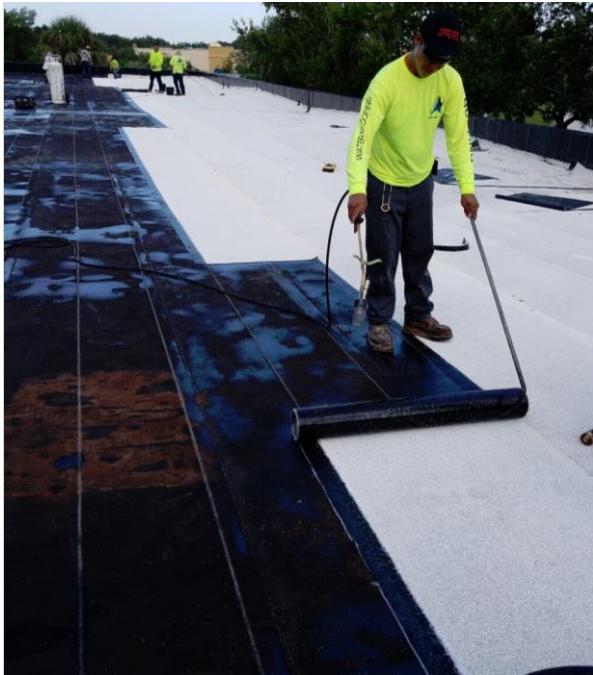


REVISED

SBBC Workshop

Roofing Overview



Agenda

1 Introduction to SMART Program Roofing

2 Roofing 101

3 Why Roofing is Important to SMART

4 How did we get here?

5 Where we are today

6 Recommended Path Forward





Introduction to SMART Program Roofing

Assessing the Causes, Costs, & Conditions

- **A team was established** to perform a **comprehensive review of roofing conditions** affecting the SMART program.
- **Comparable agencies** including Miami-Dade and Palm Beach County School Districts were compared for **increased objectivity and context**
- The review **measured original cost estimates and scope of work** for individual schools as well as the following factors
 - ✓ Applicable roofing design standards
 - ✓ Florida Building Code requirements
 - ✓ BCPS Building Department Procedures
 - ✓ Market Conditions
- Met with Roofing Contractors for **Roundtable Discussion**





Roofing 101

Re-Roofing Options

Re-Roofing

OR

Recovering

If no leaks, apply new membrane over existing membrane

Roof Replacement

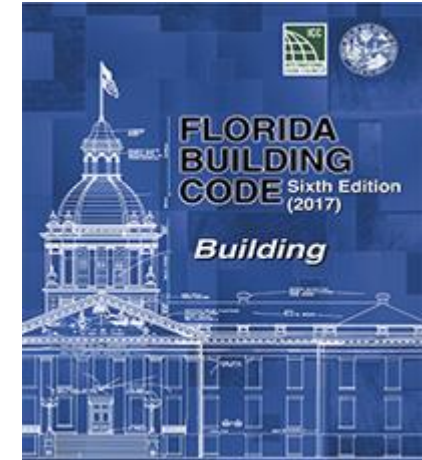
“New Roof” – strip down to the deck and add new roof assembly



Re-Roofing Defined

SECTION 1513 - HIGH-VELOCITY HURRICANE ZONES—DEFINITIONS

- **ROOFING ASSEMBLY.** An assembly of interacting roofing components [includes the roof deck, vapor retarder (if present), insulation, and roof covering]
- **RECOVERING.** The process of covering an existing roofing assembly with a new roofing system or a prepared roofing system.
- **REROOFING.** The process of recovering or replacing an existing roofing system, either in its entirety or in existing sections.
- **ROOF COVERING.** An assembly of multiple field-applied components or a single component designed to weatherproof a building's top surface. A roof covering may be a roofing assembly or form a portion thereof.
- **ROOFING COMPONENT.** A roofing product that is incorporated into various roofing assemblies.
- **ROOF DECK.** Solid or spaced sheathing to which the roofing or waterproofing system is applied.
- **ROOF REPLACEMENT.** The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.



Reasons for Roof Replacement

EXAMPLE: Coconut Creek Elementary



Lack of roof maintenance



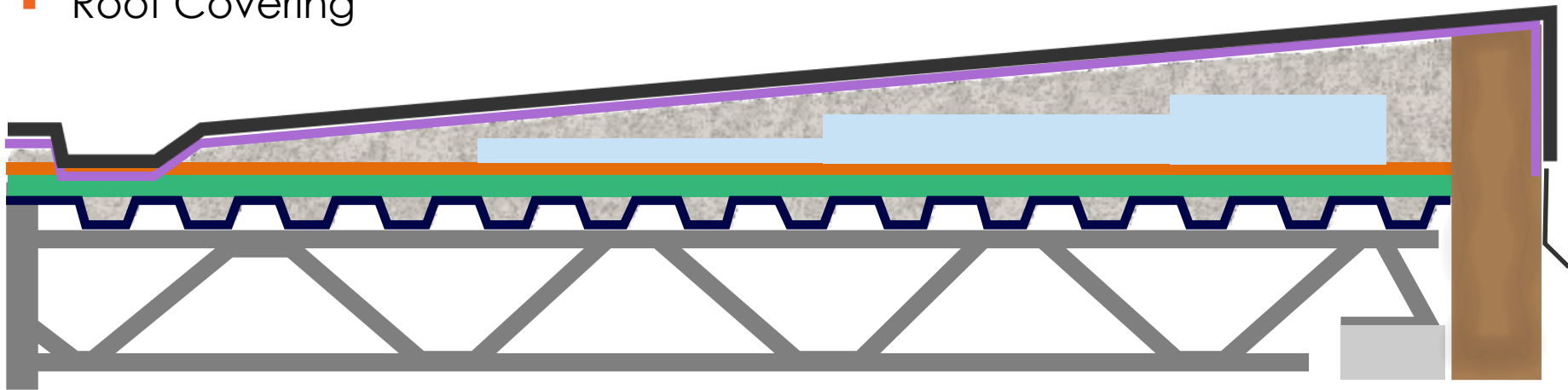
Lack of proper slope causing ponding of water on roof



The Anatomy of a School Roof

Roofing Assembly: The interaction of roofing components that include:

- Existing Roof Deck
- Temporary Membrane
- Lightweight Insulating Concrete
- Roof Covering

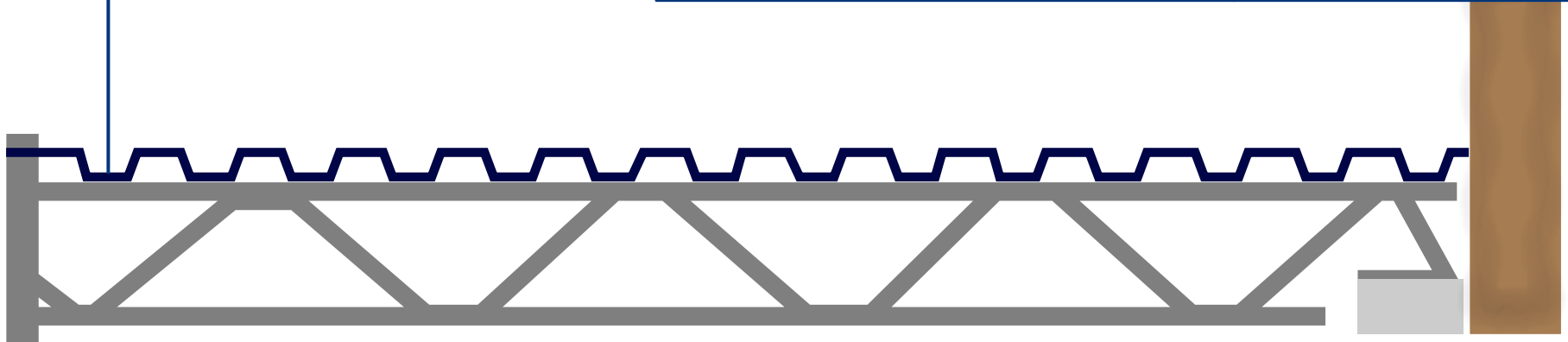


The Anatomy of a School Roof

Roofing Components – Existing Galvanized Steel Deck



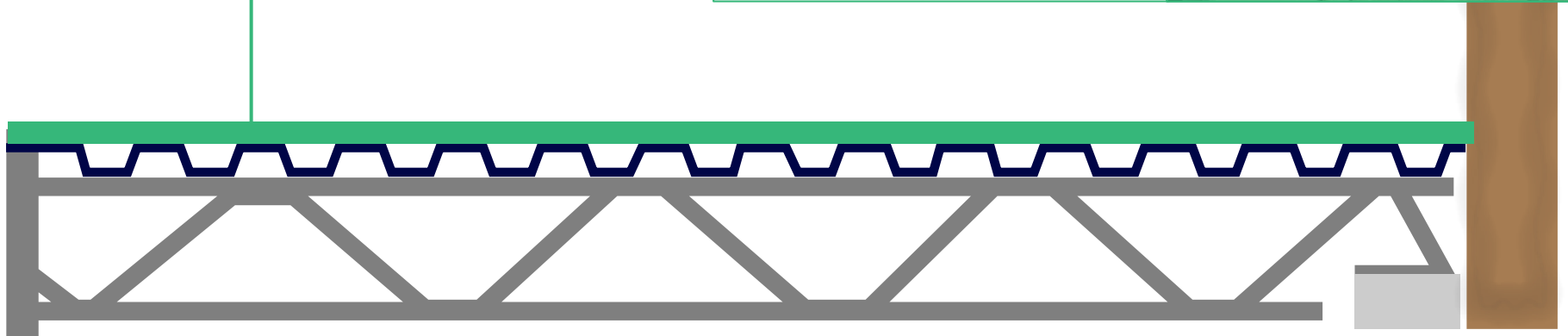
Existing Galvanized
Steel Deck



The Anatomy of a School Roof

Roofing Components – Densboard

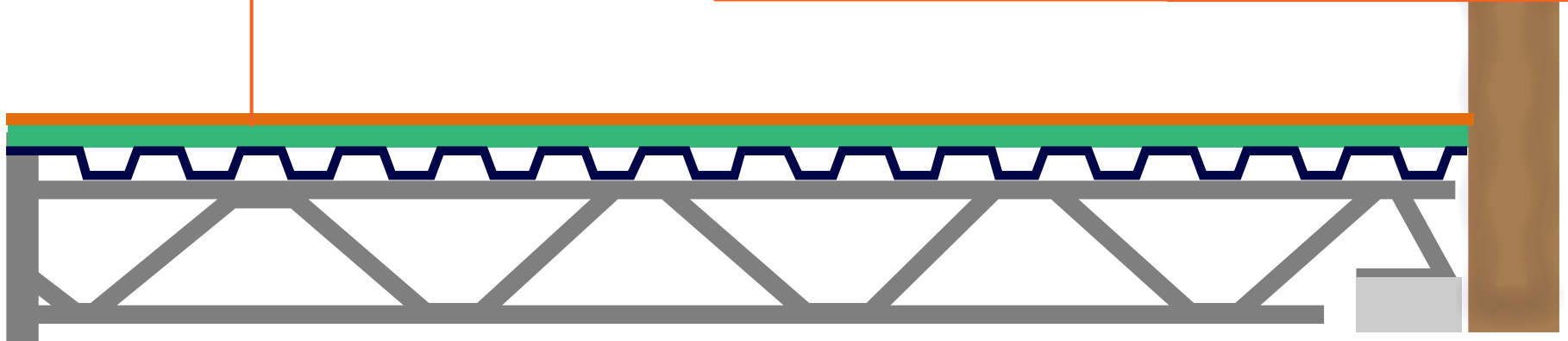
Densboard



The Anatomy of a School Roof

Roofing Components – Membrane (temporary roof)

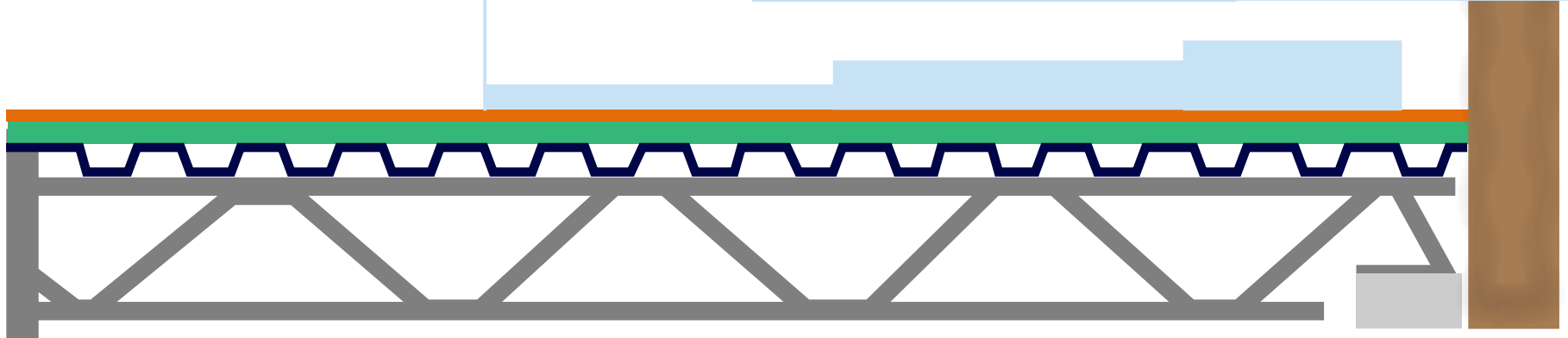
Membrane
(temporary roof)



The Anatomy of a School Roof

Roofing Components – Expanded Polystyrene (EPS)

Expanded Polystyrene (EPS)

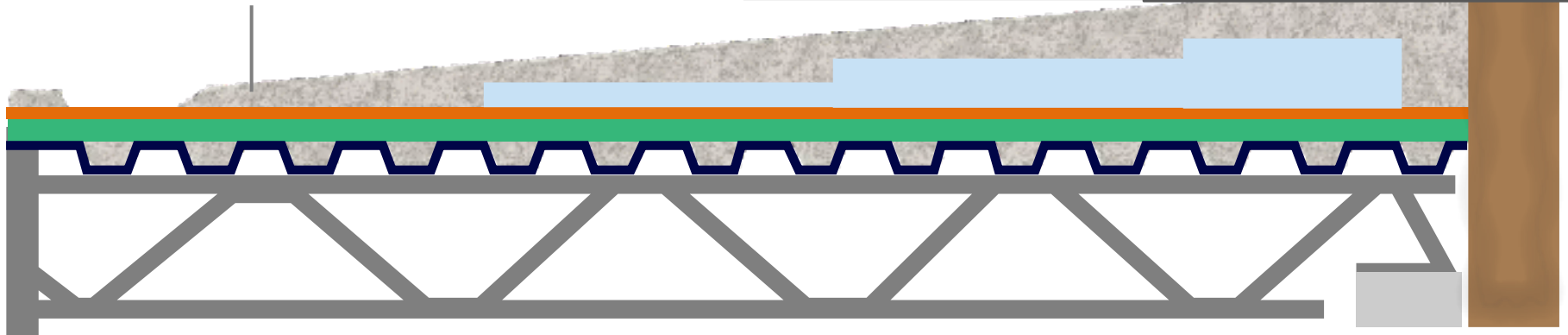


The Anatomy of a School Roof

Roofing Components – Lightweight Insulated Concrete



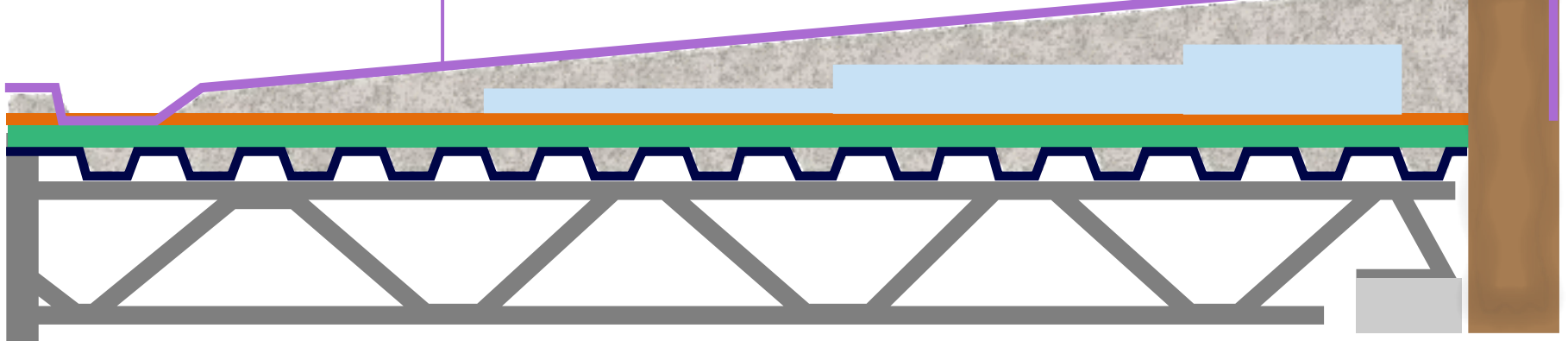
Lightweight
Insulated Concrete



The Anatomy of a School Roof

Roofing Components – Base Sheet & Attachments

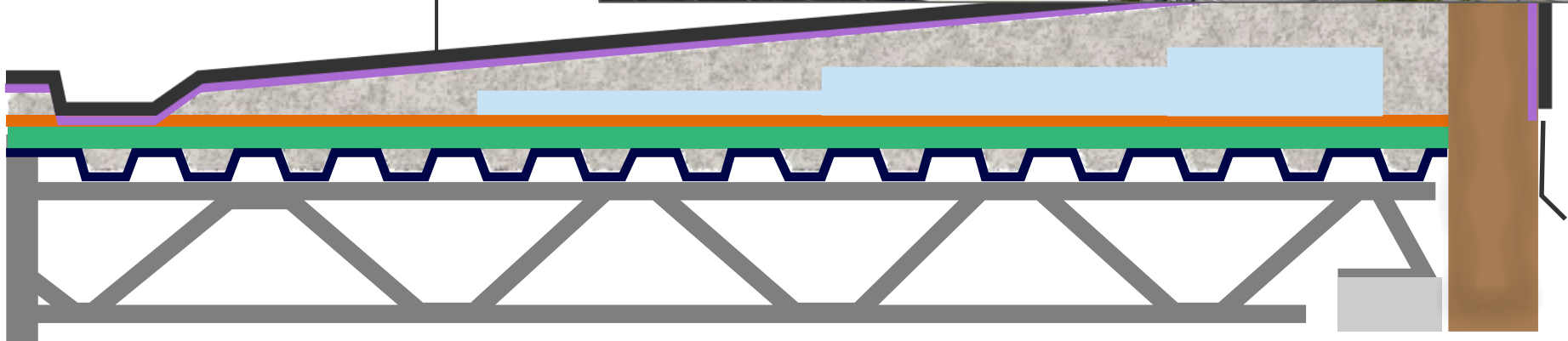
Base Sheet
& Attachments



The Anatomy of a School Roof

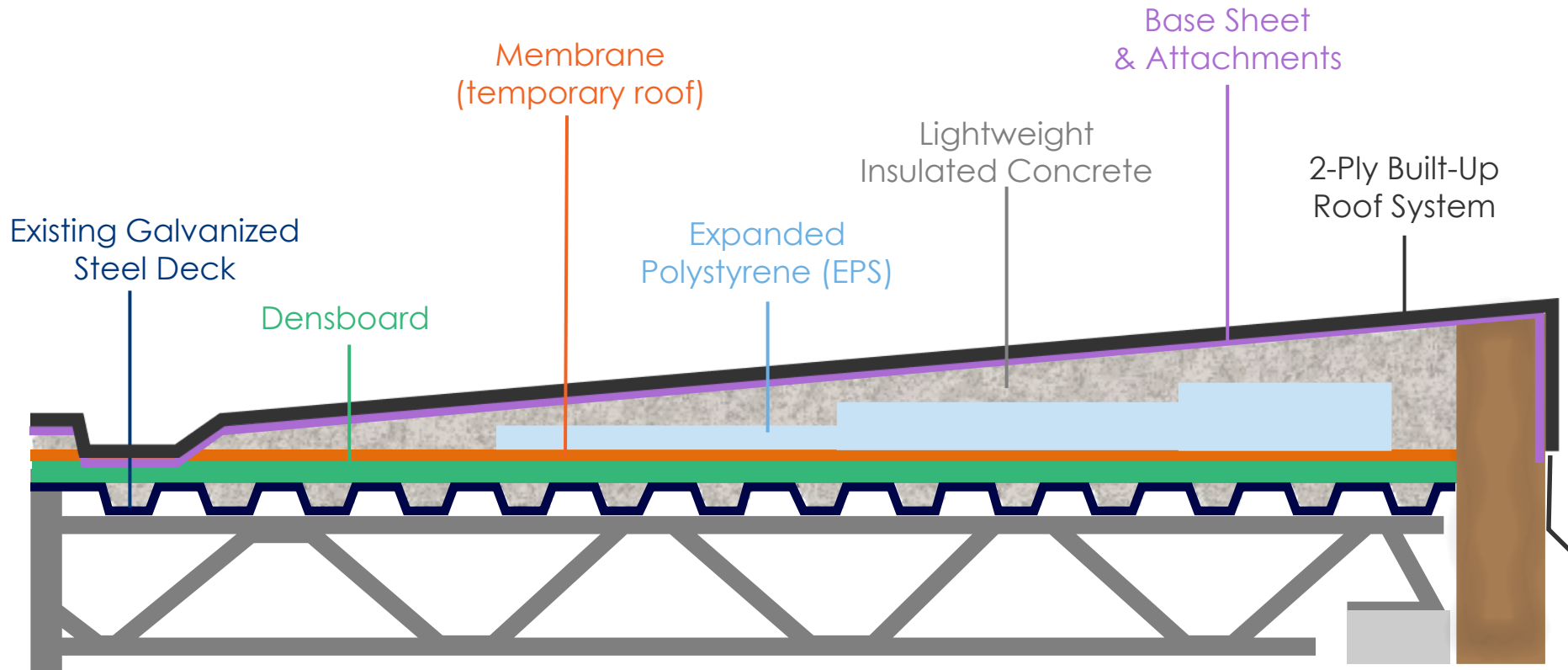
Roofing Components – 2-Ply Built-Up Roof System

2-Ply Built-Up
Roof System



The Anatomy of a School Roof

Roofing Components – Complete Roof



4 Phase Temporary Roof/Dry-in Example

1. **Lightweight after membrane removal**
2. Deck after lightweight removal
3. Densboard over existing deck
4. Temporary membrane to dry in roof



1 Lightweight after membrane removal



4 Phase Temporary Roof/Dry-in Example

1. Lightweight after membrane removal
2. Deck after lightweight removal
3. Densboard over existing deck
4. Temporary membrane to dry in roof



2 Deck after lightweight removal



4 Phase Temporary Roof/Dry-in Example

1. Lightweight after membrane removal
2. Deck after lightweight removal
- 3. Densboard over existing deck**
4. Temporary membrane to dry in roof



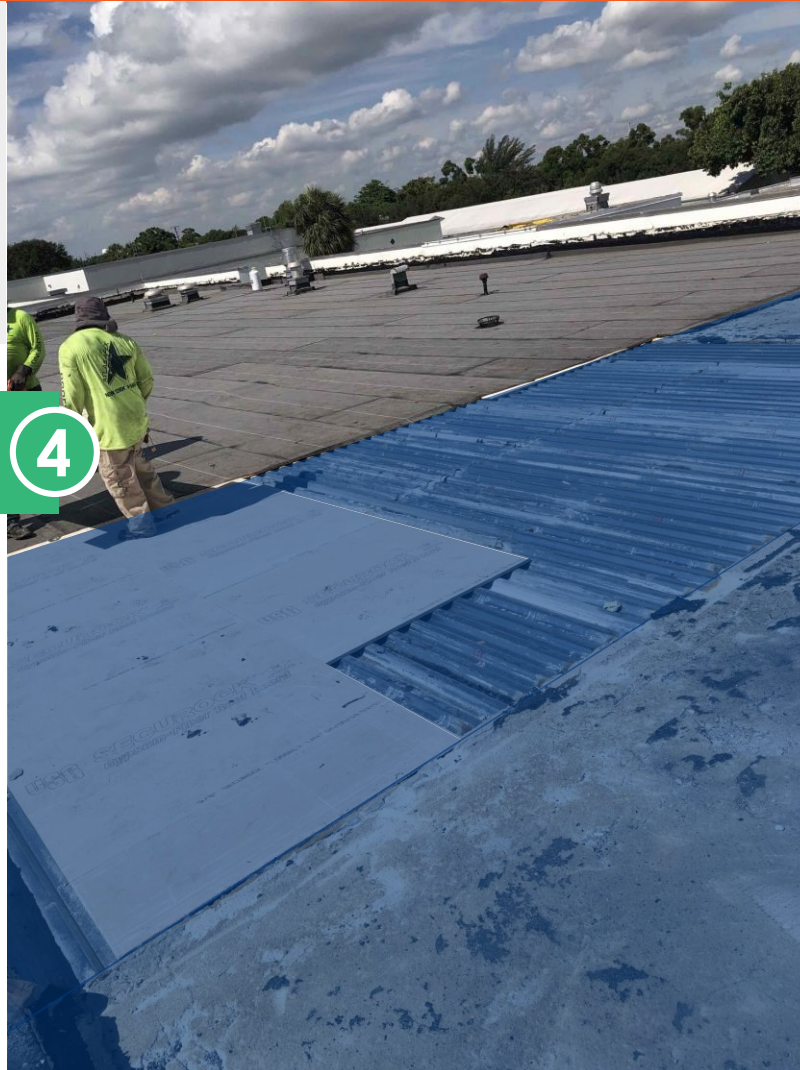
Densboard
over existing deck **3**



4 Phase Temporary Roof/Dry-in Example

1. Lightweight after membrane removal
2. Deck after lightweight removal
3. Densboard over existing deck
4. **Temporary membrane to dry in roof**

Temporary membrane
to dry in roof



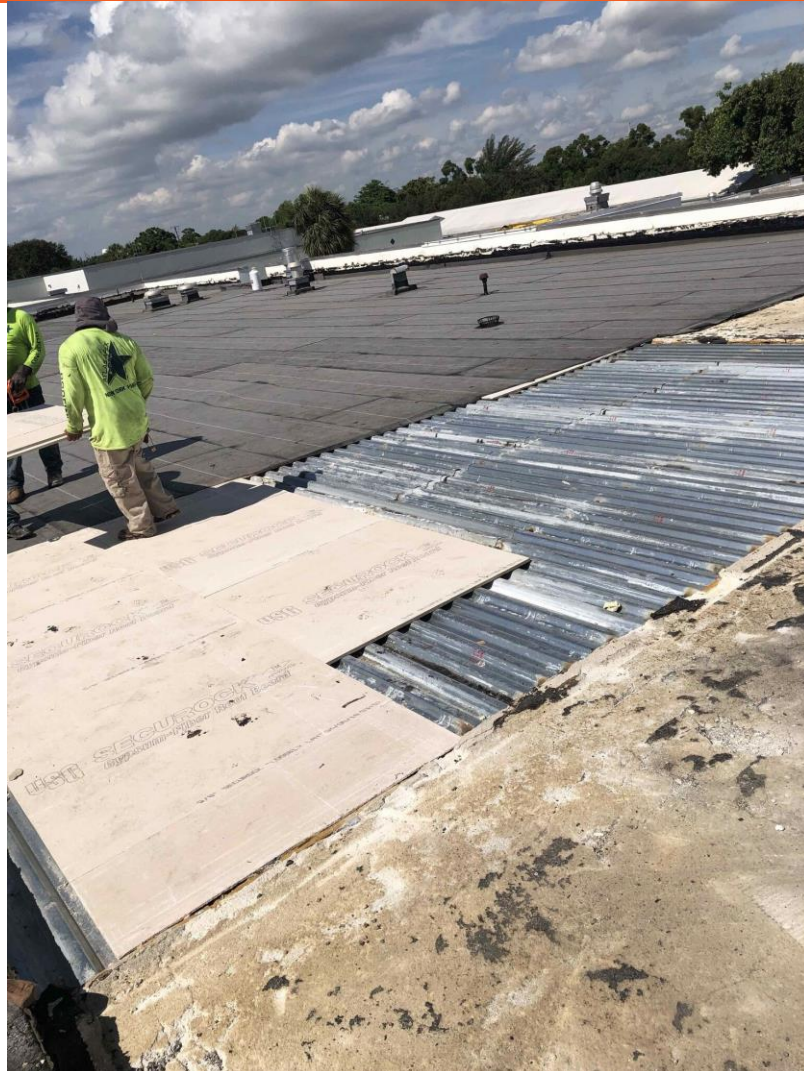
4



4 Phase Temporary Roof/Dry-in Example

Possible schedule impacts due to staging requirements

Roofing projects follow a phased work plan to accommodate the occupied facilities below the deck



Why Lightweight Insulating Concrete is Preferred

Lightweight Insulating Concrete



- ✓ Most **cost effective**
- ✓ Higher "R" Rated
- ✓ **IF MAINTAINED** – in 25 years only new membrane will be needed

Polyiso Board Insulation



- ✓ **More costly** - short and long term
- ✓ More often **re-roof will require replacement** of Polyiso Board
- ✓ **Typically** a one-time use
- ✓ More **labor intensive**



BCPS Design Criteria for Roofing

The School Board of Broward County, Florida

Design Criteria Section 2A-2

Architectural Design Criteria

SBBC- Design Services, Office of Facilities & Construction

1.4 THERMAL MOISTURE PROTECTION

07. Roofing:

- a) Accepted roofing insulation materials shall be as per SBBC Design and Material Standards.
- b) Use glass-faced gypsum roof board as a recovery or overlayment board
- c) The District Standard for new roof assemblies shall incorporate lightweight insulating concrete.**
- d) Perlite, particleboard, wood fiber, or wood composite boards are not allowed.



Why 1/4" per Foot Roof Slope is Required

- **The BCPS Building Department has done the following:**
 - ✓ reviewed the 1/4" per foot roof slope issue numerous times
 - ✓ been enforcing this code interpretation since 2005

Supporting sections of the Florida Building Code to provide 1/4" per foot roof slope

The referenced Exception in Section 1511.1 that reroofing is not required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units for roofs that provide positive roof drainage does not apply as it is not one of the referenced sections noted in Section 1501 for high-velocity hurricane zones.

CHAPTER 15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES | SECTION 1501 GENERAL

- **1501.1 Scope.** The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures
- **Exception:** Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Section 1503.7 and Sections 1512 through 1525. (emphasis added)



Why 1/4" per Foot Roof Slope is Required

Supporting sections of the Florida Building Code to provide 1/4" per foot roof slope

The 2017 Florida Building Code governs the minimum requirements and standards of the industry for roofing system installations, Section 1515.2.2 deals with the requirements for minimum slope for building and structures located in within the high-velocity hurricane zones

- **1515.2.2 Minimum slope.**

All roofing assemblies must be installed in compliance with the slope requirements specified in the product control approval, in compliance with Table 1515.2.

- **1515.2.2.1 In new construction the minimum deck slope shall be not less than 1/4:12.**

Understanding the definitions and additional code sections that apply. Per the Florida Building Code - Section 453 State Requirements for Educational Facilities it has always been the position of the BCPS Building Department that on existing roof replacement projects in which the existing substrate system is removed due to the existing conditions and replaced with new installation of lightweight insulating concrete as the substrate, we have required compliance with the FBC as a new roof system, and therefore must meet the minimum design slope requirements of one-quarter unit vertical in 12 units horizontal (2-percent slope) per Section 1515.2.2.1.

SECTION 453 - STATE REQUIREMENTS FOR EDUCATIONAL FACILITIES - DEFINITIONS

- **453.5.14 RENOVATION.** The rejuvenating or upgrading of existing facilities by installation or replacement of materials and equipment. The use and occupancy of the spaces remain the same. **Only that portion of the building being renovated must be brought into compliance with the Florida Building Code (emphasis added)** and Florida Fire Prevention Code as adopted by the State Fire Marshal unless the renovation adversely impacts the existing life safety systems of the building.



Sampling of BCPS Roofing Projects

Indian Ridge Middle School



Before



During



After



Sampling of BCPS Roofing Projects

Manatee Bay Elementary School



Before



During



After



Sampling of BCPS Roofing Projects

Coconut Creek Elementary School



Before



During



After



Sampling of BCPS Roofing Projects

Cypress Elementary School



Before



During



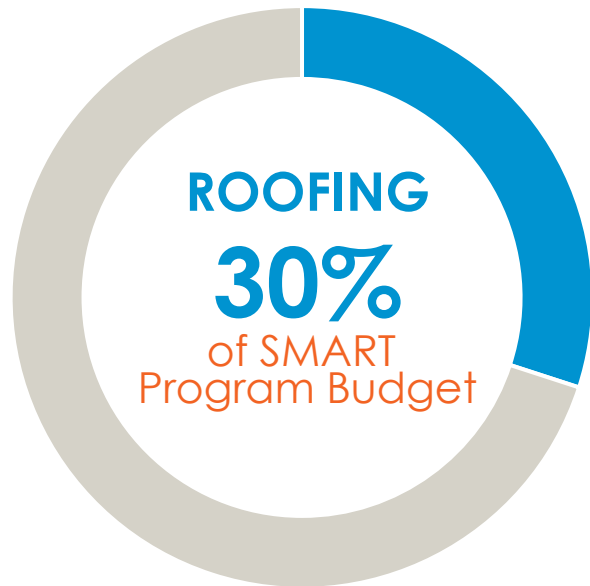
After





Why Roofing is Important to SMART

Roofing: The Significance for SMART



Compared to original estimates, actual roofing costs are trending consistently

Up to 3x Original Budget



Roofing: The Significance for SMART

of projects + Higher Costs = Significant Impact on the SMART Program

Due to the Magnitude of the roofing program
a slight change can cause a big impact

Example of Impact

18 Million SF of Buildings to be Roofed

\$1/SF Increase = **\$18 Million** Cost Impact



Roofing: The Significance for SMART

of projects + Higher Costs = Significant Impact on the SMART Program

Due to the Magnitude of the roofing program
a slight change can cause a big impact

Potential Impact

Up to \$280 Million

SMART Reserve Impact





How did we get here?

Flawed 2014 Roofing Cost Estimates

2014 Assessment
Avg. Raw Cost
\$6.80/SF



Roofing: Historical Cost from Projects Completed 2007-2008

Loc No.	School Name	Scope	Sq. Ft.	Contract Amount	\$ / SF
2221	Atlantic Vocational Center	Building No.'s 4 and 19	26,755	\$443,108.00	\$16.56
2611	Bair Middle School	Building No. 2.	7,348	\$77,759.00	\$10.58
0201	Bennett Elementary School	Building No. 2.	31,460	\$268,760.00	\$8.54
2551	Coral Springs Elementary School	Facility (Bldg 1 & 3	75,382	\$888,656.00	\$11.79
0101	Dania Elementary School	Building No.'s 1 and 2	62,150	\$774,524.00	\$12.46
3441	Eagle Ridge Elementary School	Building No. 2.	41,800	\$607,716.00	\$14.54
1971	Hunt Elementary School	Building No. 1	56,933	\$992,070.00	\$17.43
1751	Miramar High School	Building No.'s 4, 6, 7 and 8.	35,521	\$312,595.00	\$8.80
2691	Morrow Elementary School	Building No. 1	66,660	\$1,042,104.00	\$15.63
1282	Nova Blanche Forman Elementary School	Facility Bldg 1 & 2	77,356	\$1,148,320.00	\$14.84
1021	The Quest Center	Building No.'s 1, 2, 3, and 4	73,840	\$1,223,476.00	\$16.57

Basic Example

Bennett Elementary	Roofing SF	Contract Cost	\$/SF
	31,460	\$268,760.00	\$8.54

Complex Example

Hunt Elementary School	Roofing SF	Contract Cost	\$/SF
	56,933	\$992,070.00	\$17.43

Basic \$8.54/SF
Complex \$17.43/SF
Average \$12.98/SF

Miami-Dade County Public Schools **costs were comparable** during same time period.





Where we are Today

Roofing: The Significance for SMART

Compared to original estimates, actual roofing costs are trending consistently

Up to 3x Original Budget

Due to the Magnitude of the roofing program a slight change can cause a big impact

Potential Impact

up to \$280 Million

SMART Reserve Impact



Other Factors Impacting Cost of Roofing

- **Increased cost of construction** due to supply and demand – triggered by historic volume of construction in South Florida
- Additional complexity of **HVAC integration** in many roof replacements and repairs contributes further impact on cost and schedule





Recommended Path Forward

Recommended Path Forward

- **Continue to Expand** the pool of qualified and Certified Roofing Contractors for better competition
- **Consider** pre-qualification and evaluations of both General Contractors and Sub-Contractors for **roofing-related work**
- **Explore** separation of roofing from project scope balance and bid separately on a case by case basis
- **Implementation** of a roof maintenance and warranty program is **STRONGLY RECOMMENDED**
- **Schedule** mandatory roof permitting seminars for designers and contractors to limit underestimations and continued scope fluctuations within **Q1 2019**





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