construction) also generates large quantities of moisture. For each 200-pound tank of propane burned, 30 gallons of water are produced.
- Oil-burning heaters produce 1 gallon of water for every 1 gallon of oil burned.
- Paint, plaster, drywall and other water-based construction materials also contribute to construction-generated moisture and potential accumulation in the roofing system assembly.

Approved August 2008 1

SPRI Advisory: Construction-Generated Moisture and Its Effect on Roofing Systems

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25

Some things we know…

Construction-generated moisture

- Cooler temperatures are more challenging than warmer temperatures
  - Cool air holds less moisture
- Some "modern" materials are less moisture tolerant
- Water-based products release moisture; more than solvent-based materials
- Concrete is placed using much more water than is necessary for proper hydration
- Many concrete admixtures slow moisture release

26

Some things we know (cont.)…

Construction-generated moisture

- Temporary enclosures can trap moisture/prevent moisture release
- Temporary heating can be problematic
  - Propane heaters release large amounts of moisture vapor
- Bringing warm, stored materials out into a cold environment can result in surface condensation

27

Recommendations

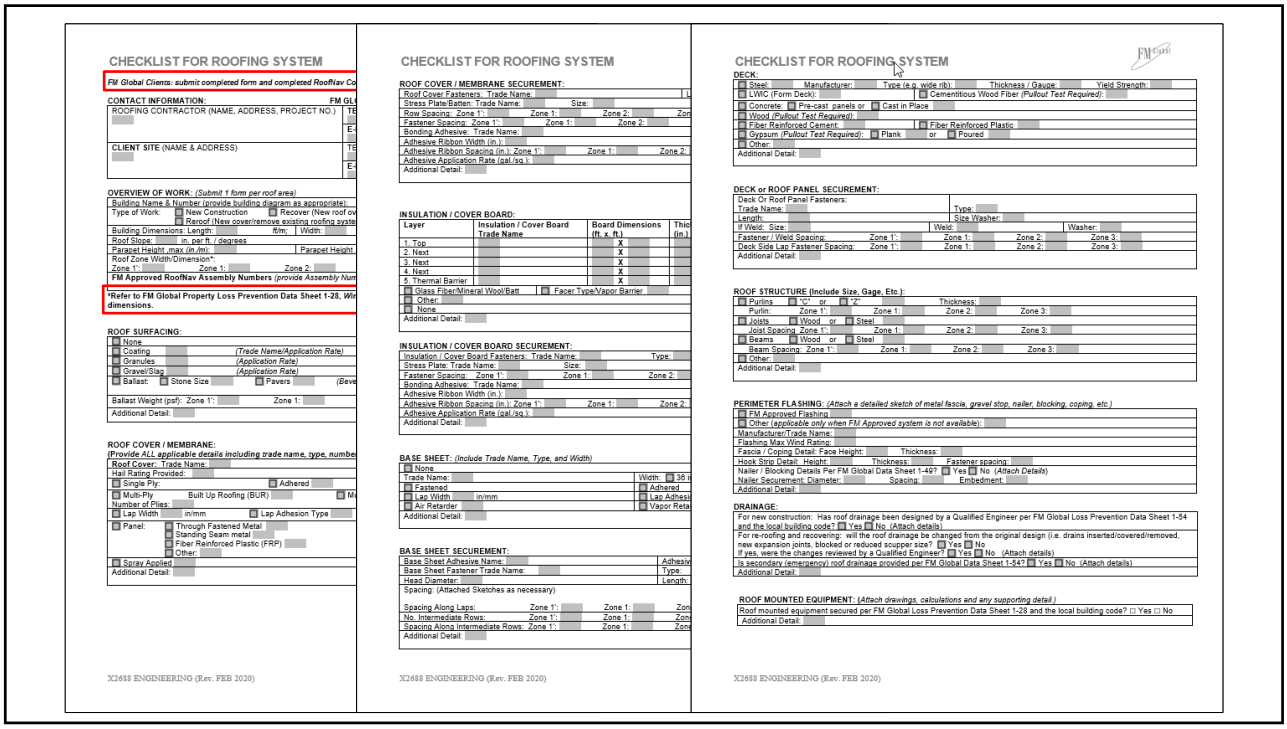
Construction-generated moisture

- Realize practical (and physical) limitations
- Consider appropriate contract provision language so you don't take on additional liability

28

FM Global-insured roofing project process

29



CHECKLIST FOR ROOFING SYSTEM

FM Global Clients: submit completed form and completed RoofNav Co

CONTACT INFORMATION: FM GL

ROOFING CONTRACTOR (NAME, ADDRESS, PROJECT NO.) | TE

CLIENT SITE (NAME & ADDRESS) | TE

OVERVIEW OF WORK: *(Submit 1 form per roof area)*

Building Name & Number (provide building diagram as appropriate):

Type of Work: New Construction Recover (New roof ov Reroof (New cover/remove existing roofing syste

Building Dimensions: Length ft/m, Width:

Roof Slope: in. per ft. / degrees

Parapet Height, max (in./m): Parapet Height

Roof Zone Width/Dimension*:

Zone 1': Zone 1: Zone 2:

FM Approved RoofNav Assembly Numbers *(provide Assembly Num*

***Refer to FM Global Property Loss Prevention Data Sheet 1-28, Wi dimensions.**

ROOF SURFACING:

None

Coating *(Trade Name/Application Rate)*

Granules *(Application Rate)*

Gravel/Slag *(Application Rate)*

Ballast: Stone Size Pavers *(Beve*

Ballast Weight (psf): Zone 1': Zone 1:

Additional Detail:

ROOF COVER / MEMBRANE:

(Provide ALL applicable details including trade name, type, numbe

Roof Cover: Trade Name:

Hail Rating Provided:

Single Ply: Adhered

Multi-Ply Built Up Roofing (BUR) Me

Number of Plies:

Lap Width: in/mm Lap Adhesion Type

Panel: Through Fastened Metal

Standing Seam metal

Fiber Reinforced Plastic (FRP)

Other:

Spray Applied

Additional Detail:

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CHECKLIST FOR ROOFING SYSTEM

ROOF COVER / MEMBRANE SECUREMENT:

Roof Cover Fasteners: Trade Name:

Stress Plate/Batten: Trade Name: Size:

Row Spacing: Zone 1': Zone 1: Zone 2: Zon

Fastener Spacing: Zone 1': Zone 1: Zone 2:

Bonding Adhesive: Trade Name:

Adhesive Ribbon Width (in.):

Adhesive Ribbon Spacing (in.): Zone 1': Zone 1: Zone 2:

Adhesive Application Rate (gal./sq.):

Additional Detail:

INSULATION / COVER BOARD:

Layer	Insulation / Cover Board Trade Name	Board Dimensions (ft. x. ft.)	Thic (in.)
1. Top		X	
2. Next		X	
3. Next		X	
4. Next		X	
5. Thermal Barrier		X	

Glass Fiber/Mineral Wool/Batt Facer Type/Vapor Barrier

Other:

None

Additional Detail:

INSULATION / COVER BOARD SECUREMENT:

Insulation / Cover Board Fasteners: Trade Name: Type:

Stress Plate: Trade Name: Size:

Fastener Spacing: Zone 1': Zone 1: Zone 2:

Bonding Adhesive: Trade Name:

Adhesive Ribbon Width (in.):

Adhesive Ribbon Spacing (in.): Zone 1': Zone 1: Zone 2:

Adhesive Application Rate (gal./sq.):

Additional Detail:

BASE SHEET: *(Include Trade Name, Type, and Width)*

None

Trade Name: Width: 36 i

Fastened Adhered

Lap Width: in/mm Lap Adhesi

Air Retarder Vapor Reta

Additional Detail:

BASE SHEET SECUREMENT:

Base Sheet Adhesive Name: Adhesiv

Base Sheet Fastener Trade Name: Type:

Head Diameter: Length:

Spacing: (Attached Sketches as necessary)

Spacing Along Laps: Zone 1': Zone 1: Zon

No. Intermediate Rows: Zone 1': Zone 1: Zon

Spacing Along Intermediate Rows: Zone 1': Zone 1: Zone

Additional Detail:

X2688 ENGINEERING (Rev. FEB 2020)

CHECKLIST FOR ROOFING SYSTEM

DECK:

Steel Manufacturer: Type (e.g. wide rib): Thickness / Gauge: Yield Strength:

LWIC (Form Deck): Cementitious Wood Fiber *(Pullout Test Required)*:

Concrete: Pre-cast panels or Cast in Place

Wood *(Pullout Test Required)*:

Fiber Reinforced Cement: Fiber Reinforced Plastic

Gypsum *(Pullout Test Required)*: Plank or Poured

Other:

Additional Detail:

DECK or ROOF PANEL SECUREMENT:

Deck Or Roof Panel Fasteners: Type:

Trade Name: Size Washer:

Length:

If Weld: Size: Weld: Washer:

Fastener / Weld Spacing: Zone 1': Zone 1: Zone 2: Zone 3:

Deck Side Lap Fastener Spacing: Zone 1': Zone 1: Zone 2: Zone 3:

Additional Detail:

ROOF STRUCTURE (Include Size, Gage, Etc.):

Purlins "C" or "Z" Thickness:

Purlin: Zone 1': Zone 1: Zone 2: Zone 3:

Joists Wood or Steel

Joist Spacing Zone 1': Zone 1: Zone 2: Zone 3:

Beams Wood or Steel

Beam Spacing: Zone 1': Zone 1: Zone 2: Zone 3:

Other:

Additional Detail:

PERIMETER FLASHING: *(Attach a detailed sketch of metal fascia, gravel stop, nailer, blocking, coping, etc.)*

FM Approved Flashing

Other *(applicable only when FM Approved system is not available)*:

Manufacturer/Trade Name:

Flashing Max Wind Rating:

Fascia / Coping Detail: Face Height: Thickness:

Hook Strip Detail: Height: Thickness: Fastener spacing:

Nailer / Blocking Details Per FM Global Data Sheet 1-49? Yes No *(Attach Details)*

Nailer Securement: Diameter: Spacing: Embedment:

Additional Detail:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Global Loss Prevention Data Sheet 1-54 and the local building code? Yes No (Attach details)

For re-roofing and recovering: will the roof drainage be changed from the original design (i.e. drains inserted/covered/removed, new expansion joints, blocked or reduced scupper size? Yes No

If yes, were the changes reviewed by a Qualified Engineer? Yes No (Attach details)

Is secondary (emergency) roof drainage provided per FM Global Data Sheet 1-54? Yes No (Attach details)

Additional Detail:

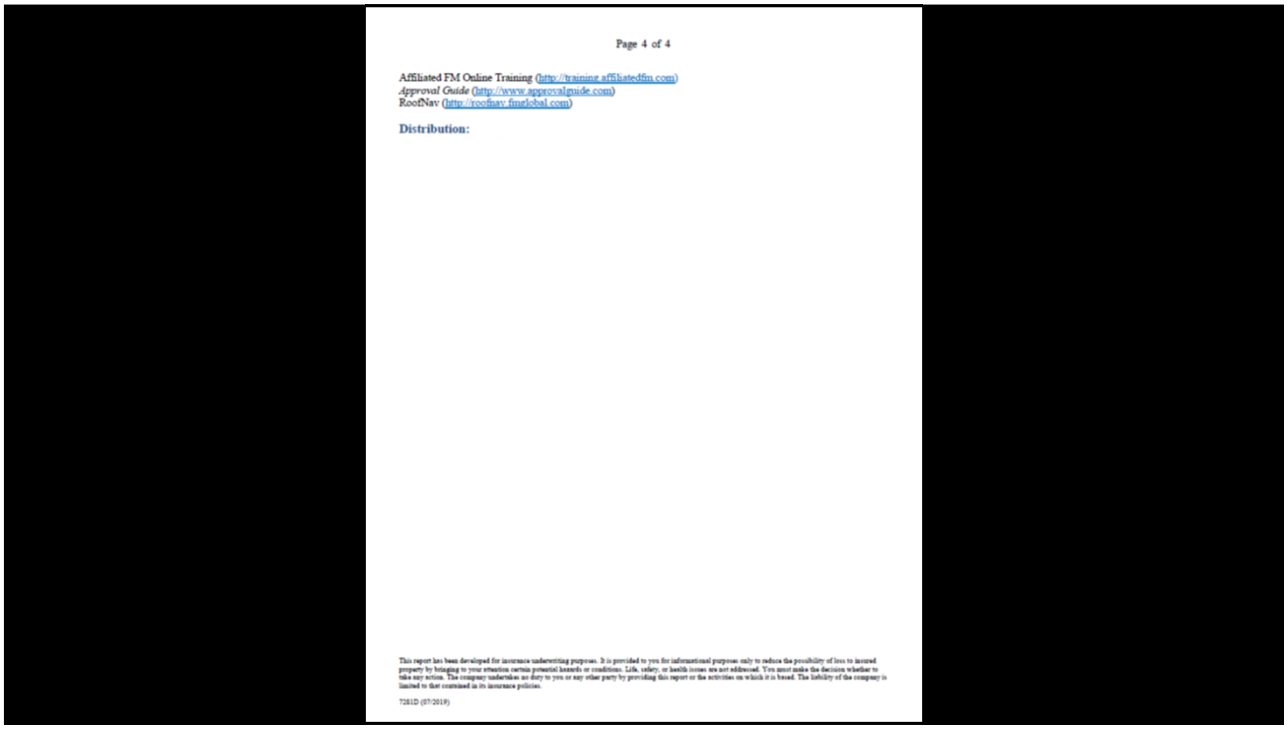
ROOF MOUNTED EQUIPMENT: *(Attach drawings, calculations and any supporting detail.)*

Roof mounted equipment secured per FM Global Loss Prevention Data Sheet 1-28 and the local building code? ☐ Yes ☐ No

Additional Detail:

X2688 ENGINEERING (Rev. FEB 2020)

30



Page 4 of 4

Affiliated FM Online Training (http://training.affiliatedfm.com)
Approval Guide (http://www.approvalguide.com)
RoofNav (http://roofnav.fmglobal.com)

Distribution:

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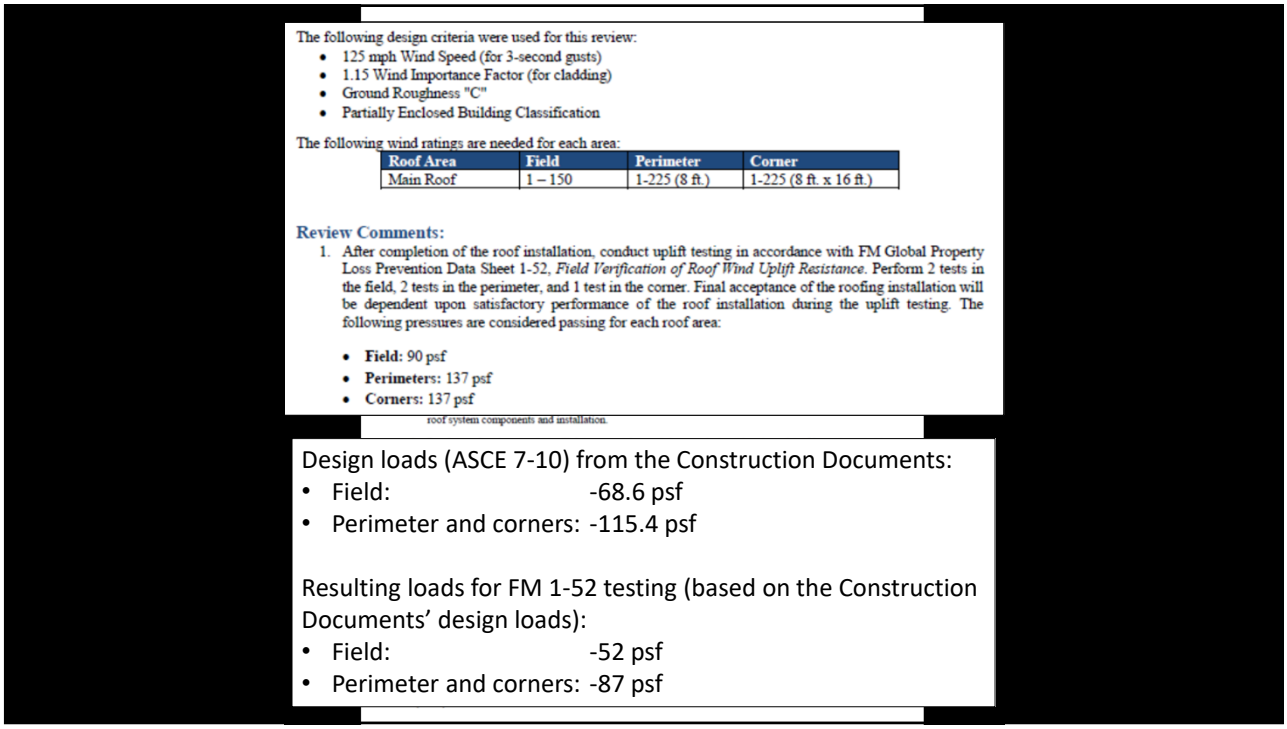
31



The following design criteria were used for this review:

- 125 mph Wind Speed (for 3-second gusts)
- 1.15 Wind Importance Factor (for cladding)
- Ground Roughness "C"
- Partially Enclosed Building Classification

The following wind ratings are needed for each area:

Roof Area	Field	Perimeter	Corner
Main Roof	1 – 150	1-225 (8 ft.)	1-225 (8 ft. x 16 ft.)

Review Comments:

1. After completion of the roof installation, conduct uplift testing in accordance with FM Global Property Loss Prevention Data Sheet 1-52, *Field Verification of Roof Wind Uplift Resistance*. Perform 2 tests in the field, 2 tests in the perimeter, and 1 test in the corner. Final acceptance of the roofing installation will be dependent upon satisfactory performance of the roof installation during the uplift testing. The following pressures are considered passing for each roof area:

   - **Field:** 90 psf
   - **Perimeters:** 137 psf
   - **Corners:** 137 psf

roof system components and installation.

Design loads (ASCE 7-10) from the Construction Documents:

- Field: -68.6 psf
- Perimeter and corners: -115.4 psf

Resulting loads for FM 1-52 testing (based on the Construction Documents' design loads):

- Field: -52 psf
- Perimeter and corners: -87 psf

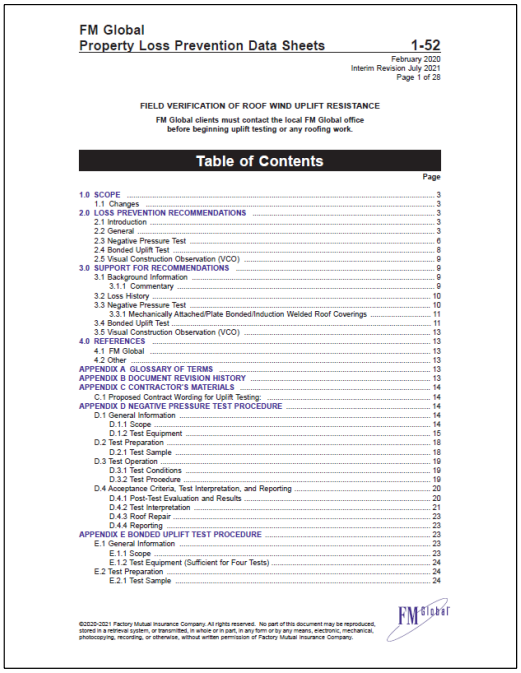
32

Conclusions and recommendations

FM Global-insured roofing project process

- FM Global/FM Approvals is not likely a party to the Contract for roofing work
  - FM Global makes recommendations to their insureds/building owner clients
  - FM Global should not be dictating to the Roofing Contractor
- A FM Global-insured roof assembly is a premium product
  - It is typically (well) above minimum code requirements
- Actively manage roofing projects for FM Global-insured clients

33



FM Global
Property Loss Prevention Data Sheets 1-52

February 2020
Interim Revision July 2021
Page 1 of 28

FIELD VERIFICATION OF ROOF WIND UPLIFT RESISTANCE

FM Global clients must contact the local FM Global office before beginning uplift testing or any roofing work.

Table of Contents

Page

FM 1-52: Field uplift testing

34

INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Field-uplift testing

ASTM E907 and FM 1-52 tests continue to be problematic

June 2015

NRCA continues to receive a significant number of reports from roofing contractors, manufacturers and designers regarding the use of and problems associated with field-uplift tests as post-installation quality assurance measures for membrane roof systems. NRCA has addressed these testing issues a number of times during the years. Following is a summary of NRCA's previous discussions, as well as updated information and recommendations.

ASTM E907/FM 1-52

There are two recognized field test methods for determining adhered membrane roof systems' uplift resistances: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Loss Prevention Data Sheet 1-52 (FM 1-52), "Field Verification of Roof Wind Uplift Resistance."

An example of a test chamber used for negative-pressure uplift testing

Both test methods are similar and provide for affixing a 5- by 5-foot dome-like chamber to a roof surface's topside and applying a defined negative (uplift) pressure inside the chamber to the roof system's exterior-side surface using a vacuum pump (see photo). During the test, membrane surface deflection inside the chamber is visually monitored and measured to determine whether a roof system passes or is "suspect."

Using ASTM E907, a roof system is considered to be suspect if the deflection measured during the test is 25 mm (about 1 inch) or greater. During FM 1-52 testing, a roof system is suspect if the measured deflection is between ¼ of an inch and 7/8 of an inch depending on the maximum test pressure: 1 inch where a thin topping board (cover board) is used; or 2 inches where a thin cover board or flexible, mechanically attached insulation is used.

If an ASTM E907 or FM 1-52 test yields a suspect result, a test cut should be taken in the test area to determine whether failure has occurred and the specific failure mode.

ASTM E907 and FM 1-52 differ notably in their test cycles and maximum test pressures for determining roof system deflections and whether a roof system passes or is suspect. ASTM E907 testing is conducted in 15-pounds per square foot (psf) pressure intervals up to the calculated design wind (uplift) pressure for the specific roof system being evaluated. FM 1-52 testing is conducted using an initial 15-pounds psf pressure followed by 7.5-pound psf increments up to a maximum test pressure of 1.25 times the design uplift pressure for the specific roof system being evaluated.

Considering maximum test loading and allowable test deflections in combination, FM 1-52 requires 25 percent higher test loads, yet only allows as little as ¼ the test deflection of ASTM E907. That said, FM 1-52 is a significantly more stringent test than ASTM E907.

ASTM E907 originally was published as a recognized consensus standard in 1983, and it was revised in 1996. In 2013, ASTM withdrew ASTM E907 because a consensus could not be reached regarding necessary revisions—most significantly, defining the test method's precision and bias (accuracy). ASTM E907-96 still is available for use and can be obtained directly from ASTM's website, www.astm.org.

FM 1-52 is an FM Global-promulgated evaluation method and not a recognized industry-consensus test standard. FM 1-52's scope indicates it only is intended to confirm acceptable wind-uplift resistance on completed roof systems in hurricane-prone regions, where a partial blow-off has occurred or where inferior roof system construction is suspected or known to be present.

FM 1-52 originally was published by FM Global in October 1970. The negative-pressure uplift test was added in August 1980 and has been revised several times. The current edition is dated July 2012 and includes an option for "visual construction observation (VCO)" as an alternative to negative-pressure uplift testing. VCO provides for full-time, third-party monitoring of a roof system application to verify roof system installation in accordance with contract documents.

NRCA Industry Issue Update

June 2015

Link

35

Field Verification of Roof Wind Uplift Resistance 1-52

FM Global Property Loss Prevention Data Sheets Page 3

1.0 SCOPE

This data sheet describes two methods of field testing new installations of above-deck roofing assemblies to determine if there is adequate wind resistance. It also provides alternative visual construction observation guidelines. Confirmation of acceptable wind uplift resistance on completed roof systems is critical in tropical cyclone-prone regions.

Field tests can be used to assess existing roofs for adequate wind resistance, but not to determine the cause of wind uplift damage after a storm event. Field tests are not applicable to metal panel roofs (standing seam and through fastened), ballasted roofs, or mechanically fastened covers with fasteners spaced more than 2 ft (0.6 m) apart in either direction.

1.1 Changes

July 2021. Interim revision. Updated the scope of this data sheet to clarify the intent of the document for existing situations. Also removed references to an incorrect FM Global form.

meets the specifications in this data sheet.

2.1.3 Have testing witnessed by the owner's representative.

2.1.4 Record the results of uplift tests or visual construction observation (VCO) and forward to the FM Global local servicing office. See Appendix C for a copy and suggested contract wording.

2.1.5 Have a roofing professional present to repair the test areas and return the roof area to a watertight condition should any of the tests fail.

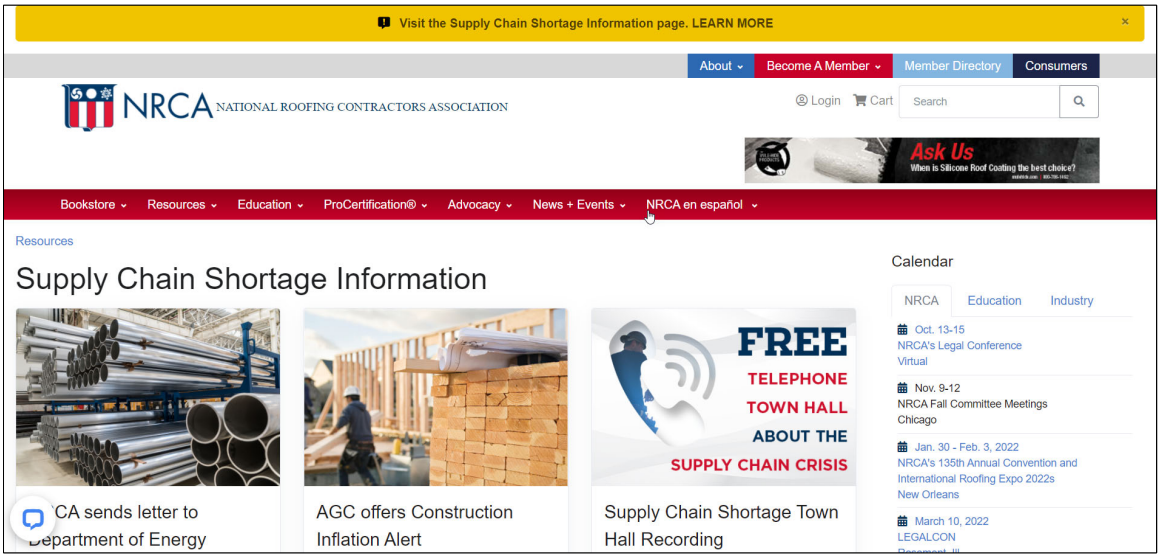
2.2 General

2.2.1 Prior to any testing, ensure adequate curing of roof adhesives in accordance with the manufacturer's instructions.

2.2.2 Select the appropriate field uplift test based on roof system per Table 2.2.2-1.

36

Material and product shortages and price volatility



37

INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Roofing material shortages and price volatility

September 2021

The U.S. roofing industry is experiencing unprecedented shortages of roofing materials and products and significant price volatility. NRCA is providing this Industry Issue Update to help its members with building owners, facility managers, general contractors and construction managers involved in roof purchasing decisions.

Although this information is intended to apply specifically to the U.S. roofing market, based on NRCA's communications with its affiliates and partners in Canada, Mexico and elsewhere worldwide, shortages of roofing materials and products and price volatility appear to be global issues.

BACKGROUND

Compared with other industries, the U.S. roofing industry is domestic in nature. With few exceptions, a vast majority of roofing products and materials used are manufactured in the U.S. from U.S.-sourced raw materials, delivered by U.S. suppliers and distributors, and installed by U.S. roofing contractor companies. Although the global economy has some effect on many purchasing decisions, the U.S. roofing industry is largely driven by the U.S. economy, interest rates and consumer sentiment.

During the past decade, the U.S. roofing industry has experienced a period of consistent, moderate growth. The roofing materials and products supply chain has expanded in capacity and roofing contractors have added field personnel and capability to fill this growing need. In many regions of the U.S., additional roofing industry growth has been limited by a lack of adequately trained field personnel.

At the same time, energy code requirements and sustainability incentive programs have resulted in a demand for more energy-efficient roof systems. For example, when reroofing a building, it is not unusual to replace an existing, aged roof system having an R-10 insulation value with a new roof system with an energy code mandated minimum R-20, R-25, R-30 or R-35 insulation value. Such increases in insulation value necessitate using greater amounts of and thicker insulation, usually in multiple layers, longer fasteners, more layers of insulation adhesive and additional material handling and installation labor.

The level of roofing material and product in inventory shrunk considerably

THE CURRENT SITUATION

The U.S. roofing industry responded and adapted to the onset of the COVID-19 pandemic remarkably well. The U.S. roofing industry quickly was considered "essential," and at the start of the pandemic, the roofing materials and products supply chain functioned with only minimal interruptions. Roofing contractors adapted to additional safe work practices necessary to perform work on occupied buildings during the pandemic.

By many measures, 2020 was a productive year for the U.S. roofing industry. For example, 2020 was a near historic record level year for asphalt shingle installations. Homeowners invested in reroofing and maintaining their homes during the pandemic, spurred in part by low interest rates and the availability of stimulus funding, and the roofing industry responded to several weather events involving high winds and hail. The institutional and industrial segments of the U.S. roofing industry also experienced similar levels of activity.

However, one noticeable change in the level of roofing material and product in inventory shrunk considerably. Roofing material suppliers and distributors reduced their material and product inventories. Since the start of the pandemic, far more roofing materials and products are being shipped on a job-specific basis. This especially is the case with roof insulation and roof covering products and certain specialty products, such as fasteners and adhesives. A few years ago, many roofing jobs often could be carried out with roofing materials and products held in inventory, but manufacturers now are shipping roofing materials and products on a job-specific basis with fewer roofing materials and products being stocked in inventory.

NRCA Industry Issue Update: Roofing Material Shortages and Price Volatility

Link

38


RESEARCH+TECH

Considering substitutions

Be aware of potential consequences with product substitution

by Mark S. Graham

With ongoing shortages of building materials and products, substitutions have become more commonplace—but they can have unintended consequences. One issue that has arisen involves substituting European lumber for North American lumber, a decision that could result in unintended consequences.

The situation

At the start of the COVID-19 pandemic, wood product producers were operating under the same uncertainty as the rest of the world. Many mills curtailed production in anticipation of worker shortages and reduced demand. At the same time, many wholesale and retail lumber customers significantly reduced inventory levels. Also, because of the Great Recession, several mills had closed permanently. The American Wood Council reports between 2007 and 2017, mill closures in the South resulted in a lumber capacity loss between 1.7 to 2 billion board feet. Mill closures in the Pacific Northwest represented 10% of the area's mills.

Although the demand for wood products had dipped, it quickly rebounded during the pandemic because of increased remodeling projects and new housing starts spurred, in part, by low interest

20 professionalroofing.net SEPTEMBER 2021

Professional Roofing
September 2021

Link

39

Questions… and other topics

40

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41