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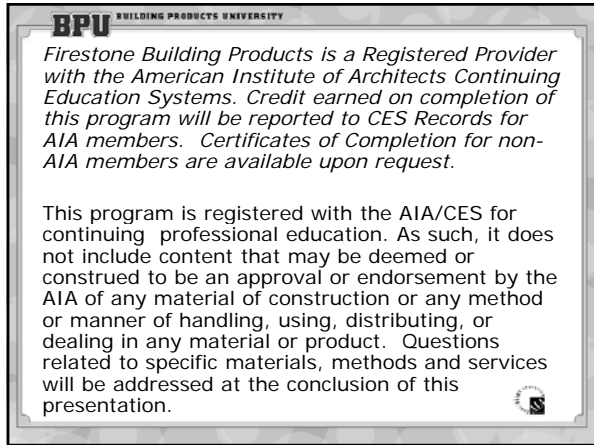
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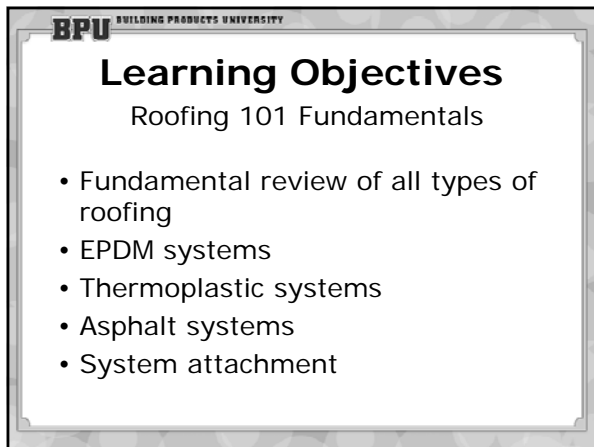
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## Roofing 101 – “A Selection Process”

### IS YOUR ROOF AN ASSET OR LIABILITY?

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## The Buzzwords

- Some common roofing terms:
  - Alligatoring – The cracking of the asphalt surface, looks like alligators hide
  - Blistering – Air pocket between layers of felt usually caused by trapped water.
  - Bridging – When membrane is un-supported at a juncture.
  - Fishmouth – opening along side lap of membrane, gives appearance of a fish’s mouth.
  - Slope - Direction of the slant of the roofing substrate. (Positive or Negative or Flat)
  - Oil Canning...

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## Industry Acronyms

- **AIA** – American Institute of Architects
- **ANSI** – American National Standards Institute
- **ARMA** – Asphalt Roofing Manufacturers Assoc.
- **ASHRAE** – American Society of Heating, Refrigeration & A-C Engineers
- **ASTM** – American Society for Testing and Materials
- **CABO** – Council of American Building Officials
- **CSI** – Construction Specifications Institute
- **ICC** – International Code Council
- **IBC** – International Building Code
- **ERA** – EPDM Roofing Association
- **NRCA** – National Roofing Contractors Association
- **PIMA** – Polyisocyanurate Insulation Manufacturers Assoc.
- **RCI** – Roof Consultants Institute
- **SMACNA** – Sheet Metal and Air Conditioning Contractors Nat’l Assoc.
- **SPRI** – Single Ply Roofing Institute
- **UL** – Underwriters Laboratories, Inc.

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### Myriad of Acronyms

APAO	Atactic Polyalphaolefin
APP	Atactic Polypropylene
BUR	Built-up Roofing
CPA	Copolymer Alloy
CPE	Chlorinated Polyethylene
CSPE	Chlorosulfonate Polyethylene
EIP	Ethylene Interpolymers
EPDM	Ethylene Propylene Diene Monomer
PIB	Polyisobutylene
PVC	Polyvinyl Chloride
SBS	Styrene Butadiene Styrene
TPA	Thermoplastic Alloy
TPO	Thermoplastic Polyolefin

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### Product Acronyms

- Thermoset Single Ply:
  - EPDM Ethylene Propylene Diene Monomer
- Thermoplastic Single Ply:
  - PVC Polyvinyl Chloride
  - TPO Thermoplastic Polyolefin
- Modified Bitumen:
  - APP Atactic Polypropylene
  - SBS Styrene Butadiene Styrene
- Built-Up Roofing - BUR

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### TWO BASIC TYPES OF ROOFING

- STEEP ROOFING**
  - HIGH SLOPE, DESIGNED TO SHED WATER RAPIDLY
  - SHINGLES, SLATE, THATCH – (Pieces)

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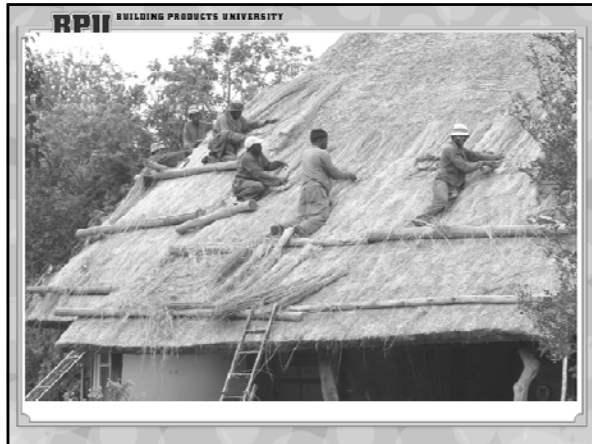
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## TWO BASIC TYPES OF ROOFING

- **LOW SLOPE ROOFING**
  - SOMETIMES CALLED “FLAT ROOFING”, HAVE TO BE DESIGNED TO MOVE THE WATER OFF
  - SINGLE PLY MEMBRANES AND BITUMEN BASED



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**Prototype - Tampa, FL**  
General Roof Design Considerations

**WHAT ARE THE ROOF DESIGN CONSIDERATIONS?**

- Cost
- Location within USA (North, South, East, West)
- Surrounding Topography (Open City, Coastal, Desert)
- Loads on Building (Equipment, Wind, Rain Snow ...)
- Shape, Location & Height (Compass Direction)
- Maintenance (Roof System, HVAC, Roof Access ...)
- Aesthetics
- Contractor Availability




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**BASIC ROOFING DIFFERENCES**

<ul style="list-style-type: none"> <li>• <b>STEEP</b></li> <li>• DISCRETE PIECES</li> <li>• ROOF DIRECTLY ON DECK</li> <li>• LOOSE FLUFFY INSULATION</li> <li>• UNDER DECK</li> <li>• WATER DRAINS RAPIDLY</li> <li>• DISCOURAGES TRAFFIC</li> <li>• RESIDENTIAL</li> </ul>	<ul style="list-style-type: none"> <li>• <b>LOW SLOPE</b></li> <li>• LARGE PANEL SIZES</li> <li>• ROOF ON THE INSULATION</li> <li>• BOARD STOCK INSULATION</li> <li>• WATER DRAINS SLOWLY</li> <li>• CAN DESIGN FOR TRAFFIC</li> <li>• COMMERCIAL</li> </ul>
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**ALL ROOFS MUST:**

- DRAIN TO WORK
- STEEP ROOFS DRAIN TO THE SIDE
- LOW SLOPE ROOFS DRAIN OFF THE SIDES OR TO INTERIOR DRAINS
- REMEMBER -

**SLOPE GOOD.....WATER BAD**

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**BASIC ROOFING:  
A SELECTION OF  
COMPONENTS**

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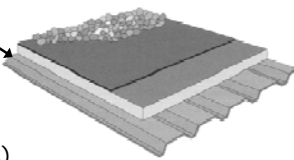
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**DECKING TYPES**

- STEEL
- CONCRETE
  - STRUCTURAL
  - LIGHT WEIGHT
- WOOD
- TECTUM (Schools)
- CEMENTITIOUS WOODFIBER
- GYPSUM



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**DECK TYPE & CONDITION  
WILL IMPACT:**

- WEIGHT OF SYSTEM ALLOWABLE
- TYPE OF AFFIXMENT METHOD WHICH CAN BE USED
  - BALLASTED
  - ADHERED
  - MECHANICALLY ATTACHED
- FOR MECHANICALLY ATTACHED, REQUIRED FREQUENCY WILL BE DETERMINED

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### METAL DECK TYPE & GRADE

- PAINTED, GALVANIZED, STAINLESS STEEL, ACOUSTICAL....
- GRADES – C (30ksi) or E (80ksi)
- TYPES – A, B, F...



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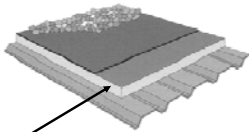
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### ROOF INSULATION

- BOARD STOCK
  - WOOD FIBER
  - PERLITE
  - POLYSTYRENE
    - EXPANDED
    - EXTRUDED
  - POLYISOCYANURATE
  - FOAMGLAS
  - GLASS MAT GYPSUM BOARD



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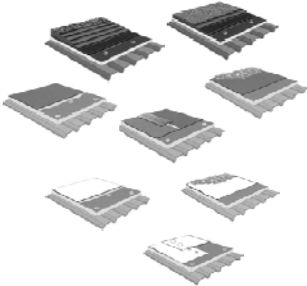
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### ROOF COVERING MATERIALS

- BITUMEN
  - COAL TAR PITCH
  - Asphalt
  - SBS
  - APP
- SINGLE PLIES
  - THERMOSET
    - EPDM
  - THERMOPLASTIC
    - PVC & PVC BASED
    - TPO



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## ROOF COVERING MATERIALS

- METAL ROOFING
  - STRUCTURAL METAL
    - STANDING SEAM
  - ARCHITECTURAL METAL
    - CRAFTED METALS
  - FASTEN THROUGH



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## The Roofing System

- ROOF DECK
- INSULATION
- ROOF COVERING
- AFFIXMENT METHOD

PROPER SELECTION OF EACH COMPONENT IS NECESSARY TO FORM A ROOF SYSTEM

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## BASIC ROOFING: Sample Systems

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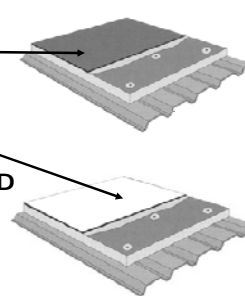
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### Single Ply

- MEMBRANES
  - THERMOSET
    - EPDM
  - THERMOPLASTIC
    - PVC & PVC BASED
    - TPO



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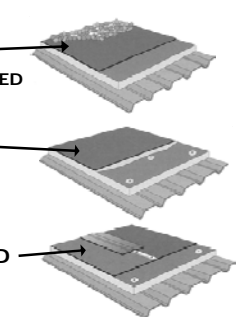
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### EPDM ROOFING SYSTEMS

- BALLASTED
  - STONE/PAVERS/INSULATED PAVERS
- FULLY ADHERED
  - SOLVENT/ WATER BASED CONTACT ADHESIVES
  - URETHANE ADHESIVE
- MECHANICALLY AFFIXED



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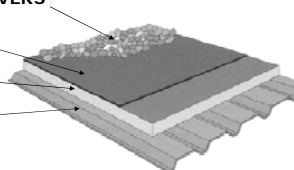
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### Ballasted System

STONE BALLAST/ PAVERS  
MEMBRANE  
INSULATION  
DECK



Simple, economical design provides proven performance

Stone ballast provides economical UL Class A Fire Rating

Design Flexibility - Compatible with most insulation's

Wide panel sizes with EPDM provide fast and efficient coverage of large roof areas

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## BALLASTED

- STONE SURFACING
- PAVERS
- PRE-CAST STRUCTURAL CONCRETE SLABS
  - LIGHT WEIGHT INTERLOCKING
  - INSULATING CEMENT FACED (IRMA)

Weight and size of ballast are used to resist wind forces

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## Ballasted System

← Pavers/Ballast  
← Membrane  
← Insulation  
← Metal Deck

**Membranes:**

- EPDM
- TPO
- PVC

Simple, economical design provides proven performance  
Stone ballast provides economical UL Class A Fire Rating  
Design Flexibility - Compatible with most insulation's

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**BALLAST SHOULD BE CLEAN, ROUND AND FREE OF SHARP EDGES.**

STONE BALLAST /10-13 PSF

**NOTE THE WALKWAYS IN THE LOWER RIGHT CORNERS. STONE IS DIFFICULT TO WALK ON.**

EPDM BALLASTED ROOF

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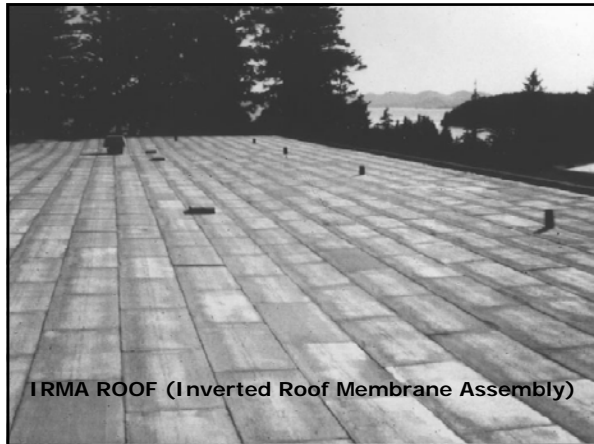
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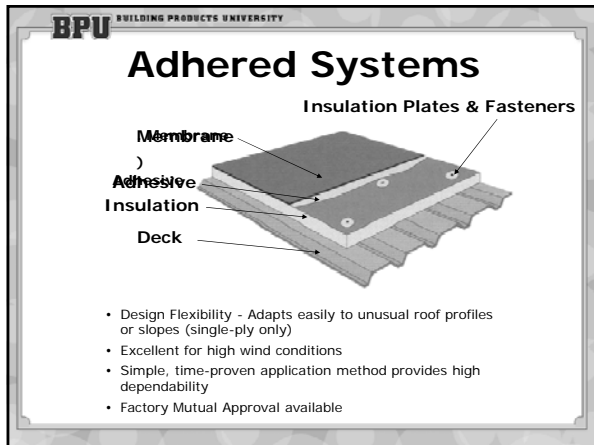
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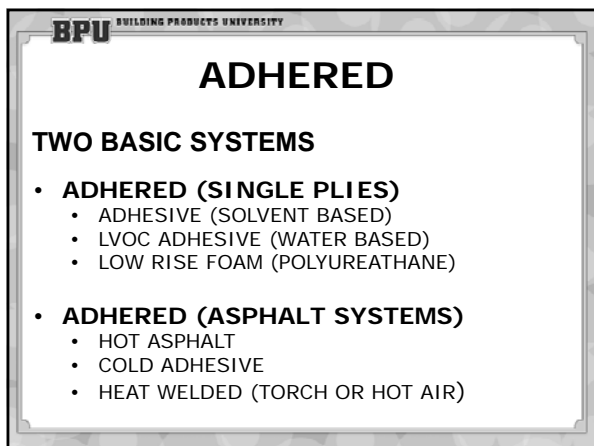
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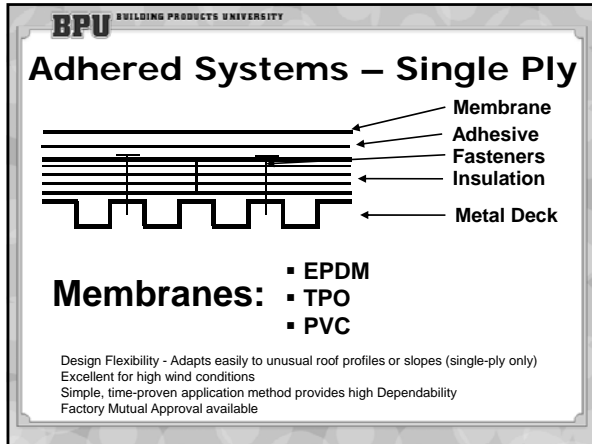
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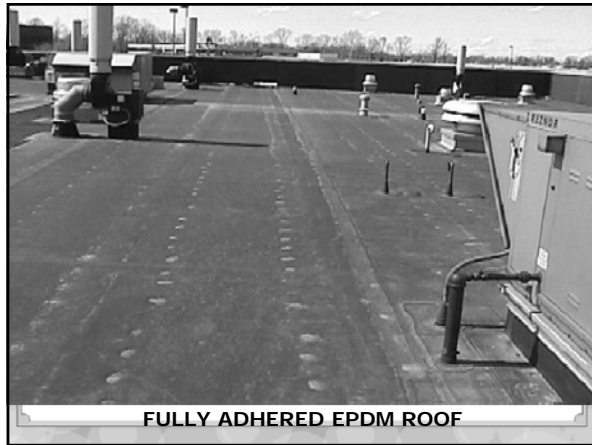
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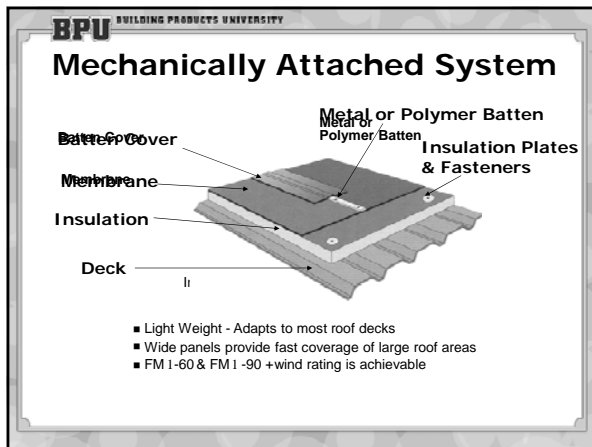
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### In-Seam Mechanically Attached

Labels: Membrane, Seaming Tape, Insulation, Deck, Metal or Polymer Batten Embedded in Field Seam

- Light Weight - Adapts to most roof decks
- Smaller panels are ideal for small, complicated or hard to-reach roof areas
- FM I-60 wind rating available
- FM I-90 wind rating available

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### MECHANICALLY ATTACHED

**THREE BASIC SYSTEMS:**

**MECHANICALLY ATTACHED**

- METAL BATTEN
- NYLON BATTEN

**BATTEN IN THE SEAM (BITS)**

- METAL BATTEN
- NYLON BATTEN
- SEAM PLATES AND SCREWS

**MODIFIED BITUMEN (BITS)**

- METAL BATTEN

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### Mechanically Attached Systems

Labels: Cover Strip, Batten Bar, Membrane, Fasteners, Insulation, Metal Deck

**Membranes:**

- EPDM
- PVC
- TPO

Light Weight - Adapts to most roof decks  
Wide panels provide fast coverage of large roof areas  
FM I-60 & FM I-90 wind rating achievable

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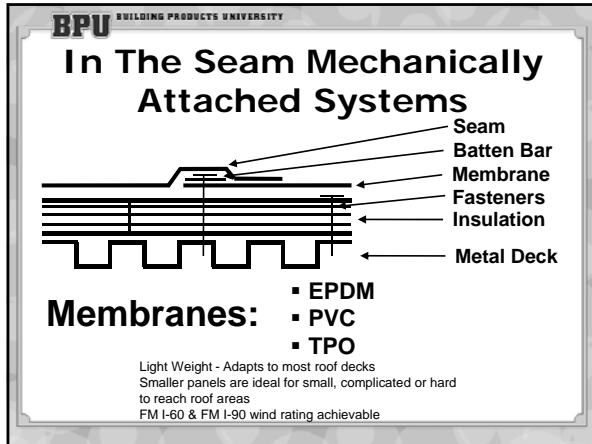
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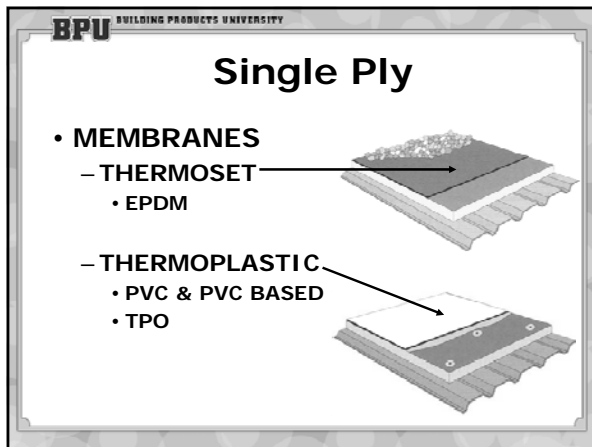
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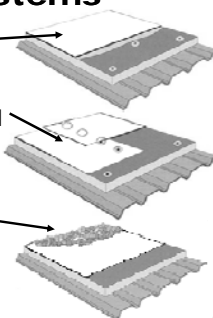
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### TPO/PVC Roofing Systems

- **Fully Adhered**
  - 17% of the Market
- **Mechanically Attached**
  - 82% of the Market
- **Ballasted**
  - < 1 % of the Market
  - WHY?



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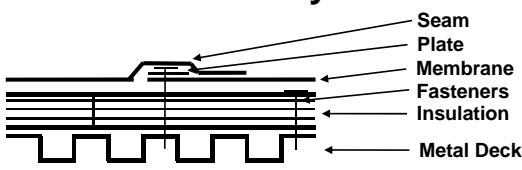
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### Reinforced Mechanically Attached System



- Light Weight - Adapts to most roof decks
- Smaller panels are ideal for small, complicated or hard to-reach roof areas
- FM1-60 wind rating available
- FM1-90 wind rating available

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## With FM - Attachment is the issue

**Traits**

- UL Class A Fire Rating
- High Tear Resistance
- Compatible with most insulations
- Wide panel sizes providing fast efficient coverage
- FM 1-90 Tested \*WARNING – BE AWARE OF DECK\*

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## Typical FM Ratings

Membrane Width (1)(2)	Fastener/Plate (1)	Spacing	FM Rating: over Min. 22 Gauge Grade U Steel (6)		FM Rating: over Min. 22 Gauge Grade F Steel (9) or Structural Concrete	
			Standard or EXTRA	HS or GSD	Standard or EXTRA	HS or GSD
8 Foot	HP-X/Pins/ks	6"	1-105	-	1-133	-
		12"	1-60	1-60	1-60	1-75
10 Foot	HP-X/Pins/ks	6"	1-105	1-P0	1-120	1-105
		8" (7)	1-75 (7)	-	1-80 (7)	1-80 (7)
		12"	-	-	1-75	1-60
	HP-Xtra/Pins/ks Xtra	12"	1-60	-	1-60	-
12 Foot	HP-X/Pins/ks	6"	1-105	-	1-120	-
		8" (7)	1-75 (7)	-	1-75 (7)	-
		12"	-	-	1-60	-
	HP-Xtra/Pins/ks Xtra	6"	1-120	-	1-120	-
		8" (7)	1-75 (7)	-	1-75 (7)	-
	12"	1-60	-	1-60	-	

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## Bitumen Based Systems

- Built Up Roof (BUR)
  - Coal Tar
  - Asphalt
- Modified Bitumen (MB)
  - APP (Atactic Polypropylene)
  - SBS (Styrene Butadiene Styrene)

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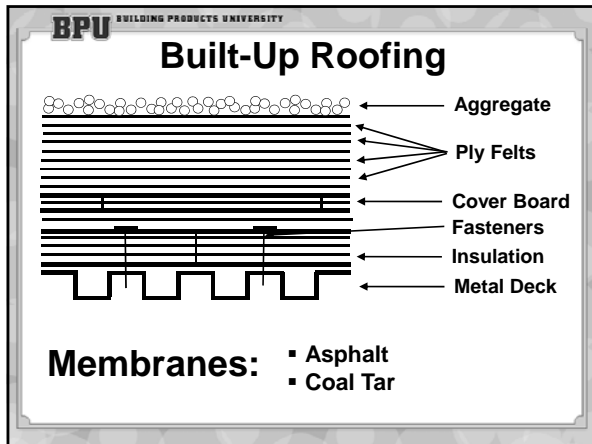
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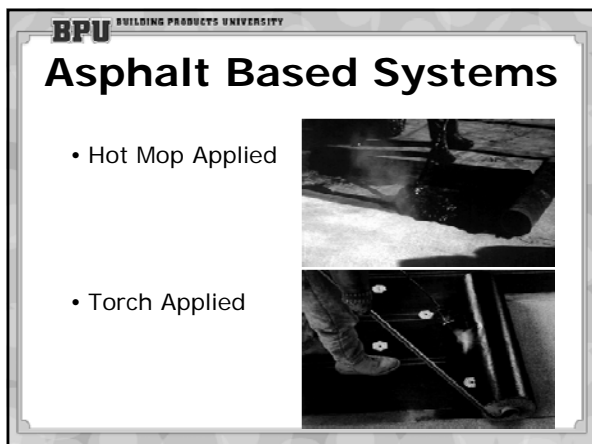
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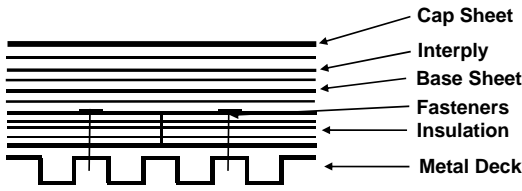
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### Modified Bitumen

Base Sheet, Interply & Cap Sheet



- Cap Sheet
- Interply
- Base Sheet
- Fasteners
- Insulation
- Metal Deck

**Membranes:** • SBS  
• APP

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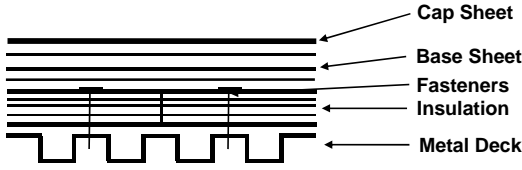
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### Modified Bitumen

Base Sheet & Cap Sheet



- Cap Sheet
- Base Sheet
- Fasteners
- Insulation
- Metal Deck

**Membranes:** • SBS  
• APP

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### Asphalt Based Systems

- Adhered SBS
- Self Adhered SBS



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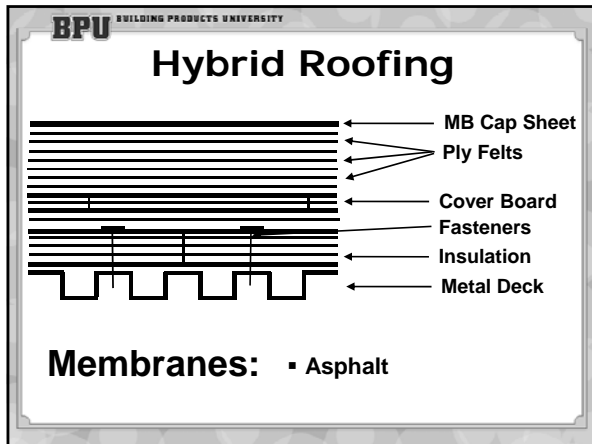
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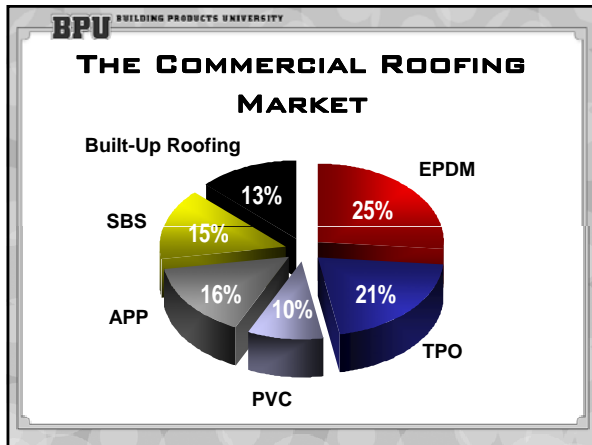
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## QUESTIONS?

This concludes the American Institute of Architects Continuing Education Systems Program

Firestone Building Products

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