

## Roofing Systems

### Examples - Roofing Systems

- Shingle roof system
  - Metal roof with blanket insulation
  - Metal roof with rigid insulation
  - Built-up asphalt roof system
  - Single-ply roof system
  - Modified bitumen roofing system
- NOTES
- ~~Other types of roof systems may be acceptable if system meets or exceeds the performance standards listed below.~~
  - All roof system and products shall be designed in accordance with state fire prevention code and state building code

#### Other Roofing Systems

- Other types of roof systems may be acceptable if system meets or exceeds the "Performance Standards - Roofing Systems"

### Performance Standards - Roofing Systems

~~Moisture resistant – integral finishes~~

1. Roofing and flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

2. ~~Thermal resistant – m~~Minimum U R-factor for low-slope roof is R-26.0 and steep roof. is ~~19.6~~ R-19.0

~~Wind / weather resistant – meet Factory Mutual (FM) uplift criteria~~

3. Impact resistant: Class 4 per Underwriters Laboratories (UL) 2218 impact test

4. Fire resistive - meet UL Class "A"

5. Positive slope - minimum slope ¼:12, unless specified otherwise; 1/8:12 for existing buildings

~~4. Minimal maintenance upkeep but not continual maintenance~~

~~6. Wind / weather resistant – meet Factory Mutual (FM) uplift criteria~~

6. Positive drainage to interior drains or exterior sources collection systems

~~7. Fire resistive – meet UL class "A"~~

7. "ENERGY STAR" compliant ratings for surface treatments

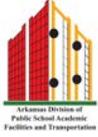
8. Minimum 20 year manufacturer's warranty on materials and system performance

9. Minimum 2 year Contractor guarantee on all materials and workmanship of all system components and accessories

~~9. Consider "radiant barriers", such as aluminum foil at~~

#### Roofing System Guidelines

- Consider installing "radiant barriers," such as aluminum foil ~~at the ceiling of attics~~ above attic spaces



the ceiling of attics

10. Sheet metal flashings shall conform to SMACNA's "Architectural Sheet Metal Manual."

~~Pre Roofing Conference prior to field installation of roofing System to comply with the manufacturer's requirements. Post installation inspection shall be made per manufacturers requirements.~~

"SMACNA"

Sheet Metal and Air Conditioning Contractors' National Association

**Construction Standards - Roofing Systems**

1. Provide pre-roofing conference prior to field installation of Roofing System to comply with the manufacturer's requirements. Provide post installation inspection to comply with manufacturer's requirements.

## Shingle Roof Systems

### Components

- Asphalt Shingles, UL Class "A", ASTM B108 or UL790
- Roofing accessories
  - Felt Underlayment
  - Self-adhering sheet underlayment
  - Sheet metal drip edge and flashing
- Oriented strand board (OSB) or plywood
- Rigid insulation ~~with vapor barrier on underside:~~ extruded polystyrene or polyisocyanurate board
- Vapor barrier, on underside of rigid insulation
- Structural support: steel deck or cementitious deck; or wood deck (lumber, plywood or oriented strand board, OSB) permitted in accordance with Arkansas State Fire Prevention Code and Building Code

### Performance Standards - Shingle Roofing Systems

1. Roofing and flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

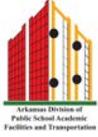
#### Moisture resistant

#### Thermal resistant

2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatments
5. ~~Maximum industry available~~ Minimum 20 year material and weather tightness warranty by manufacturer
6. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories

### Construction Standards - Shingle Roofing Systems

1. Minimum 3:12 slope
2. Fasten shingles to roof sheathing with nails - not staple fasteners. Staples shall not be used on decking.
3. Metal drip edge: brake formed sheet metal with at least a 2 inch roof deck flange
4. Laminated-Strip Asphalt Shingles: ASTM D3462 laminated, multi-ply overlay construction glass-fiber reinforced, mineral-granule surfaced, self-sealing shingles
5. Felt underlayment 30 pound asphalt-saturated organic felts, non-perforated. ~~Use two layers where slope equals or is less than 4/12.~~ Use ice & water shield for slopes less than 4:12.
6. Sheet metal flashings conform to SMACNA's



"Architectural Sheet Metal" manual. Includes perimeter edge metal; penetration flashings; valley construction; and apron, step, cricket, or back flashings.

~~7. Minimum 20 year warranty.~~

7. Provide pre-roofing conference prior to field installation of Roofing System to comply with the manufacturer's requirements. Provide post installation inspection to comply with manufacturer's requirements.

## Metal Roof with Blanket Insulation

### Components

- Standing seam metal roof panels, minimum 26 gauge
  - Profile: vertical, rib, seamed joint
  - Material: aluminum zinc alloy coated steel sheet
  - Exterior finish: fluoropolymer two-coat finish system, 70% PDFY resin
  - ~~Snow guards: seam mounted, stop or bare type (surface mounted is not acceptable)~~
- Insulation: glass fiber blanket (Minimum R-value R-19) with vapor tight edge tabs and ~~face~~ faced on under side (~~Minimum R-Value R-19~~)
- Galvanized steel purlins
- Solid substrate ~~with ice/water shield moisture barrier recommended.~~
- Structural support:
  - Steel joist or truss joists
  - Pre-engineered structural framing system
- Sheet metal drip edge and flashing
- Snow guards

#### Component - Ice / water shield

- Ice / water shield moisture barrier recommended
- Install over required solid substrate component

### Performance Standards - Metal Roof with Blanket Insulation

1. Roofing and flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

#### ~~Guideline - Metal Roof with Blanket Insulation~~

- ~~"ENERGY STAR" compliant roof surface recommended~~

~~Moisture resistant~~

~~Thermal resistant~~

2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. System shall have ASTM E1592-94 wind uplift classification
5. No water penetration when tested according to ~~ASTE~~ ASTM E1646
6. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E1680
7. "ENERGY STAR" compliant surface treatments
8. Special warranty on panel finishes by manufacturer: 20 years
9. Special weather tightness warranty by manufacturer for standing seam metal roof panels: 20 years
10. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of required manufacturer's ~~20 year weather tightness warranty warranties~~)

### Construction Standards - Metal Roof with Blanket Insulation

1. Minimum 1:12 slope
2. Thermal spacers where panels attach directly to purlins
3. Standing seam assembly: factory formed, cap seam assembly designed for concealed mechanical attachment of panels to roof purlins or deck
4. ~~Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E 1680.~~
5. ~~No water penetration when tested according to ASTM E 1646.~~
6. ~~Roof panels shall be 26 gauge minimum.~~
4. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection ~~required~~ per with manufacturer's ~~recommendations~~ requirements.
5. ~~Snow guards shall be installed~~

## Metal Roof with Rigid Insulation

### Components

- Standing seam metal roof panels, minimum 26 gauge
  - Profile: vertical, rib, seamed joint
  - Material: aluminum zinc alloy coated steel sheet
  - Exterior finish: fluoropolymer two-coat finish system, 70% PDFY resin
  - ~~Snow guards: seam mounted, stop or bare type (surface mounted is not acceptable)~~
- Underlayment (ice and water shield)
- Nail base rigid roof insulation - ~~one or two layers~~
- Structural support: steel deck or cementitious deck; wood deck (lumber, plywood, or oriented strand board - OSB) permitted in accordance with Arkansas State Fire Prevention Code and Building Code
- Sheet metal drip edge and flashing
- Snow guards

### Performance Standards - Metal Roof with Rigid Insulation

1. Roofing and flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

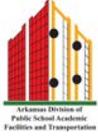
#### ~~Moderate Impact resistant~~

#### ~~Moisture resistant~~

2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. System shall have ASTM E1592-94 wind uplift classification
5. No water penetration when tested according to ASTE ASTM E1646
6. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E1680
7. "ENERGY STAR" compliant surface treatments
8. Special warranty by manufacturer on panel finishes: 20 years
9. Special weather tightness warranty by manufacturer for standing seam metal roof panels: 20 years
10. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's ~~20 year weathertightness warranty warranties~~)
11. ~~System shall have ASTM E 1592-94 wind uplift classification.~~
12. ~~No water penetration when tested according to ASTE~~

#### Component - rigid roof insulation

- Required nail base rigid roof insulation may be installed using one or two layers.
  - Recommend that insulation be installed in two layers with joints offset in each direction, to reduce thermal bridging and make the roofing system more energy efficient



~~ASTM E1646.~~

~~13. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E1680.~~

### Construction Standards - Metal Roof with Rigid Insulation

1. Minimum 1:12 slope
2. Underlayment: self-adhering high temperature sheet, 30 to 40 mils thick
3. Standing seam assembly: factory formed, cap seam assembly designed for concealed mechanical attachment of panels to roof purlins or deck
- ~~4. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E 1680.~~
- ~~5. Roof panels shall be 26 gauge minimum.~~
5. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.
- ~~6. Snow Guards~~

## Built-Up Asphalt Roof System

### Components

- Alternating layers of bituminous sheets and viscous bituminous coatings over an insulated deck

### Performance Standards - Built-Up Asphalt Roof System

1. Roofing membrane and base flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

~~Thermal resistant~~

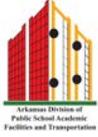
~~Impact resistant~~

~~Moisture resistant~~

2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatment
5. Manufacturer to provide minimum 15 20 year warranty on materials and system performance
6. Contractor to provide 2 year guarantee warranting the roofing, insulation and flashing on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)
7. ~~Post installation inspection shall be per the manufacturer's requirements.~~

### Construction Standards - Built-Up Asphalt Roof System

1. System description
  - BU-I-A-G (4) A (Built up membrane over insulated deck using asphalt with glass fiber ply sheets and aggregate surfacing)
  - BU-I-L-G2 (coated base) (4) A (built up membrane over insulated deck using cold liquid applied asphalt with ply sheets and aggregate surfacing)
2. Base sheet (recommended by manufacturer)
3. Ply felt: asphalt impregnated, glass fiber felt, complying with ASTM D2178, Type VI or 28 lb. coated base sheets as required by manufacturer to meet warranty requirements
4. Flashing sheet
  - SB5 modified asphalt sheet, mineral granule surfaced, ASTM G162 (composite sheet) or ASTM G164 (polyester)
  - APP modified asphalt sheet, mineral granule surfaced, ASTM G223 (composite)



5. Asphalt materials
  - Roofing asphalt: recommended by built-up roofing manufacturer
  - Cold applied adhesive
6. Auxiliary membrane materials may include: aggregate surfacing, substrate board, vapor retarder, roof coating, and/or protective walkways.
7. Polyisocyanurate board insulation with a minimum compressive strength of 20 psi and ~~be~~-faced on both top and bottom
8. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.
9. Minimum slope ¼:12. Reroofs may remain 1/8: 12 if current roof has 1/8:12 slope. Flat roofs are unacceptable.

## Single Ply Roof System

### Components

- Uniform elastomeric EPDM membrane, PVC or TPO
- ½ inch, rigid cover board
- Rigid insulation—~~one or two layers~~
- Vapor barrier
- ¼ inch substrate board
- Structural support: steel deck or cementitious deck or wood deck (lumber, plywood or oriented strand board, OSB)

### Performance Standards - Single Ply Roof System

1. Roofing membrane and base flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

~~Thermal resistant~~

~~Moisture resistant~~

~~Weather / temperature resistant~~

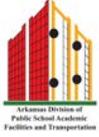
2. System shall meet Class 4 per UL 2218 impact test
  3. System shall meet UL Class "A" for fire resistance
  4. "ENERGY STAR" compliant surface treatment
- ~~Class "A" U.L. roof system~~
5. Manufacturer to provide 20 year warranty on materials and system performance
  6. Contractor to provide 2 year guarantee warranting the roofing, insulation and flashing on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)
  7. ~~Post installation inspection shall be per the manufacturer's requirements~~

### Construction Standards - Single Ply Roof System

1. Minimum slope 1/4:12 for new construction. Reroofs may remain 1/8:12 if current roof has 1/8:12 slope. Flat roofs are unacceptable.
2. Loose laid/ballasted, fully adhered or mechanically fastened ethylene propylene diene monomers (EPDM), TPO, PVC membrane, ~~0.45 inch~~ 50 mils thick minimum
3. Cover board: ASTM C 1177, glass mat, water resistant gypsum substrate Type X, or ASTM C 272 gypsum wood fiber composite board
4. Insulation: extruded polystyrene board or polyisocyanurate board
5. Vapor barrier: polyethylene retarder, ASTM D 4397, 6 mils (0.15 mm) thick minimum

### Component - rigid insulation

- Required nail base rigid roof insulation may be installed using one or two layers
  - Recommend that insulation be installed in two layers with joints offset in each direction, to reduce thermal bridging and make the roofing system more energy efficient



6. Substrate board: glass mat, water resistant gypsum board
7. Provide pre-roofing conference prior to field installation of roofing to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.

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## Modified Bituminous Membrane

### Components

- Roofing system formed with modified bituminous membranes over an insulated deck

### Performance Standards - Modified Bituminous Membrane

1. Roofing membrane and base flashings shall
  - remain watertight
  - not permit the passage of water
  - resist uplift pressure calculated according to current version(s) of applicable code(s)
  - resist thermally induced movement
  - not fail when exposed to weather

Thermal resistant

Impact resistant

Moisture resistant

2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatments
5. Manufacturer to provide a minimum 20 year warranty on materials and system performance
6. Contractor to provide 2 year guarantee warranting the roofing, insulation and flashing on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)

### Construction Standards - Modified Bituminous Membrane

1. System description - provide one of the following:
  - MBA(1)-i-(T,M, or L)-G(2)-M or A (modified bitumen APP roofing membrane over insulated deck, mopped or set in cold, liquid-applied adhesive, with glass fiber ply sheet and mineral or aggregate surfacing)
  - MBS(1)-I-(TM, or L)-G(2)-M or A (modified bitumen SBS roofing membrane, over insulated deck, mopped or set in cold, liquid-applied adhesive, with glass fiber ply sheet and mineral or aggregate surfacing)
2. Cap sheet - provide one of the following:
  - SBS modified bituminous cap sheet: SBS modified asphalt sheet, smooth surfaced, dusted with fine parting agent on both sides or granular surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use of reinforcing type as follows:
    - Use: roof membrane and base flashing
    - Reinforcing: composite woven (ASTM G162) and

glass fiber mat

- APP-modified cap sheet, smooth surfaced: atactic ~~polypropylene~~ polypropylene modified asphalt sheet, smooth surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing types as follows:
  - Use: roof membrane and base flashing
  - Reinforcing: composite woven (ASTM-G162) and glass fiber mat
- 3. Auxiliary membrane materials may include: protective surfacing (aggregate surfacing or roof granules); roofing asphalt (as recommended by system manufacturer); substrate board (if required by design professional or roof manufacturer); cold applied adhesive: vapor ~~retarder~~ retarder (if required by project conditions by design professional or manufacturer); and protective walkway materials recommended by system manufacturer.
- 4. Base sheet: ~~unperforated~~—unperforated, asphalt impregnated and coated glass fiber sheet, dusted with fine mineral surfacing on both sides
- 5. Base ply felts: asphalt coated, glass fiber felt, complying with ASTM D2178, Type VI or 28 lb. coated base sheets as required by manufacturer to meet warranty requirements
- 6. Polyisocyanurate board insulation with a minimum compressive strength of 20 PSI and faced both top and bottom. Provide tapered insulation, preformed saddles, crickets, tapered edge strips and other insulation shapes as required for "positive drainage."
- 7. Insulation accessories as may be recommended by the insulation manufacturer and as compatible with membrane roofing including: fasteners; cold fluid applied adhesive; wood nailer strips; and cover board (perlite insulation board or cellulosic-fiber insulation board)
- 8. Provide pre-roofing conference prior to field installation of roofing to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.
- 9. Minimum slope ¼:12. Reroofs may remain 1/8:12 if current roof slope is 1/8:12. Flat roofs are unacceptable.