ROOFING TAC
WITH COMMENTS

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850-487-1824

Total Mods for report: 19

TAC: Roofing

Total Mods for **Roofing** in **Approved as Submitted: 6**

Total Mods for report: 19

Sub Code: Building

R7878

1

Date Submitted	12/14/2018	**Section**	1504	**Proponent**	Andy Williams
Chapter	15	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **Yes**

Related Modifications

Summary of Modification

New Section for Metal roof shingles that recognizes ASTM D3161 classification based on wind resistance code requirements.

Rationale

The proposal shows "wind resistance of metal roof shingles" as a separate item unlike asphalt shingles (1504.1.1) or other roof systems (1504.3.1) for non-ballasted roofs. Showing compliance with the FBC wind resistance requirements is necessary for proper evaluation.

UL580, UL1897, and FM4474 (used in “Other roof systems” including metal panel systems) are added test options for metal shingles. TAS 107, which directly states appropriateness for metal shingles, is added with ASTM equivalent D3161. UL has provided metal shingle wind classifications for many years and currently has D3161-related listings in the Online Certifications Directory.

D3161, created for asphalt shingles, was expanded in 2013 to include other discontinuous, air permeable, steep slope roofing products. This includes metal shingles (specifically identified in Section 1.3). UL was a proponent of the D3161 scope change showing support of D3161 to demonstrate wind resistance.

The proposal removes problems for metal shingle use by clarifying options to show compliance with the wind resistance code requirements. Included are uplift resistance methods used for many years (UL1897, UL580, FM4474), and accepted methods of fan-induced wind simulations (TAS 107, ASTM D3161) that are used for other discontinuous, air-permeable roof covers (asphalt shingles) and building integrated PV shingles. The fan-induced options provide alternatives for evaluation of air permeable metal shingles in a non-air-permeable manner via uplift resistance methods, which unfairly represents these products.

Table 1504.3.3 is added to establish recognition of metal shingles qualified via D3161. Classifications are equivalent to those for asphalt shingles (Table 1507.2.7.1). Shingles qualified via D3161 must to bear a label to show classification (Table 1504.3.3) - also required for asphalt shingles.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This alternate testing method should not impact the local enforcement entity

Impact to building and property owners relative to cost of compliance with code

This alternate testing method should not impact the property owner

Impact to industry relative to the cost of compliance with code

This alternate testing method will more accurately represent the performance of metal shingles and should eliminate non-representative testing costs.

Impact to small business relative to the cost of compliance with code

This alternate testing method should not impact small business and the cost of compliance

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This alternate testing method should not impact the health, safety, and welfare of the general public

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This alternate testing method will provide a realistic indicator of the performance of metal shingles

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This alternate testing method is not specific to any one product type however it does recognize the value of this method of testing to obtain accurate results

Does not degrade the effectiveness of the code

This alternate testing method should not degrade the effectiveness of the code and should make the code parallel to these same criteria that have already been recognized by the IBC.

Alternate Language

2nd Comment Period

7878-A1

Proponent Andy Williams **Submitted** 4/19/2019 **Attachments** Yes

Rationale

No change in text. Only change is Maximum Basic Wind Speed Figure reference. Used an incorrect reference. Corrected to be in accordance with 2017 FBC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No change from initial proposal

Impact to building and property owners relative to cost of compliance with code

No change from initial proposal

Impact to industry relative to the cost of compliance with code

No change from initial proposal

Impact to Small Business relative to the cost of compliance with code

This alternate testing method should not impact small business and the cost of compliance

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change from initial proposal

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No change from initial proposal

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change from initial proposal

Does not degrade the effectiveness of the code

No change from initial proposal

Add new text as follows:

1504.3.3 Metal roof shingles.

Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with FM 4474, UL 580, UL 1897, ASTM D3161, or TAS 107. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table 1504.3.3 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.3.3.

Add new table as follows:

TABLE 1504.3.3

CLASSIFICATION OF METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161

MAXIMUM BASIC WIND SPEED FROM FIGURE ~~1609A, B, C or ASCE 7~~ 1609.3(1), (2), (3) or ASCE 7	V_{asd}	ASTM D3161
110	85	D or F
116	90	D or F
129	100	D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

Add new text as follows:

1504.3.3 Metal roof shingles.

Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with FM 4474, UL 580, UL 1897, ASTM D3161, or TAS 107. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table 1504.3.3 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.3.3.

Add new table as follows:

TABLE 1504.3.3

CLASSIFICATION OF METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609A, B, C or ASCE-7	V_{asd}	ASTM D3161
110	85	D or F
116	90	D or F
129	100	D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

R7365

Date Submitted	11/20/2018	**Section**	3111	**Proponent**	Bryan Holland
Chapter	31	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments No

Alternate Language Yes

Related Modifications

7345, 7347, 7348

Summary of Modification

This proposed modification updates requirement for solar energy systems in the FBC-B.

Rationale

This proposed modification deletes the current requirements in Section 3111 and replaces them with the updated rules in 3111 of the 2018 IBC that have been correlated and harmonized with current industry standards and other applicable references. This change is similar to those proposed under Mods 7345, 7347, and 7348 for inclusion into the FBC-R. This change will also coordinate the FBC-B with the FFPC.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by coordinating the FBC-B with the FFPC for life, fire, and property safety related to solar energy system installations.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by updating the rules for solar energy systems in the FBC-B.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

Alternate Language

2nd Comment Period

7365-A2

Proponent Bryan Holland **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This alternative language comment simply corrects a pointer to the applicable section of the FFPC in 3111.3.4 related to access and pathways. "Section 1204" is replaced with "Section 11.12.2.2".

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This alternative language comment will have no impact on the local entity.

Impact to building and property owners relative to cost of compliance with code

This alternative language comment will have no impact on building owners.

Impact to industry relative to the cost of compliance with code

This alternative language comment will have no impact on industry.

Impact to Small Business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This alternative language comment corrects an error in the code which relates directly to the health, safety, and welfare of the public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This alternative language comment improves the code by correcting an error.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This alternative language comment does not discriminate against any materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This alternative language comment enhances the effectiveness of the code by correcting an error.

Alternate Language

2nd Comment Period

7365-A1

Proponent John Hall **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This alternate language does not alter the text of the modification. It only adds references to appropriate code sections to make the modification applicable to the high velocity hurricane zone.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to Small Business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by coordinating the FBC-B with the FFPC for life, fire and property safety related to solar energy system installations throughout Florida including the HVHZ.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code by updating the rules for solar energy systems in the FBC-B throughout Florida including the HVHZ.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

SECTION 3111

SOLAR ENERGY SYSTEMS

3111.1 General. Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind resistance. Rooftop-mounted photovoltaic panels and modules and solar thermal collectors shall be designed in accordance with Section 1609.

3111.1.2 Roof live load. Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.13.5.

3111.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with the Florida Building Code-Plumbing, the Florida Building Code-Mechanical, and the Florida Fire Prevention Code.

3111.2.1 Equipment. Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic solar energy systems. Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the Florida Fire Prevention Code, NFPA 70 and the manufacturer's installation instructions.

3111.3.1 Equipment. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire classification. Rooftop-mounted photovoltaic systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section 1505.8.

3111.3.3 Building-integrated photovoltaic systems. Building-integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 1507.18.

3111.3.4 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Section ~~1204~~ 11.12.2.2 of the Florida Fire Prevention Code.

3111.3.5 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Chapter 16 and the Florida Fire Prevention Code.

3111.3.5.1 Fire separation distances. Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

~~SECTION 3111~~

~~PHOTOVOLTAIC PANELS AND MODULES~~

~~3111.1 General. Photovoltaic panels and modules shall comply with the requirements of this code and the Florida Fire Prevention Code.~~

~~3111.1.1 Rooftop-mounted 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 Chapter 15 and the Florida Fire Prevention Code.~~

SECTION 3111

SOLAR ENERGY SYSTEMS

3111.1 General. Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind resistance. Rooftop-mounted photovoltaic panels and modules and solar thermal collectors shall be designed in accordance with Section 1609. For buildings and structures located within the high-velocity hurricane zone refer to Section 1620.

3111.1.2 Roof live load. Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.13.5.

3111.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with the Florida Building Code-Plumbing, the Florida Building Code-Mechanical, and the Florida Fire Prevention Code.

3111.2.1 Equipment. Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic solar energy systems. Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the Florida Fire Prevention Code, NFPA 70 and the manufacturer's installation instructions.

3111.3.1 Equipment. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire classification. Rooftop-mounted photovoltaic systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section 1505.8. For buildings and structures located within the high-velocity hurricane zone refer to Section 1516.

3111.3.3 Building-integrated photovoltaic systems. Building-integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 1507.18. For buildings and structures located within the high-velocity hurricane zone refer to Section 1518.11.

3111.3.4 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Section 1204 of the Florida Fire Prevention Code.

3111.3.5 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Chapter 16 and the Florida Fire Prevention Code.

3111.3.5.1 Fire separation distances. Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

~~SECTION 3111~~

~~PHOTOVOLTAIC PANELS AND MODULES~~

~~3111.1 General. Photovoltaic panels and modules shall comply with the requirements of this code and the Florida Fire Prevention Code.~~

~~3111.1.1 Rooftop-mounted 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 Chapter 15 and the Florida Fire Prevention Code.~~

SECTION 3111

SOLAR ENERGY SYSTEMS

3111.1 General. Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind resistance. Rooftop-mounted photovoltaic panels and modules and solar thermal collectors shall be designed in accordance with Section 1609.

3111.1.2 Roof live load. Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.13.5.

3111.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with the Florida Building Code-Plumbing, the Florida Building Code-Mechanical, and the Florida Fire Prevention Code.

3111.2.1 Equipment. Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic solar energy systems. Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the Florida Fire Prevention Code, NFPA 70 and the manufacturer's installation instructions.

3111.3.1 Equipment. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire classification. Rooftop-mounted photovoltaic systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section 1505.8.

3111.3.3 Building-integrated photovoltaic systems. Building-integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 1507.18.

3111.3.4 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Section 1204 of the Florida Fire Prevention Code.

3111.3.5 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Chapter 16 and the Florida Fire Prevention Code.

3111.3.5.1 Fire separation distances. Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

~~SECTION 3111~~

~~PHOTOVOLTAIC PANELS AND MODULES~~

~~3111.1 General. Photovoltaic panels and modules shall comply with the requirements of this code and the Florida Fire Prevention Code.~~

~~3111.1.1 Rooftop-mounted 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 Chapter 15 and the Florida Fire Prevention Code.~~

SECTION 3111

SOLAR ENERGY SYSTEMS

3111.1 General. Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind resistance. Rooftop-mounted photovoltaic panels and modules and solar thermal collectors shall be designed in accordance with Section 1609. For buildings and structures located within the high-velocity hurricane zone refer to Section 1620.

3111.1.2 Roof live load. Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.13.5.

3111.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with the Florida Building Code-Plumbing, the Florida Building Code-Mechanical, and the Florida Fire Prevention Code.

3111.2.1 Equipment. Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic solar energy systems. Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the Florida Fire Prevention Code, NFPA 70 and the manufacturer's installation instructions.

3111.3.1 Equipment. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703. Inverters shall be listed and

labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire classification. Rooftop-mounted photovoltaic systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section 1505.8. For buildings and structures located within the high-velocity hurricane zone refer to Section 1516.

3111.3.3 Building-integrated photovoltaic systems. Building-integrated photovoltaic systems that serve as roof coverings shall be designed and installed in accordance with Section 1507.18. For buildings and structures located within the high-velocity hurricane zone refer to Section 1518.11.

3111.3.4 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Section 1204 of the Florida Fire Prevention Code.

3111.3.5 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Chapter 16 and the Florida Fire Prevention Code.

3111.3.5.1 Fire separation distances. Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

Sub Code: Existing Building

R7219

3

Date Submitted	11/8/2018	**Section**	706.7.2.1	**Proponent**	Gaspar Rodriguez
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **Yes**

Related Modifications

Summary of Modification

The current language does not correctly describe the limitation on the width of the modified bitumen tape that can be used as a secondary water barrier.

Rationale

This modification indicates the limitation to the width of the modified bitumen tape. This allows for the user to easily understand the current code requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Provides language to properly indicate current code requirements.

Impact to building and property owners relative to cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Impact to industry relative to the cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Impact to small business relative to the cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Allows the users of the code to more easily understand the current code requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by creating a more understandable document.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require use of any specific type of products.

Does not degrade the effectiveness of the code

No, it does not degrade, it allows for a more precise interpretation.

2nd Comment Period

7219-A1

Proponent Gaspar Rodriguez **Submitted** 4/22/2019 **Attachments** Yes

Rationale

This modification indicates the limitation to the width of the modified bitumen tape. This allows for the user to easily understand the current code requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Provides language to properly indicate current code requirements.

Impact to building and property owners relative to cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Impact to industry relative to the cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Impact to Small Business relative to the cost of compliance with code

No impact. Provides language to properly indicate current code requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Allows the users of the code to more easily understand the current code requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by creating a more understandable document.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require use of any specific type of products.

Does not degrade the effectiveness of the code

No, it does not degrade, it allows for a more precise interpretation.

706.7.2 Roof secondary water barrier for site-built single family residential structures. A secondary water barrier shall be installed using one of the following methods when roof covering is removed and replaced:

1. In High-Velocity Hurricane Zone regions:

a) All joints in structural panel roof sheathing or decking shall be covered with a ~~minimum 4 inch (102 mm) wide~~ strip of self-adhering polymer modified bitumen tape not to exceed six inches (153 mm) in width, applied directly to the sheathing or decking. The deck and self-adhering polymer modified bitumen tape shall be covered with one of the underlayment systems approved for the particular roof covering to be applied to the roof.

706.7.2 Roof secondary water barrier for site-built single family residential structures. A secondary water barrier shall be installed using one of the following methods when roof covering is removed and replaced:

1. In High-Velocity Hurricane Zone regions:

a) All joints in structural panel roof sheathing or decking shall be covered with a ~~minimum~~ 4 inch (102 mm) to six inch (153 mm) wide strip of self-adhering polymer modified bitumen tape applied directly to the sheathing or decking. The deck and self-adhering polymer modified bitumen tape shall be covered with one of the underlayment systems approved for the particular roof covering to be applied to the roof.

Sub Code: Residential

R7967

4

Date Submitted	12/14/2018	**Section**	905	**Proponent**	Andy Williams
Chapter	9	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments No

Alternate Language Yes

Related Modifications

R301.2.1

Summary of Modification

Addition of Wind Resistance testing ASTM D3161 to measure metal roof shingle wind resistance performance

Rationale

This proposal recognizes wind resistance of metal roof shingles as a separate item, R905.4.4.1. These items are not the same as asphalt shingles, R905.2.4.1. Showing compliance with the FRC wind resistance requirements is necessary for proper evaluation. UL580, UL1897, and FM4474, currently recognized in the FBC for “Other roof systems,” including metal panel systems, are added as options for metal shingles. TAS 107, which directly states its appropriateness for metal shingles, is added with ASTM equivalent D3161. UL has provided metal shingle wind classifications for many years and currently has D3161-related listings in the Online Certifications Directory.

D3161, created for asphalt shingles, was expanded in 2013 to include other discontinuous, air permeable, steep slope roofing products. This includes metal shingles (specifically identified in Section 1.3). UL was a proponent of the D3161 scope change showing support of D3161 to demonstrate wind resistance.

This proposal removes problems for metal shingle use by clarifying options to show compliance with the wind resistance code requirements. Included are uplift resistance methods used in the FBC for many years (UL1897, UL580, FM4474), and accepted methods of fan-induced wind simulations (TAS 107, ASTM D3161) that are used for other discontinuous, air-permeable roof covers (asphalt shingles) and building integrated PV shingles. The fan-induced options provide alternatives for evaluation of air permeable metal shingles in a non-air-permeable manner via the uplift resistance methods, which unfairly represents the products.

Table R905.4.4.1 is added to establish recognition of metal shingles qualified via D3161. Classifications are equivalent to those for asphalt shingles (Table R905.2.6.1). Like asphalt, metal shingles qualified via D3161 must to bear a label and classification (Table R905.4.4.1).

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal should have no additional impact on enforcement of the code

Impact to building and property owners relative to cost of compliance with code

This proposal should have no additional cost impact for compliance with the code

Impact to industry relative to the cost of compliance with code

This proposal should have no additional cost impact for compliance with the code

Impact to small business relative to the cost of compliance with code

This proposal should have no additional cost impact for compliance with the code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal should provide realistic performance information to better ensure safety through code compliance.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal provides more accurate performance information on this type of roofing system.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal provides more accurate performance information on this type of roofing system.

Does not degrade the effectiveness of the code

This proposal provides more accurate performance information on this type of roofing system.

Alternate Language

2nd Comment Period

7967-A2

Proponent Andy Williams **Submitted** 4/19/2019 **Attachments** Yes

Rationale

The only modification is within the table and a change in reference in the first column. The wrong tables 1609A, B, C or ASCE-7 were called out and it should have been table R301.2(4) or ASCE-7

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No change to the original proposed modification

Impact to building and property owners relative to cost of compliance with code

No change to the original proposed modification

Impact to industry relative to the cost of compliance with code

No change to the original proposed modification

Impact to Small Business relative to the cost of compliance with code

This proposal should have no additional cost impact for compliance with the code

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No change to the original proposed modification

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No change to the original proposed modification

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No change to the original proposed modification

Does not degrade the effectiveness of the code

No change to the original proposed modification

Add new text as follows:

R905.4.4.1 Wind Resistance of Metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580, UL 1897, or TAS 107. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table R905.2.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.4.4.1.

Add new table as follows:

TABLE R905.4.4.1

CLASSIFICATION OF METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161

MAXIMUM BASIC WIND SPEED FROM FIGURE ~~1609A, B, C or ASCE-7~~ R301.2(4) or ASCE-7	V_{asd}	ASTM D3161
110	85	D or F
116	90	D or F
129	100	D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

Modify existing text as follows

R301.2.1Wind design criteria.

Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, and exterior doors (other than garage doors). Where loads for garage doors are not otherwise specified, the loads listed in Table R301.2(4) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. Metal roof shingles shall be designed for wind speeds in accordance with Section R905.4.4. A continuous load path shall be provided to transmit the applicable uplift forces from the roof assembly to the foundation.

Add new text as follows

R905.4.4.1

R905.4.4.1 Wind Resistance of Metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580, UL 1897 or TAS 107. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table R905.2.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.4.4.1.

Add new table as follows:

TABLE R905.4.4.1

CLASSIFICATION OF METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161

MAXIMUM BASIC WIND SPEED FROM FIGURE 1609A, B, C or ASCE-7	V_{asd}	ASTM D3161
110	85	D or F
116	90	D or F
129	100	D or F
142	110	F
155	120	F
168	130	F
181	140	F
194	150	F

Modify existing text as follows

R301.2.1Wind design criteria.

Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in Table R301.2(1) as determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, and exterior doors (other than garage doors). Where loads for garage doors are not otherwise specified, the loads listed in Table R301.2(4) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.4. Metal roof shingles shall be designed for wind speeds in accordance with Section R905.4.4. A continuous load path shall be provided to transmit the applicable uplift forces from the roof assembly to the foundation.

Sub Code: Test Protocols

R8282

5

Date Submitted	12/15/2018	**Section**	1	**Proponent**	Chadwick Collins
Chapter	TAS 103	**Affects HVHZ**	Yes	**Attachments**	Yes

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **Yes**

Alternate Language **Yes**

Related Modifications

RAS TAS

Summary of Modification

HVHZ Roofing Updates

Rationale

The Asphalt Roofing Manufacturers Association staff and volunteers and the Miami-Dade roofing product staff team worked together over the past year to perform a thorough review of the HVHZ requirements for asphalt roofing, and underlayment materials, as well as related RAS and TAS protocols. Many of these requirements have not been updated in decades; this review is an attempt to correlate the FBC with other changes that have occurred within the FBC, at ASCE, and with other standards developers including ASTM International. ARMA has submitted a series of code modifications that reflect that effort.

These proposed modifications include:

- Removal of references to withdrawn standards.
- Removal of references to legacy documents, including ICBO acceptance criteria.
- Updates to referenced standards, including name changes.
- Updates to performance criteria to reflect changes in referenced standards.
- Modifications to certain initial and aged performance values for test requirements to more accurately reflect the intent of the code.
- Removal of redundant or unnecessary requirements.
- Editorial changes and grammatical corrections.

ARMA would like to thank the staff at Miami-Dade for their efforts in working through this very tedious process.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

$0

Impact to building and property owners relative to cost of compliance with code

$0

Impact to industry relative to the cost of compliance with code

Reduced product approval expense

Impact to small business relative to the cost of compliance with code

$0

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Updates important roofing requirements for HVHZ use.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Removes outdated references

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require use of any specific type of product.

Does not degrade the effectiveness of the code

Ensures that the code is up to date with available research and referenced standards.

Alternate Language

2nd Comment Period

8282-A1

Proponent Riku Ylipelkonen **Submitted** 5/15/2019 **Attachments** Yes

Rationale

The requirement for 10 psi matches what is required in AC152 currently for the 120 day period. The old 15 psi requirement was based on available test results of first generation products available at the time of writing the original criteria, and had no basis for performance on the roof. ICP manufactures and markets roof tile adhesives for this application, and supports the 10 psi requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

$0

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

New requirement of 10psi is consistent with AC152.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

New requirement of 10psi is consistent with AC152.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

New requirement of 10psi is consistent with AC152.

Does not degrade the effectiveness of the code

Makes RAS TAS protocols equivalent to requirements in ICC AC152.

2nd Comment Period

R8282-G1

Proponent Michael Silvers (FRSA **Submitted** 5/23/2019 **Attachments** No

Comment:

We support the alternative language in the previous comment.

23.4 The average tensile adhesion of (5) specimens after 0, 14, 60, and 120 days shall be min. ~~15~~ 10 psi. Any set of specimens with an average tensile adhesion below ~~15~~ 10 psi will be considered as having failed this test.

See attached file.

TESTING APPLICATION STANDARD (TAS) No. 103-~~95~~ 20
TEST PROCEDURE FOR SELF-ADHERED UNDERLAYMENTS FOR USE IN ~~DISCONTINUOUS~~ TILE ROOF SYSTEMS

1. Scope

1.1 This Protocol covers procedures for testing self-adhering, prefabricated~~, reinforced~~, polymer modified bituminous, and solid thermoplastic sheet roofing materials intended for use as underlayment in ~~Discontinuous~~ Tile Roof Systems to assist in the waterproofing to function in combination with a Prepared Roof Covering. These products may employ granular or particulate surfacing materials on one side. The Granular Adhesion test shall be required for all granular surfaced materials used as a bonding surface for mortar or adhesive set tile systems.

1.2 The test procedures outlined in this Protocol cover the determination of the Wind Uplift Resistance; the Thickness; the Dimensional Stability; the Tear Resistance; the Breaking Strength; the Elongation; ~~the Water Absorption;~~ the Low Temperature Flexibility; the Ultraviolet Resistance; the Accelerated Aging Performance; the Cyclic Elongation Performance; the Water Vapor Transmission; the Compound Stability; the Puncture Resistance; the Tile Slippage Resistance; ~~the Crack Cycling Resistance; and~~ the Peel Resistance; the Accelerated Weathering Performance of an underlayment material; the Tensile Adhesion properties of the exposed surface of the underlayment; and Granular Adhesion ~~of a mineral~~ for granular surfaced ~~roll roofing material, for use as an~~ underlayment.

1.3 These test methods appear in the following order:

	Section
Conditioning	5
Thickness	6
Wind Uplift	7
Dimensional Stability	8
Tear Resistance	9
Breaking Strength and Elongation	10
Reserved	11
Low Temperature Flexibility	12
Ultraviolet Resistance	13
Accelerated Aging	14
Cyclic Elongation	15
Water Vapor Transmission	16
Compound Stability	17
Puncture Resistance	18
Tile Slippage Resistance	19
~~Crack Cycling~~ Reserved	20
Peel Resistance	21
Granule Adhesion	22
Tensile Adhesion	23
Accelerated Weathering	24

2. Referenced Documents

2.1 *ASTM Test Standards:*

~~C 794 Adhesion in Peel of Elastomeric Joint Sealants~~
~~D 570 Water Absorption of Plastics~~
D 1079 Standard Definitions and Terms Relating to Roofing, Waterproofing and Bituminous Materials
~~D 1938 Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method~~
D 4073 Standard Test Method For Tensile Tear Strength of Bituminous Roofing Membranes
D 1970 Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (Low Temperature Flexibility)
D 2523 Testing Load-Strain Properties of Roofing Membranes
D 1623 Standard Test Method For Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
D 5147 Sampling and Testing Modified Bituminous Sheet Materials
E 96 Water Vapor Transmission of Materials
E 380 Excerpts from the Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)

2.2 *Reserved*

2.3 *Reserved*

2.4 *The Florida Building Code, Building.*

2.5 *Application Standards*

TAS 124 Test Procedure for Field Uplift Testing of Existing Membrane Roof Systems

2.6 *Reserved*

3. Terminology & Units

3.1 Definitions - For definitions of terms used in this Protocol, refer to ASTM D 1079; Chapters 2 and 15 (High-Velocity Hurricane Zones) of the *Florida Building Code, Building.* The definitions from the *Florida Building Code, Building* shall take precedence.

3.2 Units - For conversion of U.S. customary units to SI units, refer to ASTM E 380.

4. Significance and Use

4.1 The test procedures outlined in this Protocol provide a means of determining whether a self-adhering roofing material, intended for use as an underlayment in a Discontinuous Roof System~~,~~ for use in the High-Velocity Hurricane Zones, meets the requirements of the *Florida Building Code, Building.*

5. Conditioning

5.1 Specimens shall be selected in accordance with ASTM D5147. Unless otherwise specified, condition test specimens for a minimum of four (4) hours at 73.4 ± 3.6°F and 50 ± 5% relative humidity prior to testing. Note separate conditioning requirements for cold bend testing in Section 12.1.

6. Thickness

6.1 Materials shall be checked at five points across the roll width. Measurements shall be made at

two points, each being 6 ± 0.5 inches from each edge, and at three points equally spaced between these two points.

6.2 Compute the average thickness and the standard deviation of the thicknesses, in mils, based on the total number of point measurements from all of the rolls taken.

6.3 Report the individual point measurements, average, and standard deviation in mils.

6.4 Any modified bitumen and bituminous membrane test specimen which exhibits an average thickness less than sixty (60) mils shall be considered as failing the thickness test. For granular surfaced products, thickness measurements shall be at the selvage edge, not at a granular surface.

6.5 Nonbituminous membranes shall not have a thickness minimum. Performance shall be based on physical property testing.

7. Wind Uplift

7.1 This test covers the determination of the wind uplift resistance of materials specified in Section 1 of this Protocol in accordance with TAS 124 except as noted below.

7.1.1 Test Deck Construction

7.1.1.1 Test is being conducted on materials noted in Section 1 of this Protocol; therefore, any reference to “roof membrane” in TAS 124 shall be regarded as ‘underlayment.’

7.1.1.2 Four (4) 8' x 8' test decks shall be constructed of 40/20 $^{19}/_{32}$ in. APA Rated Plywood Sheathing attached to wood joists spaced 24 o.c. Each test deck shall consist of four (4) panels of said sheathing, the corners of which shall meet at the center of each test deck, leaving a $^{1}/_{8}$ in. gap between panels.

7.1.1.3 Adhere one (1) layer of underlayment to each test deck.

7.1.2 Procedure

7.1.2.1 Test shall be a laboratory test not a field test; therefore, any instruction in TAS 124 which references “building or outdoor conditions” shall be regarded as “laboratory conditions.”

7.1.2.2 Regulate the negative pressure in the chamber. Begin by raising the negative pressure in the chamber to 30 lbf/ft^2 and holding this pressure for one (1) minute. Thereafter, raise the negative pressure in increments of 15 lbf/ft^2, holding each incremented pressure for one (1) minute, until the negative pressure has been held at 90 lbf/ft^2 for one (1) minute.

7.1.3 Report

7.1.3.1 Any test specimen which exhibits any significant separation between the membrane and tested substrate deflection or significant blistering from the sheathing surface-shall be considered as failing the wind uplift test.

8. Dimensional Stability

8.1 Prepare five (5) 2 foot wide x 6 foot long specimens with a 4 inch overlap seam across the center of the 6 foot length. Prepare the specimens: one from each edge of the roll and three from random places in the roll. The length of each specimen should be in the “machine direction” of the roll.

8.2 The substrate shall be APA 32/16 span rated sheathing of a $^{15}/_{32}$ in. thickness that has been reinforced on the back side with two angle irons.

8.3 Adhere the underlayment specimen on the substrate and install a $1^1/_2$ in. x $1^1/_2$ in. x 2' wood termination batten to one "free" end of the underlayment using three (3) equally spaced #12 wood screws to secure the batten through the underlayment and the sheathing. Mechanically attach the other "free" end of the underlayment using three (3) equally spaced ~~10d~~ roofing nails, located two (2) inches from the "free" end, with one nail at one inch from each edge, penetrating the sheathing a minimum of $^1/_2$ inch.

8.4 Condition each specimen in an oven or under heat lamps maintained at 180 ± 5°F for a minimum of six (6) hours.

8.5 Report any tears or "tear drop" conditions which arise at fastener penetrations during and/or after conditioning is complete. Report any shrinking or wrinkling which appears to have compromised the lapped area of underlayment.

8.6 Any test specimen which exhibits conditions noted in Section 8.5 of this Protocol shall be considered as failing the dimensional stability test.

8.7 Provide before and after photographs of each specimen in the final test report.

9. Tear Resistance

9.1 This test covers the determination of the tear propagation resistance of materials specified in Section 1 of this Protocol in accordance with ASTM Test Method D 4073, except as noted below.

9.1.1 The prescribed Test Method shall be run in both the machine and the cross-machine direction of the roll material.

9.1.2 The final test report shall include average tear propagation force values and standard deviations of these value for both the machine and the cross-machine direction of the material.

9.1.3 Any test specimen which exhibits a tear propagation value less than 20 lbf (88.5 N) in either the machine or cross-machine directions shall be considered as failing the tear strength test.

10. Breaking Strength and Elongation

10.1 This test covers the determination of the breaking strength and elongation of materials specified in Section 1 of this Protocol in accordance with ASTM Test Method D 2523, except as noted below.

10.1.1 Sampling

10.1.1.1 Ten specimens; five in the machine direction and five in the cross-machine direction of the roll, shall be cut to dimensions of 1 in. x 6 in.

10.1.2 Conditioning

10.1.2.1 Heat Aging, shall consist of seven (7) days in an air circulating oven at a controlled temperature of 149 ± 5°F.

10.1.2.2 UV Exposure shall consist of 460 hours of continuous ultraviolet light exposure in

accordance with the apparatus and configuration in 13.1.2.1 herein.

10.1.3 Procedure

10.1.3.1 Each set of samples, as specified in 10.1.1.1 herein, shall be tested "as received", after heat aging, and after UV exposure, as specified in 10.1.2.1 and 10.1.2.2 herein.

10.1.3.2 Grip separation rate shall be 20 ± 0.2 inches per minute for all tests conducted.

10.1.3.3 Temperatures of specimens and test grips during conditioning and testing shall ~~comply with ASTM D 2523~~ be 73.4 ± 3.6°F.

10.1.4 Report

10.1.4.1 Report the grip separation rate used.

10.1.4.2 Breaking strength shall be reported, in lbf/inch of width, for all test specimens and shall be itemized in grouping of "as received," after heat conditioning, and after UV exposure. The~~se grouping~~ test specimens shall be itemized in subgroups of machine direction and cross-machine direction. Any test specimen which exhibits a breaking strength value less than those listed in Table 1 shall be considered as failing the breaking strength test.

TABLE 1 MINIMUM BREAKING STRENGTH VALUES

SPECIMEN	BREAKING STRENGTH
	(Machine Direction or Cross-Machine Direction)
As Received	25 lbf/inch of width (35 N/cm of width)
After Heat Aging	25 lbf/inch of width (35 N/cm of width)
After UV Exposure	25 lbf/inch of width (35 N/cm of width)

10.1.4.3 Elongation shall be reported, in (%), for all test specimens and shall be itemized in groupings of "as received," after heat conditioning, and after UV exposure. These groupings shall be itemized in subgroups of machine direction and cross-machine direction. Any test specimen which exhibits elongation values at ultimate load condition less than those listed in Table 2 shall be considered as failing the elongation test.

TABLE 2 MINIMUM ELONGATION VALUES (%)

SPECIMEN	ORGANIC REINFORCEMENT	FIBERGLASS REINFORCED	POLYESTER OR POLYPROPYLENE REINFORCED	SOLID THERMOPLASTIC ~~SHEATHING~~ SHEETS
As Received	6%	3%	25%	225%
After Heat Aging	5%	2.5%	21%	191%
After UV Exposure	5%	2.5%	21%	191%

11. Reserved

12. Low Temperature Flexibility

12.1 This test covers the determination of the low temperature flexibility of materials specified in Section 1 of this Protocol in accordance with ASTM Test Method D 1970 except as noted below. Membranes shall be tested at a maximum of -10°F.

12.1.1 Procedure

12.1.1.1 Each set of specimens shall be tested “as received” and after conditioning, as specified in ASTM D 1970 (7.4.2).

12.1.2 Report

12.1.2.1 Low temperature flexibility results shall be reported on a pass/fail basis, for all test specimens and shall be itemized in grouping of “as received” and after conditioning. No cracking at -10°F shall be considered as passing the low temperature flexibility test.

13. Ultraviolet Resistance

13.1 This test covers the determination of the ultraviolet resistance performance of materials specified in Section 1.

13.1.1 Sampling - Two 18 in. x ~~18~~48 in. specimens are to be cut.

13.1.2 Conditioning

13.1.2.1 Ultraviolet light shall be produced by four 275 watt UV lamps in an enclosure in accordance with Figure 1. Recommended lamps are: Ultra-Vitalux, 275 watt, 220-230 V, #E27; Osram 275 W lamps, or; equivalent bulbs providing UV characteristics of 5.0 W/m2/nm irradiance at a wavelength of 315 to 400 nm at one meter.

13.1.2.2 Specimens to be exposed for ~~200~~ 460 (± 2) continuous hours ~~(10 hours per day for 20 days)~~.

13.1.2.3 Specimen temperature to be maintained at 135-140°F throughout the ~~UV exposure portion of the~~ test period. ~~Specimens shall be maintained between 70°F +/- 15°F when not exposed to UV during the test period.~~

13.1.3 Report & Conditions of Acceptance

13.1.3.1 Report any visible peeling, chipping, cracking, flaking, pitting or other damage, under 5x

magnification, which resulted from the ultraviolet conditioning. Report the type and location of the damage (if any).

13.1.3.2 Report the type of UV lamps used to condition the samples.

13.1.3.3 Any test specimen which exhibits damage as defined in Section 13.1.3.1 of this Protocol shall be considered as failing the ultraviolet resistance test.

14. Accelerated Aging

14.1 This test covers the determination of the accelerated aging performance of materials specified in Section 1 of this Protocol.

14.2 ~~Sampling~~ Specimen Preparation - ~~-~~Six (6) 12 in. x 12 in. specimens shall be prepared with three (3) in the machine direction and three (3) in the cross-machine direction of the roll. Specimens shall be marked to indicate machine direction.

14.3 Accelerated Aging – The specimens prepared per Section 14.2 are aged by the following cyclic process. Twenty-five cycles are required, with each cycle consisting of the following:

1. Oven dry at 120°F for three hours with all surfaces exposed.
2. Immerse in water maintained at room temperature for three hours, with all surfaces exposed.
3. Remove from water and blot dry, then air dry for 18 hours at room temperature for eighteen hours with all surfaces exposed.

Samples shall be in the air dry period over weekends and holidays, which shall be confirmed in the test log. The room temperature shall be maintained at 73 ± 5°F (22.8 ± 2.8°C).

14.3.1 Conditions of Acceptance – No visible damage to the specimens, such as chipping, cracking, or delamination.

14.3.2 Breaking strength and elongation tests of aged specimens shall be conducted in accordance with Section 10 of this Protocol, except as noted below.

14.3.2.1 Sampling - After the six (6) 12 in. x 12 in. aged specimens have been examined for visible damage, prepare ten (10) 1 in. x 6 in. specimens from the aged material; five in the machine direction and five in the cross-machine direction of the roll. In addition to these ten aged specimens, prepare ten “as received” specimens of the same dimensions; five in the machine direction and five in the cross-machine direction of the roll.

14.3.2.2 Conditioning - No further conditioning is to be incurred on the aged specimens.

14.3.2.3 Procedure - Each set of samples, as specified in ~~13.1.3.1~~ 14.2 herein, shall be tested “as received” and after accelerated aging.

14.3.2.4 Report

14.3.2.4.1 Breaking strength shall be reported, in lbf/inch of width, for all test specimens and shall be itemized in grouping of “as received” and after accelerated aging. These ~~grouping~~ specimens shall be itemized in subgroups of machine direction and cross-machine direction. Any aged specimen

which exhibits a breaking strength less than the value listed in Table 2 shall be considered as failing the accelerated aging test.

14.3.2.4.2 Elongation shall be reported, in (%), for all test specimens and shall be itemized in grouping of 'as received' and after accelerated aging. These ~~grouping~~ specimens shall be itemized in subgroups of machine direction and cross-machine direction. Any aged specimen which exhibits an elongation value less than the applicable value listed in Table 2 shall be considered as failing the accelerated aging test.

15. Cyclic Elongation

15.1 This test covers the determination of the cyclic elongation performance of materials specified in Section 1 of this Protocol.

15.1.1 Three specimens are prepared with $^{15}/_{32}$-inch-thick (12.7 mm), 3-inch-by-6-inch (76 mm by 152 mm) APA Rated A-C plywood. Each specimen includes two plywood pieces aligned so that the 6-inch (152 mm) edges are parallel and separated by 1/8 inch (3.2 mm). One piece of underlayment, 5 inches by 5 inches is attached to the plywood pieces across the joint and rolled 3 times back and forth (2-3s per direction) using a 26 lb. (11.8 kg) roller. The specimens are then conditioned at 73 ± 4°F (22.8 ± 2.2°C) for seven days. After conditioning, specimens are placed in a cold box, which is maintained at –20°F (–28.9°C) for ~~48~~ 24 hours ± 1 hour. Specimens are then cycled between a 1/8-inch (3.2 mm) and 1/4-inch (6.4 mm) plywood edge separation for 100 cycles while maintaining the temperature at –20°F (–28.9°C). The rate of movement shall be 1/8 inch (3.2 mm) per hour.

15.1.2 Conditions of Acceptance -_Any test specimen which exhibits cracking of material shall be considered as failing the cyclic elongation test.

16. Water Vapor Transmission

16.1 This test covers the determination of the water vapor transmission of materials specified in Section 1 of this Protocol in accordance with ASTM Test Method E96, procedure B.

16.2 The water vapor transmission of the membrane shall not be greater than 1.0 g/m^2 in 24 hours.

17. Compound Stability

17.1 This test covers the determination of the high temperature stability of materials specified in Section 1 of this Protocol in accordance with ASTM Test Method D 5147, Section 15, except as noted below.

17.1.1 Any test specimen which exhibits flowing, dripping or drop formation at a temperature less than 220°F shall be considered as failing the compound stability test.

18. Puncture Resistance

18.1 This test covers the determination of the puncture resistance of materials specified in Section 1 of this Protocol as noted below.

18.1.1 Two 12 in. x 25 in. specimens shall be prepared; one ultraviolet light conditioned and one accelerated aging conditioned, as specified in Sections 13 and 14 of this Protocol, respectively.

18.1.2 The puncture point shall be affixed to any shaft and have a right angle triangular pyramid shape that is 1 inch in height with rounded leading edges of 0.062 ± .002 inch radius. The point should be honed to a 0.062 inch radius and the base edges left sharp. The weight of the puncture point and shaft shall be 1.0lb ± 0.1lb.

18.1.2.1 Attach each specimen to a frame consisting of nominal wood members spaced 24 inches on center.

18.1.2.2 The test specimens shall have a maximum sag of 1 inch measured from the top of the framing member.

18.1.2.3 Drop the puncture point from a height of 30 inches above the top of the framing in five different locations.

18.1.3~~2~~ Any test specimen which exhibits any sign of puncture shall be considered as failing the puncture test.

19. Tile Slippage Resistance

19.1 Prepare three (3) 4 foot ~~wide~~ x 8 foot ~~long~~ test frames using min. 2 inch by 4 inch nominal lumber spaced at 24 inches on center. ~~specimens with a 4 inch overlap seam across the center of the 8 foot length. Prepare the specimens: one from one edge of the roll and one from the center of the roll. The length of each specimen should be in the "machine direction" of the roll.~~

19.2 ~~The substrate shall be~~ Install ~~32/16~~ $^{15}/_{32}$ in. APA 32/16 span rated sheathing on the test frames ~~that has been reinforced on the back side with two angle irons~~.

19.3 Adhere the underlayment to the substrate with a side lap and back nailed per the manufacturer's installation instructions. The side lap width and back nailing details shall be included in the final test report.

19.4 Condition each test deck in an oven or under heat lamps maintained at 165 ± 5°F for a minimum of four (4) hours. Thereafter, the deck shall be cooled for minimum three hours at 75° ± 5°F.

19.5 After conditioning, position one test deck at a slope of 4 in:12 in.; one at a slope of 5 in:12 in.; and the third at a slope of 6 in:12 in. The 5 in:12 in. test deck may be omitted if requested by the client.

19.6 Onto each sloped test deck, place one (1) stack of 10 flat concrete tiles and one (1) stack of 10 profiled tiles manufactured with "lugs" on the underside of each tile. Allow the tile stacks to sit on the underlayment surface for ~~72~~ minimum 36 hours while maintaining a controlled surface temperature of 165 ± 5°F. Temperature to be maintained by a ~~surface mounted~~ thermocouple mounted on the surface of the underlayment.

19.7 Report any of the following: ~~tears or tile slippage on any portion of the underlayment. Report any tile sliding which has damaged any portion of the top surface of the underlayment.~~

- Any tile slippage on any portion of the underlayment

- Any tears in the underlayment
- Any tears in the underlayment surfacing
- Any delamination of the underlayment facing from the adhesive layer

19.8 Any test specimen which exhibits conditions noted in Section 19.7 of this Protocol shall be considered as failing the tile slippage resistance test.

19.9 Provide before and after photographs of each specimen in the final test report.

19.10 Alternate stacking configurations shall be permitted to be approved as part of a Product Approval. Details of such stacking configurations shall be included in the final test report.

20. ~~Crack Cycling~~ Reserved

~~20.1 This test covers the determination of the crack cycling performance of materials specified in Section 1 of this Protocol in accordance with the ICBO Acceptance Criteria For Roof Underlayment For Use In Severe Climate Areas (Section IV, F), except as noted below.~~

~~20.1.1 Three specimens are prepared with $^{15}/_{32}$-inch-thick (12.7 mm), 3-inch-by-6-inch (76 mm by 152 mm) APA Rated A-C plywood. Each specimen includes two plywood pieces aligned so that the 6-inch (152 mm) edges are parallel and separated by 1/8 inch (3.2 mm). The underlayment is attached to the plywood pieces across the joint and rolled 3 times back and forth (2-3s per direction) using a 26 lb. (11.8 kg) roller. The specimens are then conditioned at 73 ± 4°F (22.8 ± 2.2°C) for seven days. After conditioning, specimens are placed in an oven which is maintained at 180 ± 5°F and 55 ± 5% relative humidity for 48 hours ± 1 hour. Specimens are then cycled between a 1/8-inch (3.2 mm) and 1/4 inch (6.4 mm) plywood edge separation for 100 cycles while maintaining the temperature at 180°F and 55 ± 5% relative humidity. The rate of movement shall be 1/8 inch (3.2 mm) per hour.~~
~~Specimens shall be adhered over the two pieces of sheathing.~~

~~20.1.2 The three specimens shall be prepared with 32/16 $^{15}/_{32}$ in. x 3 in. x 6 in. APA span rated plywood sheathing.~~

~~20.1.3 Conditioning shall consist of exposure to a controlled temperature of 180 ± 5°F and 55 ± 5% relative humidity for a period of seven (7) days.~~

~~20.1.42 Conditions of Acceptance - Any test specimen which exhibits cracking of material shall be considered as failing the cyclic elongation test.~~

21. Peel Adhesion

21.1 This test covers the determination of the peel adhesion to substrate performance of materials specified in Section 1 of this Protocol in accordance with the applicable provisions of ASTM Test Method D 1970 and as noted below.

21.1.1 Specimen Preparation

21.1.1.1 The substrate shall be APA 32/16 span rated plywood sheathing of a $^{15}/_{32}$ in. thickness.

21.1.2 Conditioning

21.1.2.1 One set of samples shall be conditioned at 73.45 ± 23.6°F for four (4) hours; a second and third set shall be conditioned per Sections 13 and 14 of this protocol for accelerated aging and ultraviolet resistance, respectively.

21.1.1 Report

21.1.3.1 Peel Adhesion shall be reported, in lbf/foot of width, for all test specimens and shall be itemized in grouping of "conditioned at 73.45°F," "after accelerated aging" and "after ultraviolet conditioning."

21.1.3.2 Any "conditioned" specimen which exhibits a peel strength less than 6.5 lbf/foot of width shall be considered as failing the peel adhesion test.

21.1.3.3 Any aged or ultraviolet conditioned specimen which exhibits a peel strength less than 4.9 lbf/foot of width shall be considered as failing the peel adhesion test.

FOR MINERAL SURFACED ~~ROLL~~ MATERIAL TO BE USED AS A MORTAR OR ADHESIVE SET TILE UNDERLAYMENT

22. Granule Adhesion

22.1 This test covers the determination of granule loss of materials specified in Section 1 of this Protocol, which employ a fine or granular surfacing on one side, in accordance with ASTM Test Method D 5147 except as noted below.

22.1.1 Any test specimen which exhibits an average granule loss greater than 0.75 grams shall be considered as failing the granule adhesion test.

FOR UNDERLAYMENTS TO BE USED WITH ADHESIVE SET TILE SYSTEMS

23. Tensile Adhesion of Tile Adhesives

23.1This test covers the determination of the tensile adhesion bond between a tile adhesive and the underlayment surface.

23.2 This test is required to be performed on all adhesives for which approval is sought.

23.3 Sample Preparation and Testing

23.3.1 Prepare 20 (5 each) specimens for testing at 0 days (control), 14 days, 60 days, and 120 days:

23.3.1.1 Bond a 2 inch wide by 24 inch long piece of underlayment to a 2 inch wide by 24 inch long piece of 23/32" B-C APA rated plywood. Take care that the method of bonding does not interfere with or otherwise alter the surface of the underlayment to which the tile adhesive is to be applied. Prepare (6) underlayment/plywood strips in this fashion.

23.3.1.2 Place 2 prepared specimens with the long edge horizontal in a jig such that there is a max. ¾ inches between specimens and the specimens are braced to prevent expansion. The exposed surface of the specimens should be facing each other.

23.3.1.3 Apply foam adhesive in the void between specimens in a manner specified by the adhesive manufacturer's instructions.

23.3.1.4 Allow the adhesive to cure for min. two hours.

23.3.1.5 Remove the adhered specimens from the jig and trim excess adhesive from all edges.

23.3.1.6 Cut each adhered specimen into 2 inch by 2 inch squares.

23.3.2 Condition the 2 inch by 2 inch specimens as follows:

23.3.2.1 Control specimens shall be conditioned at 73.4 ± 3.6°F and 50% relative humidity for 4 hours.

23.3.2.2 All remaining specimens shall be conditioned at 180 ± 2°F and 65% relative humidity. Six specimens each shall be conditioned for 14, 60, and 120 days.

23.3.3 Test all samples in accordance with ASTM D1623. Testing shall be performed after a stabilization at 73.4 ± 3.6°F and 50% relative humidity.

23.4 The average tensile adhesion of (5) specimens after 0, 14, 60, and 120 days shall be min. 15 psi. Any set of specimens with an average tensile adhesion below 15 psi will be considered as having failed this test.

24. Accelerated Weathering

24.1 Underlayments for which an outdoor exposure greater than 30 days is desired must comply with the requirements of this section.

24.2 Underlayments shall be exposed to accelerated weathering in accordance with ASTM D4798, Cycle A-1.

24.2.1 Exposure Limitations shall be established per Table 24.1.

24.2.2 At the conclusion of the required accelerated weathering, the weathered underlayment shall be tested per Table 24.2. Any product not achieving the values therein will be considered as having failed the test.

24.3 Report the results of testing per Table 24.2 and the duration of Accelerated Weathering exposure.

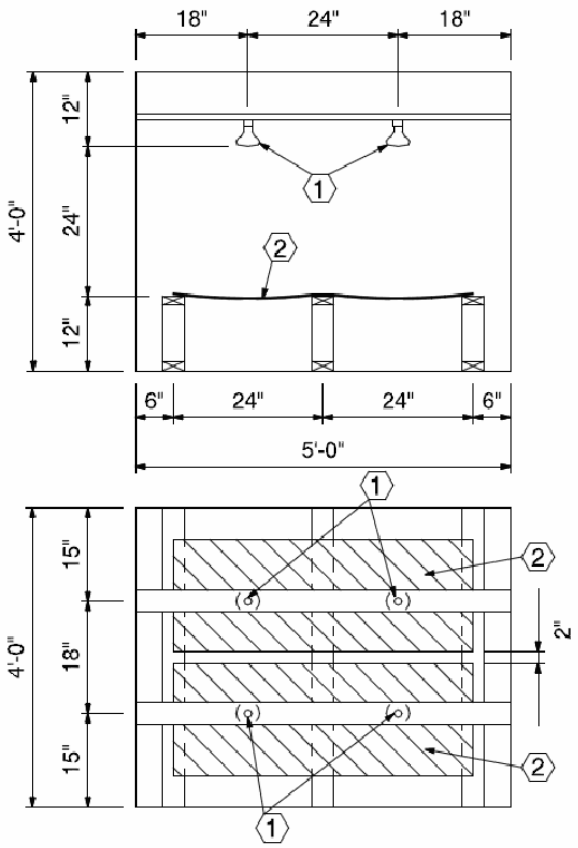
TABLE 24.1

Days of Allowable Outdoor Exposure	Accelerated Weathering Duration (Hours)

45	250
60	333
90	500
120	666
150	833
180	1,000

TABLE 24.2

Property Tested	Section Number	Minimum Requirement (MD & CD)			
Breaking Strength	10	25 lbf/in			
Elongation	10	Organic Reinforcement	Fiberglass Reinforcement	Polyester or Polypropylene Reinforced	Solid Thermoplastic Sheeting
		6%	3%	25%	225%
Low Temperature Flexibilty	12	No Cracking			



CODED NOTES:

1. Ultraviolet Lamps (4 @ 275W Each)
2. 18"x48" Piece of Underlayment

FIGURE 1

R8286

Date Submitted	12/15/2018	**Section**	1	**Proponent**	Chadwick Collins
Chapter	TAS 131	**Affects HVHZ**	Yes	**Attachments**	Yes

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language No

Related Modifications

RAS TAS

Summary of Modification

HVHZ roofing updates

Rationale

The Asphalt Roofing Manufacturers Association staff and volunteers and the Miami-Dade roofing product staff team worked together over the past year to perform a thorough review of the HVHZ requirements for asphalt roofing, and underlayment materials, as well as related RAS and TAS protocols. Many of these requirements have not been updated in decades; this review is an attempt to correlate the FBC with other changes that have occurred within the FBC, at ASCE, and with other standards developers including ASTM International. ARMA has submitted a series of code modifications that reflect that effort.

These proposed modifications include:

- Removal of references to withdrawn standards.
- Removal of references to legacy documents, including ICBO acceptance criteria.
- Updates to referenced standards, including name changes.
- Updates to performance criteria to reflect changes in referenced standards.
- Modifications to certain initial and aged performance values for test requirements to more accurately reflect the intent of the code.
- Removal of redundant or unnecessary requirements.
- Editorial changes and grammatical corrections.

ARMA would like to thank the staff at Miami-Dade for their efforts in working through this very tedious process.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

$0

Impact to building and property owners relative to cost of compliance with code

$0

Impact to industry relative to the cost of compliance with code

Reduced product approval expense.

Impact to small business relative to the cost of compliance with code

$0

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Updates important roofing requirements for HVHZ use.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Removes outdated references.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require use of any specific type of product.

Does not degrade the effectiveness of the code

Ensures that the code is up to date with available research and referenced standards.

2nd Comment Period

Proponent Michael Goolsby **Submitted** 5/23/2019 **Attachments** No

R8286-G1

Comment:

The intention was for Mod 8286 to be withdrawn as it conflicts with Modification 7307.

For this reason Mod 8286 should be withdrawn or be assigned a "no affirmative recommendation".

See attached file.

~~TESTING APPLICATION STANDARD (TAS) 131-95~~

~~Appendix A~~

~~TEST PROCEDURE FOR THICKNESS MEASUREMENT OF~~

~~COATING OVER CLASS SR OLEFIN ELASTOMER BASED SHEET ROOFING~~

~~1. Scope:~~

~~1.1 The procedure outlined in this Protocol Appendix provides a method for measuring the thickness of the coating over fiber backing or reinforcing fabric.~~

~~2. Measurement Method:~~

~~2.1 Principal~~

~~2.1.1 The thickness of coating material over fiber, fabric, or scrim can be observed with a standard microscope. Measurement is made with a calibrated eyepiece.~~

~~2.2 Apparatus~~

~~2.2.1 Microscope, 60x with reticule.~~

~~2.2.2 Light Source - If light source on the microscope is not adequate, a small high-intensity lamp may also be used.~~

~~2.2.3 Stage Micrometer, 0.001 in. (0.0254 mm) divisions.~~

~~2.3 Calibration Procedure~~

~~2.3.1 Place a standard reflectance stage micrometer in place of the specimen.~~

~~2.3.2 Position the reticle eyepiece and the micrometer such that the scales are superimposed. Focus the reticle by turning the eyepiece. Focus the specimen and reticle by turning the vertical adjustment knob.~~

~~2.3.3 Locate a point at which both scales line up. Count the number of micrometer divisions away. Measure to the nearest 0.0005 in. or 0.5 mil (0.0125 mm). The calibration may be optimized by increasing the number of divisions measured.~~

~~2.3.4 Repeat the calibration three times and average the results. A calibration example is given below.~~

~~2.3.5 Calibration Example~~

~~2.3.5.1 If four reticle divisions (RD) are found equal to 4.5 micrometer divisions (MD), then 1 RD = 0.001125 in. or 1.125 mils (28.6 mm) or the calibration factor.~~

~~2.4 Specimen Analysis:~~

~~2.4.1 Carefully center a sharp single edge razor or equivalent over the fiber intersections along the x-x axis.~~

~~2.4.2 Make a clean bias cut completely through the sheet.~~

~~2.4.3 Remove the razor cut section and mount in common putty with the cut surface facing upward.~~

~~2.4.4 Observe the cut surface with the eyepiece reticle. Measure the thickness of the coating on either side of the thread intersection by counting the number of reticle divisions (to the nearest one-half division).~~

~~2.4.5 Sample three areas of the coatings and average the results.~~

~~3. Calculation and Report:~~

~~3.1 Multiply the number or reticle divisions representing the thickness of the coating by calibration factor. Report the average results from the areas of the coating to the nearest 0.005" or 0.5 mils (12.7 mm).~~

~~4. Precision:~~

~~4.1 Precision - Measurements are accurate to ± 0.005 in. or 5.0 mils (12.7 mm) when the thickness is about 0.020 in. or 20 mils (0.5 mm).~~

TAC: Roofing

Total Mods for **Roofing** in **No Affirmative Recommendation: 13**

Total Mods for report: 19

Sub Code: Building

R7603

7

Date Submitted	11/30/2018	**Section**	202	**Proponent**	Ann Russo5
Chapter	2	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation

Commission Action Pending Review

Comments

General Comments Yes

Alternate Language No

Related Modifications

Summary of Modification

This proposal clarifies and makes corrections to the definition. Specifically, in the definition in the Building and Residential Codes it replaces one of the redundant "vapor retarder" listings with "underlayment".

Rationale

The revision to the definition of "roof assembly" removes duplicative wording and clarifies which items are in all roof assemblies. It clarifies that underlayment can be included in the roof assembly but it not a requirement of all roof assemblies.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Improved definition clarifies items in proposed assembly for plan review and inspection

Impact to building and property owners relative to cost of compliance with code

No impact expected

Impact to industry relative to the cost of compliance with code

Helps incidental cost as it clarifies that systems have different components depending on use and listing

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

By clarifying definition and shifting focus to components that may be offered in systems, assists in evaluation based on usage and needs thus improving overall choices with positive impact of building integrity thus general health and safety

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves procedures for Code compliance as well as allowing for better comprehension as to effects of components in selecting system for use on specific projects needs

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

No, it assists in improving effectiveness

2nd Comment Period

R7603-G1

Proponent Borrone Jeanette **Submitted** 5/21/2019 **Attachments** No

Comment:

I agree with the proposed revision.

2nd Comment Period

R7603-G2

Proponent	Jennifer Privateer	Submitted	5/24/2019	Attachments	No

Comment:

I agree

2nd Comment Period

R7603-G3

Proponent	Harold Barrineau	Submitted	5/26/2019	Attachments	No

Comment:

I agree with this modification.

Modify as follows:

[BS]ROOF ASSEMBLY (For application to Chapter 15 only). A system designed to provide weather protection and resistance to design *loads.* The system consists of a *roof covering* and *roof deck* or a single component serving as both the roof covering and the *roof deck*. A roof assembly includes the *roof deck*, can also include an underlayment, ~~*vapor retarder*~~, ~~substrate or~~ a thermal barrier, insulation, or a *vapor retarder* ~~and roof covering~~.

R7182

Date Submitted	11/5/2018	**Section**	1514	**Proponent**	Michael Goolsby
Chapter	15	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Clarifying roof drainage requirements.

Rationale

The modification clarifies location of structural requirements for roof drainage design and includes language consistent with the FBC definitions. Additionally, adds guidance when utilizing flow restricting drain inserts.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Removes confusion by providing accurate direction regarding guidance to applicable code sections.

Impact to building and property owners relative to cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Impact to industry relative to the cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Impact to small business relative to the cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The modification ensures rain loads are not exceeded, thereby removing possible overloading of the structure and preventing collapse.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification ensures rain loads are not exceeded, thereby removing possible overloading of the structure and preventing collapse.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The change does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The change improves the effectiveness of the code by providing a path to compliant roof drainage design.

2nd Comment Period

7182-A1

Proponent Michael Goolsby **Submitted** 4/23/2019 **Attachments** Yes

Rationale

Changes to the HVHZ roof drainage modification are based on concerns expressed by the Roofing TAC in March.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Removes confusion by providing accurate direction regarding guidance to applicable code sections.

Impact to building and property owners relative to cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Impact to industry relative to the cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Impact to Small Business relative to the cost of compliance with code

Will economize costs by eliminating confusion in achieving code compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The modification ensures rain loads are not exceeded, thereby removing possible overloading of the structure and preventing collapse.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The modification ensures rain loads are not exceeded, thereby removing possible overloading of the structure and preventing collapse.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The modification does not discriminate against materials, products, methods or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

The modification improves the effectiveness of the code by providing a path to compliant roof drainage design.

1514.4 Roof drainage. Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. If required, roof drains shall comply with the *Florida Building Code, Plumbing.* Where required for primary roof drainage, scuppers shall be placed level with the roof surface in a wall or parapet. The scupper shall be located as determined by the roof slope and contributing roof area. Scuppers shall be sized in accordance with the provisions contained in ASCE 7, ~~Section~~ Chapter 8 with commentary and shall comply with Section 1611 herein.

1514.4.1 Gutters. Gutters shall be in compliance with RAS 111.

1514.4.2 Overflow drains and scuppers. Where roof drains are required, overflow drains or overflow scuppers sized in accordance with *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary shall be installed with the inlet flow line located not less than 2 inches (51 mm) or more than 4 inches (102 mm) above the low point of the finished roofing surface, excluding sumps. Overflow scuppers shall be a minimum of 4 inches (102 mm) in any dimension and shall be located as close as practical to required vertical leaders, conductors or downspouts. Overflow drains and scuppers shall also comply with the *Florida Building Code, Plumbing*, and Section 1611 of this code.

1514.4.2.1 When overflow scuppers and roof drains are installed, they shall be lined with approved metal or other approved materials set forth, herein ~~in the roofing system assembly product approval~~.

1514.4.2.2 When recovering, reroofing or repairing an existing roof, the existing number or size of required scuppers and/or roof drains shall not be reduced, unless a new drainage system is designed by a *registered design professional* ~~an architect or engineer~~, in compliance with the provisions of this code.

1514.4.3 Sizing and discharge. Roof drains, gutters, conductors and leaders shall be sized and discharge in accordance with the *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary.

1514.4 Roof drainage. Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof. If required, roof drains shall comply with the *Florida Building Code, Plumbing.* Where required for primary roof drainage, scuppers shall be placed level with the roof surface in a wall or parapet. The scupper shall be located as determined by the roof slope and contributing roof area. Scuppers shall be sized in accordance with the provisions contained in ASCE 7, ~~Section~~ Chapter 8 with commentary and shall comply with Section 1611 herein.

1514.4.1 Gutters. Gutters shall be in compliance with RAS 111.

1514.4.2 Overflow drains and scuppers. Where roof drains are required, overflow drains or overflow scuppers sized in accordance with *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary shall be installed with the inlet flow line located not less than 2 inches (51 mm) or more than 4 inches (102 mm) above the low point of the finished roofing surface, excluding sumps. Overflow scuppers shall ~~be~~ have a minimum width dimension of 4 inches (102 mm) ~~in any dimension~~ and shall be located as close as practical to required vertical leaders, conductors or downspouts. The height of the scupper opening shall be at least one inch (25 mm) above the depth of water at its design flow, but not less than 4 inches (102 mm). Overflow drains and scuppers shall also comply with the *Florida Building Code, Plumbing*, and Section 1611 of this code.

1514.4.2.1 When overflow scuppers and roof drains are installed, they shall be lined with approved metal or other approved materials set forth, herein ~~in the roofing system assembly product approval~~.

1514.4.2.2 When recovering, reroofing or repairing an existing roof, the existing number of scuppers and/or roof drains shall not be reduced, unless a new drainage system is designed by a *registered design professional* ~~an architect or engineer~~, in compliance with the provisions of this code.

1514.4.2.3 When retrofit roof drains are installed into or over existing roof drains a *registered design professional* shall perform an analysis of the altered roof drainage system to ensure the roof will sustain the load of rainwater which will accumulate.

1514.4.3 Sizing and discharge. Roof drains, gutters, conductors and leaders shall be sized and discharge in accordance with the *Florida Building Code, Plumbing* and ASCE 7, Chapter 8 with commentary.

R7600

Date Submitted	12/4/2018	**Section**	1510.11	**Proponent**	Deborah Lawson
Chapter	15	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language Yes

Related Modifications

NONE

Summary of Modification

Creates new code section to provide minimum standards for positioning and securing metal conduit and electrical wiring near a roof assembly.

Rationale

Without guidance from the Florida Building Code it is becoming more and more common for electrical conduit and wiring to be encapsulated and completely hidden within roofing systems. The potential danger to persons and property when re-roofing, attaching roof top structures or performing roofing repairs is substantial and warrants guidance in the placement and installation of electrical conduit and wiring.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local code enforcement entities is anticipated with this proposed code amendment.

Impact to building and property owners relative to cost of compliance with code

The impact to building and property owners will vary for new versus existing construction and existing conditions. The cost to building and property owners up front is offset by a reduction in liability for damage to persons and property from hidden conduit and electrical wiring.

Impact to industry relative to the cost of compliance with code

The impact to industry if this code amendment is adopted would be positive in that it should increase safety and reduce injuries that may be caused by hidden electrical conduit and wiring.

Impact to small business relative to the cost of compliance with code

The impact to small businesses will be the same as the impact to building and property owners if a small business is the property owner. Again, the upfront cost should be offset by a reduction in liability for damage to persons and property caused by hidden conduit and electrical wiring.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed code amendment provides increased safety and a reduction in potential accidents impacting the health, safety and welfare of the general public including increased safety for workers, repair persons, building occupants and owners.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed code amendment requires safe installation and placement of electrical conduit and wiring, strengthening and improving the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed code amendment treats all materials, products, methods and systems equally and does not discriminate.

Does not degrade the effectiveness of the code

The proposed code amendment strengthens and does not degrade the code.

2nd Comment Period

R7600-A1

Proponent Deborah Lawson **Submitted** 5/7/2019 **Attachments** Yes

Rationale

Without guidance from the Florida Building Code it is becoming more and more common for electrical wiring and conduit to be encapsulated and completely hidden within roofing systems. The potential danger to persons and property when re-roofing, attaching roof-top structures or performing repairs is substantial and warrants guidance in the placement and installation of cable- and raceway-type wiring.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local code enforcement entities is anticipated with this proposed code amendment.

Impact to building and property owners relative to cost of compliance with code

The impact to building and property owners will vary for new versus existing construction and existing conditions. The cost to building owners up front is offset by a reduction in liability and damages to persons and property from hidden conduit and electrical wiring.

Impact to industry relative to the cost of compliance with code

The impact to industry will be positive in that it will increase safety and reduce injuries that may be caused by hidden electrical conduit and wiring.

Impact to Small Business relative to the cost of compliance with code

The impact to small businesses will be the same as the impact to building and property owners if a small business is the property owner. Again, the upfront cost should be offset by a reduction in liability for damage to persons and property caused by hidden conduit and electrical wiring.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed code amendment provides increased safety and a reduction in potential accidents impacting the health, safety and welfare of the general public including increased safety for workers, repair persons, building occupants and owners.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed code amendment requires safe installation and placement of cable- and raceway-type electrical wiring, strengthening and improving the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed code amendment treats all materials, products, methods and systems equally and does not discriminate.

Does not degrade the effectiveness of the code

The proposed code amendment strengthens and does not degrade the code.

2nd Comment Period

R7600-G1

Proponent Bryan Holland **Submitted** 5/21/2019 **Attachments** No

Comment:

I support alternative language comment R7600-A1. The revised language of the proposal adequately addresses the issue of concern while maintaining consistency with the requirements of the National Electrical Code for cable- and raceway-type wiring methods installed in, under, or above roof structures.

1510.11 Cable- and Raceway-Type Wiring Methods.

Cable- and raceway-type wiring methods installed on rooftops, when not encased in a structural concrete environment, shall be supported above the roof system and covering. Cable- and raceway-type wiring methods installed in locations under metal-corrugated sheet roof decking shall be supported so there is not less than 38 mm (1½ in.) measured from the lowest surface of the roof decking to the top of the cable or raceway. A cable or raceway shall not be installed in concealed locations in metal-corrugated sheet decking–type roof.

1510.11 Metal conduit and electrical wiring.

If metal conduit or electrical wiring needs to be placed near a roof assembly, where possible, the conduit shall be positioned and supported a minimum of 1-1/2 inches from the bottom side of the roof deck or substrate to which the roof system is applied. In no instances shall conduit of any type be run horizontally through any type of roofing insulation to include lightweight insulating concrete or polyisocyanurate.

Hangers or other supports used to attach and support metal or pvc conduit and electrical wiring should be attached to framing or roof deck supports and not the roof deck or substrate. Where it is not possible to place metal or pvc conduit or electrical wiring on the bottom side of a roof deck or substrate, the metal or pvc conduit or electrical wiring may not be hidden or encapsulated within the roofing system and must be visible, easily locatable and properly supported above the roofing system.

Roofing and electrical conduit

The electrical code provides some guidelines regarding conduit placement

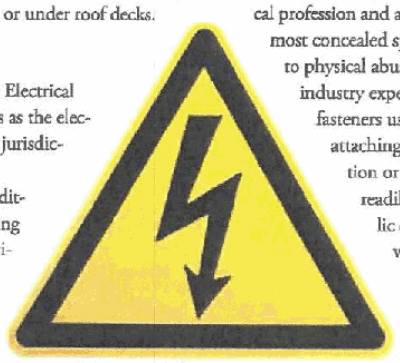
by Mark S. Graham

During roof system removal operations or when mechanically attaching rigid board insulation or membranes, roofing professionals sometimes find electrical conduit embedded within roof systems or placed directly below roof decks. In many instances, the presence of electrical conduit is unforeseen, problematic and potentially dangerous.

However, the electrical code provides some guidance regarding electrical cables, raceways and boxes placed in or under roof decks.

Electrical code

NFPA 70: National Electrical Code® (NEC) serves as the electrical code for most jurisdictions in the U.S.



In NEC's 2011 edition, Chapter 3-Wiring Methods and Materials provides placement and methods for wiring. Section 300.4-Protection Against Physical Damage includes the following statement specific to wiring installed in or under roof decks: "**(E) Cables, Raceways, or Boxes Installed in or Under Roof Decking.** A cable, raceway, or box, installed in exposed or concealed locations under metal-corrugated sheet roof decking, shall be installed and supported so there is not less than 38 mm (1½ in.) measured from the lowest surface of the roof decking to the top of the cable, raceway, or box. A cable raceway, or box shall not be installed in concealed locations in metal-corrugated, sheet decking-type roof.

"Informational Note: Roof decking material is often repaired or replaced after the initial raceway or cabling and roofing installation and may be penetrated by the screws or other mechanical devices designed to provide 'hold down' strength of the waterproofing membrane or roof insulating material.

"Exception: Rigid metal conduit and intermediate metal conduit shall not be required to comply with 300.4(E)."

Generally, wiring placed in metallic conduit is considered "protected" by the electrical profession and appropriate for use in most concealed spaces and areas subject to physical abuse. However, roofing industry experience has shown fasteners used for mechanically attaching rigid board insulation or membranes can readily penetrate metallic conduit embedded within or directly underneath roof assemblies. By way of comparison, the wall thickness of ½-inch-thick metallic conduit is comparable to the metal thickness of a 20-gauge steel roof deck. Self-cutting or self-drilling roof fasteners can readily penetrate metals of these thicknesses.

Also, cutting and roof system removal operations can damage and penetrate metallic conduit. Another section of the NEC, Section 690.31-Methods Permitted, addresses wiring methods for solar photovoltaic systems: "**(1) Beneath Roofs.** Wiring methods shall not be installed within 25 cm (10 in.) of roof decking or sheathing except where directly below the roof surface covered by PV modules and associated equipment. Circuits shall be run perpendicular to the roof penetration point to supports a minimum of 25 cm. (10 in.) below roof decking.

"Informational Note: the 25 cm (10 in.) requirement is to prevent accidental damage from saws used by fire fighters for roof ventilation during structural fire."

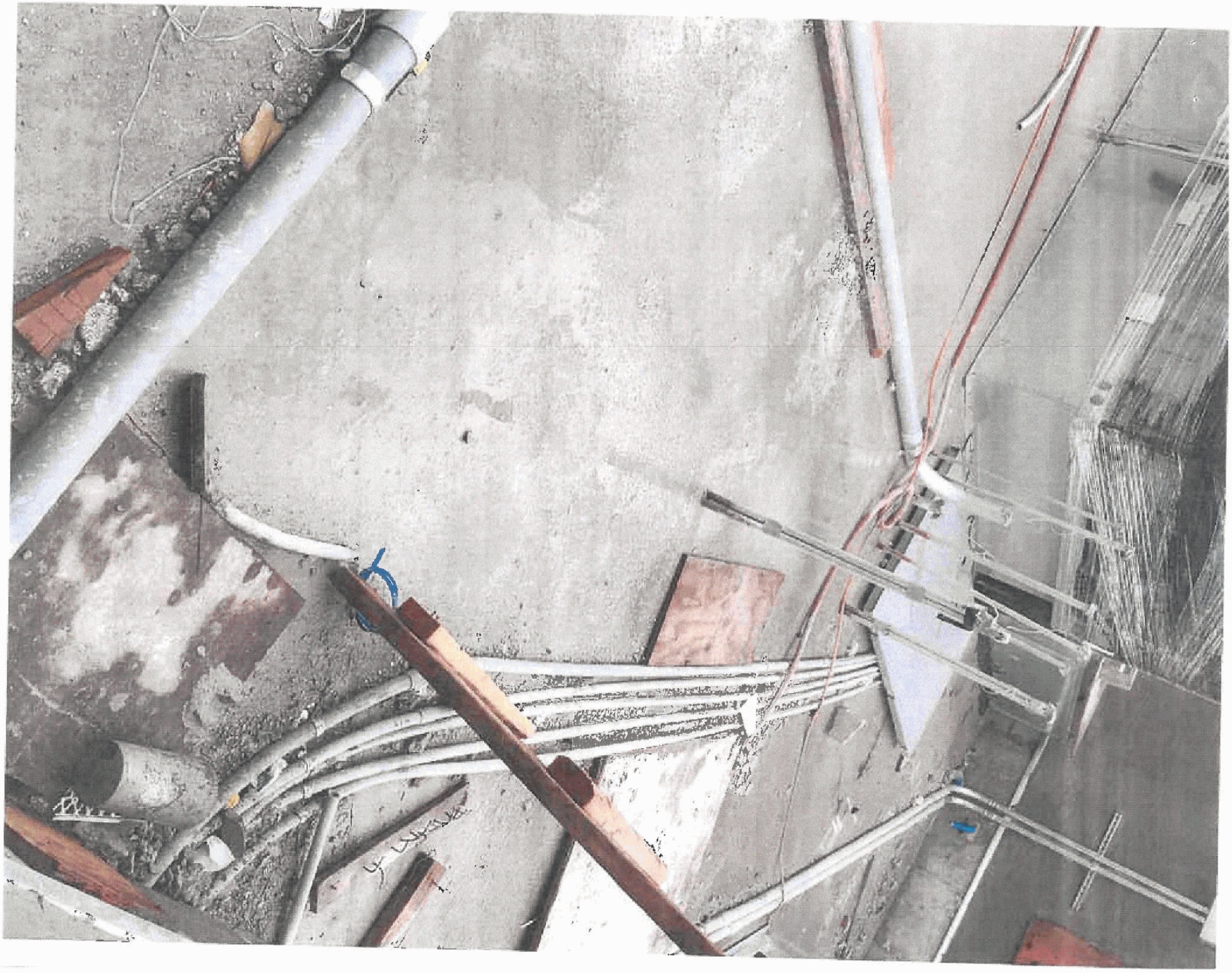
This statement indicates NEC acknowledges the potential for accidentally cutting metallic conduit; however, it does not adequately restrict metallic conduit placement or prevent such accidental cutting during reroofing.

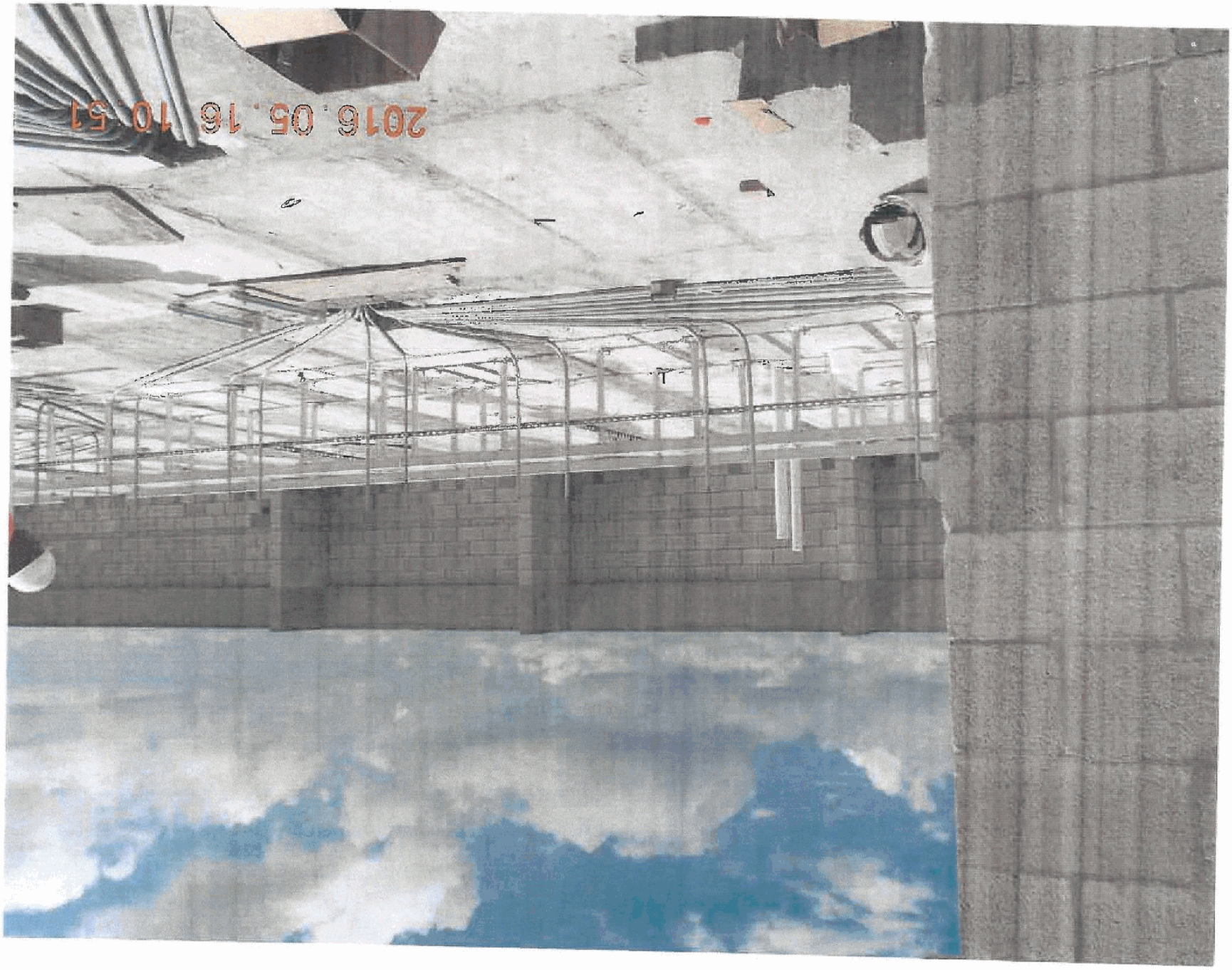
NRCA's recommendations

Electrical conduit embedded within roof systems or placed directly below roof decks can be problematic for roofing professionals. Although the electrical code provides some guidance regarding metallic conduit placement within or directly underneath roof systems, experience has shown these requirements are not adequate to address roofing industry concerns.

NRCA does not recommend metallic conduit or wiring be embedded within roof assemblies or placed directly below roof decks. If metallic conduit or wiring needs to be placed near the roof assembly, NRCA recommends it be positioned and supported at least 1½ inches from the bottom side of the roof deck or substrate to which the roof system is applied. Also, hangers or other supports used to attach and support metallic conduit and wiring should be attached to framing or roof deck supports, not the roof deck or roof substrate.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

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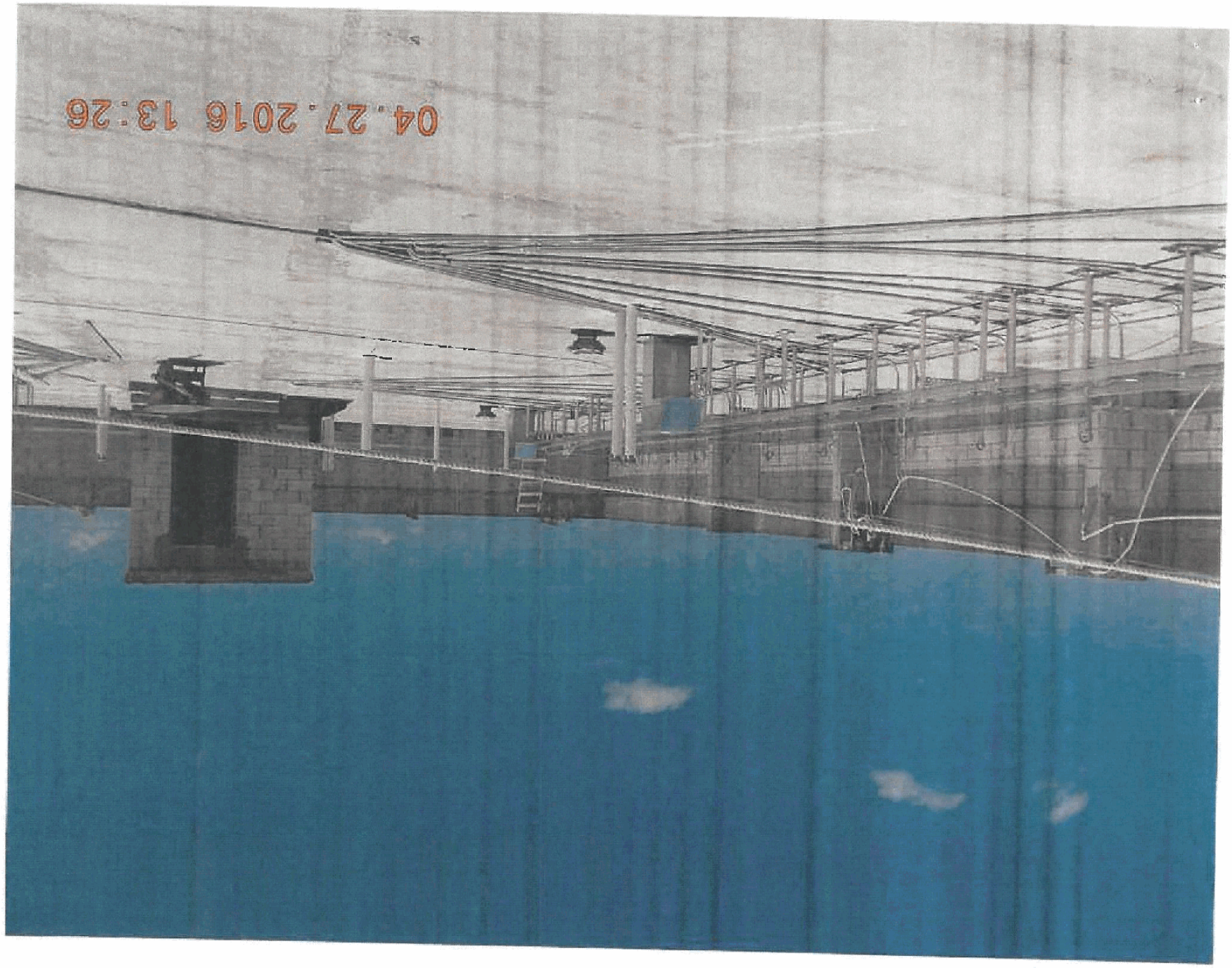
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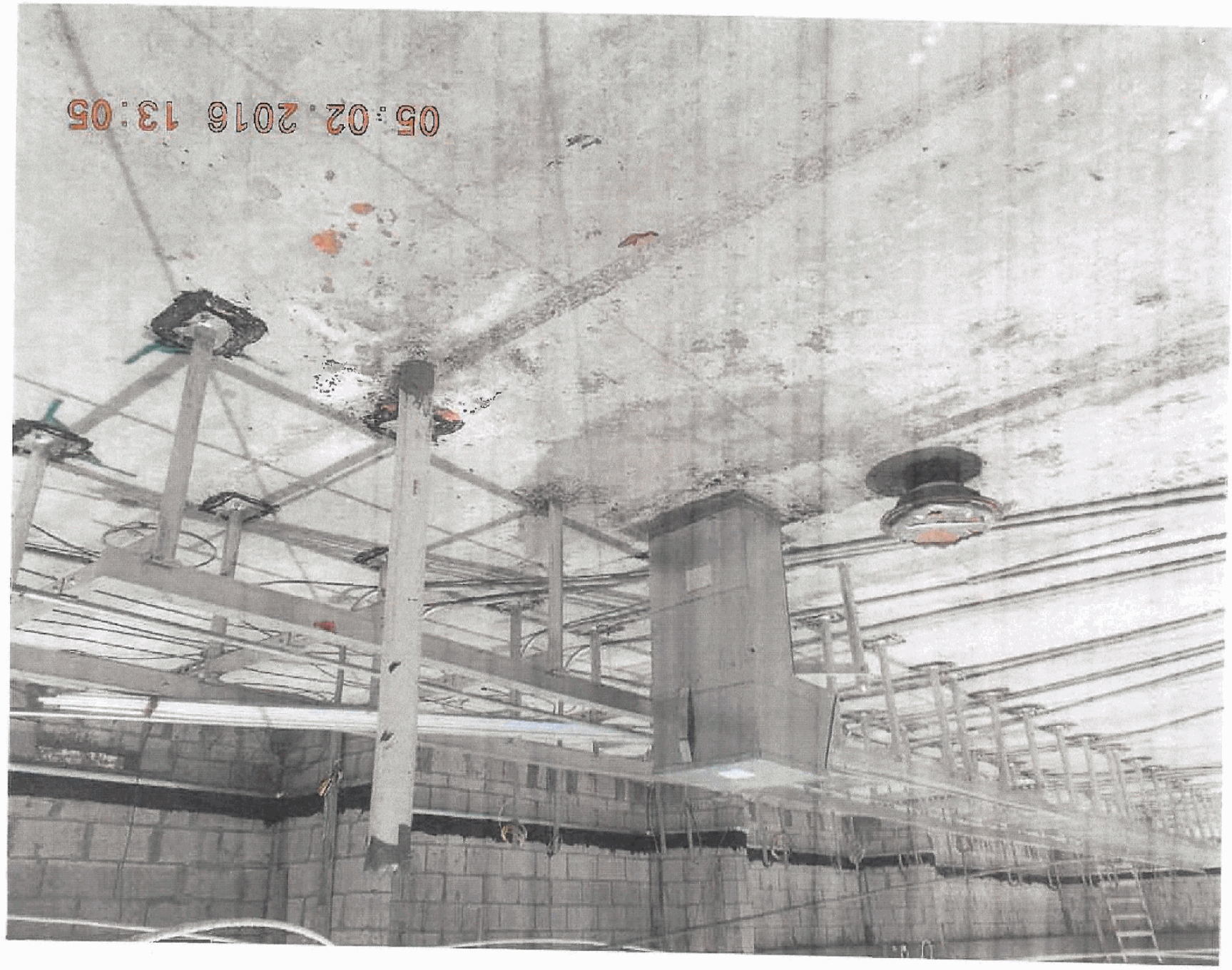
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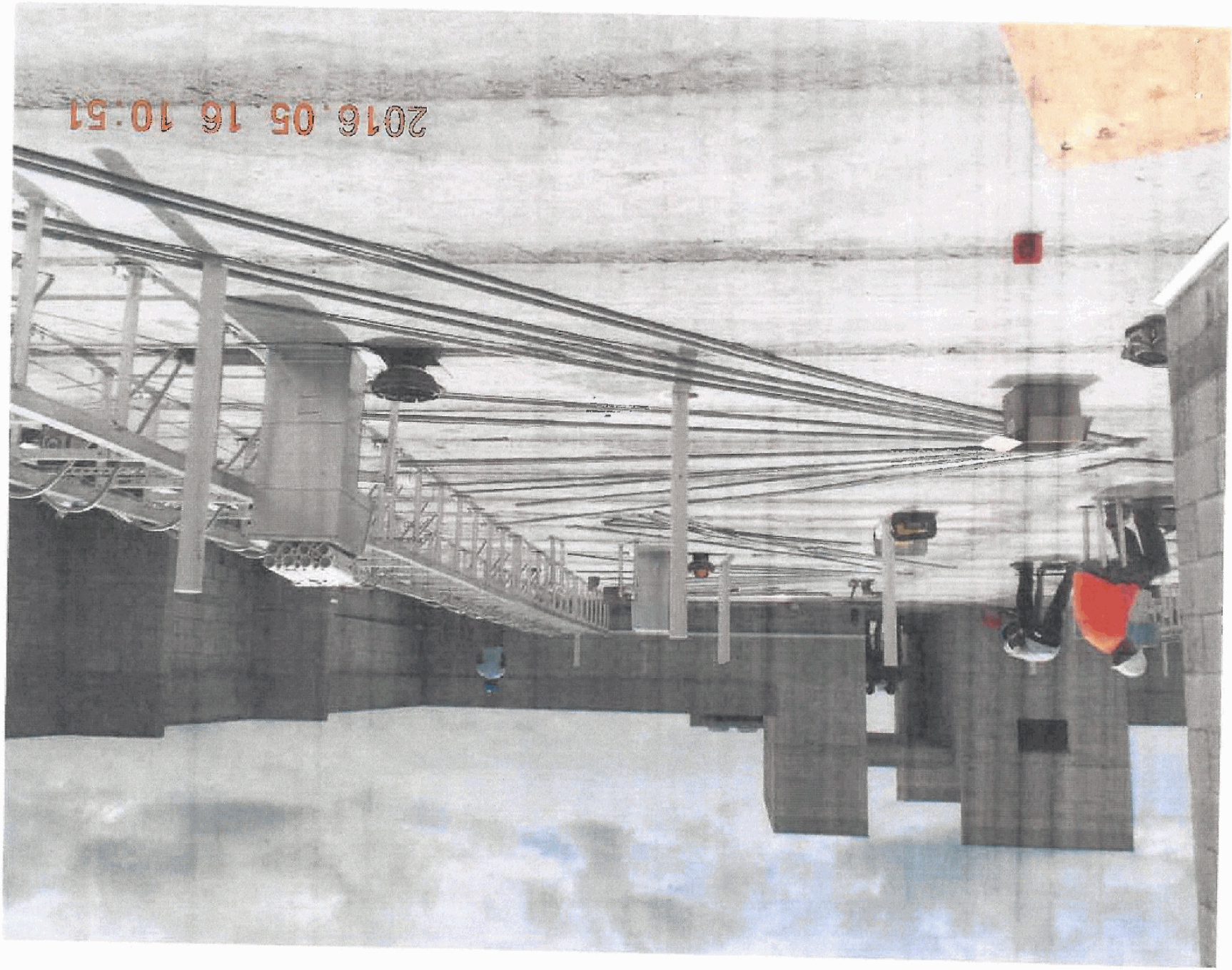
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Roofing and electrical conduit

The electrical code provides some guidelines regarding conduit placement

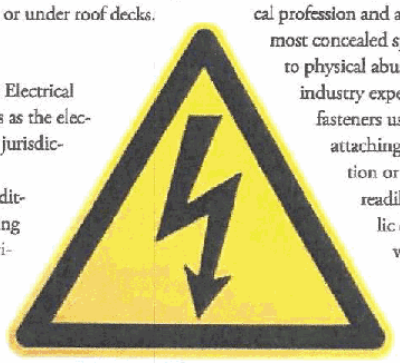
by Mark S. Graham

During roof system removal operations or when mechanically attaching rigid board insulation or membranes, roofing professionals sometimes find electrical conduit embedded within roof systems or placed directly below roof decks. In many instances, the presence of electrical conduit is unforeseen, problematic and potentially dangerous.

However, the electrical code provides some guidance regarding electrical cables, raceways and boxes placed in or under roof decks.

Electrical code

NFPA 70: National Electrical Code® (NEC) serves as the electrical code for most jurisdictions in the U.S.



In NEC's 2011 edition, Chapter 3-Wiring Methods and Materials provides placement and methods for wiring. Section 300.4-Protection Against Physical Damage includes the following statement specific to wiring installed in or under roof decks: "**(E) Cables, Raceways, or Boxes Installed in or Under Roof Decking.** A cable, raceway, or box, installed in exposed or concealed locations under metal-corrugated sheet roof decking, shall be installed and supported so there is not less than 38 mm (1½ in.) measured from the lowest surface of the roof decking to the top of the cable, raceway, or box. A cable raceway, or box shall not be installed in concealed locations in metal-corrugated, sheet decking-type roof.

"Informational Note: Roof decking material is often repaired or replaced after the initial raceway or cabling and roofing installation and may be penetrated by the screws or other mechanical devices designed to provide 'hold down' strength of the waterproofing membrane or roof insulating material.

"Exception: Rigid metal conduit and intermediate metal conduit shall not be required to comply with 300.4(E)."

Generally, wiring placed in metallic conduit is considered "protected" by the electrical profession and appropriate for use in most concealed spaces and areas subject to physical abuse. However, roofing industry experience has shown fasteners used for mechanically attaching rigid board insulation or membranes can readily penetrate metallic conduit embedded within or directly underneath roof assemblies. By way of comparison, the wall thickness of ½-inch-thick metallic conduit is comparable to the metal thickness of a 20-gauge steel roof deck. Self-cutting or self-drilling roof fasteners can readily penetrate metals of these thicknesses.

Also, cutting and roof system removal operations can damage and penetrate metallic conduit. Another section of the NEC, Section 690.31-Methods Permitted, addresses wiring methods for solar photovoltaic systems: "**(1) Beneath Roofs.** Wiring methods shall not be installed within 25 cm (10 in.) of roof decking or sheathing except where directly below the roof surface covered by PV modules and associated equipment. Circuits shall be run perpendicular to the roof penetration point to supports a minimum of 25 cm. (10 in.) below roof decking.

"Informational Note: the 25 cm (10 in.) requirement is to prevent accidental damage from saws used by fire fighters for roof ventilation during structural fire."

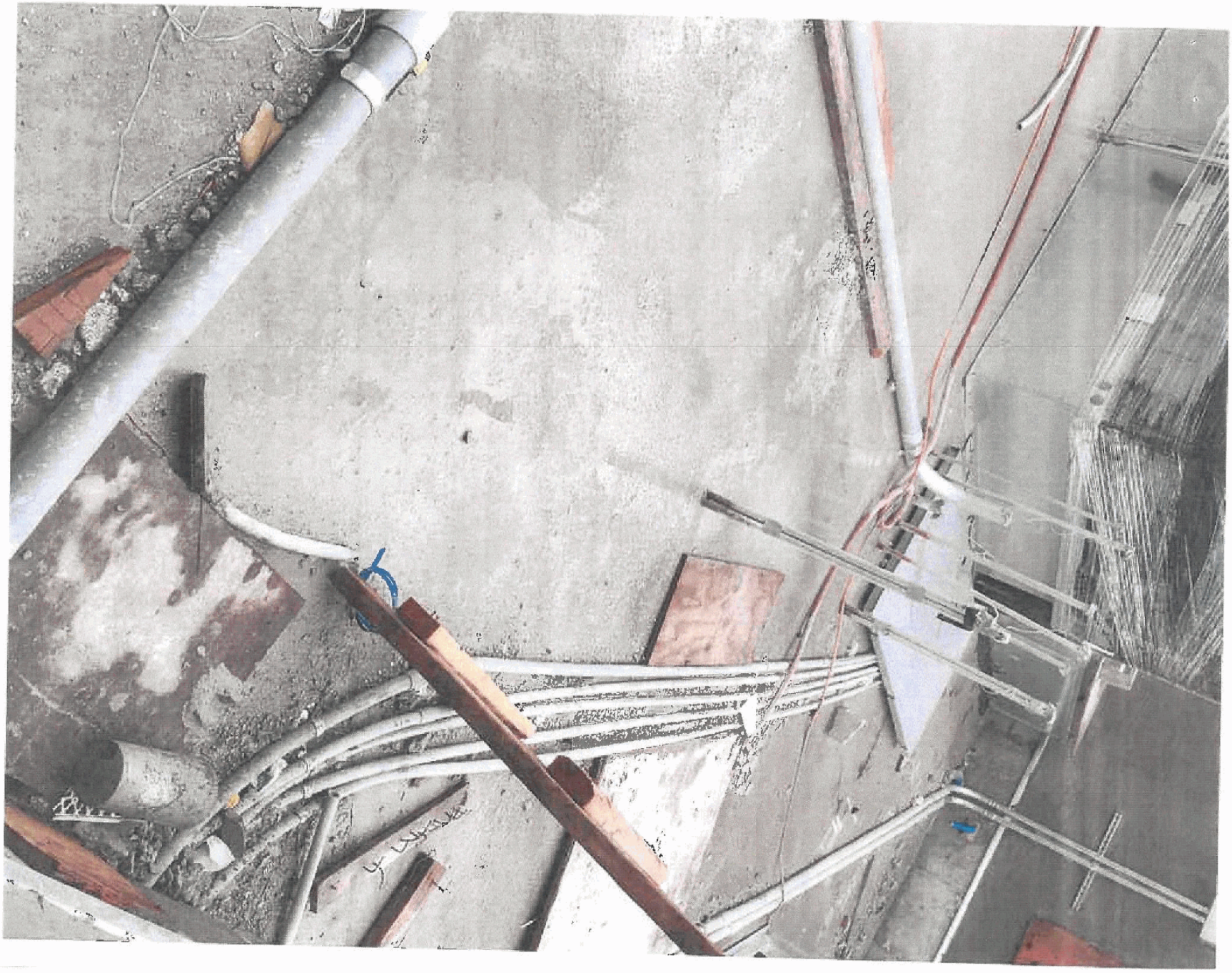
This statement indicates NEC acknowledges the potential for accidentally cutting metallic conduit; however, it does not adequately restrict metallic conduit placement or prevent such accidental cutting during reroofing.

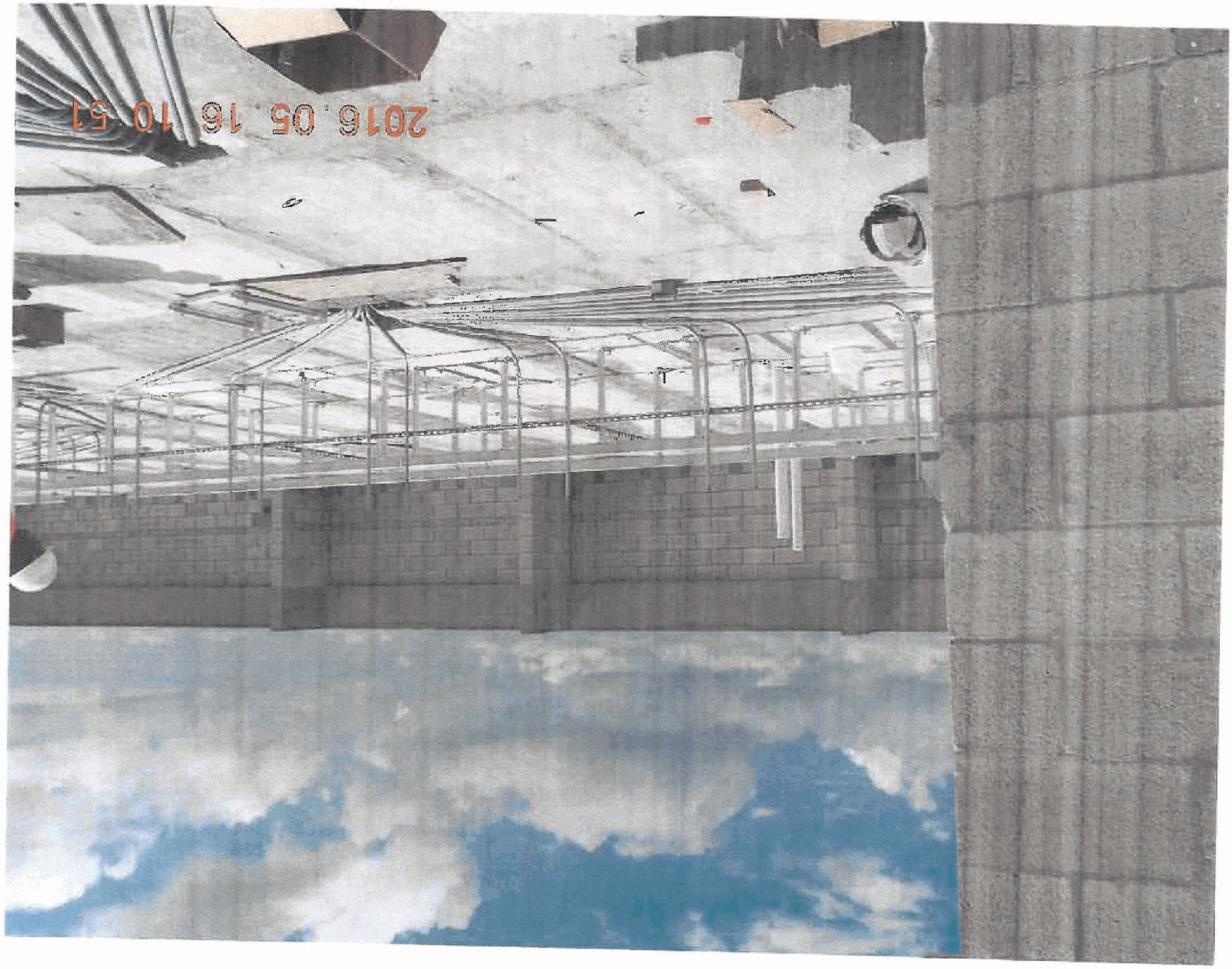
NRCA's recommendations

Electrical conduit embedded within roof systems or placed directly below roof decks can be problematic for roofing professionals. Although the electrical code provides some guidance regarding metallic conduit placement within or directly underneath roof systems, experience has shown these requirements are not adequate to address roofing industry concerns.

NRCA does not recommend metallic conduit or wiring be embedded within roof assemblies or placed directly below roof decks. If metallic conduit or wiring needs to be placed near the roof assembly, NRCA recommends it be positioned and supported at least 1½ inches from the bottom side of the roof deck or substrate to which the roof system is applied. Also, hangers or other supports used to attach and support metallic conduit and wiring should be attached to framing or roof deck supports, not the roof deck or roof substrate.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

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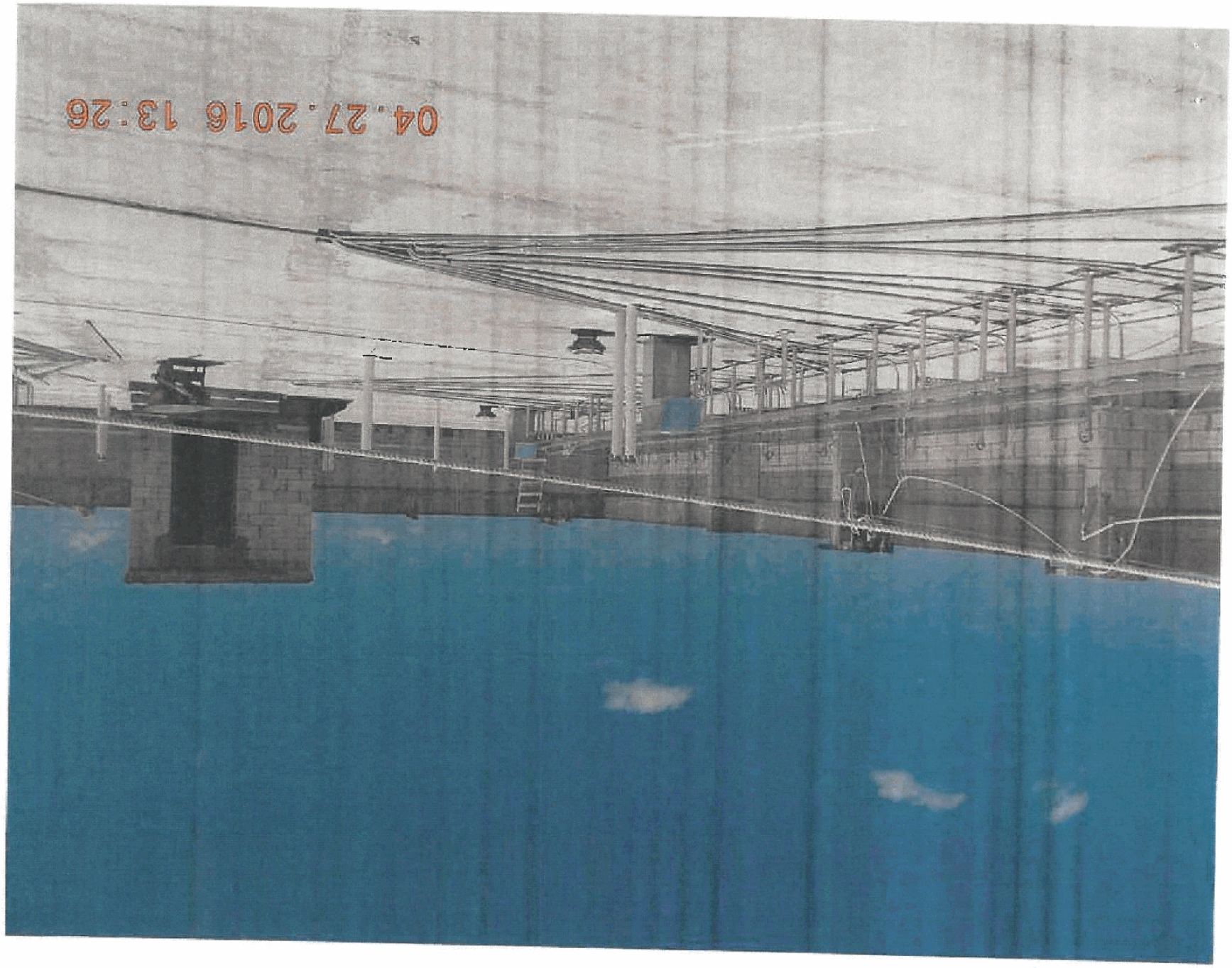
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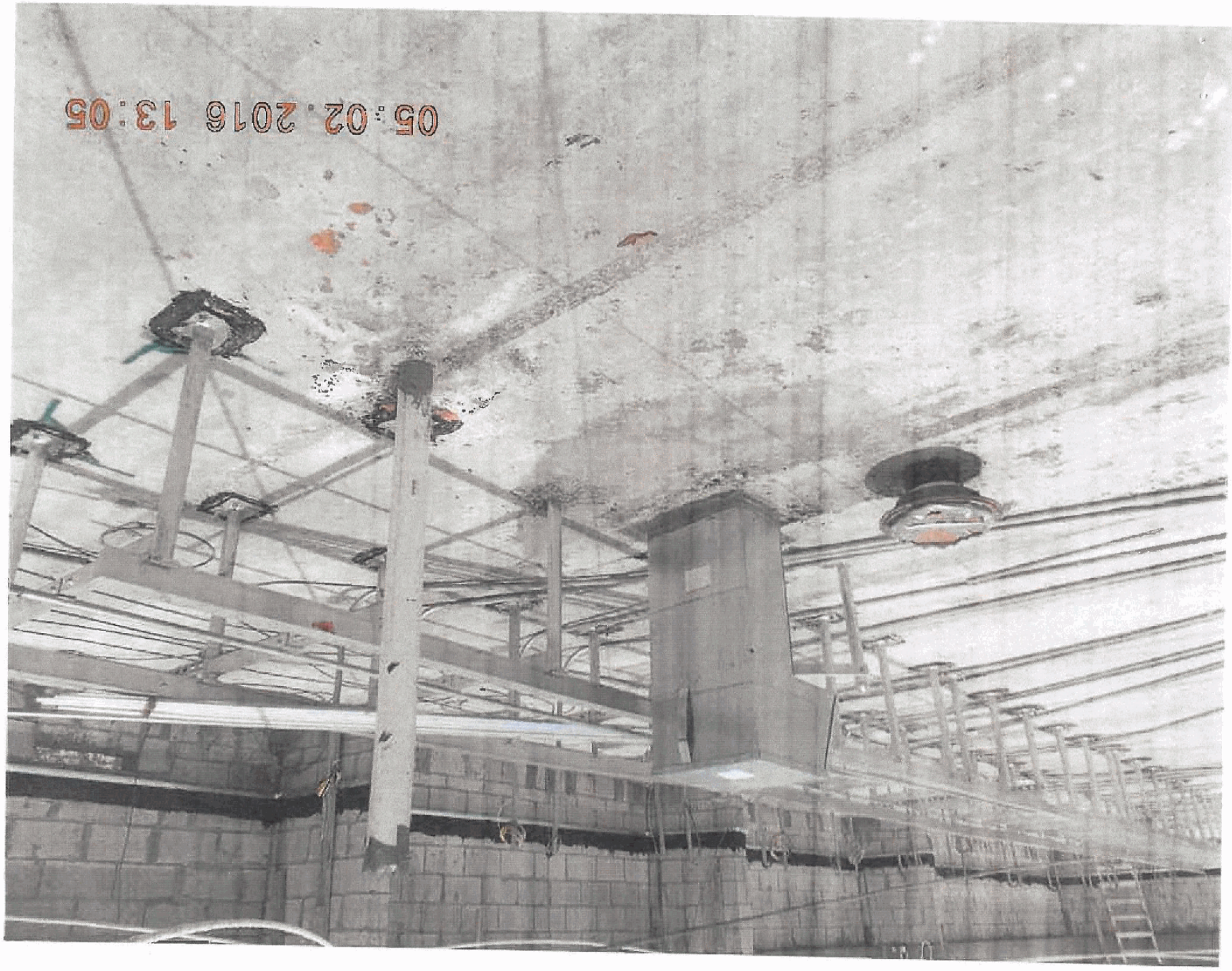
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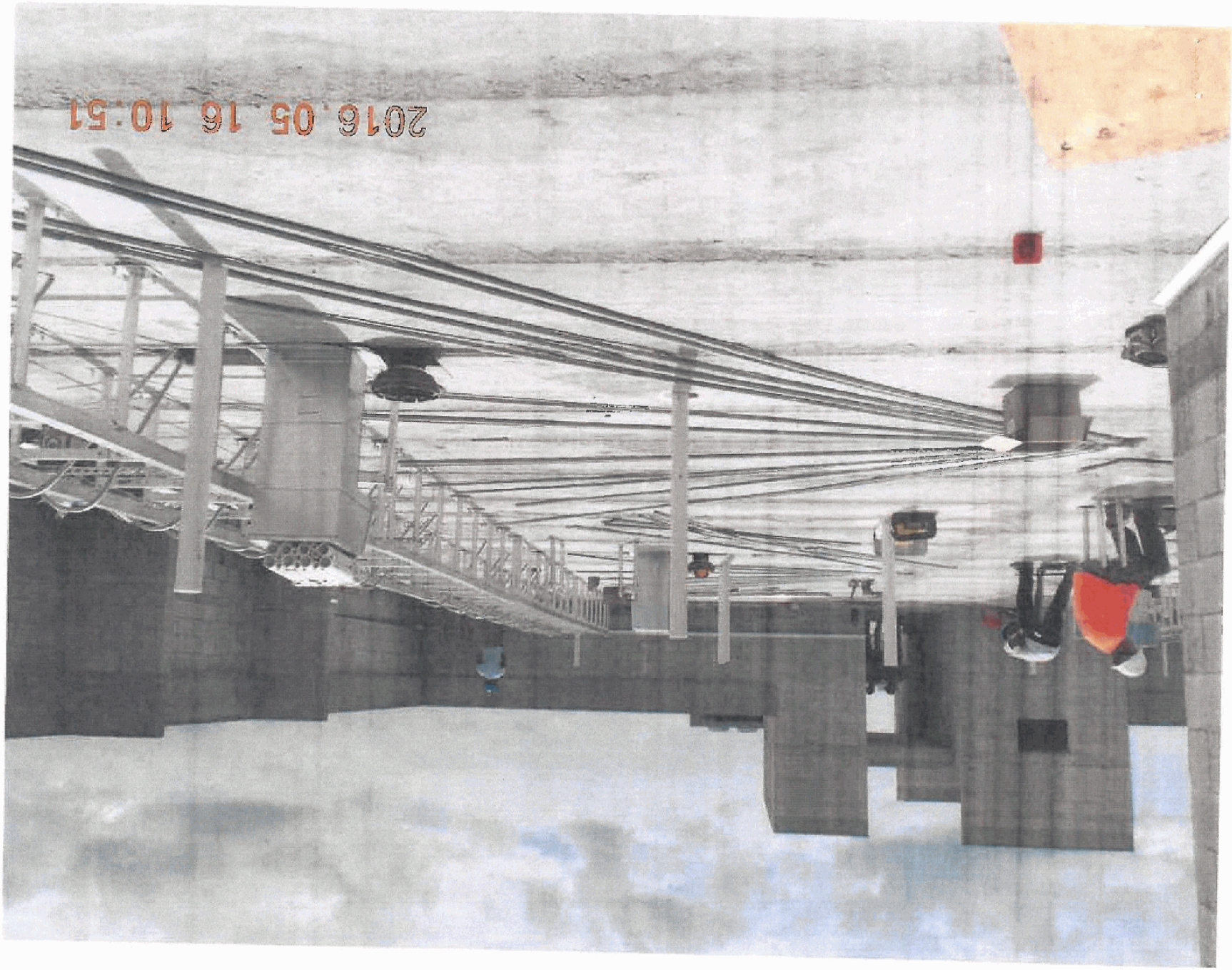
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R7696

Date Submitted	12/5/2018	**Section**	1507.1.1	**Proponent**	T Stafford
Chapter	15	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language Yes

Related Modifications

Summary of Modification

This proposal will require a sealed roof deck consistent with the IBHS Fortified Bronze designation.

Rationale

This proposal will require sealing of the the roof deck that is consistent with the IBHS Fortified Home Bronze designation. See uploaded support file for the rationale and justification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

This proposal will slightly increase cost. For roof slopes 4:12 and greater, the cost increase for a typical 2000 square foot roof will be approximately $220. For roof slopes less than 4:12, the cost increase for a typical 2000 square foot roof will be approximately $440.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal will reduce the amount of water infiltration through the roof deck when roof coverings are lost due to a wind event.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal strengthens the code by requiring a sealed roof deck to reduce the amount of water infiltration through the roof deck when roof coverings are lost due to a wind event.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7696-A5

Proponent Greg Keeler **Submitted** 5/25/2019 **Attachments** Yes

Rationale

Data indicates that the tear and fastener pull through strength of synthetic underlayments is higher than that of ASTM D226 and ASTM D4869 felts. Thus, it would not make sense to allow a double layer of organic felt underlayment without tape on the deck joints, and not allow a double layer of synthetic underlayment without tape on the deck joints.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Yes

Does not degrade the effectiveness of the code

Yes

Alternate Language

2nd Comment Period

7696-A3

Proponent T Stafford **Submitted** 5/23/2019 **Attachments** Yes

Rationale

This public comment simply clarifies that the provisions of this section only apply to roofs with slopes of 2:12 and greater and corrects a error in regard to wood shakes and shingles.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entity relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This public comment clarifies the intent of the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This public comment improves the code by clarifying the intent.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7696-A2

Proponent T Stafford **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This public comment simply adds the double layer of ASTM D 226 Type II or ASTM D4869 Types III or IV as a sealed roof deck option for concrete and clay tile roof coverings. This oversight was mentioned by a representative of TRI at the last Roofing TAC meeting. We request the TAC support this public comment with the original modification and forward to the Commission with a recommendation of Approval of the original proposal as modified by this public comment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal adds another option for creating a sealed roof deck under concrete and clay tile roofs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by adding another option for creating a sealed roof deck under concrete and clay tile roofs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7696-A1

Proponent T Stafford **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This public comment adds an exception to the sealed roof deck requirements for roofs over exterior walkways and agricultural buildings. These concerns were discussed at the previous Roofing TAC meeting. We believe this new exception will address those concerns. We request the Roofing TAC support the original proposal as modified by this public comment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entity relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with code.

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This public comment provides an exception to the sealed roof deck for areas where water infiltration would not be detrimental.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This public comment improves the code by providing an exception to the sealed roof deck for areas where water infiltration would not be detrimental.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

2nd Comment Period

R7696-G1

Proponent Michael Silvers (FRSA **Submitted** 5/24/2019 **Attachments** Yes

Comment:

During the March TAC meetings FRSA was ask to provide cost estimates for the proposed sealed deck criteria outlined in modifications R7694 and R7696.Attached to this comment are pricing for:
1. A Single Layer of #30 felt underlayment;
2. A Double Layer of #30;
3. For Taped Joints for plywood.
The price difference between a single layer and a double layer of # 30 is $633.05 for a 20 square residential type roof. The price for Taped Joints is $795.47 for the same roof size and type. These prices include typical material cost, conservative labor, burden, overhead and profit rates all established by information from several contractors and also from previous bids submitted to roof consultants.

1507.1.1 Underlayment. ~~Unless otherwise noted u~~Underlayment ~~for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels~~ shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated ~~in Table 1507.1.1~~. Underlayment shall be applied and attached in accordance with Section 1507.1.1.1, 1507.1.1.2, or 1507.1.1.3 as applicable ~~Table 1507.1.1~~.

1507.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

Exceptions:

1. A reinforced synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV and having a minimum tear strength of 15 lbf in accordance with ASTM D4533 and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted to be applied over the entire roof over the 4-inch wide (102 mm) membrane strips. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table 1507.1.1.1 for the applicable roof covering and slope.

2. Compliance with Section 1507.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

Revise the original modification as follows:

1507.1.1 Underlayment. Underlayment for roof slopes 2:12 and greater shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated. Underlayment for roof slopes 2:12 and greater shall be applied and attached in accordance with Section 1507.1.1.1, 1507.1.1.2, or 1507.1.1.3 as applicable.

1507.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, ~~wood shingles, wood shakes~~ and metal roof panels shall comply with one of the following methods:

No change to remainder of text.

Revise Section 1507.1.1.2 or the original modification as follows:

1507.1.1.2 Underlayment for concrete and clay tile. Underlayment for concrete and clay tile shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section 1507.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section 1507.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

Exception: Compliance with Section 1507.1.1.2 is not required where a fully adhered underlayment is applied in accordance with Section 1507.3.3.

Revise Sections 1507.1.1 of the original modification as follows:

1507.1.1 Underlayment. Underlayment shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated. Underlayment shall be applied and attached in accordance with Section 1507.1.1.1, 1507.1.1.2, or 1507.1.1.3 as applicable.

Exception: For areas of a roof that cover exterior walkways and roofs of agricultural buildings, underlayment shall comply with the manufacturer's installation instructions.

Revise as follows:

1507.1.1 Underlayment. ~~Unless otherwise noted u~~Underlayment ~~for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels~~ shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated ~~in Table 1507.1.1~~. Underlayment shall be applied and attached in accordance with Section 1507.1.1.1, 1507.1.1.2, or 1507.1.1.3 as applicable ~~Table 1507.1.1~~.

1507.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

> **Exception:** A reinforced synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II and having a minimum tear strength of 15 lbf in accordance with ~~ASTM D1970 or~~ ASTM D4533 ~~of 20 pounds~~ and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted to be applied over the entire roof over the 4-inch wide (102 mm) membrane strips. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table 1507.1.1.1 for the applicable roof covering and slope~~, except metal cap nails shall be required where the ultimate design wind speed, V_{ult}, equals or exceeds 150 mph~~.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C)), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

> **Exception:** A reinforced synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II and having a minimum tear strength of 15 lbf in accordance with ASTM D4533 and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted to be applied over the entire roof over the 4-inch wide (102 mm) membrane strips. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table 1507.1.1.1 for the applicable roof covering and slope.

4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

> **Exception:** Compliance with Section 1507.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

TABLE 1507.1.1.1

UNDERLAYMENT WITH SELF-ADHERING STRIPS OVER ROOF DECKING JOINTS

Roof Covering	Underlayment Type	Underlayment Attachment	
		2:12 = Roof Slope < 4:12	Roof Slope > 4:12
Asphalt Shingles, Metal Roof Panels, Photovoltaic Shingles	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D 6757	Apply in accordance with Section 1507.1.1.1 Item 4 or Section 1507.1.1.3 Item 3 as applicable to the type of roof covering.	Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches (51 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with two staggered rows in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.
Metal Roof Shingles, Mineral-Surface Roll Roofing, Slate and Slate-type Shingles, Wood Shingles, Wood Shakes	ASTM D226 Type II ASTM D4869 Type III or IV		

~~**TABLE 1507.1.1**~~

~~**UNDERLAYMENT TABLE**~~

~~Roof Covering Section~~	~~Roof Slope 2:12 and Less Than 4:12 Underlayment~~	~~Underlayment Attachment[a]~~	~~Roof Slope 4:12 and Greater Underlayment~~	~~Underlayment Attachment[a]~~
~~Asphalt shingles 1507.2~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type III or IV ASTM D 6757~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D 1970~~	~~3~~
~~Concrete and Clay Tile 1507.3~~	~~See Section 1507.3.3~~			
~~Metal roof panels 1507.4~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV ASTM D6757~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D1970~~	~~3~~
~~Metal roof shingles 1507.5~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~

	ASTM D1970	3	ASTM D1970	3
Mineral-surfaced roll roofing 1507.6	ASTM D226 Type I or II ASTM D4869 Type II, III or IV	1	ASTM D226 Type II ASTM D4869 Type IV	2
	ASTM D1970	3	ASTMD 1970	3
Slate shingles 1507.7	ASTM D226 Type I or II ASTM D4869 Type II, III or IV	1	ASTM D226 Type II ASTM D4869 Type IV	2
	ASTM D1970	3	ASTM D1970	3
Wood shingles 1507.8	ASTM D226 Type I or II ASTM D4869 Type II, III or IV	1	ASTM D226 Type II ASTM D4869 Type IV	2
Wood shakes 1507.9	Limited to roof slopes 4:12 and Greater	ASTM D226 Type II ASTM D4869 Type IV	2	2
Photovoltaic Shingles 1507.17	ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757	1	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757	
	ASTM D1970	3	ASTM D1970	3

[a]Underlayment Attachment

1. Roof slopes from two units vertical in 12 units horizontal (17-percent slope), and less than four units vertical in 12 units horizontal (33-percent slope). Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

2. Roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches (51 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with two staggered rows in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

3. Roof slopes from two units vertical in 12 units horizontal (17-percent slope) and greater. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970(2015a) installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

Exception: A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970(2015a), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1507.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

1507.1.1.2 Underlayment for concrete and clay tile. Underlayment for concrete and clay tile shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section 1507.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section 1507.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

Exception: Compliance with Section 1507.1.1.2 is not required where a fully adhered underlayment is applied in accordance with Section 1507.3.3.

1507.1.1.3 Underlayment for wood shakes and shingles. Underlayment for wood shakes and shingles shall comply with one of the following methods:

1. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

2. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C)), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Table 1507.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

3. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

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Roofing Cost and Profit Recap Report
Entire Job

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$396.39	19.672/SQ	
Material Subtotal			$396.39	19.672/SQ	
	Tax	7.00%	$27.75	1.377/SQ	
	SubTotal Material		$424.14	21.049/SQ	
Labor					
07-100-011 ROOFING LABOR			$172.66	8.569/SQ	10.16
Labor Subtotal			$172.66	8.569/SQ	10.16
	Labor Burden	95.00%	$164.02	8.140/SQ	
	SubTotal Labor		$336.68	16.709/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$15.00	0.00%	$15.00		
Miscellaneous Subtotal	$25.00	0.00%	$25.00	1.241/SQ	
	Subtotal		$785.82	38.998/SQ	
	Overhead	45.00%	$353.62	17.549/SQ	
Profit		6.00%	$68.37	3.393/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$1,207.80	59.941/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	10.16
Total Mandays:	1.27
SQ/Hour	1.984
SQ/Manday	15.872

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Condition Detail Report

Thursday, May 23, 2019
2:25 PM

Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Undrelayment 5/12 (2,015.00 SF)							
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
1" Cap Nail	3,053.03	EA	3,053.03	EA	0.020	EA	$61.06
Lab 1 Ply Nailed	20.15	SQ	1.01	MDAYS	136.000	MDAYS	$137.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Undrelayment 5/12							**$429.83**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
And							
OR							
Lab 1 Ply Nailed	89.00	SF	0.04	MDAYS	136.000	MDAYS	$6.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**178.00**	**SF**					**$16.29**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
And							
OR							
Lab 1 Ply Nailed	221.12	SF	0.11	MDAYS	136.000	MDAYS	$15.04
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**442.23**	**SF**					**$40.47**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
And							
OR							
Lab 1 Ply Nailed	88.45	SF	0.04	MDAYS	136.000	MDAYS	$6.02
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**176.89**	**SF**					**$16.19**
Condition = Eave Flashing (199.00 LF)							
1" Cap Nail	199.00	EA	199.00	EA	0.020	EA	$3.98
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							

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Condition Detail Report

Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Total Eave Flashing							**$9.70**
Condition = VTR Flashing w/ 2" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	32.350	CANS	$1.94
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 2" Lead Boot							**$3.64**
Condition = VTR Flashing w/ 3" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	32.350	CANS	$1.94
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 3" Lead Boot							**$3.64**
Condition = VENT Large GRV (2.00 EA)							
Flashing Cement	2.00	SF	0.04	CANS	32.350	CANS	$1.29
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Large GRV							**$4.69**
Condition = Flashing for 5/12 @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
Misc SF:							
Flashing Cement	1.00	SF	0.02	CANS	32.350	CANS	$0.65
Misc EA:							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Total Flashing for 5/12 @ Electrical Ris							**$2.35**
Job Totals:							**$526.80**

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Condition Summary

Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Single Layer #30										
Undrelayment 5/12	2,015.00	SF	$293	$137	$0	$0	$0	$430	0.213	SF
Ridge	44.50	LF	$10	$6	$0	$0	$0	$16	0.366	LF
Hip	110.56	LF	$25	$15	$0	$0	$0	$40	0.366	LF
Valley 5/12	29.48	LF	$10	$6	$0	$0	$0	$16	0.549	LF
Eave Flashing	199.00	LF	$10	$0	$0	$0	$0	$10	0.049	LF
VTR Flashing w/ 2" Lead Boot	1.00	EA	$2	$2	$0	$0	$0	$4	3.641	EA
VTR Flashing w/ 3" Lead Boot	1.00	EA	$2	$2	$0	$0	$0	$4	3.641	EA
VENT Large GRV	2.00	EA	$1	$3	$0	$0	$0	$5	2.347	EA
Flashing for 5/12 @ Electrical Riser	1.00	EA	$1	$2	$0	$0	$0	$2	2.347	EA
Total Single Layer #30			$354	$173	$0	$0	$0	$527		
Job Totals:			$354	$173	$0	$0	$0	$527		

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Drawing Report
Single Layer #30

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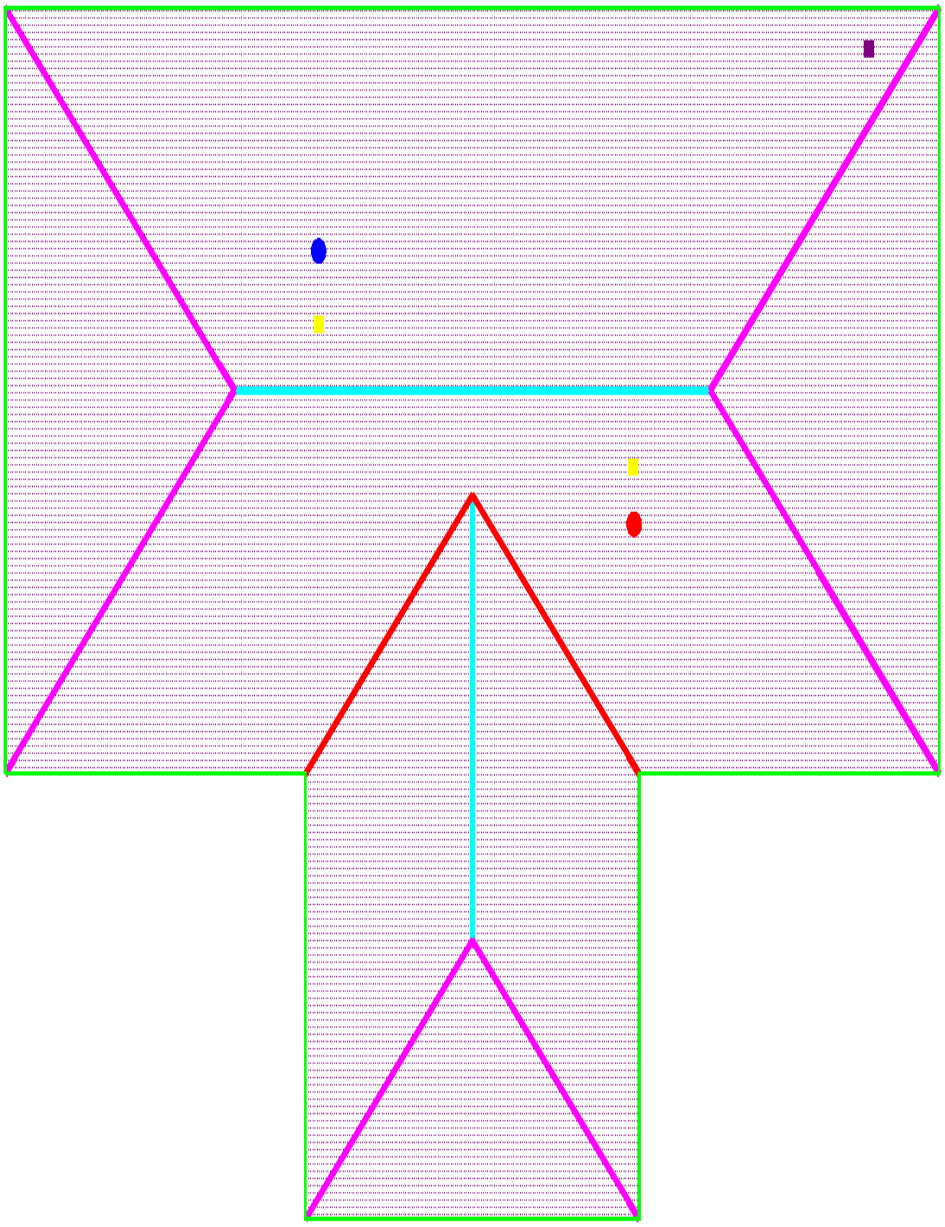
Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers



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Drawing Report
Single Layer #30

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Sealed Deck Underlayment Estimate - Single Layer of #30

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Undrelayment 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	5/12	VTR Flashing w/ 2" Lead Boot			1.00
	5/12	VTR Flashing w/ 3" Lead Boot			1.00
	5/12	VENT Large GRV			2.00
	5/12	Flashing for 5/12 @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Lab 1 Ply Nailed	398.56	SF	1,999.600	249.950	0.20	1.59	$27.11	0.000
Lab 1 Ply Nailed	20.15	SQ	19.996	2.499	1.01	8.06	$137.05	0.000
Cut Underlayment for Penetration	5.00	EA	79.984	9.998	0.06	0.50	$8.50	0.000
Job Totals:					1.27	10.16	$172.66	

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Pricing - Purchase Report

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
30# Felt	13.00	ROLLS	23.000		ROLL	$299.00
Flashing Cement	1.00	CANS	32.350		CANS	$32.35
1" Cap Nail	3,252.03	EA	0.020		EA	$65.04
Job Totals:						$396.39

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Roofing Cost and Profit Recap Report
Entire Job

Thursday, May 23, 2019
2:29 PM

Sealed Deck Underlayment Estimate - Double Layer of #30 — Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$677.98	33.647/SQ	
Material Subtotal			$677.98	33.647/SQ	
	Tax	7.00%	$47.46	2.355/SQ	
	SubTotal Material		$725.44	36.002/SQ	
Labor					
07-100-011 ROOFING LABOR			$226.80	11.255/SQ	13.34
Labor Subtotal			$226.80	11.255/SQ	13.34
	Labor Burden	95.00%	$215.46	10.693/SQ	
	SubTotal Labor		$442.25	21.948/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$20.00	0.00%	$20.00		
Miscellaneous Subtotal	$30.00	0.00%	$30.00	1.489/SQ	
	Subtotal		$1,197.69	59.439/SQ	
	Overhead	45.00%	$538.96	26.747/SQ	
Profit		6.00%	$104.20	5.171/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$1,840.85	91.357/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	13.34
Total Mandays:	1.67
SQ/Hour	1.510
SQ/Manday	12.083

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Condition Detail Report

Thursday, May 23, 2019
2:30 PM

Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Undrelayment 5/12 (2,015.00 SF)							
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
1" Cap Nail	3,250.00	EA	3,250.00	EA	0.020	EA	$65.00
Lab 2 Ply Nailed	20.15	SQ	1.34	MDAYS	136.000	MDAYS	$182.69
Misc LF:							
Misc SF:							
Misc EA:							
Total Undrelayment 5/12							**$711.14**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
And							
OR							
Lab 1 Ply Nailed	89.00	SF	0.04	MDAYS	136.000	MDAYS	$6.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**267.00**	**SF**					**$26.52**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
And							
OR							
Lab 1 Ply Nailed	221.12	SF	0.11	MDAYS	136.000	MDAYS	$15.04
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**663.35**	**SF**					**$65.89**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
And							
OR							
Lab 1 Ply Nailed	88.45	SF	0.04	MDAYS	136.000	MDAYS	$6.01
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**265.34**	**SF**					**$26.36**
Condition = Eave Flashing (199.00 LF)							
1" Cap Nail	199.00	EA	199.00	EA	0.020	EA	$3.98
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
And							
OR							

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Condition Detail Report

Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Total Eave Flashing							**$15.42**
Condition = VTR Flashing w/ 2" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	34.000	CANS	$2.04
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 2" Lead Boot							**$5.44**
Condition = VTR Flashing w/ 3" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	34.000	CANS	$2.04
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 3" Lead Boot							**$5.44**
Condition = VENT Large GRV (2.00 EA)							
Flashing Cement	2.00	SF	0.04	CANS	34.000	CANS	$1.36
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Large GRV							**$8.16**
Condition = Flashing for 5/12 @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
Misc SF:							
Flashing Cement	1.00	SF	0.02	CANS	34.000	CANS	$0.68
Misc EA:							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Total Flashing for 5/12 @ Electrical Ris							**$4.08**
Job Totals:							**$868.46**

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Condition Summary

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Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Double Layer #30										
Undrelayment 5/12	2,015.00	SF	$528	$183	$0	$0	$0	$711	0.353	SF
Ridge	44.50	LF	$20	$6	$0	$0	$0	$27	0.596	LF
Hip	110.56	LF	$51	$15	$0	$0	$0	$66	0.596	LF
Valley 5/12	29.48	LF	$20	$6	$0	$0	$0	$26	0.894	LF
Eave Flashing	199.00	LF	$15	$0	$0	$0	$0	$15	0.077	LF
VTR Flashing w/ 2" Lead Boot	1.00	EA	$2	$3	$0	$0	$0	$5	5.440	EA
VTR Flashing w/ 3" Lead Boot	1.00	EA	$2	$3	$0	$0	$0	$5	5.440	EA
VENT Large GRV	2.00	EA	$1	$7	$0	$0	$0	$8	4.080	EA
Flashing for 5/12 @ Electrical Riser	1.00	EA	$1	$3	$0	$0	$0	$4	4.080	EA
Total Double Layer #30			$642	$227	$0	$0	$0	$868		
Job Totals:			$642	$227	$0	$0	$0	$868		

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Drawing Report
Double Layer #30

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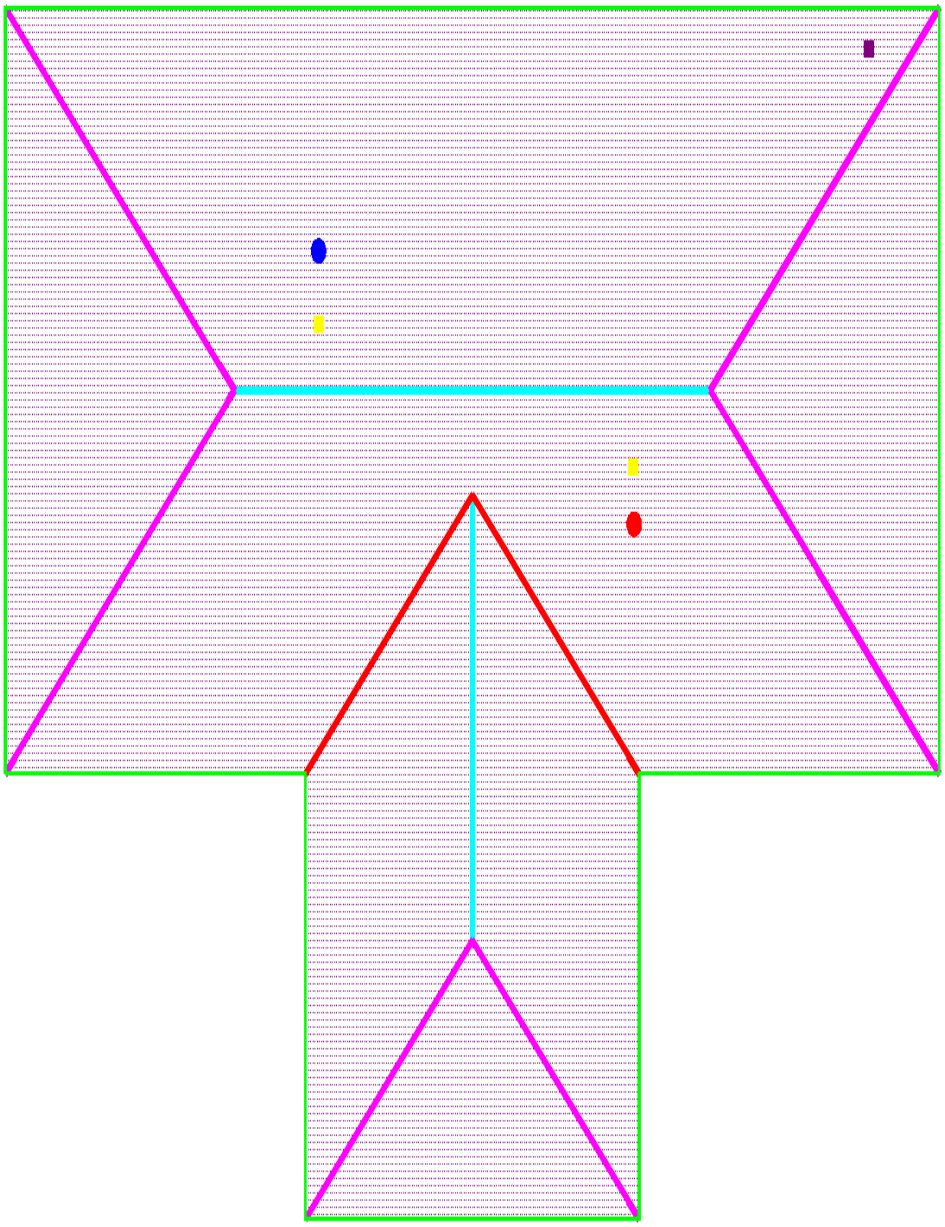
Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers



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Drawing Report
Double Layer #30

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Sealed Deck Underlayment Estimate - Double Layer of #30

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Undrelayment 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	5/12	VTR Flashing w/ 2" Lead Boot			1.00
	5/12	VTR Flashing w/ 3" Lead Boot			1.00
	5/12	VENT Large GRV			2.00
	5/12	Flashing for 5/12 @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Lab 1 Ply Nailed	398.56	SF	2,000.000	250.000	0.20	1.59	$27.10	0.000
Lab 2 Ply Nailed	20.15	SQ	15.000	1.875	1.34	10.75	$182.69	0.000
Cut Underlayment for Penetration	10.00	EA	80.000	10.000	0.13	1.00	$17.00	0.000
Job Totals:					1.67	13.34	$226.80	

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Pricing - Purchase Report

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Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
30# Felt	25.00	ROLLS	23.000		ROLL	$575.00
Flashing Cement	1.00	CANS	34.000		CANS	$34.00
1" Cap Nail	3,449.00	EA	0.020		EA	$68.98
Job Totals:						$677.98

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Roofing Cost and Profit Recap Report
Entire Job

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$198.13	9.833/SQ	
Material Subtotal			$198.13	9.833/SQ	
	Tax	7.00%	$13.87	0.688/SQ	
	SubTotal Material		$212.00	10.521/SQ	
Labor					
07-100-011 ROOFING LABOR			$146.44	7.267/SQ	8.61
Labor Subtotal			$146.44	7.267/SQ	8.61
	Labor Burden	95.00%	$139.12	6.904/SQ	
	SubTotal Labor		$285.55	14.171/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$10.00	0.00%	$10.00		
Miscellaneous Subtotal	$20.00	0.00%	$20.00	0.993/SQ	
	Subtotal		$517.55	25.685/SQ	
	Overhead	45.00%	$232.90	11.558/SQ	
Profit		6.00%	$45.03	2.235/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$795.47	39.478/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	8.61
Total Mandays:	1.08
SQ/Hour	2.339
SQ/Manday	18.714

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Condition Detail Report

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Roof Area 5/12 (2,015.00 SF)							
Misc LF:							
Misc SF:							
Misc EA:							
Total Roof Area 5/12	**0.00**		**0.00**				**$0.00**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**0.00**		**0.00**				**$0.00**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**0.00**		**0.00**				**$0.00**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**0.00**		**0.00**				**$0.00**
Condition = Eave Flashing (199.00 LF)							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Eave Flashing	**0.00**		**0.00**				**$0.00**
Condition = Tape Joint Horiztntal (417.47 LF)							
SA Seam Tape Tamko TW	417.47	LF	6.84	RL	15.000	RL	$102.66
Install Tape Joint Horiztntal	417.47	LF	0.52	MDAYS	136.000	MDAYS	$70.97
Total Tape Joint Horiztntal	**834.94**	**LF**					**$173.63**

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Condition Detail Report

Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Tape Joint Vertical (233.21 LF)							
SA Seam Tape Tamko TW	233.21	LF	3.82	RL	15.000	RL	$57.35
Install Tape Joint Vertical	233.21	LF	0.29	MDAYS	136.000	MDAYS	$39.65
Total Tape Joint Vertical	**466.42**	**LF**					**$96.99**
Condition = Tape Joint Valley or Hip (140.04 LF)							
SA Seam Tape Tamko TW	140.04	LF	2.30	RL	15.000	RL	$34.44
Install Tape Joint Valley or Hip	140.04	LF	0.23	MDAYS	136.000	MDAYS	$31.74
Total Tape Joint Valley or Hip	**280.08**	**LF**					**$66.18**
Condition = VTR Seam Tape (1.00 EA)							
SA Seam Tape Tamko TW	2.00	LF	0.03	RL	15.000	RL	$0.49
Install VTR Seam Tape	2.00	LF	0.00	MDAYS	136.000	MDAYS	$0.54
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Seam Tape	**4.00**	**LF**					**$1.04**
Condition = VTR Seam Tape (1.00 EA)							
SA Seam Tape Tamko TW	2.50	LF	0.04	RL	15.000	RL	$0.61
Install VTR Seam Tape	2.50	LF	0.01	MDAYS	136.000	MDAYS	$0.68
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Seam Tape	**5.00**	**LF**					**$1.29**
Condition = VENT Seam Tape (2.00 EA)							
SA Seam Tape Tamko TW	8.00	LF	0.13	RL	15.000	RL	$1.97
Install VENT Seam Tape	8.00	LF	0.02	MDAYS	136.000	MDAYS	$2.18
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Seam Tape	**16.00**	**LF**					**$4.14**
Condition = Seam Tape @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
SA Seam Tape Tamko TW	2.50	LF	0.04	RL	15.000	RL	$0.61
Install Seam Tape @ Electrical Riser	2.50	LF	0.01	MDAYS	136.000	MDAYS	$0.68
Misc SF:							
Misc EA:							
Total Seam Tape @ Electrical Riser	**5.00**	**LF**					**$1.29**
Job Totals:	**1,611.44**	**LF**					**$344.56**

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Condition Summary

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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Taped Joints										
Tape Joint Horiztntal	417.47	LF	$103	$71	$0	$0	$0	$174	0.416	LF
Tape Joint Vertical	233.21	LF	$57	$40	$0	$0	$0	$97	0.416	LF
Tape Joint Valley or Hip	140.04	LF	$34	$32	$0	$0	$0	$66	0.473	LF
VTR Seam Tape	1.00	EA	$0	$1	$0	$0	$0	$1	1.036	EA
VTR Seam Tape	1.00	EA	$1	$1	$0	$0	$0	$1	1.295	EA
VENT Seam Tape	2.00	EA	$2	$2	$0	$0	$0	$4	2.072	EA
Seam Tape @ Electrical Riser	1.00	EA	$1	$1	$0	$0	$0	$1	1.295	EA
Total Taped Joints			$198	$146	$0	$0	$0	$345		
Job Totals:			$198	$146	$0	$0	$0	$345		

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Drawing Report
Taped Joints

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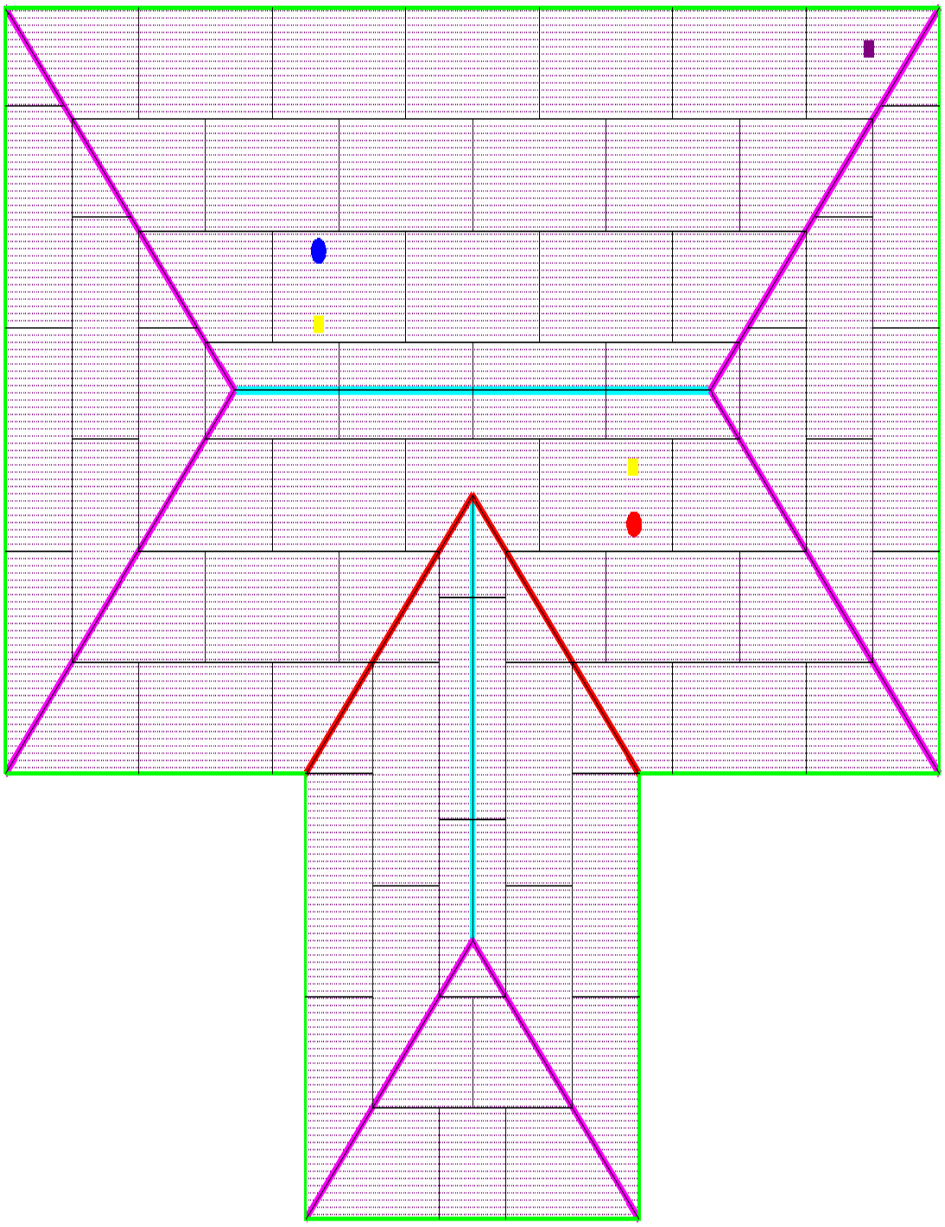
Sealed Deck Underlayment Estimate - Taped Joints

Silvers



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Drawing Report
Taped Joints

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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Roof Area 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	<none>	Tape Joint Horiztntal		417.47	
	5/12	Tape Joint Vertical		233.21	
	5/12	Tape Joint Valley or Hip		140.04	
	5/12	VTR Seam Tape			1.00
	5/12	VTR Seam Tape			1.00
	5/12	VENT Seam Tape			2.00
	5/12	Seam Tape @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Install Seam Tape @ Electrical Riser	2.50	LF	500.000	62.500	0.01	0.04	$0.68	0.000
Install Tape Joint Horiztntal	417.47	LF	800.000	100.000	0.52	4.17	$70.97	0.000
Install Tape Joint Valley or Hip	140.04	LF	600.000	75.000	0.23	1.87	$31.74	0.000
Install Tape Joint Vertical	233.21	LF	800.000	100.000	0.29	2.33	$39.65	0.000
Install VENT Seam Tape	8.00	LF	500.000	62.500	0.02	0.13	$2.18	0.000
Install VTR Seam Tape	4.50	LF	500.000	62.500	0.01	0.07	$1.22	0.000
Job Totals:	805.72	LF	748.288	93.536	1.08	8.61	$146.44	

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Pricing - Purchase Report

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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
SA Seam Tape Tamko TW	13.21	RL	15.000		RL	$198.13
Job Totals:	13.21	RL			RL	$198.13

Insurance Institute for Business & Home Safety

Where building science leads to real-world solutions.

Hurricane Demonstration Testing

Insights on Wind-Driven Water Entry

The Insurance Institute for Business & Home Safety (IBHS) Research Center 2011 hurricane season demonstration test offered an opportunity to gain insight into roof and ventilation system wind-driven water entry issues.

This unique, full-scale study of how wind-driven water penetrates openings in residential roof systems was modeled on real world, post-event damage assessments in areas where hurricane winds were strong enough to rip off roof cover, but not strong enough to blow off roof sheathing. In such instances, significant property damage and extended occupant displacement routinely occur due to water intrusion. In addition to wind-driven water pouring in – or being blown through – cracks between roof sheathing elements when primary roof cover is damaged and the underlayment is lost, water intrusion through residential roofs can originate from attic ventilation elements (e.g., ridge vents, gable end vents, and soffit vents).

Such damage is particularly common in inland areas, where hurricane-strength winds occur, but building codes and standards are not as stringent as in coastal jurisdictions. For example, when 2005's Hurricane Wilma crossed the southern tip of Florida as a Category 2 hurricane with peak wind speed gusts of about 110 mph, she caused more than $10 billion of damage, most of which related to roof damage and resulting water intrusion. Much of this damage occurred far inland. Other hurricanes have caused catastrophic damage as they moved well inland. For example, after Hurricane Ike made landfall in Texas, it remained strong for two days, creating Category 1 hurricane force winds as far away as Ohio (and causing more than $1.5 billion of losses there).

Water penetration can cause extensive damage to interior finishes, furnishings and other contents, and can lead to ceiling collapse when insulation is saturated. Also, where power is lost and/or a house cannot otherwise be quickly dried out, mold growth is common. IBHS believes that the tremendous human and financial costs associated with water penetration during hurricanes could be substantially reduced through widespread adoption of relatively simple, inexpensive changes to residential roofing systems, such as sealing the roof deck (which only costs about $500 for an average-sized home).

Objectives for IBHS' first wind-driven water research program included:

- quantifying the relative volume of water penetration through different roof openings;
- cataloguing types of water penetration damage to different parts of a house;
- demonstrating effective individual damage mitigation techniques, such as sealing the roof deck; and,
- illustrating why sealed roof decks are core components of the IBHS FORTIFIED for Existing Homes™ and FORTIFIED for Safer Living® program requirements for hurricane-prone regions.

The building specimen designed and constructed for the demonstration was a duplex, where sheathing joints on one half of the roof deck were sealed prior to installing roofing materials and the other half was not sealed. Both halves of the roof were then covered with simple felt paper underlayment prior to installing the asphalt shingles. The building included gable ends fitted with gable end vents and one foot wide soffits at the eaves. The roof sheathing stopped short along the primary ridge so it was possible to install a ridge vent during one set of tests.

All of these features have been addressed in the IBHS FORTIFIED Existing Homes™ bronze designation, which incorporates current best practices in a systems based approach to

reducing water entry related losses in high wind events. These recommendations are also incorporated in the IBHS Roofing the Right Way guide.

Figure 1 -Test duplex moving into the large test chamber at the IBHS Research Center.

The basic recommendations in the IBHS FORTIFIED Existing Homes ™ bronze brochure and the IBHS Roofing the Right Way guide related to preventing or reducing wind-driven water entry include:

1. Sealing the roof deck (joints or the entire surface) to prevent water from running into the attic through the gaps between the roof sheathing panels.

2. Ensuring that soffit panels (the flat panels installed between the bottom of the eaves at the roof edge and the wall of the house) are well attached to the house so they do not blow off in high winds, thereby creating an opening through which wind-driven water could enter the attic.

3. Covering gable end vents with flat shutter panels (plywood or some other flat material) when a hurricane threatens, to keep water from being blown into the attic.

4. Ensuring that ridge vents are products that have been tested and approved for resisting wind driven water entry and that they are adequately attached using the manufacturer's recommendations for high wind installations.

The 2011 hurricane demonstration test gave IBHS its first opportunity to illustrate the relative success and importance of taking these steps to reduce the potential for water entry using high-definition photos and videos of the consequences of water entry into attic spaces during the demonstration testing. Quantitative measurements of water entry were obtained by researchers opportunistically during this demonstration testing to provide preliminary measurements and insight into the quantity of water entering into an attic through vents and between sheathing joints.

Establishing Wind-Driven Rain Capabilities

Planning and research leading to the development of wind-driven rain capabilities at the IBHS Research Center have been ongoing for several years. IBHS provided support to the University of Florida (UF) to assist with deployment of a research disdrometer (an instrument that quantifies droplet size and rain fall rates, shown in Figure 2 on page 3) in Hurricane Ike.

IBHS followed up with partial support for a Ph.D. student to analyze rain droplet size distribution based on Hurricane Ike data, and then to use the UF wind simulator to select a commercially available spray nozzle to produce a similar distribution of rain droplet sizes in the IBHS Research Center test chamber. Thus, a realistic distribution of droplet sizes is required to achieve the same wetting patterns on buildings that occur during real world storms.

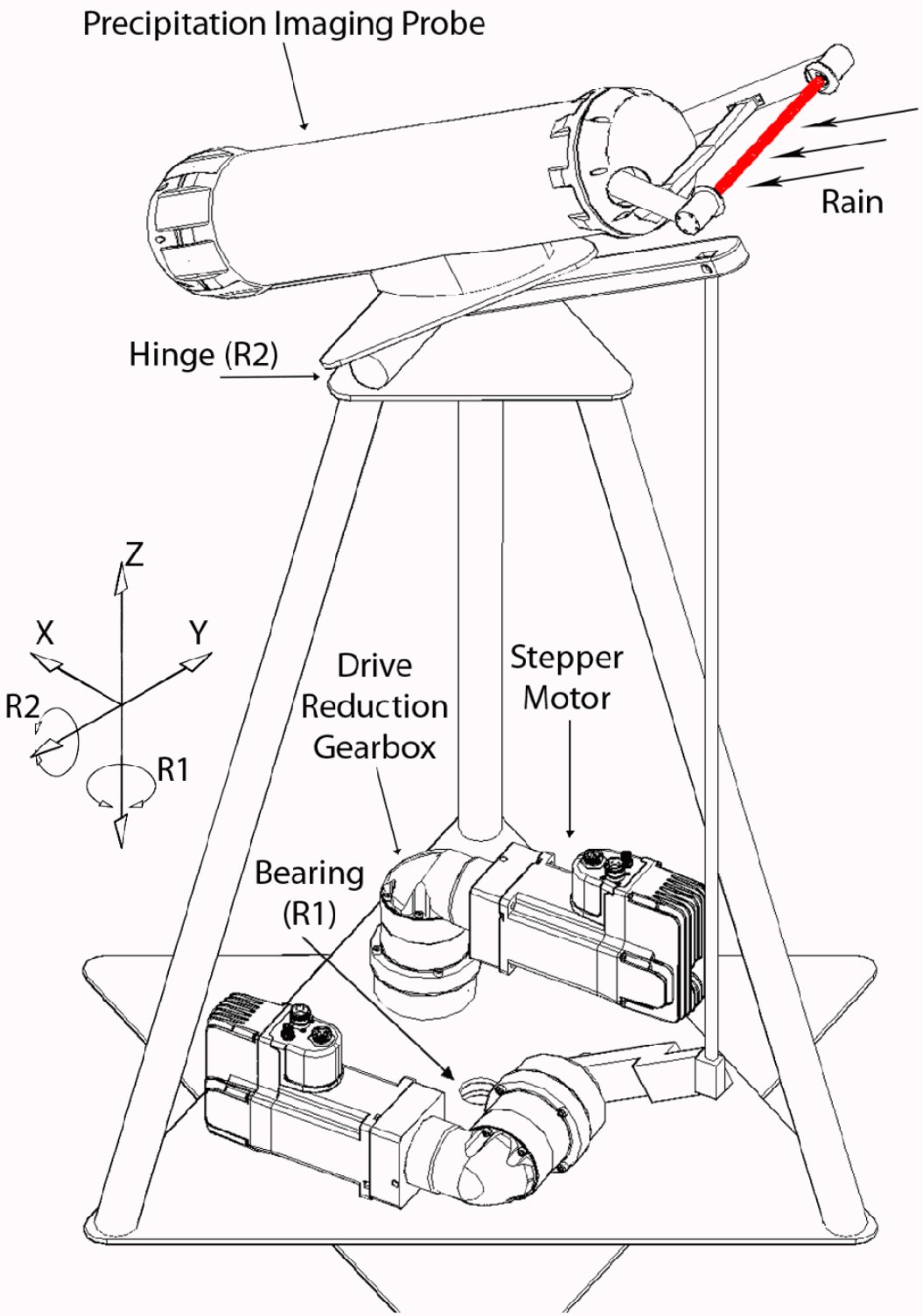

Figure 2 - Precipitation Imaging Probe (PIP) style disdrometer mounted on Florida Coastal Monitoring Program (FCMP) portable weather station for Hurricane Ike data collection by University of Florida.

This summer, the student brought the research disdrometer to the IBHS lab to conduct tests of the completed system. The validation tests demonstrated that target rain deposition rates (8 inches per hour in American Society of Testing and Materials and Florida Building Code test standards) and droplet size distributions were properly reproduced. NOTE: A Ph.D. dissertation is being written on this research and should be completed by the end of 2011.

Measuring Water Entry Rates

When the duplex was completed, including installation of wall board and ceiling drywall, drainage panels and tracks (DrySpaceTM) were installed to create water collection channels between the ceiling trusses, as shown in Figure 3. These channels were outfitted with drains and pipes that allowed collected water to be captured in plastic containers arranged throughout the interior (non-attic) space in the two halves of the duplex. The drainage system was installed in a modular system that allowed the collection of water in ceiling areas roughly 10 feet long by 2 feet wide. The trusses ran from front to back of the house and the 22½ inch space between the trusses was divided into three sections, each about 10 feet long. Each drainage channel directed water to a separate numbered plastic container. Typical drain and collection locations are shown in Figure 4, Figure 5, and Figure 6 (shown on page 6). Tests were typically conducted for a 20-minute period, during which a constant wind speed was maintained and rainfall rate was set to produce 8 inches per hour on the test building (i.e., horizontally driven rain). At the completion of each test, water in the buckets was measured and quantity was recorded.

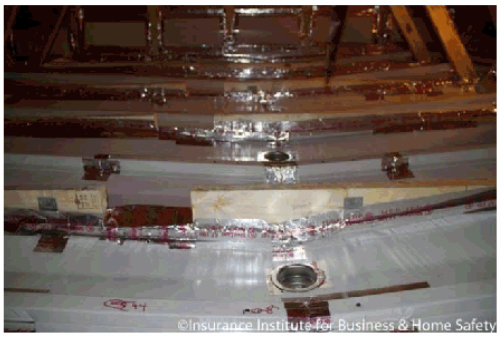

Figure 3 - Photograph of water collection channels between ceiling trusses in duplex.

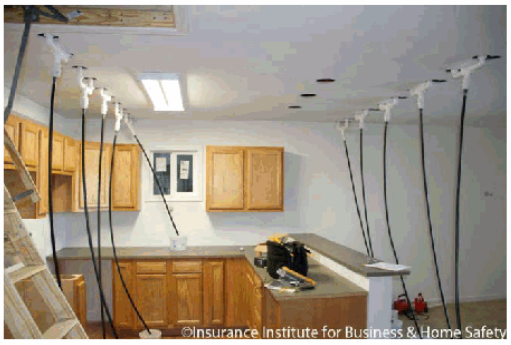

Figure 4 - Photograph of water collection drains to collection buckets in the duplex.

Figure 5 - Photograph of water collection drains to collection buckets in the duplex.

Figure 6 - Photograph of water collection drains to collection buckets in the duplex.

Quantitative Test Program Summary

A series of quantitative tests was conducted during the time available before the scheduled hurricane demonstration. The first test sequence involved measuring water entry rates when the soffit cover was missing along the entire length of the back eave of the duplex. The opening of approximately 8.5 sq. ft. under the eave of the roof where wind and wind-driven rain could enter the attic caused by the missing soffit is typical of the observed loss of the soffit cover in strong winds. Tests were conducted for wind speeds of 30 mph, 50 mph and 70 mph, during which the wall with the open soffit faced the wind flow, as shown in Figure 7. A quartering wind test (i.e., the wall with the open soffit was oriented at 45 degrees off perpendicular to the wind direction) was also conducted with a 50 mph wind speed.

The second test sequence involved repeating soffit tests with a typical perforated vinyl soffit panel intact, thus quantifying differences in water entry for typical soffits that remain undamaged vs. soffit material blown off during an event. For this round of quantification, tests were conducted at 50 mph and 70 mph with the wall with the soffit facing the wind, and at 50 mph for the quartering wind case.

The third test sequence focused on measuring water entry through the gable end vent. These tests were conducted with 30 mph and 50 mph wind-driven rain beating directly against the gable end. During these tests, soffits were covered with typical perforated vinyl soffit panel material.

Figure 7 - Photographs of the water entry quantification testing for the open soffit case with the wall facing the wind flow: top) whole duplex; and bottom) close-up of the open soffit area.

Following the soffit and gable end quantification test series, roof cover on the front of the duplex was blown off using high winds. Similar efforts were started for the roof surface at the back of the duplex, when a fan drive fault ended wind generation for that day. Because of schedule constraints, it was decided

to remove roof cover from the back roof surface to expose the sealed and un-sealed roof decks above the same eave where soffit water entry testing was conducted. Removal of roof cover from the front and back surfaces exposed the gap at the top of the primary ridge, so it was fitted with a Florida Building Code High Velocity Hurricane Zone approved ridge vent.

The final sequence of quantification testing included wind speeds of 50 mph with the back of the duplex facing the wind flow. This configuration put the exposed sealed and un-sealed roof decks, shown in Figure 8, perpendicular to the wind-driven rain to allow a relative comparison in the amount of water entry in the attic for each half of the roof.

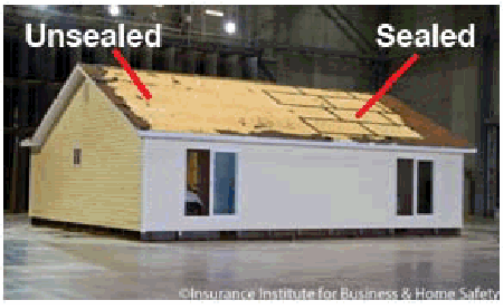

Figure 8 - Photograph of the back of the duplex after shingle and underlayment removal, illustrating the sealed roof deck (on the right) and the un-sealed roof deck (on the left).

Summary of Quantitative Test Results

Open Soffit Tests (simulating loss of soffit material during a high-wind event):

1. A wind speed of 30 mph produced a light sprinkling of drops on the water collection drainage pans within 8 feet of the open soffit. However, no water actually trickled down the drainage system to collection buckets.

2. A wind speed of 50 mph produced an overall water entry rate into the attic of about 1.3 inches per hour based on the open area of the soffit. This is about 15% of the rainfall deposited on the adjacent wall surface (8 inches per hour). Most water was within the first 10 feet of the attic space adjacent to the open soffit.

3. A wind speed of 70 mph produced an overall water entry rate into the attic of about 2.9 inches per hour based on the open area of the soffit. This is a little more than 33% of the deposition rate on the adjacent wall surface.

4. A quartering wind of 50 mph produced an uneven distribution of water in the attic, but still resulted in about 1.6 inches per hour based on the open area of the soffit. This is about 20% of the deposition rate on a wall surface that would have been facing the wind flow.

Covered Soffit Tests (where soffit material remains in place):

- A wind speed of 50 mph resulted in water accumulation in the attic space of approximately 6% of the amount of water that entered during the same test for the open soffit case.
- A wind of 70 mph produced about 9 times more water accumulation in the attic than the 50 mph test. This was about 25% of the amount of water that entered the attic during the same test (70 mph) for the open soffit case.
- A quartering wind of 50 mph produced very little accumulation of water in the attic. The amount was about 2.5% of the water entering during the same test for the open soffit case.

Gable End Vent Tests:

For winds of 30 mph and above, the water entry rate was about equal to the wind driven water deposition rate based on the area of the gable

end vent. There was a slight indication of less water entry for higher wind speeds, but that likely was due to missed water that was blown farther into the attic and collected in the area around the access stairs where no collection pans were in place.

Exposed Roof Sheathing Tests:

The sealed roof deck side (where joints between the roof sheathing were sealed by applying a self adhesive modified bitumen tape) experienced about one-third of the water entry experienced by the side without tape. The amount of water entry through the roof deck was unprecedented in relation to tests conducted for soffit and gable end vents. The roof deck test actually had to be stopped at 16 minutes in duration, because the 3-gallon containers collecting water from each 10 foot by 2 foot collection area were overflowing. Some water entry on the sealed roof side was due to cuts in the tape that occurred when roof cover was removed. Even holes left by nails that pulled out when roof cover was removed led to steady drips of water into the attic. On the side where roof cover was blown off (shown in Figure 9), nails tended to stay in place, which would have reduced nail hole drips. Use of ring shank nails to fasten shingles and underlayment would likely help reduce these leaks, because they will be less likely to pull out, even if roof shingles are blown off. There was no sign of leaks through the Florida Building Code High Velocity Hurricane Zone approved ridge vent.

Consequences of Water Entry

Following quantitative testing, water collection devices were removed from the structure and the required drainage holes in the ceiling were patched. Furniture was placed in the duplex to model actual living spaces. The finished structure was then subjected to a series of wind-driven rain events modeled after Hurricane Dolly. These tests gave IBHS the opportunity to illustrate the consequences of water entry into attic spaces with compelling photos and video. Figure 10 shows photographs taken on the un-sealed roof deck side of the duplex during the demonstration testing, while Figure 11 (shown on page 9) shows a similar view on the sealed roof deck side.

Figure 9 - Photograph of the front of the duplex after shingle and underlayment removal using high winds, illustrating the sealed roof deck (on the left) and the un-sealed roof deck (on the right).

Figure 10 - Photograph of the water entry during the demonstration event on the un-sealed roof deck side of the duplex: close up of the recessed lighting in the kitchen.

Figure 11 - Photograph of the kitchen during the demonstration event on the sealed roof deck side of the duplex.

The amount of water streaming into the living space during the demonstration in the un-sealed roof deck side of the duplex, and the level of damage ultimately experienced on this half of the duplex, is typical of the level of water entry reported during real-world events. Within 45 minutes of the conclusion of testing, the kitchen ceiling in the un-sealed side of the duplex collapsed, as shown in Figure 12 and Figure 13. Shortly thereafter, the living room area ceiling also collapsed, as shown in Figure 14.

Figure 12 - Photograph of collapsed ceiling in the kitchen on the un-sealed roof deck side of the duplex.

Figure 13 - Photograph of fallen portions of collapsed ceiling in the kitchen on the un-sealed roof deck side of the duplex.

Figure 14 - Photograph of fallen portions of collapsed ceiling in the living room on the un-sealed roof deck side of the duplex.

Following the test, IBHS brought in an experienced property insurance claims adjuster to estimate the amount of damage each side of the duplex suffered. He assessed damage to the front three rooms on both sides of the duplex, including the kitchen, dining room, and family room. During a hurricane or high wind event, winds generally come from a relatively small range of directions after roof cover blows off, so damage confined to one area of a house would be typical of most people's experience. The difference between estimated repair costs on the two sides of the duplex was substantial. The loss estimate for the side without a sealed roof deck is more than three times the loss estimate for the side with the sealed roof deck. Of particular note: the furniture in the side without a sealed roof deck required replacement, while furnishings in the side with the sealed roof deck only required cleaning.

Conclusions and Recommendations

These preliminary tests clearly demonstrate that the areas addressed in the IBHS FORTIFIED Existing Homes™ and Roofing the Right Way guidance are important to reducing water entry in hurricanes and other storms where wind-driven rain is a factor. Clearly, sealing the roof deck is one of the most important protective measures that can be undertaken. However, the installer should be careful to make sure that seams are securely sealed and that the drip edge is attached using typical high-wind requirements for fasteners. It is likely that the High Velocity Hurricane Zone requirements for applying roofing cement around edges of the roof would also help reduce water entry if roof cover does suffer damage in a storm.

As a preliminary study, this work suggests that much more investigation is needed to quantify the amount of water entry that can be expected for normal construction, how much water entry is likely to be reduced with various water entry prevention measures, and how much water entry can be tolerated before costs of water entry remediation increase significantly.

Reason: This proposal will require sealing of the the roof deck that is consistent with the *IBHS Fortified Home Bronze* designation. When the primary roof covering is lost due to a wind event, water infiltration can cause extensive damage to interior finishes, furnishings and other contents, and can lead to ceiling collapse when insulation is saturated. Also, where power is lost and/or a building cannot otherwise be quickly dried out, mold growth is common.

While observations from recent hurricanes indicate buildings built to the Florida Building Code (FBC) are performing better than older buildings, significant roof covering loss is still occurring. Many of these buildings, while relatively undamaged structurally, experienced significant and costly damage to interior components due the loss of the primary roof covering. A sealed roof deck can significantly reduce the amount of water infiltration when the primary roof covering is lost. A demonstration test by IBHS on building with portion of the roof sealed and another portion unsealed showed significant reductions in water infiltration in the areas where the roof deck was sealed. (See attached support file Hurricane_Test_Wind_Driven_Water_Report.)

While underlayment requirements in the FBC have been strengthened recently, this proposal, if approved, will take them one step further to comply with the *IBHS Fortified Home Bronze* designation. From a practical standpoint, only two changes are proposed to the current underlayment requirements in the 6th Edition (2017) FBC. First, where felt underlayments are used without membrane/flashing strips applied over the joints in the roof deck, two layers would now be required. The lap requirements currently required for low slope roofs would be required for all slopes. Fasteners for felt underlayment are required to be annular ring or deformed shank fasteners. The number of fasteners and spacing of fasteners is consistent with current requirements.

The options for using adhered underlayments are unchanged from the 6th Edition (2017) FBC.

The requirements for synthetic underlayments have been revised to be consistent with the new standard for synthetic underlayments that is near completion and expected to be published in 2019.

Preliminary observations from Hurricane Michael are also indicating that newer buildings built to the FBC are performing better but water infiltration due to roof covering loss is still a problem. This proposal, if approved, will significantly reduce the amount of water infiltration through the roof deck when roof coverings are lost.

R8158

Date Submitted	12/14/2018	**Section**	1504.3.3	**Proponent**	Ann Russo5
Chapter	15	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Summary of Modification

The proposal expands the definition of roofing beyond recognizing metal roof singles

Rationale

This proposal separates "metal roof shingles" as a separate line item product in Section 1504, specifically under the non- ballasted roof systems provisions. This proposal would create a separate line item for metal roof shingles based on the fact that metal shingles are not the same in all respects as either asphalt shingles (Section 1504.1.1) or the other roof systems (Section 1504.3.1) provisions.

One of the major considerations for this product type is the wind uplift testing which is addressed by several industry standards including FM, UL, and ASTM. The majority of manufacturers use one or more of these standards and we propose that the choice should remain with the manufacturer to demonstrate compliance. ASTM D3161M-15, is no longer constrained to asphalt shingles, but expanded to evaluate wind resistance of discontinuous, air permeable, steep slope roofing products that results from the product's rigidity, with or without contribution from sealant or other adhesive to help hold down the leading edge of the tabs, or mechanical interlocking, with or without contribution from sealant or other adhesive to hold down the leading edge of the tab, or any combination thereof." Inclusion of this standard as a compliance path for metal shingles would alleviate many of the difficulties experienced by metal shingle manufacturers.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Clarifies design and standard requirements making for clearer application and enforcement

Impact to building and property owners relative to cost of compliance with code

None expected

Impact to industry relative to the cost of compliance with code

None expected

Impact to small business relative to the cost of compliance with code

None expected

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves safety by improving definition of roofing covering options to correct standard(s)

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves Code

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

2nd Comment Period

R8158-G1

Proponent Borrone Jeanette **Submitted** 5/21/2019 **Attachments** No

Comment:

I agree with the proposed revision.

2nd Comment Period

R8158-G2

Proponent	Harold Barrineau	Submitted	5/26/2019	Attachments	No

Comment:

I agree with this modification.

Add as follows:

1504.3.3 Metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with FM 4474, UL 580, UL 1897, or ASTM D 3161. Metal roof shingles tested in accordance with ASTM D 3161 shall meet the classification requirements of Table 1507.2.7.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D 3161 and the required classification in Table 1507.2.7.1.

R8161

Date Submitted	12/14/2018	**Section**	1507.2.7.1	**Proponent**	Ann Russo5
Chapter	15	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language No

Related Modifications

Summary of Modification

The proposal expands the definition of roofing beyond recognizing metal roof singles

Rationale

This proposal separates "metal roof shingles" as a separate line item product in Section 1504, specifically under the non- ballasted roof systems provisions. This proposal would create a separate line item for metal roof shingles based on the fact that metal shingles are not the same in all respects as either asphalt shingles (Section 1504.1.1) or the other roof systems (Section 1504.3.1) provisions. It revises title of Table 1507.2.7.1 as well as adding additional parameter information.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Clarifies design and standard requirements making for clearer application and enforcement

Impact to building and property owners relative to cost of compliance with code

None expected

Impact to industry relative to the cost of compliance with code

None expected

Impact to small business relative to the cost of compliance with code

None expected

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves safety by improving definition of roofing covering options to correct standard(s)

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves Code

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not

Does not degrade the effectiveness of the code

Does not

2nd Comment Period

R8161-G1

Proponent Borrone Jeanette **Submitted** 5/21/2019 **Attachments** No

Comment:

I agree with the proposed revision.

2nd Comment Period

R8161-G2

Proponent Harold Barrineau **Submitted** 5/26/2019 **Attachments** No

Comment:

I agree with this modification.

Revise as follows:

TABLE 1507.2.7.1
CLASSIFICATION OF ~~ASPHALT~~ STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE TO WITH ASTM D7158 OR D 3161

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

a. The standard calculations contained in ASTM D 7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of theseassumptions.

Sub Code: Existing Building

R7525

13

Date Submitted	11/29/2018	**Section**	706	**Proponent**	Michael Silvers (FRSA)
Chapter	7	**Affects HVHZ**	Yes	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation

Commission Action Pending Review

Comments

General Comments No

Alternate Language Yes

Related Modifications

Changes to Section 707 and 403.8 are also included and shouldn't be considered separately.

Summary of Modification

Expands 706.7 Mitigation by eliminating "single family residential" thereby covering all applicable site built structures. It removes the "roofing materials are removed" trigger and replaces it with prescriptive methods already in code.

Rationale

Engineers who can perform an evaluation can't agree when it applies, or what it requires. It states: "When roofing materials are removed from more than 50 percent of the roof diaphragm" which when you consider the 25% rule (Existing Building, 706.1.1) makes the 50% threshold actually 25%. It can be interpreted that during any roof replacement the structural evaluation and mitigation is required. The owner must commit to an open ended contract with a no idea of the potential cost, what the scope of work might be or how many trades may be involved. Some older deck types that proceed uplift testing are deemed unacceptable for use as a substrate. This could necessitate complete deck replacement as well as reworking or replacement of the roof to wall connections. If the building is occupied there is additional cost. The cost of this work could very well make continued use of the building nonviable. This would apply to a building that conformed to the building code when it was built. Expanding the current prescriptive methods in 706.7 Mitigation will provide a clear, consistent and familiar approach to improving the wind resistance of applicable structures. Changing the trigger from "Where roofing materials are removed from more than 50 percent of the roof diaphragm" to "Where more than 25 percent of the roof diaphragm is repaired or replaced" will properly place the requirement for a roof diaphragm and roof to wall connection evaluation and possible repair or replacement in the structural scope as opposed to part of the routine building maintenance of a roof covering replacement. The 25% threshold mirrors existing requirements to bring the balance of the work into compliance with the code. See 706.1.1. This approach will address recommendations outlined in the FBC funded University of Florida report titled Cost Impacts of 2017 FBC-EB 707.3.2 Roof Diaphragm Reroofing Requirements. (Portions attached)

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification provides cost savings by reducing enforcement of requirements of 707.3.2 on all applicable roof replacement projects and replacing them with prescriptive methods currently in the code.

Impact to building and property owners relative to cost of compliance with code

This modification provides cost savings. See Support File.

Impact to industry relative to the cost of compliance with code

This modification provides cost savings. See Support File

Impact to small business relative to the cost of compliance with code

This modification provides cost savings. See Support File.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification eliminates the extremely burdensome requirements and associated cost of 707.3.2 on all applicable roof replacements. The change clarifies when the required engineering evaluation and related work needs to be done.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

It will allow a simple roof covering replacement without the burdensome roof diaphragm engineering evaluation currently required. The current requirements are ambiguous which creates wide spread confusion for contractors, engineers and code enforcement officials.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against any materials, products, methods or systems of construction.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code. Current requirements of 707.3.2 are ambiguous and are typically ignored. The modification replaces the confusing and unenforced requirements with prescriptive requirements currently in the code for applicable structures

Alternate Language

2nd Comment Period

7525-A1

Proponent T Stafford **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This public comment represents a compromise on a package of proposals regarding the roof diaphragm mitigation provisions of the FBCEB and the sealed roof deck proposals submitted for the FBCB and FBCR. This public comment combines some of the key elements of Modifications 7525 and 7960 with some additional clarification. Specifically, this public comment proposes the following: 1. Limits the applicability of the roof diaphragm mitigation provisions of Sections 707.3.2 and 403.8 of the FBCEB to situations where more than 30% of the roof deck is removed for repair. 2. Expands the mitigation provisions of Sections 706.7 and 706.8 to apply to all buildings with wood roofs. We have worked with the key stakeholders to craft this compromise that will benefit homeowners and building owners throughout the State of Florida. In exchange for support of the sealed roof deck proposals (Modifications 7696 and 7694), we believe a relaxing of the roof diaphragm mitigation provisions in the FBCEB is warranted. We request the TAC support this public comment with an action of Approved as Submitted.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

Will reduce the cost associated with reroofing on certain commercial buildings.

Impact to industry relative to the cost of compliance with code

Will reduce the cost associated with reroofing on certain commercial buildings.

Impact to Small Business relative to the cost of compliance with code

This modification provides cost savings. See Support File.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This public comment expands the wind mitigation triggers of the existing code to all buildings with wood roofs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This public comment will improve the code by making it easier to perform wind mitigation on certain types of commercial buildings and will strengthen the code through support of other proposals for the FBCB and FBCR addressing water intrusion through roofs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

1st Comment Period History

R7525-G1

Proponent Gaspar Rodriguez **Submitted** 1/16/2019 **Attachments** No

Comment:

The code section referring to site-built single-family residential structure is derived from statutorily-mandated language. 553.844(2) (b) FS, specifically indicates “single-family residential structures.” This proposed code mod will expand the statue, which I believe is beyond the scope of updating the code.
Also, the cost savings indicated on the support file only refers to the Cost Impact of Roof Diaphragm Reroofing Requirements. I would maintain that the cost impact of expanding FEBC 706.7 Mitigation Section, has an increase cost impact on enforcement cost.

1st Comment Period History

R7525-G2

Proponent Mo Madani **Submitted** 1/27/2019 **Attachments** No

Comment:

Mitigation techniques and requirements of the 2017 FBC are consistent with section 553.844 FS.

Replace the original modification completely with the revised text as follows:

706.7 Mitigation.

When a roof covering on an existing ~~site-built single-family residential~~ structure with a sawn lumber, wood plank, or wood structural panel roof deck is removed and replaced, the following procedures shall be permitted to be performed by the roofing contractor:

(a) Roof-decking attachment shall be as required by Section 706.7.1.

(b) A secondary water barrier shall be provided as required by Section 706.7.2.

Exception: ~~Single-family residential~~ structures permitted subject to the Florida Building Code are not required to comply with this section.

706.7.1 Roof decking attachment for existing ~~site-built single family residential~~ structures with wood roof decks.

~~For site-built single-family residential structures the f~~Fastening for sawn lumber, wood plank, or wood structural panel roof decks shall be in accordance with Section 706.7.1.1 or 706.7.1.2 as appropriate for the existing construction. 8d nails shall be a minimum of 0.113 inch (2.9 mm) in diameter and shall be a minimum of 2¼ inches (57 mm) long to qualify for the provisions of this section for existing nails regardless of head shape or head diameter.

Remaining text unchanged.

706.7.2 Roof secondary water barrier for existing ~~site-built singlefamily residential~~ structures with wood roof decks.

706.8

When a roof covering on an existing ~~site-built single family residential~~ structure with a sawn lumber, wood plank, or wood structural panel roof deck is removed and replaced on a building that is located in the wind-borne debris region as defined in the Florida Building Code, Building and that has an insured value of $300,000 or more or, if the building is uninsured or for which documentation of insured value is not presented, has a just valuation for the structure for purposes of ad valorem taxation of $300,000 or more:

(a) Roof to wall connections shall be improved as required by Section 706.8.1.

(b) Mandated retrofits of the roof-to-wall connection shall not be required beyond a 15 percent increase in the cost of reroofing.

Exception: ~~Single-family residential~~ structures permitted subject to the Florida Building Code are not required to comply with this section.

706.8.1 Roof-to-wall connections for ~~site-built singlefamily residential~~ structures with wood roof decks.

Remaining text unchanged.

SECTION 707
STRUCTURAL

707.3.2 Roof diaphragms resisting wind loads in high-wind regions. Where ~~roofing materials are~~ the structural roof deck is removed from more than ~~50~~ 30 percent of the ~~roof~~ structural diaphragm or section of a building located where the ultimate design wind speed, V_{ult}, is greater than 115 mph, as defined in Section 1609 (the HVHZ shall comply with Section 1620) of the *Florida Building Code, Building*, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *Florida Building Code, Building*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting at least 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *Florida Building Code, Building*.

Exceptions:

~~1.~~ This section does not apply to buildings permitted subject to the Florida Building Code.

~~2.This section does not apply to buildings permitted subject to the 1991 *Standard Building Code*, or later edition, or designed to the wind loading requirements of the ASCE 7-88 or later editions, where an evaluation is performed by a registered design professional to confirm the roof diaphragm, connections of the roof diaphragm to roof framing members, and roof-to-wall connections are in compliance with the wind loading requirements of either of these standards or later editions.~~

~~3.Buildings with steel or concrete moment resisting frames shall only be required to have the roof diaphragm panels and diaphragm connections to framing members evaluated for wind uplift.~~

~~4. This section does not apply to site-built singlefamily dwellings. Site-built single-family dwellings shall comply with Sections 706.7 and 706.8.~~

~~5. This section does not apply to buildings permitted within the HVHZ after January 1, 1994 subject to the 1994 South Florida Building Code, or later editions, or where the building's wind design is based on the wind loading requirements of ASCE 7-88 or later editions.~~

SECTION 403
ALTERATIONS

403.8 Roof diaphragms resisting wind loads in highwind regions. Where ~~the intended alteration requires a permit for reroofing and involves removal of roofing materials~~ the structural roof deck is removed from more than ~~50~~ 30 percent of the ~~roof~~ structural diaphragm of a building or section of a building located where the ultimate design wind speed is greater than 115 mph (51 m/s) in accordance with Figure 1609.3(1) of the Florida Building Code, Building as defined in Section 1609 (the HVHZ shall comply with Section 1620) of the Florida Building Code, Building, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the Florida Building Code, Building, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting at least 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the Florida Building Code, Building.

Exceptions:

~~1.~~ This section does not apply to buildings permitted subject to the Florida Building Code.

~~2.This section does not apply to buildings permitted subject to the 1991 *Standard Building Code*, or later edition, or designed to the wind loading requirements of the ASCE 7-88 or later editions, where an evaluation is performed by a registered design professional to confirm the roof diaphragm, connections of the roof diaphragm to roof framing members, and roof-to-wall connections are in compliance with the wind loading requirements of either of these standards or later editions.~~

~~3.Buildings with steel or concrete moment resisting frames shall only be required to have the roof diaphragm panels and diaphragm connections to framing members evaluated for wind uplift.~~

4. This section does not apply to site-built singlefamily dwellings. Site-built single-family dwellings shall comply with Sections 706.7 and 706.8.

5. This section does not apply to buildings permitted within the HVHZ after January 1, 1994 subject to the 1994 South Florida Building Code, or later editions, or where the building's wind design is based on the wind loading requirements of ASCE 7-88 or later editions.

706.7 Mitigation.

When a roof covering on an existing site-built ~~single-family residential~~ structure is removed and replaced, the following procedures shall be permitted to be performed by the roofing contractor:

(a) Roof-decking attachment shall be as required by Section 706.7.1.

(b) A secondary water barrier shall be provided as required by Section 706.7.2.

Exception: ~~Single-family residential~~ structures permitted subject to the Florida Building Code are not required to comply with this section.

706.7.1 Roof decking attachment for site-built ~~singlefamily residential~~ structures.

For site-built ~~single-family residential~~ structures the fastening shall be in accordance with Section 706.7.1.1 or 706.7.1.2 as appropriate for the existing construction. 8d nails shall be a minimum of 0.113 inch (2.9 mm) in diameter and shall be a minimum of $2^1/_4$ inches (57 mm) long to qualify for the provisions of this section for existing nails regardless of head shape or head diameter.

Remaining text unchanged.

706.7.2 Roof secondary water barrier for site-built ~~singlefamily residential~~ structures.

706.8

When a roof covering on an existing site-built ~~single family residential~~ structure is removed and replaced on a building that is located in the wind-borne debris region as defined in the Florida Building Code, Building and that has an insured value of $300,000 or more or, if the building is uninsured or for which documentation of insured value is not presented, has a just valuation for the structure for purposes of ad valorem taxation of $300,000 or more:

(a) Roof to wall connections shall be improved as required by Section 706.8.1.

(b) Mandated retrofits of the roof-to-wall connection shall not be required beyond a 15 percent increase in the cost of reroofing.

Exception: ~~Single-family residential~~ structures permitted subject to the Florida Building Code are not required to comply with this section.

706.8.1 Roof-to-wall connections for site-built ~~singlefamily residential~~ structures.

Remaining text unchanged.

SECTION 707
STRUCTURAL

707.3.2 Roof diaphragms resisting wind loads in high-wind regions.
Where ~~roofing materials are removed from~~ more than ~~50~~ 25 percent of the roof diaphragm ~~or section~~ ~~of~~ is repaired or replaced on a building located where the ultimate design wind speed, V_{ult}, is greater than 115 mph, as defined in Section 1609 (the HVHZ shall comply with Section 1620) of the *Florida Building Code, Building*, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in the *Florida Building Code, Building*, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting at least 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in the *Florida Building Code, Building*.

~~**Exceptions:**~~

~~1.This section does not apply to buildings permitted subject to the Florida Building Code.~~

~~2.This section does not apply to buildings permitted subject to the 1991 *Standard Building Code*, or later edition, or designed to the wind loading requirements of the ASCE 7-88 or later editions, where an evaluation is performed by a registered design professional to confirm the roof diaphragm, connections of the roof diaphragm to roof framing members, and roof-to-wall connections are in compliance with the wind loading requirements of either of these standards or later editions.~~

~~3.Buildings with steel or concrete moment resisting frames shall only be required to have the roof diaphragm panels and diaphragm connections to framing members evaluated for wind uplift.~~

~~4. This section does not apply to site-built singlefamily dwellings. Site-built single-family dwellings shall comply with Sections 706.7 and 706.8.~~

~~5. This section does not apply to buildings permitted within the HVHZ after January 1, 1994 subject to the 1994 South Florida Building Code, or later editions, or where the building's wind design is based on the wind loading requirements of ASCE 7-88 or later editions.~~

SECTION 403

ALTERATIONS

403.8 Roof diaphragms resisting wind loads in highwind regions.

Where ~~the intended alteration requires a permit for reroofing and involves removal of roofing materials from~~ more than ~~50~~25 percent of the roof diaphragm <u>is repaired or replaced on</u> ~~of a building or section of~~ a building located where the ultimate design wind speed is greater than 115 mph (51 m/s) in accordance with Figure 1609.3(1) of the Florida Building Code, Building as defined in Section 1609 (the HVHZ shall comply with Section 1620) of the Florida Building Code, Building, roof diaphragms, connections of the roof diaphragm to roof framing members, and roof-to-wall connections shall be evaluated for the wind loads specified in Section 1609 of the Florida Building Code, Building, including wind uplift. If the diaphragms and connections in their current condition are not capable of resisting at least 75 percent of those wind loads, they shall be replaced or strengthened in accordance with the loads specified in Section 1609 of the Florida Building Code, Building.

Remaining text unchanged.

Cost Impact of 2017 FBC-EB § 707.3.2 Roof Diaphragm Reroofing Requirements

RINKER-CR-2018-105

Final Report
1 June 2018

Submitted to

Mo Madani

Department of Business and Professional Regulation
1940 North Monroe Street
Tallahassee, FL 32399

Authors

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Table 7. Bid Prices for A-F Roof type and A-C Repair Scenarios[+*]

Repair	LWC on Bar Joists	Wood Deck System	Metal on Steel Bar Joists	Gypsum on Spaced Joists	Tectum on Spaced Joists	LWEC Deck System
Base Bid (incl. in A-C Repair Scenarios)	**1:**$129,940 **2:**$109,688 **3:**$138,000	**1:** $128,540 **2:** $105,931 **3:** $139,000	**1:** $153,300 **2:** $128,773 **3:** $149,000	**1:**$129,940 **2:**$118,311 **3:**$143,000	**1:**$128,570 **2:**$118,311 **3:**$146,000	**1:**$128,540 **2:**$106,334 **3:**$141,000
Bid Line No.	1	1	1	1	1	1
A. Enhanced fastening of the roof deck	**1:**$134,440+ **2:**$157,556 **3:**$164,400	NA	**1:**$156,800+ **2:** $140,092 **3:** $163,425	NA	NA	**1:**$133,040+ **2:**$118,753 **3:**$155,900
Bid Line Nos.	1,2,3,4 & 8	---	1,2,3,4 & 8	---	---	1,2,3,4,5 & 9
B. Roof-to-wall connections enhanced fastening	**1:**$146,940+* **2:**$128,208 **3:**$164,990	**1:** $131,040+ **2:** $123,631 **3:** $158,560	**1:** $169,300+* **2:** $147,293 **3:** $173,200	**1:**$145,940+ **2:**$134,231 **3:**$134,575	**1:**$144,570+ **2:**$134,231 **3:**$179,075	**1:**$145,540+* **2:**$125,954 **3:**$165,675
Bid Line Nos.	1,2, 4,5 & 8	1, 2, 3 & 7	1,2,4,5 & 8	1,2,3,4 & 7	1,2,3,4 & 7	1,2,3,5,6 & 9
C. Entire roof deck replacement	**1:**$284,440+ **2:**$265,188* **3:**$173,790	**1:** $158,540+ **2:** $148,431* **3:** $196,600	**1:** $231,800+ **2:** $219,273* **3:** $230,150	**1:**$293,440+ **2:**$226,211* **3:**$207,795	**1:**$282,070+ **2:**$226,211* **3:**$246,815	**1:**$283,040+ **2:**$252,934* **3:**$235,075
Bid Line Nos.	1,2,4,7 & 8	1, 2, 6 &7	1,2, 4,7 & 8	1,2,3,6 & 7	1,2,3,6 & 7	1,2,3,5,8 & 9

+ = No Bid Items; * = Condition/Exclusions

COST NOTES:

- For all 6 deck types the following cost items need to be also taken into consideration:
  - **1:** Cost for relocation if needed of occupants, contents, etc. (Depends on use)
  - **2:** Cost for loss of business (Depends on use)
  - **3:** Cost for isolating dust from occupied area if contents are not relocated (Depends on use)
  - **4:** Cost to repair or replacing ceilings (Depends on use)
  - **5:** Cost to keep temporarily watertight or phasing of work to do the same (Factored in Bid)
  - **6:** Cost of engineering for each protocol ($8,250).
- For deck types with rigid insulation for replacement (A, B, D, E & F) the Cost for the cover board that is required over the polyisocyanurate insulation is factored in bid and cost if replacement triggers energy code requirements would apply across the boards regardless of diaphragm frame.
- For light weight insulating concrete deck type (A) the cost for required tapered insulation for replacement of LWIC fill is factored in bid.
- For gypsum deck type (D) cost for relocation (mandatory) depends on building use type and the cost for removal and replacement of ceiling, ductwork, wiring etc. depends on building use type and cannot all be pinned on diaphragm roof type.

Table 8. Mean Bid Prices for A-F Roof type and A-B Repair Scenarios[+*]

Repair	LWC on Bar Joists	Wood Deck System	Metal on Steel Bar Joists	Gypsum on Spaced Joists	Tectum on Spaced Joists	LWEC Deck System
Base Bid (incl. in A-C Repair Scenarios)	**1:** $129,940	**1:** $128,540	**3:** $149,000	**1:** $129,940	**1:** $128,570	**1:** $128,540
A. Enhanced fastening of the roof deck	**2:** $157,556	NA	**3:** $163,425	NA	NA	**1:** $133,040+
% Cost Increase over Base Bid	21.3 %	----	9.7%	----	----	3.5%
B. Roof-to-wall connections enhanced fastening	**1:** $146,940+*	**1:** $131,040+	**3:** $173,200	**1:** $134,575	**1:** $144,570+	**1:** $145,540+*
% Cost Increase over Base Bid	13.1%	1.9%	16.2%	3.6%	12.4%	13.2%
C. Entire roof deck replacement	**2:** $265,188*	**1:** $158,540+	**3:** $230,150	**2:** $226,211*	**3:** $246,815	**2:** $252,934*
% Cost Increase over Base Bid	104.1%	23.3%	54.5%	74.1%	92.0%	96.8%

+ = No Bid Items; * = Condition/Exclusions

COST NOTES:

- For all 6 deck types the following cost items need to be also taken into consideration:
  - **7:** Cost for relocation if needed of occupants, contents, etc. (Depends on use)
  - **8:** Cost for loss of business (Depends on use)
  - **9:** Cost for isolating dust from occupied area if contents are not relocated (Depends on use)
  - **10:** Cost to repair or replacing ceilings (Depends on use)
  - **11:** Cost to keep temporarily watertight or phasing of work to do the same (Factored in Bid)
  - **12:** Cost of engineering for each protocol ($8,250).
- For deck types with rigid insulation for replacement (A, B, D, E & F) the Cost for the cover board that is required over the polyisocyanurate insulation is factored in bid and cost if replacement triggers energy code requirements would apply across the boards regardless of diaphragm frame.
- For light weight insulating concrete deck type (A) the cost for required tapered insulation for replacement of LWIC fill is factored in bid.
- For gypsum deck type (D) cost for relocation (mandatory) depends on building use type and the cost for removal and replacement of ceiling, ductwork, wiring etc. depends on building use type and cannot all be pinned on diaphragm roof type.

Conclusions

Roofing subcontractor bid data were collected for six roof types (A-F) covering the base bid and three repair scenarios (A-C). Unit costs were also collected for partial roof replacement options. The collected data was used to make cost comparisons between different replacement scenarios among three roofing subcontractors and determine mean base bid costs and repair/replacement costs for three scenarios: enhanced fastening of the roof deck; roof-to-wall connections enhanced fastening; and entire roof deck replacement. In general, based solely on the three bids received, the wood deck system was the least costly system to bring in compliance with 2017 FBC-EB § 707.3.2, while the LWC on bar joists was the most expensive

Future work should address the following:

a. Setting minimum deck attachment criteria (similar to wood decks) and standardizing this for all NOA/Product Approval tests. This will eliminate non-applicability of approved products for several field conditions and streamline the roofing permitting process.
b. On properties valued over a certain threshold (say $500,000), requiring scenario B (roof to wall connections and enhanced edge supports) up to a pre-set percentage (say 15%) of re-roofing cost.
c. Conducting a cost impact analysis for future code changes, before implementation, except in the case of life and/or fire safety requirements.

R8083

Date Submitted	12/13/2018	**Section**	706.1	**Proponent**	Harold Barrineau
Chapter	7	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Section: [BS] 706.3, 706.3 (New), 706.3.1 (New), 706.3.1.1 (New)

Summary of Modification

[BS] 706.1 General. [BS] 706.2 Structural and construction loads. 706.3 Roof replacement. 706.3.1 Roof recover. 706.3.1.1 Exceptions

Rationale

This proposal is simply editorial and matches the FBC Existing Reroofing sections with the FBC Building.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal does not impact local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction
Since this proposal is intended to be editorial to coordinate the FBC Existing reroofing sections with the FBC Building. There will be no increase in the cost of construction.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction
Since this proposal is intended to be editorial to coordinate the FBC Existing reroofing sections with the FBC Building. There will be no increase in the cost of construction.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction
Since this proposal is intended to be editorial to coordinate the FBC Existing reroofing sections with the FBC Building. There will be no increase in the cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal improves the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal strengthens or improves the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

2nd Comment Period

R8083-G2

Proponent	Robert Couch	**Submitted**	5/13/2019	**Attachments**	No

Comment:

This modification will be good for the State of Florida

2nd Comment Period

R8083-G3

Proponent	Michael Savage	**Submitted**	5/14/2019	**Attachments**	No

Comment:

I agree with the proposed modification.

2nd Comment Period

R8083-G4

Proponent Jennifer Privateer **Submitted** 5/20/2019 **Attachments** No

Comment:

I agree with this

2nd Comment Period

R8083-G5

Proponent Michael Goolsby **Submitted** 5/22/2019 **Attachments** Yes

Comment:

Just like with airplane crashes a roof collapse often is the result of an accumulation of events and not just a single failure. Contributing factors to roof collapse generally start with a design or near design strength rain event, along with increased wind speed, often with obstructed primary drainage elements and sometimes with unanticipated accumulation of loads on the roof. However, roof collapse investigation will usually lead back to missing or insufficient secondary drainage as the final proverbial straw - which if it had been provided would have prevented the collapse.

Roof drainage design requires consideration of several important elements, roof slope, sizing of primary drains, design rainfall rates, anticipated depth of accumulated rain water and the ability of the structure to carry the rain load. But, no design element is more critical than a properly installed and functioning overflow drainage system.

Unfortunately, every year roof collapses occur with life safety implications and considerable property loss damage. When this occurs the search for finding and assigning blame takes place. I do not want to see that blame focus on the Florida Building Code. In our State with our characteristic weather events it would be irresponsible to adopt a code provision implemented with a generic national application that does not address the considerable life safety concerns for us regionally. Maintaining the “no affirmative recommendation” is the appropriate action.

1st Comment Period History

R8083-G1

Proponent Gaspar Rodriguez **Submitted** 1/17/2019 **Attachments** No

Comment:

This proposed mod indicates it does not affect HVHZ, however, this mod does affect the HVHZ. If the mod is recommended for approval it must contain language to indicate Reroofing in the HVHZ shall comply with Section 1521 FBC.

The rationale indicates that this proposal is simply editorial, however, I see that an exception is added that is not part of the current code. Also, my reading and comparing of the proposed mod’s language, compared to Section 1511 FBC does not match. Actually, the current Section 706.3 FEBC is almost identical to Section 1511.3 FBC and in my opinion needs no modification.

Revise as follows:

[BS] 706.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the Florida Building Code, Building, or Chapter 9 of the Florida Building Code, Residential. Roof repairs to existing roofs and roof coverings shall comply with the provisions of this code.

~~**Exception**~~ **Exceptions**: ~~Reroofing~~

1. Roof replacement or roof recover of existing low slope roof coverings hall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the Florida Building Code, Building for roofs that provide positive roof drainage (High-Velocity Hurricane Zones shall comply with Sections 1515.2.2.1 and 1516.2.4 of the Florida Building Code, Building).

2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 of the International Building Code for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4 of the Florida Building Code, Building.

-

[BS] 706.2 Structural and construction loads.

Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

Delete without substitution:

~~**BS] 706.3 Recovering versus replacement.** New roof coverings shall not be installed without first removing all exist-ing layers of roof coverings down to the roof deck 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 addi-tional roofing.~~

~~2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.~~

~~3. Where the existing roof has two or more applications of any type of roof covering.~~

~~4. When blisters exist in any roofing, unless blisters are cut or scraped open and remaining materials secured down before applying additional roofing.~~

~~5. Where the existing roof is to be used for attachment for a new roof system and compliance with the securement provisions of Section 1504.1 of the Florida Building Code, Building cannot be met.~~

~~**Exceptions:**~~

~~Building and structures located within the High-Velocity Hurricane Zone shall comply with the provisions of Sections 1512 through 1525 of the Florida Building Code, Building.~~

~~Complete and separate roofing systems, such as standing-seam metal roof 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.~~

~~The application of a new protective coating over an existing spray polyurethane foam roofing system shall be permitted without tear-off of existing roof coverings.~~

~~Roof Coating. Application of elastomeric and or maintenance coating systems over existing asphalt shingles shall be in accordance with the shingle manufacturer's approved installation instructions.~~

-

Add new text as follows:

706.3 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

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

Where the new roof covering is installed in accordance with the roof covering manufacturer's approved instructions.

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.

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 706.4.

The application of a new protective coating over an existing spray polyurethane foam roofing system shall be permitted without tear off of existing roof coverings.

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

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.

Where the existing roof covering is slate, clay, cement or asbestos-cement tile.

Where the existing roof has two or more applications of any type of roof covering.

Just like with airplane crashes a roof collapse often is the result of an accumulation of events and not just a single failure. Contributing factors to roof collapse generally start with a design or near design strength rain event, along with increased wind speed, often with obstructed primary drainage elements and sometimes with unanticipated accumulation of loads on the roof. However, roof collapse investigation will usually lead back to missing or insufficient secondary drainage as the final proverbial straw - which if it had been provided would have prevented the collapse.

Roof drainage design requires consideration of several important elements, roof slope, sizing of primary drains, design rainfall rates, anticipated depth of accumulated rain water and the ability of the structure to carry the rain load. But, no design element is more critical than a properly installed and functioning overflow drainage system.

Unfortunately, every year roof collapses occur with life safety implications and considerable property loss damage. When this occurs the search for finding and assigning blame takes place. I do not want to see that blame focus on the Florida Building Code. In our State with our characteristic weather events it would be irresponsible to adopt a code provision implemented with a generic national application that does not address the considerable life safety concerns for us regionally. Maintaining the “no affirmative recommendation” is the appropriate action.

R7726

15

Date Submitted	12/6/2018	**Section**	806.5	**Proponent**	Ann Russo1
Chapter	8	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Summary of Modification

Editorial improvement.

Rationale

This is an editorial improvement, which makes the code clearer. There is no change in the requirements.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No negative impact to local entity relative to enforcement of code.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal is simply an editorial improvement which makes the code clearer.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal will make to code clearer which will improve the application of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal will not discriminate against materials, products, methods or systems of construction.

Does not degrade the effectiveness of the code

This proposal will not degrade the effectiveness of the code.

2nd Comment Period

Proponent ashley ong **Submitted** 5/13/2019 **Attachments** No

Comment:

As stated in the summary, this modification is only editorial. It does allow air permeable insulation as an option. This modification will NOT discriminate other materials allowed in the code. Please support this editorial change.

R7726-G1

2nd Comment Period

R7726-G2

Proponent	Jennifer Privateer	Submitted	5/23/2019	Attachments	No

Comment:

agreed

2nd Comment Period

R7726-G3

Proponent	Harold Barrineau	Submitted	5/25/2019	Attachments	No

Comment:

I agree with this modification

Revise as follows to make the code clearer:

R806.5 Unvented attic and unvented enclosed rafter assemblies.

(no change to the text in between)

5.1.2 Where air-permeable insulation is ~~provided inside the building thermal envelope, it shall be installed in accordance withSection 5.1.1. In addition to the air-permeable insulation~~ installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the R-values in Table R806.5 for condensation control.

(no change to the text below)

R7694

Date Submitted	12/5/2018	**Section**	905.1.1	**Proponent**	T Stafford
Chapter	9	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language Yes

Related Modifications

Summary of Modification

This proposal will require a sealed roof deck consistent with the IBHS Fortified Bronze designation.

Rationale

This proposal will require sealing of the the roof deck that is consistent with the IBHS Fortified Home Bronze designation. See uploaded support file for the rationale and justification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

This proposal will slightly increase cost. For roof slopes 4:12 and greater, the cost increase for a typical 2000 square foot roof will be approximately $220. For roof slopes less than 4:12, the cost increase for a typical 2000 square foot roof will be approximately $440.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to cost of compliance with the code.

Impact to small business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal will reduce the amount of water infiltration through the roof deck when roof coverings are lost due to a wind event.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal strengthens the code by requiring a sealed roof deck to reduce the amount of water infiltration through the roof deck when roof coverings are lost due to a wind event.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7694-A4

Proponent Greg Keeler **Submitted** 5/25/2019 **Attachments** Yes

Rationale

Data shows that the tear strength and fastener pull-through strength of synthetic underlayment exceeds that of organic felt underlayment. It would only follow, then, that if 2 layers of felt are acceptable without taping the deck joints, then so too should one layer of synthetic underlayment be acceptable.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No

Impact to building and property owners relative to cost of compliance with code

No

Impact to industry relative to the cost of compliance with code

No

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Yes

Does not degrade the effectiveness of the code

Yes

Alternate Language

2nd Comment Period

7694-A2

Proponent T Stafford **Submitted** 5/23/2019 **Attachments** Yes

Rationale

This public comment simply clarifies that the provisions of this section only apply to roofs with slopes of 2:12 and greater and corrects a error in regard to wood shakes and shingles.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entity relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This public comment clarifies the intent of the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This public comment improves the code by clarifying the intent.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This public comment does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This public comment does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

R7694-A1

Proponent T Stafford **Submitted** 5/22/2019 **Attachments** Yes

Rationale

This public comment simply adds the double layer of ASTM D 226 Type II or ASTM D4869 Types III or IV as a sealed roof deck option for concrete and clay tile roof coverings. This oversight was mentioned by a representative of TRI at the last Roofing TAC meeting. We request the TAC forward this public comment with the original modification to the Commission with a positive recommendation.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact to local entities relative to enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

No impact to building and property owners relative to cost of compliance with the code.

Impact to industry relative to the cost of compliance with code

No impact to industry relative to the cost of compliance with the code.

Impact to Small Business relative to the cost of compliance with code

No impact to small business relative to cost of compliance with the code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal adds another option for creating a sealed roof deck under concrete and clay tile roofs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by adding another option for creating a sealed roof deck under concrete and clay tile roofs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This proposal does not degrade the effectiveness of the code.

2nd Comment Period

R7694-G1

Proponent T Stafford **Submitted** 5/22/2019 **Attachments** No

Comment:

We request the Roofing TAC give this proposal another look to move this forward to Commission with a recommendation of Approved as Submitted. During the first TAC meetings, this proposal received an NAR because it did not get the 2/3 majority needed in support. However, 7 out of the 11 TAC members voted to approve this proposal.

If approved, the requirements in this proposal will significantly reduce the amount of water infiltration in homes where the primary roof covering has been lost due to high winds. These systems have been tested at IBHS lab and all provide similar reductions in water intrusion compared to a bare deck situation.'

We request Approval as Submitted.

2nd Comment Period

R7694-G2

Proponent Michael Silvers (FRSA **Submitted** 5/24/2019 **Attachments** Yes

Comment:

During the March TAC meetings FRSA was ask to provide cost estimates for the proposed sealed deck criteria outlined in modifications R7694 and R7696.Attached to this comment are pricing for:
1. A Single Layer of #30 felt underlayment;
2. A Double Layer of #30;
3. For Taped Joints for plywood.

The price difference between a single layer and a double layer of # 30 is $633.05 for a 20 square residential type roof. The price for Taped Joints is $795.47 for the same roof size and type. These prices include typical material cost, conservative labor, burden, overhead and profit rates all established by information from several contractors and also from previous bids submitted to roof consultants.

R905.1.1 Underlayment. ~~Unless otherwise noted u~~Underlayment ~~for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels~~ shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated ~~in Table R905.1.1~~. Underlayment shall be applied and attached in accordance with Section R905.1.1.1, R905.1.1.2, or R905.1.1.3 as applicable ~~Table R905.1.1~~.

> **Exception:** A ~~reinforced~~ synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV, and having a minimum tear strength of 15 lbf in accordance with ~~ASTM D1970 or~~ ASTM D4533 ~~of 20 pounds~~ and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table R905.1.1.1 for the applicable roof covering and slope~~, except metal cap nails shall be required where the ultimate design wind speed, V_{ult}, equals or exceeds 150 mph~~.

R905.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C)), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment, or an approved synthetic underlayment complying with Section R905.1.1, shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

> **Exception:** Compliance with Section R905.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

Revise the original modification as follows:

R905.1.1 Underlayment. Underlayment for roof slopes 2:12 and greater shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated. Underlayment for roof slopes 2:12 and greater shall be applied and attached in accordance with Section R905.1.1.1, R905.1.1.2, or R905.1.1.3 as applicable.

R905.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, ~~wood shingles, wood shakes~~ and metal roof panels shall comply with one of the following methods:

No change to remainder of text.

Revise Section of the original modification as follows:

R905.1.1.2 Underlayment for concrete and clay tile. Underlayment for concrete and clay tile shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section R905.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section R905.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

Exception: Compliance with Section R905.1.1.2 is not required where a fully adhered underlayment is applied in accordance with Section R905.3.3.

Revise as follows:

R905.1.1 Underlayment. ~~Unless otherwise noted u~~Underlayment ~~for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels~~ shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated ~~in Table R905.1.1~~. Underlayment shall be applied and attached in accordance with Section R905.1.1.1, R905.1.1.2, or R905.1.1.3 as applicable ~~Table R905.1.1~~.

R905.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

> **Exception:** A reinforced synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II and having a minimum tear strength of 15 lbf in accordance with ~~ASTM D1970 or~~ ASTM D4533 ~~of 20 pounds~~ and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted to be applied over the entire roof over the 4-inch wide (102 mm) membrane strips. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table R905.1.1.1 for the applicable roof covering and slope~~, except metal cap nails shall be required where the ultimate design wind speed, V_{ult}, equals or exceeds 150 mph~~.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C)), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

> **Exception:** A reinforced synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II and having a minimum tear strength of 15 lbf in accordance with ASTM D4533 and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted to be applied over the entire roof over the 4-inch wide (102 mm) membrane strips. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table R905.1.1.1 for the applicable roof covering and slope.

4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

> **Exception:** Compliance with Section R905.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

TABLE R905.1.1.1
UNDERLAYMENT WITH SELF-ADHERING STRIPS OVER ROOF DECKING JOINTS

Roof Covering	Underlayment Type	Underlayment Attachment

		2:12 = Roof Slope < 4:12	Roof Slope > 4:12
Asphalt Shingles, Metal Roof Panels, Photovoltaic Shingles	ASTM D226 Type II ASTM D4869 Type III or IV ASTM D 6757	Apply in accordance with Section R905.1.1.1 Item 4 or Section R905.1.1.3 Item 3 as applicable to the type of roof covering.	Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches (51 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with two staggered rows in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.
Metal Roof Shingles, Mineral-Surface Roll Roofing, Slate and Slate-type Shingles, Wood Shingles, Wood Shakes	ASTM D226 Type II ASTM D4869 Type III or IV		

~~**TABLE R905.1.1**~~
~~**UNDERLAYMENT TABLE**~~

~~Roof Covering Section~~	~~Roof Slope 2:12 and Less Than 4:12 Underlayment~~	~~Underlayment Attachment[a]~~	~~Roof Slope 4:12 and Greater Underlayment~~	~~Underlayment Attachment[a]~~
~~Asphalt shingles R905.2~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type III or IV ASTM D 6757~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D 1970~~	~~3~~
~~Concrete and Clay Tile R905.3~~	~~See Section R905.3.3~~			
~~Metal roof shingles R905.4~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D1970~~	~~3~~
~~Mineral-surfaced roll roofing R905.5~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTMD 1970~~	~~3~~
~~Slate and slate type shingles R905.6~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D1970~~	~~3~~

~~Wood shingles R905.7~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~
~~Wood shakes R905.8~~	~~Limited to roof slopes 4:12 and Greater~~	~~ASTM D226 Type II ASTM D4869 Type IV~~	~~2~~	
~~Metal roof panels R905.10~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV ASTM D6757~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D1970~~	~~3~~
~~Photovoltaic Shingles R905.17~~	~~ASTM D226 Type I or II ASTM D4869 Type II, III or IV ASTM D6757~~	~~1~~	~~ASTM D226 Type II ASTM D4869 Type IV ASTM D6757~~	~~2~~
	~~ASTM D1970~~	~~3~~	~~ASTM D1970~~	~~3~~

~~[a] Underlayment Attachment~~

~~1. Roof slopes from two units vertical in 12 units horizontal (17-percent slope), and less than four units vertical in 12 units horizontal (33-percent slope). Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.~~

~~2. Roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches (51 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with two staggered rows in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.~~

~~3. Roof slopes from two units vertical in 12 units horizontal (17-percent slope) and greater. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970(2015a) installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.~~

~~**Exception:** A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970(2015a), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.~~

R905.1.1.2 Underlayment for concrete and clay tile. Underlayment for concrete and clay tile shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section R905.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

3. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Section R905.3.3 shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

Exception: Compliance with Section R905.1.1.2 is not required where a fully adhered underlayment is applied in accordance with Section R905.3.3.

R905.1.1.3 Underlayment for wood shakes and shingles. Underlayment for wood shakes and shingles shall comply with one of the following methods:

1. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

2. A minimum 3 ¾-inch wide (96 mm) strip of self-adhering flexible flashing tape complying with AAMA 711-13, Level 3 (for exposure up to 176° F (80° C)), installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An underlayment complying with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) flashing strips.

3. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

R905.1.1 Underlayment. ~~Unless otherwise noted u~~Underlayment ~~for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels~~ shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970, D4869 and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated ~~in Table R905.1.1~~. Underlayment shall be applied and attached in accordance with Section R905.1.1.1, R905.1.1.2, or R905.1.1.3 as applicable ~~Table R905.1.1~~.

> **Exception**: A ~~reinforced~~ synthetic underlayment that is approved as an alternate to underlayment complying with ASTM D226 Type II or ASTM D4869 Type IV, and having a minimum tear strength of 15 lbf in accordance with ~~ASTM D1970 or~~ ASTM D4533 ~~of 20 pounds~~ and a minimum tensile strength of 20 lbf/inch in accordance with ASTM D5035 shall be permitted. This underlayment shall be installed and attached in accordance with the underlayment attachment methods of Table R905.1.1.1 for the applicable roof covering and slope~~, except metal cap nails shall be required where the ultimate design wind speed, V_{ult}, equals or exceeds 150 mph~~.

R905.1.1.1 Underlayment for asphalt, metal, mineral surfaced, slate and slate-type roof coverings. Underlayment for asphalt shingles, metal roof shingles, mineral surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes and metal roof panels shall comply with one of the following methods:

1. The entire roof deck shall be covered with an approved self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure for the roof covering to be installed.

2. A minimum 4-inch-wide (102 mm) strip of self-adhering polymer-modified bitumen membrane complying with ASTM D1970, installed in accordance with the manufacturer's instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment in accordance with Table R905.1.1.1 for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.

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4. Two layers of ASTM D226 Type II or ASTM D4869 Type III or Type IV underlayment, or an approved synthetic underlayment complying with Section R905.1.1, shall be installed as follows: Apply a 19-inch (483 mm) strip of underlayment felt parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inchwide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), end laps shall be 6 inches and shall be offset by 6 feet. The underlayment shall be attached to a nailable deck with corrosion-resistant fasteners with one row centered in the field of the sheet with a maximum fastener spacing of 12 inches (305 mm) o.c., and one row at the end and side laps fastened 6 inches (152 mm) o.c. Underlayment shall be attached using annular ring or deformed shank nails with metal or plastic caps with a nominal cap diameter of not less than 1 inch. Metal caps are required where the ultimate design wind speed, V_{ult}, equals or exceeds 170 mph. Metal caps shall have a thickness of not less than 32-gage sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap nail shank shall be not less than 0.083 inch for ring shank cap nails. Cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than 3/4 inch into the roof sheathing.

> **Exception**: Compliance with Section R905.1.1.1 is not required for structural metal panels that do not require a substrate or underlayment.

Silvers Systems Incorporated
2415 28th Av N
St Petersburg, FL 33713
Ph: 727-823-7700

Roofing Cost and Profit Recap Report
Entire Job

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$396.39	19.672/SQ	
Material Subtotal			$396.39	19.672/SQ	
	Tax	7.00%	$27.75	1.377/SQ	
	SubTotal Material		$424.14	21.049/SQ	
Labor					
07-100-011 ROOFING LABOR			$172.66	8.569/SQ	10.16
Labor Subtotal			$172.66	8.569/SQ	10.16
	Labor Burden	95.00%	$164.02	8.140/SQ	
	SubTotal Labor		$336.68	16.709/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$15.00	0.00%	$15.00		
Miscellaneous Subtotal	$25.00	0.00%	$25.00	1.241/SQ	
	Subtotal		$785.82	38.998/SQ	
	Overhead	45.00%	$353.62	17.549/SQ	
Profit		6.00%	$68.37	3.393/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$1,207.80	59.941/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	10.16
Total Mandays:	1.27
SQ/Hour	1.984
SQ/Manday	15.872

Silvers Systems Incorporated
2415 28th Av N
St Petersburg, FL 33713
Ph: 727-823-7700

Condition Detail Report

Thursday, May 23, 2019
2:25 PM

Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Undrelayment 5/12 (2,015.00 SF)							
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
1" Cap Nail	3,053.03	EA	3,053.03	EA	0.020	EA	$61.06
Lab 1 Ply Nailed	20.15	SQ	1.01	MDAYS	136.000	MDAYS	$137.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Undrelayment 5/12							**$429.83**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
And							
OR							
Lab 1 Ply Nailed	89.00	SF	0.04	MDAYS	136.000	MDAYS	$6.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**178.00**	**SF**					**$16.29**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
And							
OR							
Lab 1 Ply Nailed	221.12	SF	0.11	MDAYS	136.000	MDAYS	$15.04
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**442.23**	**SF**					**$40.47**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
And							
OR							
Lab 1 Ply Nailed	88.45	SF	0.04	MDAYS	136.000	MDAYS	$6.02
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**176.89**	**SF**					**$16.19**
Condition = Eave Flashing (199.00 LF)							
1" Cap Nail	199.00	EA	199.00	EA	0.020	EA	$3.98
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							

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Condition Detail Report

Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Total Eave Flashing							**$9.70**
Condition = VTR Flashing w/ 2" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	32.350	CANS	$1.94
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 2" Lead Boot							**$3.64**
Condition = VTR Flashing w/ 3" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	32.350	CANS	$1.94
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 3" Lead Boot							**$3.64**
Condition = VENT Large GRV (2.00 EA)							
Flashing Cement	2.00	SF	0.04	CANS	32.350	CANS	$1.29
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Large GRV							**$4.69**
Condition = Flashing for 5/12 @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
Misc SF:							
Flashing Cement	1.00	SF	0.02	CANS	32.350	CANS	$0.65
Misc EA:							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Total Flashing for 5/12 @ Electrical Ris							**$2.35**
Job Totals:							**$526.80**

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Condition Summary

Sealed Deck Underlayment Estimate - Single Layer of #30 — Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Single Layer #30										
Undrelayment 5/12	2,015.00	SF	$293	$137	$0	$0	$0	$430	0.213	SF
Ridge	44.50	LF	$10	$6	$0	$0	$0	$16	0.366	LF
Hip	110.56	LF	$25	$15	$0	$0	$0	$40	0.366	LF
Valley 5/12	29.48	LF	$10	$6	$0	$0	$0	$16	0.549	LF
Eave Flashing	199.00	LF	$10	$0	$0	$0	$0	$10	0.049	LF
VTR Flashing w/ 2" Lead Boot	1.00	EA	$2	$2	$0	$0	$0	$4	3.641	EA
VTR Flashing w/ 3" Lead Boot	1.00	EA	$2	$2	$0	$0	$0	$4	3.641	EA
VENT Large GRV	2.00	EA	$1	$3	$0	$0	$0	$5	2.347	EA
Flashing for 5/12 @ Electrical Riser	1.00	EA	$1	$2	$0	$0	$0	$2	2.347	EA
Total Single Layer #30			$354	$173	$0	$0	$0	$527		
Job Totals:			$354	$173	$0	$0	$0	$527		

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Drawing Report
Single Layer #30

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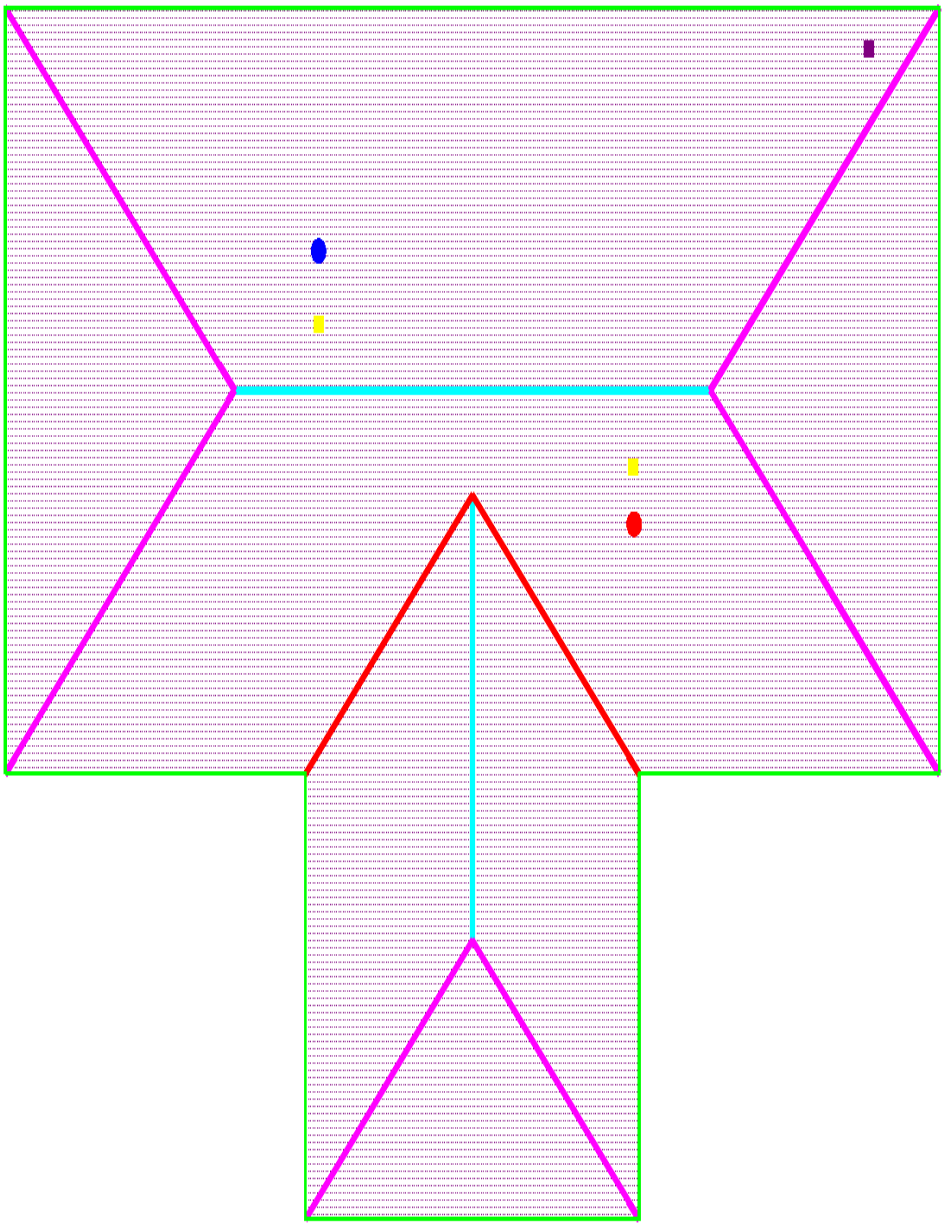
Sealed Deck Underlayment Estimate - Single Layer of #30

Silvers



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Drawing Report
Single Layer #30

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Sealed Deck Underlayment Estimate - Single Layer of #30

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Undrelayment 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	5/12	VTR Flashing w/ 2" Lead Boot			1.00
	5/12	VTR Flashing w/ 3" Lead Boot			1.00
	5/12	VENT Large GRV			2.00
	5/12	Flashing for 5/12 @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Lab 1 Ply Nailed	398.56	SF	1,999.600	249.950	0.20	1.59	$27.11	0.000
Lab 1 Ply Nailed	20.15	SQ	19.996	2.499	1.01	8.06	$137.05	0.000
Cut Underlayment for Penetration	5.00	EA	79.984	9.998	0.06	0.50	$8.50	0.000
Job Totals:					1.27	10.16	$172.66	

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Pricing - Purchase Report

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Sealed Deck Underlayment Estimate - Single Layer of #30 Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
30# Felt	13.00	ROLLS	23.000		ROLL	$299.00
Flashing Cement	1.00	CANS	32.350		CANS	$32.35
1" Cap Nail	3,252.03	EA	0.020		EA	$65.04
Job Totals:						$396.39

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Roofing Cost and Profit Recap Report
Entire Job

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Double Layer of #30

Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$677.98	33.647/SQ	
Material Subtotal			$677.98	33.647/SQ	
	Tax	7.00%	$47.46	2.355/SQ	
	SubTotal Material		$725.44	36.002/SQ	
Labor					
07-100-011 ROOFING LABOR			$226.80	11.255/SQ	13.34
Labor Subtotal			$226.80	11.255/SQ	13.34
	Labor Burden	95.00%	$215.46	10.693/SQ	
	SubTotal Labor		$442.25	21.948/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$20.00	0.00%	$20.00		
Miscellaneous Subtotal	$30.00	0.00%	$30.00	1.489/SQ	
	Subtotal		$1,197.69	59.439/SQ	
	Overhead	45.00%	$538.96	26.747/SQ	
Profit		6.00%	$104.20	5.171/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$1,840.85	91.357/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	13.34
Total Mandays:	1.67
SQ/Hour	1.510
SQ/Manday	12.083

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Condition Detail Report

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Double Layer of #30

Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Undrelayment 5/12 (2,015.00 SF)							
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
30# Felt	2,015.00	SF	10.08	ROLLS	23.000	ROLL	$231.73
1" Cap Nail	3,250.00	EA	3,250.00	EA	0.020	EA	$65.00
Lab 2 Ply Nailed	20.15	SQ	1.34	MDAYS	136.000	MDAYS	$182.69
Misc LF:							
Misc SF:							
Misc EA:							
Total Undrelayment 5/12							**$711.14**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
30# Felt	89.00	SF	0.45	ROLLS	23.000	ROLL	$10.24
And							
OR							
Lab 1 Ply Nailed	89.00	SF	0.04	MDAYS	136.000	MDAYS	$6.05
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**267.00**	**SF**					**$26.52**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
30# Felt	221.12	SF	1.11	ROLLS	23.000	ROLL	$25.43
And							
OR							
Lab 1 Ply Nailed	221.12	SF	0.11	MDAYS	136.000	MDAYS	$15.04
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**663.35**	**SF**					**$65.89**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
30# Felt	88.45	SF	0.44	ROLLS	23.000	ROLL	$10.17
And							
OR							
Lab 1 Ply Nailed	88.45	SF	0.04	MDAYS	136.000	MDAYS	$6.01
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**265.34**	**SF**					**$26.36**
Condition = Eave Flashing (199.00 LF)							
1" Cap Nail	199.00	EA	199.00	EA	0.020	EA	$3.98
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
30# Felt	49.75	SF	0.25	ROLLS	23.000	ROLL	$5.72
And							
OR							

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Condition Detail Report

Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Total Eave Flashing							**$15.42**
Condition = VTR Flashing w/ 2" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	34.000	CANS	$2.04
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 2" Lead Boot							**$5.44**
Condition = VTR Flashing w/ 3" Lead Boot (1.00 EA)							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Flashing Cement	3.00	SF	0.06	CANS	34.000	CANS	$2.04
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Flashing w/ 3" Lead Boot							**$5.44**
Condition = VENT Large GRV (2.00 EA)							
Flashing Cement	2.00	SF	0.04	CANS	34.000	CANS	$1.36
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Cut Underlayment for Penetration	2.00	EA	0.03	MDAYS	136.000	MDAYS	$3.40
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Large GRV							**$8.16**
Condition = Flashing for 5/12 @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
Misc SF:							
Flashing Cement	1.00	SF	0.02	CANS	34.000	CANS	$0.68
Misc EA:							
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Cut Underlayment for Penetration	1.00	EA	0.01	MDAYS	136.000	MDAYS	$1.70
Total Flashing for 5/12 @ Electrical Ris							**$4.08**
Job Totals:							**$868.46**

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Condition Summary

Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Double Layer #30										
Undrelayment 5/12	2,015.00	SF	$528	$183	$0	$0	$0	$711	0.353	SF
Ridge	44.50	LF	$20	$6	$0	$0	$0	$27	0.596	LF
Hip	110.56	LF	$51	$15	$0	$0	$0	$66	0.596	LF
Valley 5/12	29.48	LF	$20	$6	$0	$0	$0	$26	0.894	LF
Eave Flashing	199.00	LF	$15	$0	$0	$0	$0	$15	0.077	LF
VTR Flashing w/ 2" Lead Boot	1.00	EA	$2	$3	$0	$0	$0	$5	5.440	EA
VTR Flashing w/ 3" Lead Boot	1.00	EA	$2	$3	$0	$0	$0	$5	5.440	EA
VENT Large GRV	2.00	EA	$1	$7	$0	$0	$0	$8	4.080	EA
Flashing for 5/12 @ Electrical Riser	1.00	EA	$1	$3	$0	$0	$0	$4	4.080	EA
Total Double Layer #30			$642	$227	$0	$0	$0	$868		
Job Totals:			$642	$227	$0	$0	$0	$868		

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Drawing Report
Double Layer #30

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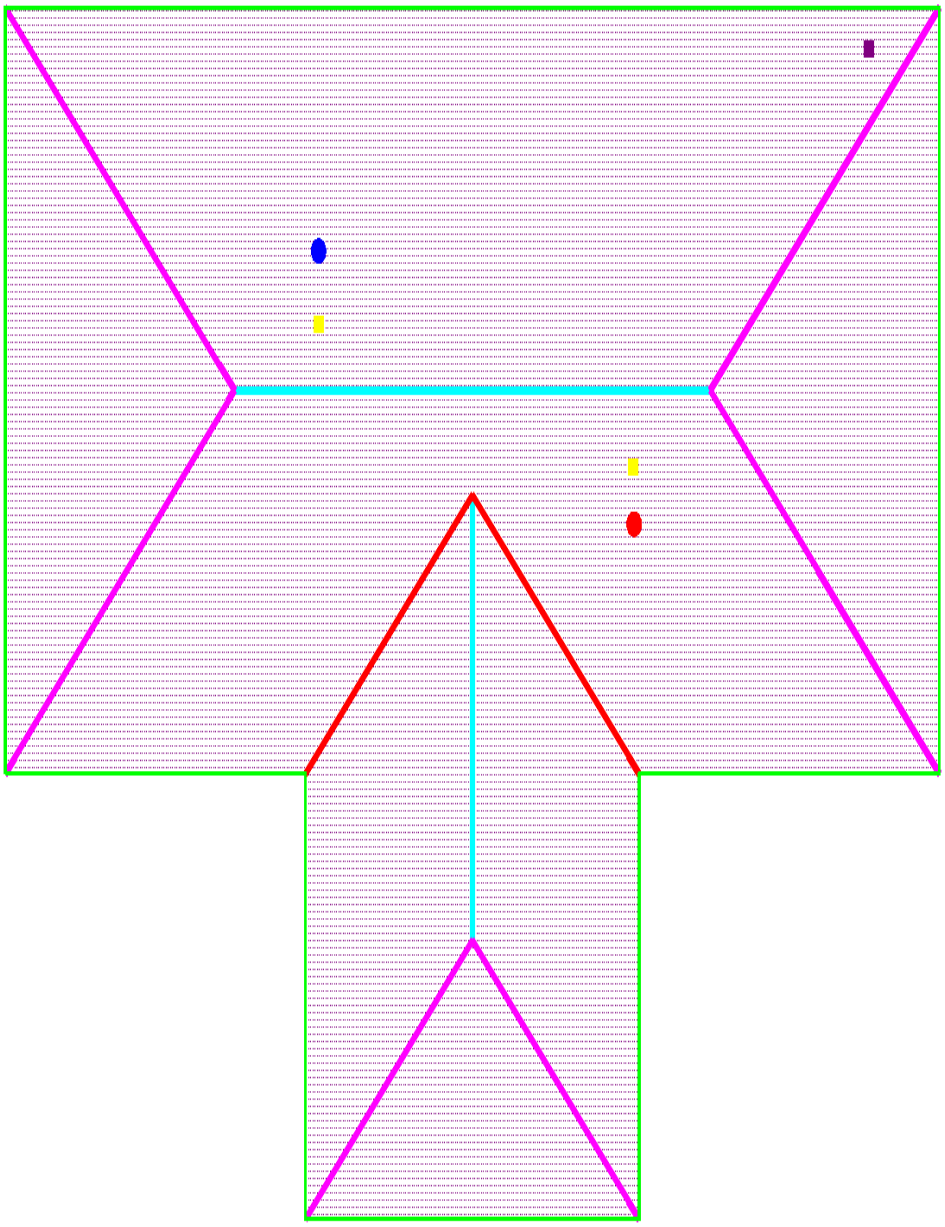
Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers



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Drawing Report
Double Layer #30

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Double Layer of #30

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Undrelayment 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	5/12	VTR Flashing w/ 2" Lead Boot			1.00
	5/12	VTR Flashing w/ 3" Lead Boot			1.00
	5/12	VENT Large GRV			2.00
	5/12	Flashing for 5/12 @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Lab 1 Ply Nailed	398.56	SF	2,000.000	250.000	0.20	1.59	$27.10	0.000
Lab 2 Ply Nailed	20.15	SQ	15.000	1.875	1.34	10.75	$182.69	0.000
Cut Underlayment for Penetration	10.00	EA	80.000	10.000	0.13	1.00	$17.00	0.000
Job Totals:					1.67	13.34	$226.80	

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Pricing - Purchase Report

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Sealed Deck Underlayment Estimate - Double Layer of #30 Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
30# Felt	25.00	ROLLS	23.000		ROLL	$575.00
Flashing Cement	1.00	CANS	34.000		CANS	$34.00
1" Cap Nail	3,449.00	EA	0.020		EA	$68.98
Job Totals:						$677.98

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Roofing Cost and Profit Recap Report
Entire Job

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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Net Amount	Markup	Gross Amount	Cost/Unit	Man Hours
Material					
07-100-010 ROOFING MATERIAL			$198.13	9.833/SQ	
Material Subtotal			$198.13	9.833/SQ	
	Tax	7.00%	$13.87	0.688/SQ	
	SubTotal Material		$212.00	10.521/SQ	
Labor					
07-100-011 ROOFING LABOR			$146.44	7.267/SQ	8.61
Labor Subtotal			$146.44	7.267/SQ	8.61
	Labor Burden	95.00%	$139.12	6.904/SQ	
	SubTotal Labor		$285.55	14.171/SQ	
SubContract					
SubContract Subtotal			$0.00	0.000/SQ	
Equipment					
Equipment Subtotal			$0.00	0.000/SQ	
Other					
Other Subtotal			$0.00	0.000/SQ	
Miscellaneous					
Toilets	$10.00	0.00%	$10.00		
Permit	$10.00	0.00%	$10.00		
Miscellaneous Subtotal	$20.00	0.00%	$20.00	0.993/SQ	
	Subtotal		$517.55	25.685/SQ	
	Overhead	45.00%	$232.90	11.558/SQ	
Profit		6.00%	$45.03	2.235/SQ	
	Bond		$0.00	0.000/SQ	
	Bid Total		$795.47	39.478/SQ	

Profit-To-Sell:	5.66%
Total SQ	20.150
Total Hours:	8.61
Total Mandays:	1.08
SQ/Hour	2.339
SQ/Manday	18.714

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Condition Detail Report

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Roof Area 5/12 (2,015.00 SF)							
Misc LF:							
Misc SF:							
Misc EA:							
Total Roof Area 5/12	**0.00**		**0.00**				**$0.00**
Condition = Ridge (44.50 LF)							
. CUT LINE WASTE .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Ridge	**0.00**		**0.00**				**$0.00**
Condition = Hip (110.56 LF)							
. CUT LINE WASTE .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Hip	**0.00**		**0.00**				**$0.00**
Condition = Valley 5/12 (29.48 LF)							
. Cut Line Waste .							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Valley 5/12	**0.00**		**0.00**				**$0.00**
Condition = Eave Flashing (199.00 LF)							
And							
OR							
Misc LF:							
Misc SF:							
Misc EA:							
Total Eave Flashing	**0.00**		**0.00**				**$0.00**
Condition = Tape Joint Horiztntal (417.47 LF)							
SA Seam Tape Tamko TW	417.47	LF	6.84	RL	15.000	RL	$102.66
Install Tape Joint Horiztntal	417.47	LF	0.52	MDAYS	136.000	MDAYS	$70.97
Total Tape Joint Horiztntal	**834.94**	**LF**					**$173.63**

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Condition Detail Report

Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Quantity	EU	Ord Qty	Ord Un	Unit Price	Prc Un	Ext Price
Condition = Tape Joint Vertical (233.21 LF)							
SA Seam Tape Tamko TW	233.21	LF	3.82	RL	15.000	RL	$57.35
Install Tape Joint Vertical	233.21	LF	0.29	MDAYS	136.000	MDAYS	$39.65
Total Tape Joint Vertical	**466.42**	**LF**					**$96.99**
Condition = Tape Joint Valley or Hip (140.04 LF)							
SA Seam Tape Tamko TW	140.04	LF	2.30	RL	15.000	RL	$34.44
Install Tape Joint Valley or Hip	140.04	LF	0.23	MDAYS	136.000	MDAYS	$31.74
Total Tape Joint Valley or Hip	**280.08**	**LF**					**$66.18**
Condition = VTR Seam Tape (1.00 EA)							
SA Seam Tape Tamko TW	2.00	LF	0.03	RL	15.000	RL	$0.49
Install VTR Seam Tape	2.00	LF	0.00	MDAYS	136.000	MDAYS	$0.54
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Seam Tape	**4.00**	**LF**					**$1.04**
Condition = VTR Seam Tape (1.00 EA)							
SA Seam Tape Tamko TW	2.50	LF	0.04	RL	15.000	RL	$0.61
Install VTR Seam Tape	2.50	LF	0.01	MDAYS	136.000	MDAYS	$0.68
Misc LF:							
Misc SF:							
Misc EA:							
Total VTR Seam Tape	**5.00**	**LF**					**$1.29**
Condition = VENT Seam Tape (2.00 EA)							
SA Seam Tape Tamko TW	8.00	LF	0.13	RL	15.000	RL	$1.97
Install VENT Seam Tape	8.00	LF	0.02	MDAYS	136.000	MDAYS	$2.18
Misc LF:							
Misc SF:							
Misc EA:							
Total VENT Seam Tape	**16.00**	**LF**					**$4.14**
Condition = Seam Tape @ Electrical Riser (1.00 EA)							
Metal 1 :							
Metal 2 :							
Metal 3 :							
Metal 4 :							
Misc LF:							
SA Seam Tape Tamko TW	2.50	LF	0.04	RL	15.000	RL	$0.61
Install Seam Tape @ Electrical Riser	2.50	LF	0.01	MDAYS	136.000	MDAYS	$0.68
Misc SF:							
Misc EA:							
Total Seam Tape @ Electrical Riser	**5.00**	**LF**					**$1.29**
Job Totals:	**1,611.44**	**LF**					**$344.56**

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Condition Summary

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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Quantity	EU	0.00% Mat'l $	0.00% Labor $	0.00% Sub $	0.00% Equip $	0.00% Other $	0.00% Total $	Price/EU	EU
Page = Taped Joints										
Tape Joint Horiztntal	417.47	LF	$103	$71	$0	$0	$0	$174	0.416	LF
Tape Joint Vertical	233.21	LF	$57	$40	$0	$0	$0	$97	0.416	LF
Tape Joint Valley or Hip	140.04	LF	$34	$32	$0	$0	$0	$66	0.473	LF
VTR Seam Tape	1.00	EA	$0	$1	$0	$0	$0	$1	1.036	EA
VTR Seam Tape	1.00	EA	$1	$1	$0	$0	$0	$1	1.295	EA
VENT Seam Tape	2.00	EA	$2	$2	$0	$0	$0	$4	2.072	EA
Seam Tape @ Electrical Riser	1.00	EA	$1	$1	$0	$0	$0	$1	1.295	EA
Total Taped Joints			$198	$146	$0	$0	$0	$345		
Job Totals:			$198	$146	$0	$0	$0	$345		

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Drawing Report
Taped Joints

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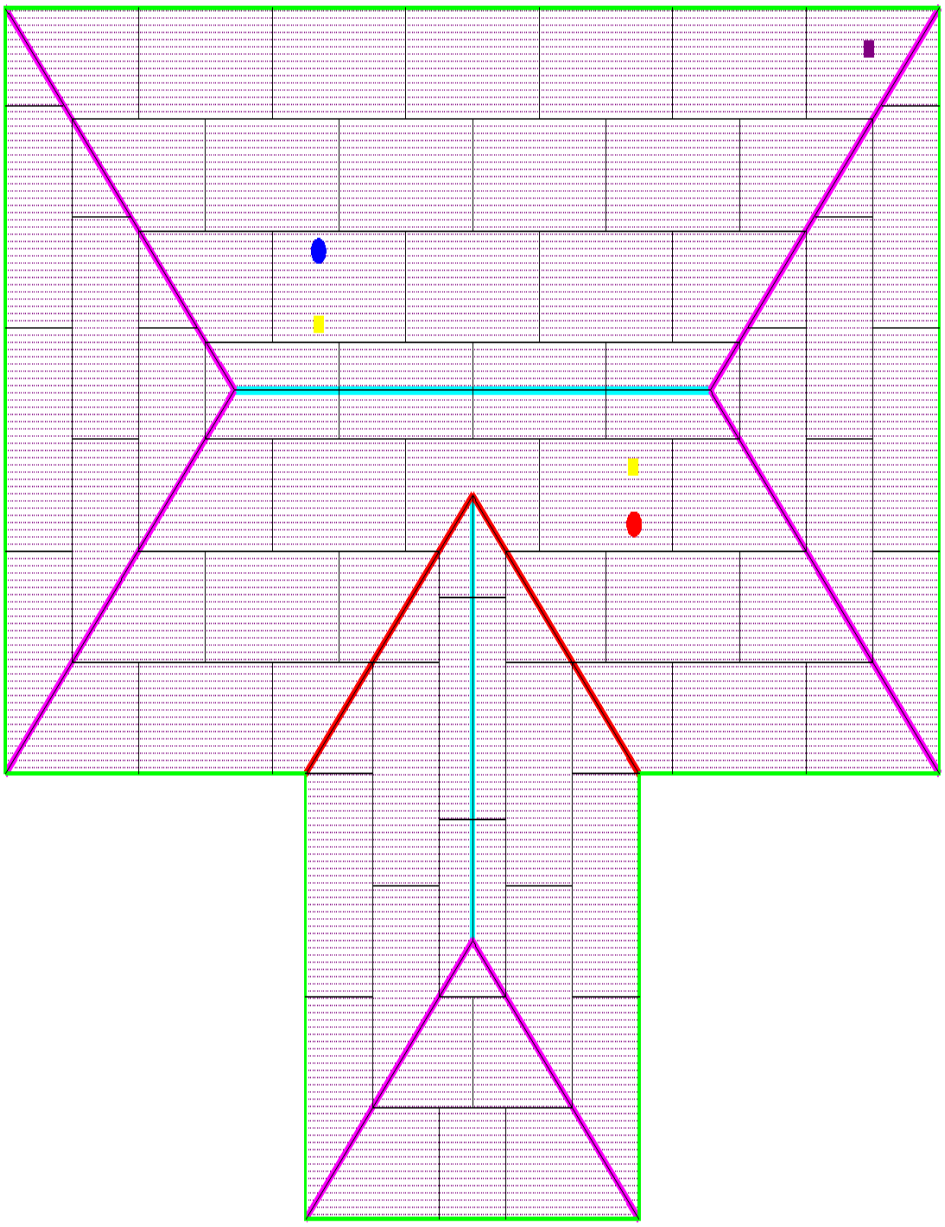
Sealed Deck Underlayment Estimate - Taped Joints

Silvers



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Drawing Report
Taped Joints

Thursday, May 23, 2019
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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Legend	Pitch	Description	SF	LF	EA
	<none>	Perimeter		199.00	
	5/12	Roof Area 5/12	2,015.00	603.09	
	<none>	Ridge		44.50	
	5/12	Hip		110.56	
	5/12	Valley 5/12		29.48	
	<none>	Eave Flashing		199.00	
	<none>	Tape Joint Horiztntal		417.47	
	5/12	Tape Joint Vertical		233.21	
	5/12	Tape Joint Valley or Hip		140.04	
	5/12	VTR Seam Tape			1.00
	5/12	VTR Seam Tape			1.00
	5/12	VENT Seam Tape			2.00
	5/12	Seam Tape @ Electrical Riser			1.00

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Labor Adjustments -Time

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Sealed Deck Underlayment Estimate - Taped Joints

Silvers

Description	Quantity	EU	EU/MDay	EU/Hour	MDays	Hours	Ext Price	Pcs/MDay
Install Seam Tape @ Electrical Riser	2.50	LF	500.000	62.500	0.01	0.04	$0.68	0.000
Install Tape Joint Horiztntal	417.47	LF	800.000	100.000	0.52	4.17	$70.97	0.000
Install Tape Joint Valley or Hip	140.04	LF	600.000	75.000	0.23	1.87	$31.74	0.000
Install Tape Joint Vertical	233.21	LF	800.000	100.000	0.29	2.33	$39.65	0.000
Install VENT Seam Tape	8.00	LF	500.000	62.500	0.02	0.13	$2.18	0.000
Install VTR Seam Tape	4.50	LF	500.000	62.500	0.01	0.07	$1.22	0.000
Job Totals:	805.72	LF	748.288	93.536	1.08	8.61	$146.44	

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Pricing - Purchase Report

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Sealed Deck Underlayment Estimate - Taped Joints — Silvers

Description	Ord Qty	Ord Un	Unit Price	Unit Price	Prc Un	Ext Price
SA Seam Tape Tamko TW	13.21	RL	15.000		RL	$198.13
Job Totals:	13.21	RL			RL	$198.13

Insurance Institute for Business & Home Safety

Where building science leads to real-world solutions.

Hurricane Demonstration Testing

Insights on Wind-Driven Water Entry

The Insurance Institute for Business & Home Safety (IBHS) Research Center 2011 hurricane season demonstration test offered an opportunity to gain insight into roof and ventilation system wind-driven water entry issues.

This unique, full-scale study of how wind-driven water penetrates openings in residential roof systems was modeled on real world, post-event damage assessments in areas where hurricane winds were strong enough to rip off roof cover, but not strong enough to blow off roof sheathing. In such instances, significant property damage and extended occupant displacement routinely occur due to water intrusion. In addition to wind-driven water pouring in – or being blown through – cracks between roof sheathing elements when primary roof cover is damaged and the underlayment is lost, water intrusion through residential roofs can originate from attic ventilation elements (e.g., ridge vents, gable end vents, and soffit vents).

Such damage is particularly common in inland areas, where hurricane-strength winds occur, but building codes and standards are not as stringent as in coastal jurisdictions. For example, when 2005's Hurricane Wilma crossed the southern tip of Florida as a Category 2 hurricane with peak wind speed gusts of about 110 mph, she caused more than $10 billion of damage, most of which related to roof damage and resulting water intrusion. Much of this damage occurred far inland. Other hurricanes have caused catastrophic damage as they moved well inland. For example, after Hurricane Ike made landfall in Texas, it remained strong for two days, creating Category 1 hurricane force winds as far away as Ohio (and causing more than $1.5 billion of losses there).

Water penetration can cause extensive damage to interior finishes, furnishings and other contents, and can lead to ceiling collapse when insulation is saturated. Also, where power is lost and/or a house cannot otherwise be quickly dried out, mold growth is common. IBHS believes that the tremendous human and financial costs associated with water penetration during hurricanes could be substantially reduced through widespread adoption of relatively simple, inexpensive changes to residential roofing systems, such as sealing the roof deck (which only costs about $500 for an average-sized home).

Objectives for IBHS' first wind-driven water research program included:

- quantifying the relative volume of water penetration through different roof openings;
- cataloguing types of water penetration damage to different parts of a house;
- demonstrating effective individual damage mitigation techniques, such as sealing the roof deck; and,
- illustrating why sealed roof decks are core components of the IBHS FORTIFIED for Existing Homes™ and FORTIFIED for Safer Living® program requirements for hurricane-prone regions.

The building specimen designed and constructed for the demonstration was a duplex, where sheathing joints on one half of the roof deck were sealed prior to installing roofing materials and the other half was not sealed. Both halves of the roof were then covered with simple felt paper underlayment prior to installing the asphalt shingles. The building included gable ends fitted with gable end vents and one foot wide soffits at the eaves. The roof sheathing stopped short along the primary ridge so it was possible to install a ridge vent during one set of tests.

All of these features have been addressed in the IBHS FORTIFIED Existing Homes™ bronze designation, which incorporates current best practices in a systems based approach to

reducing water entry related losses in high wind events. These recommendations are also incorporated in the IBHS Roofing the Right Way guide.

Figure 1 -Test duplex moving into the large test chamber at the IBHS Research Center.

The basic recommendations in the IBHS FORTIFIED Existing Homes ™ bronze brochure and the IBHS Roofing the Right Way guide related to preventing or reducing wind-driven water entry include:

1. Sealing the roof deck (joints or the entire surface) to prevent water from running into the attic through the gaps between the roof sheathing panels.

2. Ensuring that soffit panels (the flat panels installed between the bottom of the eaves at the roof edge and the wall of the house) are well attached to the house so they do not blow off in high winds, thereby creating an opening through which wind-driven water could enter the attic.

3. Covering gable end vents with flat shutter panels (plywood or some other flat material) when a hurricane threatens, to keep water from being blown into the attic.

4. Ensuring that ridge vents are products that have been tested and approved for resisting wind driven water entry and that they are adequately attached using the manufacturer's recommendations for high wind installations.

The 2011 hurricane demonstration test gave IBHS its first opportunity to illustrate the relative success and importance of taking these steps to reduce the potential for water entry using high-definition photos and videos of the consequences of water entry into attic spaces during the demonstration testing. Quantitative measurements of water entry were obtained by researchers opportunistically during this demonstration testing to provide preliminary measurements and insight into the quantity of water entering into an attic through vents and between sheathing joints.

Establishing Wind-Driven Rain Capabilities

Planning and research leading to the development of wind-driven rain capabilities at the IBHS Research Center have been ongoing for several years. IBHS provided support to the University of Florida (UF) to assist with deployment of a research disdrometer (an instrument that quantifies droplet size and rain fall rates, shown in Figure 2 on page 3) in Hurricane Ike.

IBHS followed up with partial support for a Ph.D. student to analyze rain droplet size distribution based on Hurricane Ike data, and then to use the UF wind simulator to select a commercially available spray nozzle to produce a similar distribution of rain droplet sizes in the IBHS Research Center test chamber. Thus, a realistic distribution of droplet sizes is required to achieve the same wetting patterns on buildings that occur during real world storms.

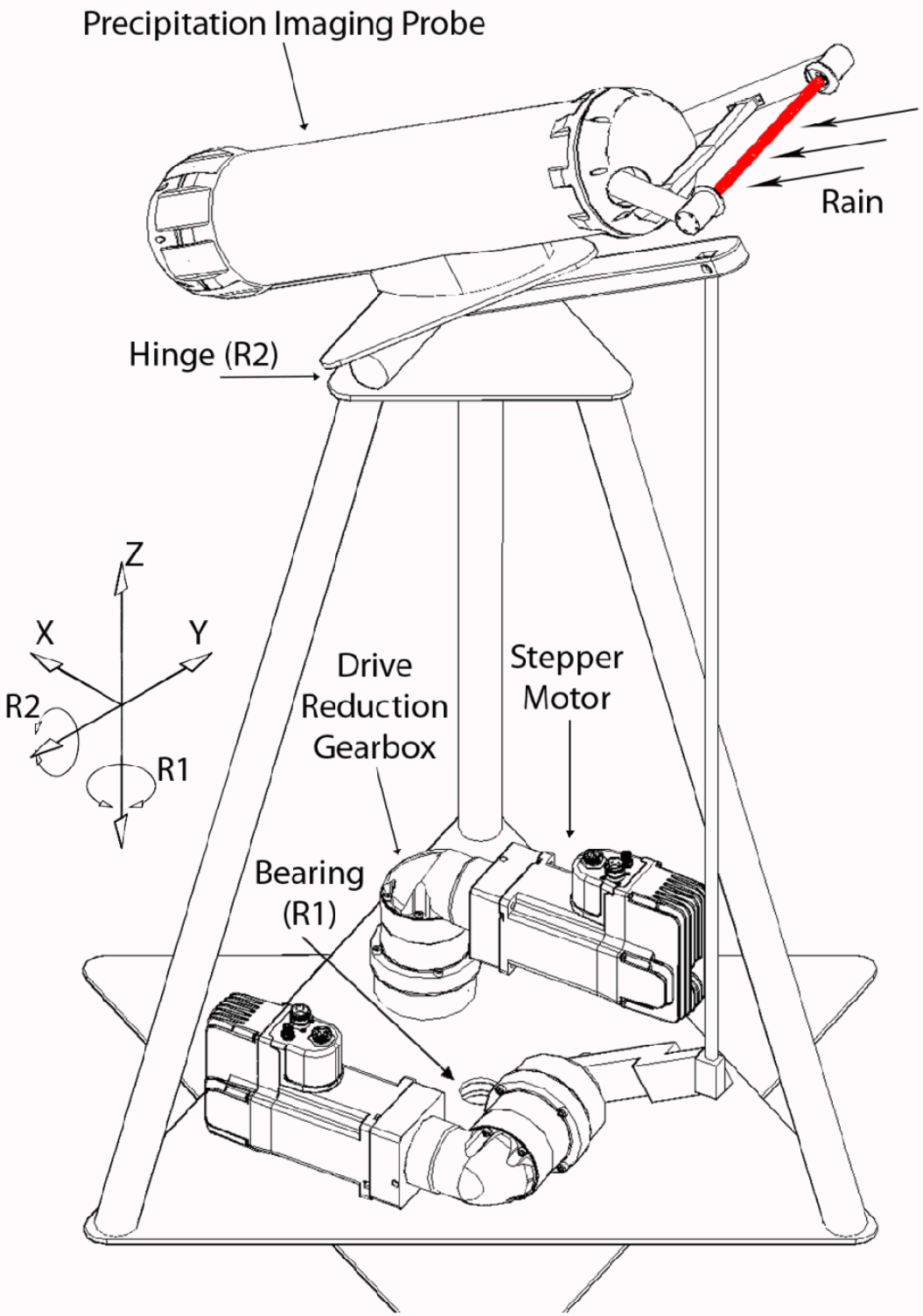

Figure 2 - Precipitation Imaging Probe (PIP) style disdrometer mounted on Florida Coastal Monitoring Program (FCMP) portable weather station for Hurricane Ike data collection by University of Florida.

This summer, the student brought the research disdrometer to the IBHS lab to conduct tests of the completed system. The validation tests demonstrated that target rain deposition rates (8 inches per hour in American Society of Testing and Materials and Florida Building Code test standards) and droplet size distributions were properly reproduced. NOTE: A Ph.D. dissertation is being written on this research and should be completed by the end of 2011.

Measuring Water Entry Rates

When the duplex was completed, including installation of wall board and ceiling drywall, drainage panels and tracks (DrySpaceTM) were installed to create water collection channels between the ceiling trusses, as shown in Figure 3. These channels were outfitted with drains and pipes that allowed collected water to be captured in plastic containers arranged throughout the interior (non-attic) space in the two halves of the duplex. The drainage system was installed in a modular system that allowed the collection of water in ceiling areas roughly 10 feet long by 2 feet wide. The trusses ran from front to back of the house and the 22½ inch space between the trusses was divided into three sections, each about 10 feet long. Each drainage channel directed water to a separate numbered plastic container. Typical drain and collection locations are shown in Figure 4, Figure 5, and Figure 6 (shown on page 6). Tests were typically conducted for a 20-minute period, during which a constant wind speed was maintained and rainfall rate was set to produce 8 inches per hour on the test building (i.e., horizontally driven rain). At the completion of each test, water in the buckets was measured and quantity was recorded.

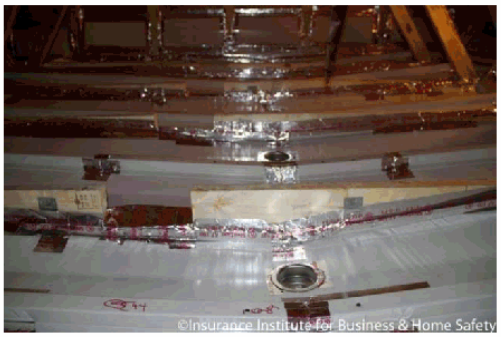

Figure 3 - Photograph of water collection channels between ceiling trusses in duplex.

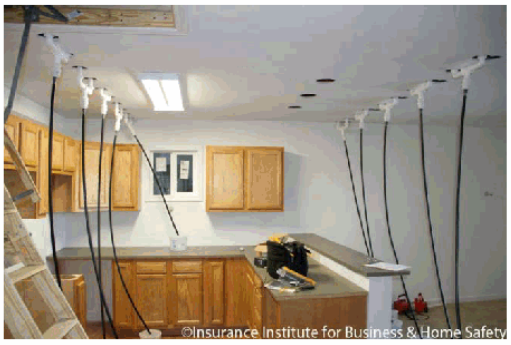

Figure 4 - Photograph of water collection drains to collection buckets in the duplex.

Figure 5 - Photograph of water collection drains to collection buckets in the duplex.

Figure 6 - Photograph of water collection drains to collection buckets in the duplex.

Quantitative Test Program Summary

A series of quantitative tests was conducted during the time available before the scheduled hurricane demonstration. The first test sequence involved measuring water entry rates when the soffit cover was missing along the entire length of the back eave of the duplex. The opening of approximately 8.5 sq. ft. under the eave of the roof where wind and wind-driven rain could enter the attic caused by the missing soffit is typical of the observed loss of the soffit cover in strong winds. Tests were conducted for wind speeds of 30 mph, 50 mph and 70 mph, during which the wall with the open soffit faced the wind flow, as shown in Figure 7. A quartering wind test (i.e., the wall with the open soffit was oriented at 45 degrees off perpendicular to the wind direction) was also conducted with a 50 mph wind speed.

The second test sequence involved repeating soffit tests with a typical perforated vinyl soffit panel intact, thus quantifying differences in water entry for typical soffits that remain undamaged vs. soffit material blown off during an event. For this round of quantification, tests were conducted at 50 mph and 70 mph with the wall with the soffit facing the wind, and at 50 mph for the quartering wind case.

The third test sequence focused on measuring water entry through the gable end vent. These tests were conducted with 30 mph and 50 mph wind-driven rain beating directly against the gable end. During these tests, soffits were covered with typical perforated vinyl soffit panel material.

Figure 7 - Photographs of the water entry quantification testing for the open soffit case with the wall facing the wind flow: top) whole duplex; and bottom) close-up of the open soffit area.

Following the soffit and gable end quantification test series, roof cover on the front of the duplex was blown off using high winds. Similar efforts were started for the roof surface at the back of the duplex, when a fan drive fault ended wind generation for that day. Because of schedule constraints, it was decided

to remove roof cover from the back roof surface to expose the sealed and un-sealed roof decks above the same eave where soffit water entry testing was conducted. Removal of roof cover from the front and back surfaces exposed the gap at the top of the primary ridge, so it was fitted with a Florida Building Code High Velocity Hurricane Zone approved ridge vent.

The final sequence of quantification testing included wind speeds of 50 mph with the back of the duplex facing the wind flow. This configuration put the exposed sealed and un-sealed roof decks, shown in Figure 8, perpendicular to the wind-driven rain to allow a relative comparison in the amount of water entry in the attic for each half of the roof.

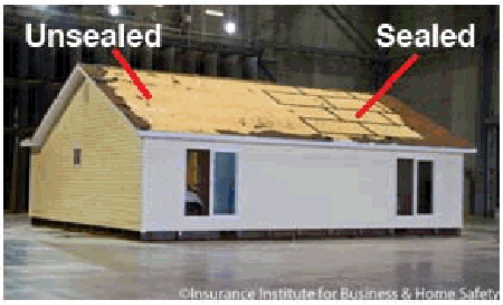

Figure 8 - Photograph of the back of the duplex after shingle and underlayment removal, illustrating the sealed roof deck (on the right) and the un-sealed roof deck (on the left).

Summary of Quantitative Test Results

Open Soffit Tests (simulating loss of soffit material during a high-wind event):

1. A wind speed of 30 mph produced a light sprinkling of drops on the water collection drainage pans within 8 feet of the open soffit. However, no water actually trickled down the drainage system to collection buckets.

2. A wind speed of 50 mph produced an overall water entry rate into the attic of about 1.3 inches per hour based on the open area of the soffit. This is about 15% of the rainfall deposited on the adjacent wall surface (8 inches per hour). Most water was within the first 10 feet of the attic space adjacent to the open soffit.

3. A wind speed of 70 mph produced an overall water entry rate into the attic of about 2.9 inches per hour based on the open area of the soffit. This is a little more than 33% of the deposition rate on the adjacent wall surface.

4. A quartering wind of 50 mph produced an uneven distribution of water in the attic, but still resulted in about 1.6 inches per hour based on the open area of the soffit. This is about 20% of the deposition rate on a wall surface that would have been facing the wind flow.

Covered Soffit Tests (where soffit material remains in place):

- A wind speed of 50 mph resulted in water accumulation in the attic space of approximately 6% of the amount of water that entered during the same test for the open soffit case.
- A wind of 70 mph produced about 9 times more water accumulation in the attic than the 50 mph test. This was about 25% of the amount of water that entered the attic during the same test (70 mph) for the open soffit case.
- A quartering wind of 50 mph produced very little accumulation of water in the attic. The amount was about 2.5% of the water entering during the same test for the open soffit case.

Gable End Vent Tests:

For winds of 30 mph and above, the water entry rate was about equal to the wind driven water deposition rate based on the area of the gable

end vent. There was a slight indication of less water entry for higher wind speeds, but that likely was due to missed water that was blown farther into the attic and collected in the area around the access stairs where no collection pans were in place.

Exposed Roof Sheathing Tests:

The sealed roof deck side (where joints between the roof sheathing were sealed by applying a self adhesive modified bitumen tape) experienced about one-third of the water entry experienced by the side without tape. The amount of water entry through the roof deck was unprecedented in relation to tests conducted for soffit and gable end vents. The roof deck test actually had to be stopped at 16 minutes in duration, because the 3-gallon containers collecting water from each 10 foot by 2 foot collection area were overflowing. Some water entry on the sealed roof side was due to cuts in the tape that occurred when roof cover was removed. Even holes left by nails that pulled out when roof cover was removed led to steady drips of water into the attic. On the side where roof cover was blown off (shown in Figure 9), nails tended to stay in place, which would have reduced nail hole drips. Use of ring shank nails to fasten shingles and underlayment would likely help reduce these leaks, because they will be less likely to pull out, even if roof shingles are blown off. There was no sign of leaks through the Florida Building Code High Velocity Hurricane Zone approved ridge vent.

Consequences of Water Entry

Following quantitative testing, water collection devices were removed from the structure and the required drainage holes in the ceiling were patched. Furniture was placed in the duplex to model actual living spaces. The finished structure was then subjected to a series of wind-driven rain events modeled after Hurricane Dolly. These tests gave IBHS the opportunity to illustrate the consequences of water entry into attic spaces with compelling photos and video. Figure 10 shows photographs taken on the un-sealed roof deck side of the duplex during the demonstration testing, while Figure 11 (shown on page 9) shows a similar view on the sealed roof deck side.

Figure 9 - Photograph of the front of the duplex after shingle and underlayment removal using high winds, illustrating the sealed roof deck (on the left) and the un-sealed roof deck (on the right).

Figure 10 - Photograph of the water entry during the demonstration event on the un-sealed roof deck side of the duplex: close up of the recessed lighting in the kitchen.

Figure 11 - Photograph of the kitchen during the demonstration event on the sealed roof deck side of the duplex.

The amount of water streaming into the living space during the demonstration in the un-sealed roof deck side of the duplex, and the level of damage ultimately experienced on this half of the duplex, is typical of the level of water entry reported during real-world events. Within 45 minutes of the conclusion of testing, the kitchen ceiling in the un-sealed side of the duplex collapsed, as shown in Figure 12 and Figure 13. Shortly thereafter, the living room area ceiling also collapsed, as shown in Figure 14.

Figure 12 - Photograph of collapsed ceiling in the kitchen on the un-sealed roof deck side of the duplex.

Figure 13 - Photograph of fallen portions of collapsed ceiling in the kitchen on the un-sealed roof deck side of the duplex.

Figure 14 - Photograph of fallen portions of collapsed ceiling in the living room on the un-sealed roof deck side of the duplex.

Following the test, IBHS brought in an experienced property insurance claims adjuster to estimate the amount of damage each side of the duplex suffered. He assessed damage to the front three rooms on both sides of the duplex, including the kitchen, dining room, and family room. During a hurricane or high wind event, winds generally come from a relatively small range of directions after roof cover blows off, so damage confined to one area of a house would be typical of most people's experience. The difference between estimated repair costs on the two sides of the duplex was substantial. The loss estimate for the side without a sealed roof deck is more than three times the loss estimate for the side with the sealed roof deck. Of particular note: the furniture in the side without a sealed roof deck required replacement, while furnishings in the side with the sealed roof deck only required cleaning.

Conclusions and Recommendations

These preliminary tests clearly demonstrate that the areas addressed in the IBHS FORTIFIED Existing Homes™ and Roofing the Right Way guidance are important to reducing water entry in hurricanes and other storms where wind-driven rain is a factor. Clearly, sealing the roof deck is one of the most important protective measures that can be undertaken. However, the installer should be careful to make sure that seams are securely sealed and that the drip edge is attached using typical high-wind requirements for fasteners. It is likely that the High Velocity Hurricane Zone requirements for applying roofing cement around edges of the roof would also help reduce water entry if roof cover does suffer damage in a storm.

As a preliminary study, this work suggests that much more investigation is needed to quantify the amount of water entry that can be expected for normal construction, how much water entry is likely to be reduced with various water entry prevention measures, and how much water entry can be tolerated before costs of water entry remediation increase significantly.

Reason: This proposal will require sealing of the the roof deck that is consistent with the *IBHS Fortified Home Bronze* designation. When the primary roof covering is lost due to a wind event, water infiltration can cause extensive damage to interior finishes, furnishings and other contents, and can lead to ceiling collapse when insulation is saturated. Also, where power is lost and/or a building cannot otherwise be quickly dried out, mold growth is common.

While observations from recent hurricanes indicate buildings built to the Florida Building Code (FBC) are performing better than older buildings, significant roof covering loss is still occurring. Many of these buildings, while relatively undamaged structurally, experienced significant and costly damage to interior components due the loss of the primary roof covering. A sealed roof deck can significantly reduce the amount of water infiltration when the primary roof covering is lost. A demonstration test by IBHS on building with portion of the roof sealed and another portion unsealed showed significant reductions in water infiltration in the areas where the roof deck was sealed. (See attached support file Hurricane_Test_Wind_Driven_Water_Report.)

While underlayment requirements in the FBC have been strengthened recently, this proposal, if approved, will take them one step further to comply with the *IBHS Fortified Home Bronze* designation. From a practical standpoint, only two changes are proposed to the current underlayment requirements in the 6th Edition (2017) FBC. First, where felt underlayments are used without membrane/flashing strips applied over the joints in the roof deck, two layers would now be required. The lap requirements currently required for low slope roofs would be required for all slopes. Fasteners for felt underlayment are required to be annular ring or deformed shank fasteners. The number of fasteners and spacing of fasteners is consistent with current requirements.

The options for using adhered underlayments are unchanged from the 6th Edition (2017) FBC.

The requirements for synthetic underlayments have been revised to be consistent with the new standard for synthetic underlayments that is near completion and expected to be published in 2019.

Preliminary observations from Hurricane Michael are also indicating that newer buildings built to the FBC are performing better but water infiltration due to roof covering loss is still a problem. This proposal, if approved, will significantly reduce the amount of water infiltration through the roof deck when roof coverings are lost.

R8170

Date Submitted	12/14/2018	**Section**	905.16	**Proponent**	Ann Russo1
Chapter	9	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Summary of Modification

Expanding the requirements for Building-integrated Photovoltaic roof panels.

Rationale

This proposal adds new sections to address Building-integrated photovoltaic (BIPV) roof panels. These products form part of the roof assembly and are subject to the same requirements as any other roof covering. These BIPV panels are larger and the wind resistance is determined by UL 1897 Uplift Tests for Roof Covering System

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposal adds another type of roof covering and will provide clarity to the enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

Will not increase the cost of construction.

Impact to industry relative to the cost of compliance with code

Will not increase the cost of construction.

Impact to small business relative to the cost of compliance with code

Will not increase the cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal has reasonable and substantial connection with the health, safety and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal will improve the application of the code and will provide equivalent or better products, methods and systems of construction.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposal will not discriminate against materials, products, methods or systems of construction.

Does not degrade the effectiveness of the code

This proposal will not degrade the effectiveness of the code.

2nd Comment Period

R8170-G1

Proponent Ann Russo1 **Submitted** 5/13/2019 **Attachments** No

Comment:

The proposal provides clarity to the code users and will also provide uniformity in the application of the code throughout the State. Currently, there's no prescriptive requirement with regards to the proper installation of this new product. It will be costly for installers to go to the Alternative provisions in Section 104.11 every time this product will be installed. Please support this change.

2nd Comment Period

R8170-G2

Proponent Michael Savage **Submitted** 5/22/2019 **Attachments** No

Comment:

I agree with the proposed revision.

2nd Comment Period

R8170-G3

Proponent	Jennifer Privateer	Submitted	5/23/2019	Attachments	No

Comment:

I agree with this proposed mod

2nd Comment Period

R8170-G4

Proponent	Harold Barrineau	Submitted	5/25/2019	Attachments	No

Comment:

I agree with this modification

Revise as follows:

R905.16 Building-integrated photovoltaic ~~roofing modules/shingles~~roof panels applied directly to the roof deck.

(no change to the text below)
R905.16.1 Deck requirements.

~~Reserved~~Building-integrated photovoltaic roof panels shall be applied to a solid or closely-fitted deck, except where the roof covering is specifically designed to be applied over spaced sheathing.
R905.16.2 Deck slope.

~~Reserved~~Building-integrated photovoltaic roof panels shall be used only on roof slopes of two units vertical in 12 units horizontal (17-percent slope) or greater.
R905.16.3 Underlayment.

Underlayment shall comply ~~and be installed in accordance~~ with Section R905.1.1.
R905.16.3.1 Ice barrier.
Where required, an ice barrier shall comply with Section R905.1.2.
R905.16.4 ~~Underlayment application~~Ice barrier.

~~Reserved~~In areas where there has been a history of ice forming along the eaves causing a backup of water, as designated in Table R301.2(1), an ice barrier that consists of not less than two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the building.
Exception: Detached accessory structures that do not contain conditioned floor area.
~~R905.16.4.1 Ice barrier.~~

~~Reserved.~~
~~R905.16.4.2 Underlayment and high winds.~~
~~Reserved.~~
R905.16.5 Material standards.

Building-integrated photovoltaic ~~roofing modules/shingles~~roof panels shall be listed and labeled in accordance with UL 1703.
R905.16.6 Attachment.

~~B~~uilding-integrated photovoltaic ~~roofing modules/shingles~~roof panels shall be attached in accordance with the manufacturer's installation instructions.
R905.16.7 Wind resistance.

~~Building-integrated photovoltaic roofing modules/shingles shall be tested in accordance with procedures and acceptance criteria in ASTM D3161 or TAS 107. Building-integrated photovoltaic roofing modules/shingles shall comply with the classification requirements of Table R905.2.6.1 for the appropriate maximum basic wind speed. Building-integrated photovoltaic roofing modules/shingles packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 or TAS 107 and the required classification from Table R905.2.6.1~~Building-integrated photovoltaic roof panels shall be tested in accordance with UL 1897. Building-integrated photovoltaic roof panels packaging shall bear a label to indicate compliance with UL 1897.

R7463

Date Submitted	11/27/2018	**Section**	103	**Proponent**	Richard Schauland
Chapter	Appendix U	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes

Alternate Language No

Related Modifications

Summary of Modification

Please refer to the attached file. The documentation for this proposal exceeds the 300 character limit.

Rationale

The modifications proposed are designed to provide clarification and strengthen the existing Solar-ready Appendix U.
In Section U103.1, the roof area orientation has been modified from 110 degrees to 90 in order to maximize the roof slopes that maximize solar technology effectiveness. For similar reasons, Section U103.3 now precludes any portion of the solar zone from being located on a roof slope greater than 2:12 that faces within 45 degrees of true north.
New Section U103.5 clarifies the term "shading" used in Section U103.1, Exception #2, by clarifying how far the designated solar-ready zone should be set back from permanently affixed objects.
If necessary for the system, it is considerably cheaper to provide a path for future wiring from the solar panel to the meter at the time of new construction than after, so roofs with a slope of 2:12 or less must provide a pipe sleeve penetration. There are other design options for roofs with greater slopes, so a penetration is not necessary.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There may be little to no impact to local entities relative to the enforcement of the code. Local entities would have to verify the shading limitations and verify the penetration sleeve during already conducted inspections.

Impact to building and property owners relative to cost of compliance with code

This proposal will increase the cost of construction only in roofs with a slope of 2:12 or less. In any other projects, there will not be an increase in the cost.

Impact to industry relative to the cost of compliance with code

This proposal will increase the cost of construction only in roofs with a slope of 2:12 or less. In any other projects, there will not be an increase in the cost.

Impact to small business relative to the cost of compliance with code

There will no impact to small business because this proposal is for residential buildings only.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposal is about maximizing the solar technology effectiveness. It provides clarity to the code.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposal does strengthen the Code, it ensures maximum effectiveness of the solar technology.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposal does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposal helps the effectiveness of the code by providing clarity to the code.

2nd Comment Period

Proponent Harold Barrineau **Submitted** 5/26/2019 **Attachments** No

Comment:

I agree with this modification.

R7463-G2

1st Comment Period History

R7463-G1

Proponent Stevie Freeman-Monte **Submitted** 1/29/2019 **Attachments** No

Comment:

I support this proposed code modification.

U103.1 General. New detached one- and two-family dwellings, and multiple single-family dwellings (townhouses) with not less than 600 square feet (55.74 m2) of roof area oriented between ~~110~~ 90 degrees and 270 degrees of true north shall comply with sections U103.2 through ~~U103.8~~ U103.10.

Exceptions:

1. New residential buildings with a permanently installed on-site renewable energy system.

2. A building ~~with a solar-ready zone~~ where all areas of the roof that ~~is shaded~~ would otherwise meet the requirements of Section U103 are in full or partial shade for more than 70 percent of daylight hours annually.

U103.2 Construction document requirements for solar ready zone. Construction documents shall indicate the solar- ready *zone*.

U103.3 Solar-ready zone area. The total solar-ready *zone* area shall be not less than 300 square feet (27.87 m2) exclusive of mandatory access or set back areas as required by the *Florida Fire Prevention Code*. New multiple single-family dwellings (townhouses) three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (185.8 m2) per dwelling shall have a solar- ready zone area of not less than 150 square feet (13.94 m2). The solar-ready zone shall be composed of areas not less than 5 feet (1.52 m) in width and not less than 80 square feet (7.44 m2) exclusive of access or set back areas as required by the *Florida Fire Prevention Code*.

U103.4 Obstructions. Solar-ready *zones* shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

Add new text as follows:

U103.5 Shading The *solar-ready zone* shall be set back from any existing or new permanently affixed object on the building or site that is located south, east, or west of the solar zone a distance at least two times the object's height above the nearest point on the roof surface. Such objects include, but are not limited to, taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees, and roof plantings.

U103.6 Capped roof penetration sleeve A capped roof penetration sleeve shall be provided adjacent to a *solar-ready zone* located on a roof slope of 2:12 or less. The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit, but shall have an inside diameter of not less than 1 ¼ inches.

Revise as follows:

~~**U103.5**~~ **U103.7 Roof load documentation.** *No change to text.*

~~U103.6~~ U103.8 **Interconnection pathway.** *No change to text.*

~~U103.7~~ U103.9 **Electrical service reserved space.** *No change to text.*

~~U103.8~~ U103.10 **Construction documentation certificate.** *No change to text.*

Code Change No: RB371-16

Original Proposal

Section: U103, U103.1, U103.2, U103.3, U103.4, U103.5, U103.5 (New), U103.6, U103.6 (New), U103.7, U103.8

Proponent: Kathleen Petrie, City of Seattle, Department of Construction and Inspections, representing City of Seattle, Department of Construction and Inspections (kathleen.petrie@seattle.gov)

Revise as follows:

U103.1 General. New detached one- and two-family dwellings, and multiple single-family dwellings (townhouses) with not less than 600 square feet (55.74 m²) of roof area oriented between ~~110~~ 90 degrees and 270 degrees of true north shall comply with sections U103.2 through ~~U103.8~~ U103.10.

Exceptions:

1. New residential buildings with a permanently installed on-site renewable energy system.
2. A building ~~with a solar ready zone~~ where all areas of the roof that ~~is shaded~~ would otherwise meet the requirements of Section U103 are in full or partial shade for more than 70 percent of daylight hours annually.

U103.2 Construction document requirements for solar ready zone. Construction documents shall indicate the solar- ready *zone*.

U103.3 Solar-ready zone area. The total solar-ready *zone* area shall be not less than 300 square feet (27.87 m²) exclusive of mandatory access or set back areas as required by the *International Fire Code*. New multiple single-family dwellings (townhouses) three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (185.8 m²) per dwelling shall have a solar-ready *zone* area of not less than 150 square feet (13.94 m²). The solar-ready *zone* shall be composed of areas not less than 5 feet (1.52 m) in width and not less than 80 square feet (7.44 m²) exclusive of access or set back areas as required by the *International Fire Code*.

U103.4 Obstructions. Solar-ready *zones* shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

Add new text as follows:

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Revise as follows:

~~**U103.5**~~ **U103.7 Roof load documentation.** *No change to text.*

~~U103.6~~ U103.8 **Interconnection pathway.** *No change to text.*

~~U103.7~~ U103.9 **Electrical service reserved space.** *No change to text.*

~~U103.8~~ U103.10 **Construction documentation certificate.** *No change to text.*

Reason: The modifications proposed are designed to provide clarification and strengthen the existing Solar-ready Appendix U.

In Section U103.1, the roof area orientation has been modified from 110 degrees to 90 in order to maximize the roof slopes that maximize solar technology effectiveness. For similar reasons, Section U103.3 now precludes any portion of the solar zone from being located on a roof slope greater than 2:12 that faces within 45 degrees of true north.

New Section U103.5 clarifies the term "shading" used in Section U103.1, Exception #2, by clarifying how far the designated solar-ready zone should be set back from permanently affixed objects.

If necessary for the system, it is considerably cheaper to provide a path for future wiring from the solar panel to the meter at the time of new construction than after, so roofs with a slope of 2:12 or less must provide a pipe sleeve penetration. There are other design options for roofs with greater slopes, so a penetration is not necessary.

Cost Impact: Will increase the cost of construction
Only in roofs with a slope of 2:12 or less will this proposal increase the cost of construction by $100. In all other projects it will not increase the cost of construction.

Report of Committee Action Hearings

Committee Action: **Approved as Submitted**

Committee Reason: The new language takes shading into account, clarifies the code and adds flexibility for builders.

Assembly Action: **None**

Final Action Results

RB371-16 **AS**

Sub Code: Test Protocols

R7221

19

Date Submitted	11/8/2018	**Section**	5.3	**Proponent**	Gaspar Rodriguez
Chapter	RAS 115	**Affects HVHZ**	Yes	**Attachments**	No

TAC Recommendation No Affirmative Recommendation

Commission Action Pending Review

Comments

General Comments No

Alternate Language Yes

Related Modifications

Summary of Modification

Clearly indicate that drip edge metal shall be installed over anchor/base sheet. This is a current code requirement and needs to be precisely specified. Eliminate unnecessary requirement to coat joints of metals.

Rationale

This is a current code requirement which somehow has never been clearly indicated. We have had some users question where this requirement is indicated. This modification clearly indicates the current requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Impact to building and property owners relative to cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements .

Impact to industry relative to the cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Impact to small business relative to the cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. Adds language to more precisely define current code requirements and delete unnecessary requirements .

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes. Adds language to more precisely define current code requirements and delete unnecessary requirements .

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require any specific material, product, method or system of construction.

Does not degrade the effectiveness of the code

Does not degrade code, actually makes code more easily understandable.

2nd Comment Period

7221-A2

Proponent Gaspar Rodriguez **Submitted** 4/22/2019 **Attachments** Yes

Rationale

This is a current code requirement which somehow has never been clearly indicated. We have had some users question where this requirement is indicated. This alternate language more clearly indicates the current requirement.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Impact to building and property owners relative to cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Impact to industry relative to the cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Impact to Small Business relative to the cost of compliance with code

None. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes. Adds language to more precisely define current code requirements and delete unnecessary requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not require any specific material, product, method or system of construction.

Does not degrade the effectiveness of the code

Does not degrade code, actually makes code more easily understandable.

5.3 Eave and gable drip metal shall be joined by a minimum 4 inch lapped ~~of a minimum of 4 in. and the entire interior of the joints shall be coated with approved flashing cement~~. Eave and gable drip metal shall be installed over the underlayment and be fastened with minimum 12 gauge annular ring shank nails at a maximum spacing of 4 in. o.c. The nails shall be manufactured from similar and compatible material to the termination profile. All composite materials shall be fastened with nonferrous nails. All metal profiles shall be installed in compliance with RAS 111.

5.3 Eave and gable drip metal shall be installed over the anchor/base sheet, ~~joined by a~~ lapped ~~of~~ a minimum of 4 inches. ~~and the entire interior of the joints shall be coated with approved flashing cement.~~ Eave and gable drip metal shall be fastened with minimum 12 gauge annular ring shank nails at a maximum spacing of 4 in. o.c. The nails shall be manufactured from similar and compatible material to the termination profile. All composite materials shall be fastened with nonferrous nails. All metal profiles shall be installed in compliance with RAS 111.