

## ***XI. Performance Specifications***

Per ARS§41-1091 B: This substantive policy statement is advisory only. A substantive policy statement does not include internal procedural documents that only affect the internal procedures of the agency and does not impose additional requirements or penalties on regulated parties or include confidential information or rules made in accordance with the Arizona Administrative Procedure Act. If you believe that this substantive policy statement does impose additional requirements or penalties on regulated parties you may petition the agency under ARS§ 41-1033 for a review of the statement.

### **A. PURPOSE**

This policy is established to bring consistency in projects occurring in all SFB programs as a direct response to the Auditor General's Sunset Audit Review of the Arizona School Facilities Board.

### **B. INTRODUCTION**

The goal of the performance specifications included as part of this policy section is to bring continuity to the delivery of systems that is being funded by the SFB in both aspects of school facilities, i.e. new construction phase and building renewal phase, regardless of the specific SFB program delivery method.

### **C. POLICY**

This policy is to establish the minimum system standards and performance of each building system described in this section. Each section shall be reviewed no longer than three years after a system section has been adopted by the Board. This review is to ensure that the specifications for these systems maintain currency. The elements of the specifications that have costing information may be reviewed more frequently to ensure the relevance of these costs to assist the SFB in establishing project funding and project aggregate funding data for both the Executive and Legislative Branches of the Government.

### **D. RESPONSIBILITY**

Responsibility for the enforcement of this policy lies with the Office of the Director and the School Facilities Board.

### **E. PROCEDURES**

1. **Format of the Performance Specifications:** These performance specifications format will follow the 50 division Construction Specification Institute (CSI) MasterFormat™. An introduction page for a specific building system may be included to help in the application and interpretation of that particular building system performance specification.
2. **Phase-in of Specifications:** Each separate building system section of these specifications will be phased in over a period of time as they are being developed and will establish a staggered review schedule as noted below.

3. Initial System Specification Development Process: Each section shall initially be developed by a stakeholder group made up of members from School Districts, Professionals, Installers, and Manufacturers. This will be followed by an internal review by the SFB, after which the specification section(s) will be presented to the Board for the first time at a regularly scheduled meeting. After the first presentation to the Board a public comment period will follow to gain public input on the specifications that are being proposed for adoption. This process will conclude at the next regularly scheduled Board meeting after the Board decides to adopt the presented section(s) of the performance specifications.
4. Specifications Application: Once adopted by the Board, the specifications will be applied to all SFB projects regardless of what program the project is being generated from. Districts shall be encouraged to adopt the same performance specifications for locally funded projects.
5. Update Review of Building System Specifications: At an interval not to exceed three years, each building system specification must be reviewed by a stakeholder group consisting of School Districts, Professionals, Installers, and Manufacturers and revised to adjust for current advancements in the building system(s). A report will be made to the Board after the review is complete and the Board will be informed if the section(s) required updating. If updating is required, the updates will be presented to the Board, followed by public comment, and final adoption in accordance to the process defined in the “Initial System Specification Development” stated previously.
6. Specification Refinement Process: If for some reason that a specification section(s) needs refinement prior to a scheduled updated review, then the section(s) may be brought before the Board for the needed refinement(s). The process used to refine any specification section(s) shall follow the process defined in the “Initial System Specification Development” stated previously.

**F. RIGHT TO USE, DUPLICATE, AND DISCLOSE**

The Board may duplicate, use, and disclose in any manner and for any purpose whatsoever, within the limits established by Federal and State laws and regulations, all information relating to these Terms and Conditions.

# Flow Chart for Using Roofing Specifications

The intent of this flow chart is to provide guidance to the project team on how to use the SFB Roofing Performance Specifications to develop the design project specifications. The intent is for the Performance Specifications to apply to all roofing projects, the roofing specifications have been set up to be used in a modular method. This modular method is applied in two ways, for new and existing types of roofing projects and are shown below.

## New Construction



New construction is defined as a project that begins without any sort of a roofing system. The design project specifications shall incorporate the performance criteria found in the general roofing specification (07 30 00) and the appropriate criteria for the selected roofing system for the project.

The parts of the roofing system section for assessment and demolition should not be included in the design project specifications as there is no existing roofing that needs to be addressed as described in those parts of the system sections.

## Existing Construction



Existing construction is defined as a project that begins with any sort of a roof. The design project specifications shall incorporate the performance criteria found in the general roofing specification (07 30 00), including the appropriate criteria for the existing roof system, and adding the appropriate criteria for the selected new roofing system for the project. If the existing roofing system is the same as the new roofing system, then only one system specification will be required to form the design project specifications. However, if the existing roofing system is not the same as the new roofing system, then the two different roofing system sections must combine the appropriate parts of those roofing systems sections for the design project specifications.

The parts of the existing roofing system should include the assessment and demolition performance criteria, while the criteria for the installation of the new roofing system should be incorporated from the appropriate parts of the new roofing system section.



# General Roofing Performance Specification (07 30 00)

## 1. Assessment of roofs

### 1.1. Qualified assessor

1.1.1. A qualified assessor is an individual that is a Professional registered by the Arizona Board of Technical Registration (BTR) with not less than 5 years demonstrated commercial roofing experience or a Registered Roofing Consultant (RRC) by RCI, Inc. (formerly known as the Roofing Consulting Institute, Inc.).

1.1.1.1. Evidence of these requirements must be submitted as part of the assessment report.

1.1.1.2. If the RRC is being used, "bona fide employee" as defined by BTR shall not apply to the RRC.

1.1.2. Assessor shall carry errors and omissions insurance in the amount of \$1 million per occurrence, \$2 million aggregate, and shall submit evidence of coverage with quote / proposal.

### 1.2. Assessment report

1.2.1. The assessment shall include all items indicated in Table in Part 1.2.9.

1.2.2. The assessment shall include the age of the roof, as can best be established, and all warranty information available.

1.2.2.1. The assessment shall also include an estimated life expectancy of the existing roof system(s).

1.2.3. The report shall include a roof plan, pictures, and other data to fully document and convey existing conditions.

1.2.4. The assessment report must identify deficient elements (as defined in the roofing system specifications) found on roof, including roofing accessories, curb heights, on roof electrical elements (including conduits), mechanical elements (including ductwork), flashings, valley, ridge, eave, etc.

1.2.5. The assessment report shall have the number of roof core cut(s), the location where the roof core cut(s), and document the status of the core(s), including pictures of the cores and all analysis data of the core(s).

- 1.2.6. The assessment report shall not contain any recommendations on corrective actions, only report of items / areas of failure or deficiency.
- 1.2.6.1. For the roof system being assessed, the assessment report shall specifically note any of the conditions that meet Part 2.1 of the specific roofing system specification section.
- 1.2.7. Roofing assessment reports shall include all roofing system assessment information as included in each specific roofing system section of these performance specifications.
- 1.2.8. The assessment report shall indicate any areas that are suspected of having any ponding that might potentially increase the moisture content of roofing materials and insulation in those areas.
- 1.2.9. Other items to be added to assessment reports shall be:

Criteria	Roofing
Report Requirements	
Executive Summary	X
Conclusions	X
Recommendations	X
Repair vs Replace	
Current Conditions	X
Existing As-Built Drawings	X
Schedule of Values	X
Warranties (current)	X
Preventative Maintenance	X
Systems Details	
Age	X
Manufacturer	X
Serial #	
System ID	X
Curbs	X
Parapets	X
Flashings	X
Roof Drains	X
Code Compliance	X
Citation from Jurisdiction	
Inspection Compliance	X per A.R.S. 15-342.01
AHERA Plan	Is testing anticipated
Asbestos	X

Lead	
Hazardous	X
PCB	X
Rare Earth Metals	
Disposal of Materials	
Structural Review	X
Core samples	X
Thermal Imaging/Mapping	X
Cost Estimate	X
Construction Admin	X
Affidavit of Non-Collusion	X
Pictures	X
The Trust Participation	X
Special Requirements	X
	HOA CCR's
	Historic Districts
	Region/Elevation

### 1.3. Assessment Schedule

1.3.1. The assessor is to submit a schedule for completion of the assessment within 5 business days of receiving notice to proceed on the assessment contract.

## 2. Roof design

2.1. The requirements of roofing system selection and design of the roof:

2.1.1. To be performed only by a Professional registered by the Arizona Board of Technical Registration (BTR) with not less than 5 years demonstrated commercial roofing experience.

2.1.1.1. The Professional Registrant may use a roofing consultant in compliance with BTR rules.

2.1.1.1.1. A roofing consultant must be an individual that is a Professional registered by the Arizona Board of Technical Registration (BTR) with not less than 5 years demonstrated commercial roofing experience or a Registered Roofing Consultant (RRC) by RCI, Inc.

- 2.1.1.1.2. The inclusion of a roofing consultant will not recognize an increase in compensation under Additional Services.
      - 2.1.1.1.3. If the RRC is being used, “bona fide employee” as defined by BTR shall not apply to the RRC.
- 2.1.2. Professional Registrant shall carry errors and omissions insurance in the amount of \$1 million per occurrence, \$2 million aggregate, and shall submit evidence of coverage with quote.
- 2.1.3. The design phase shall include the roofing system selection and all information required to complete the project.
  - 2.1.3.1. The design shall include the area of the roof in square feet to assist in the preparation of an estimate of the cost of construction.
- 2.1.4. The design documents shall have a roof plan that identifies all elements of the roof and details consistent with best practices as determined by recognized industry standards and guidelines, as well as BTR requirements.
- 2.1.5. The design phase shall include identification of any and all potential hazardous-containing materials, such as, but not limited, to asbestos and lead. Testing of these materials shall be included in the design to confirm characteristics of all hazardous materials.
- 2.1.6. The design phase shall include any thermal imaging and other required testing as necessary to execute the design.
- 2.1.7. Professional Registrant shall receive from the roofing material manufacturer the wind uplift design based on the Professional Registrant’s wind pressure analysis.
- 2.1.8. Technical requirements for coverboard or substrate board may be waived if the entire roof assembly has a RoofNav Report and is deemed acceptable by the Professional Registrant.
- 2.1.9. Professional Registrant shall mark all submittals in a way that it is easily recognized as the “reviewed submittal” and shall direct the contractor to keep the “reviewed submittal” on site and accessible at all times during

the duration of the project. Marking shall be substantially similar to the sample at the end of this section.

2.1.10. Manufacturers' representation shall be mandatory at all pre-bid meeting(s).

2.1.11. Professional Registrant shall verify that all specified manufacturers will issue an "Intent to Warrant" the project as designed.

2.1.12. ASTM and UL standards and specifications shall be used.

2.1.13. The Professional Registrant shall determine substantial equivalency of submissions for prior approval and substitutions.

## 2.2. Construction administration

2.2.1. The Professional Registrant must perform construction administration to ensure construction is in compliance with the design intent of the drawings and specifications, which will require at least a weekly site visit to ensure conformance of material installation with the design intent of the plans.

## 2.3. Quality assurance / quality control

2.3.1. Quality assurance and quality control to be performed by a qualified independent third party, and may be the party that initially assessed the roof. This will require separate regular visits as appropriate to the complexity and progress of the work and are in addition to those provided by the Professional Registrant and product manufacturer, but no less than once per week. The inspection reports must be in accordance with other requirements and provisions of these specifications, including the system sections.

## 2.4. Manufacturer responsibilities

2.4.1. The product manufacturer shall provide inspections during construction which shall occur as appropriate to the complexity and progress of the work and are in addition to those provided by the Professional Registrant and quality assurance/quality control site visits to assure an installation that will be issued a warranty, but no less than once per week. The inspection reports must be in accordance with other

requirements and provisions of these specifications, including the system sections.

## 2.5. Design schedule

2.5.1. Professional Registrant to submit schedule of completion within 5 business days of receiving notice to proceed on the design contract.

## 3. Roof construction

3.1.1. Roof to be constructed per plans and specifications by a qualified licensed Arizona contractor who must comply with all Arizona Registrar of Contractors regulations, building regulations, rules, laws, codes, and ordinances.

3.1.1.1. The Professional Registrant may take into consideration for eligibility the Registrar of Contractors (ROC) record that includes open / discipline / resolved / bankruptcy actions in the last two (2) years in any combination, as reported by the ROC.

3.1.2. The contract documents and reviewed submittals shall be on site and accessible at all times.

3.1.3. The contractor shall provide full time quality control personnel during the entire construction of the roof.

3.1.4. Contractor shall submit a manufacturer's "Intent to Warrant" at the time of the request for prior approval or substitution.

3.1.5. Contractor shall carry liability insurance in the amount of \$2 million per occurrence, \$5 million aggregate, and shall submit evidence of coverage with quote.

3.1.6. Contractor shall carry umbrella liability insurance in the amount of \$5 million per occurrence, and shall submit evidence of coverage with quote.

3.1.7. Contractor shall carry performance and payments bonds for all projects that are \$100,000 or more in construction costs.

3.1.8. Bid bonds are required on all bid / quote for projects that are \$100,000 or more in construction costs.

- 3.1.9. The contractor shall submit a schedule of completion within 5 business days of receiving notice to proceed on the construction contract.
4. These specifications shall be used for all SFB funded roofing projects and are recommended for District funded projects. The applicable specification sections shall be determined as follows:
  - 4.1. The general roofing specification section (07 30 00) applies to all roofing systems.
    - 4.1.1. The specific roofing system along with the general roofing section shall apply to construction of a new roofing system.
  - 4.2. The assessment and demolition sections will apply to the specific system being removed / repaired / assessed, which may be the same as the new roofing system being installed.
  - 4.3. The specific system sections shall apply to the specific system being installed, which may be the same as the existing system.
5. All vendors are responsible to comply with all regulations, rules, laws, codes, and ordinances while performing any aspect of the project.
6. Repair or replacement of a roof
  - 6.1. Generally, when possible a roof shall be repaired to sustain the useful life of the roof with compatible materials for the existing roofing material.
  - 6.2. The Professional Registrant shall determine and provide written justification for replacement in lieu of repair.
  - 6.3. The design documents shall detail any and all actions, provisions, and requirements for completely sealing the roof to prevent water intrusion.
  - 6.4. Refer to the specific roofing system section for what conditions constitute failure of the roofing system.
    - 6.4.1. If the roof meets the conditions to repair / restore / rejuvenate then the roof shall be repaired / restored / rejuvenated as specified in the Systems Section of these specifications.
  - 6.5. If the underlayment has failed on the roofing system, the system shall be deemed as a failed system and shall be replaced.

## 7. Roof Slope Use

7.1. Each specific roofing system will be defined as to what slope of roof the system can be installed on. For these specifications, the roof slope use will be defined as the following:

7.1.1. A “Low Slope” roof will be any roof that has a pitch of 2:12 or less.

7.1.2. A “Transitional Slope” roof will have a roof pitch greater than 2:12, but less than 3:12.

7.1.3. A “High Slope” roof will have a roof pitch of 3:12 or greater.

## 8. Structural Review

8.1. The SFB requires any work on a roof to be reviewed by an Arizona Registered Structural Engineer.

8.2. The Professional Registrant’s structural analysis shall be completed to ensure that the entire roof is structurally stable and secure to continue its life after the roofing project is completed.

8.2.1. If structural deficiencies are discovered, the Professional Registrant shall design and engineer all reinforcement to the roof structure to ensure compliance with Part 8.2 above. This work shall be seen as a change in scope in the project’s design.

8.3. The minimum required information for the structural analysis shall include:

8.3.1. Site visit with photos.

8.3.2. Review of current as-built conditions of the roof structure.

8.3.3. Weight verification of existing weight(s) to new system weight(s).

8.3.4. Structural analysis of existing structure showing that the new work does not overstress existing structure.

8.3.5. Structural design recommendation(s) if the existing structure is overstressed by the new work.

8.3.6. Sealed structural analysis report with all the above minimum information.

9. International Energy Conservation Code (IECC) requirements for new roof installation.

- 9.1. All new roof installations require compliance with the minimum R / CI values found in the IECC, even if the new roof is being applied to an existing structure.
  - 9.1.1. If the existing insulation installed on the roof deck is in a condition that will be acceptable to remain, the insulation may remain and not be replaced if the AHJ allows through adoption of the International Existing Building Code (IEBC) or some other ordinance / interpretation.
- 9.2. All insulation installed under the roofing material or decking must comply with the applicable building codes.
  - 9.2.1. The SFB requires insulation above the roof deck in all steel construction.
    - 9.2.1.1. For other roof deck materials, the SFB preference is that all insulation be installed above the roof deck whenever possible.
  - 9.2.2. Thickness and R-value of all insulation shall be in accordance with the IECC.
10. Demolition requirements to be included in the design documents.
  - 10.1. Professional Registrant to include hazardous containing materials (HCM) identification for all roof work included in scope of work.
  - 10.2. When hazardous containing materials (HCM) have been identified, HCM testing / removal / oversight shall be included in the design documentation.
    - 10.2.1. HCM oversight must be completed by an independent third party and contracted by the District.
  - 10.3. Roof components
    - 10.3.1. If existing ductwork or conduit exists on the roof, the design information must delineate the scope of work on the existing ductwork or conduit.
      - 10.3.1.1. If existing ductwork or conduit is to remain, the contractor must take precautions not to damage any of the existing ductwork, conduit, and wires in any way during the demolition of the existing roofing materials. Any damage to components that are intended to remain shall be the responsibility of the contractor.

- 10.3.2. If the new roofing work requires curb heights to be increased, this height and detail(s) must be designated in the design documents.
- 10.3.3. The design documents shall note all other existing roofing components specifying whether they need to be modified including ductwork, conduits, and wires.
- 10.3.4. The design documents shall detail how decking replacement is to be completed.
  - 10.3.4.1. The design documents shall provide an allowance for a limited amount of deck replacement. For anything greater than the area of deck replacement included in the allowance, provide a per unit cost for materials and installation.
  - 10.3.4.2. The design documents shall define “unforeseen” as something that could not be seen or otherwise anticipated.

## 11. New system installation requirements

- 11.1. The installing contractor must be certified / approved by manufacturer of the system being installed and must have a minimum of five (5) years of experience installing a similar system.
  - 11.1.1. Certification(s) for all potential roofing systems (including prior approvals) shall be included in the bid / quote documents that are submitted. This section shall also apply if substitutions are being made after the award of any roofing project.
- 11.2. The roofing system shall be designed and installed to provide sustained performance for a minimum of 20 years.
  - 11.2.1. The manufacturer shall submit an “Intent to Warrant” document and that document shall be included in the bid / quote submission.
- 11.3. Overlay of a new roofing system on top of an existing system requires SFB staff’s prior written approval.
- 11.4. All roof mounted equipment and accessories have to meet the roofing manufacturer’s requirements for clearance, heights, etc. If existing roof mounted equipment does not meet those requirements, it must be modified to be compliant with the roofing manufacturer’s requirements.

12. Manufacturers shall not be cited in the specifications, and shall not limit any substantially equivalent manufactured product complying with the characteristics of the performance specification.
13. Warranty
  - 13.1. All roofs shall have at least a 20-year, no dollar limit (NDL), labor and material manufacturer product warranty. Manufacturer agrees to repair or replace components of the roofing system that fail in materials or workmanship within specified warranty period.
    - 13.1.1. The roofing material manufacturer shall certify that the installation is compliant with all manufacturer requirements upon issuance of the warranty.
  - 13.2. The installing contractor shall provide a minimum 2-year materials and labor warranty for the complete installation compliant with the State of Arizona Registrar of Contractors.
14. Discrepancies in the Documents
  - 14.1. Prioritization for resolving discrepancies in the contract documents are resolved as follows:
    1. Specifications
    2. Dimensions
    3. Notations
    4. Drawings
  - 14.2. In the event of discrepancies within the specifications, the most stringent requirement shall apply.
15. Substantial Completion
  - 15.1.1. The Professional Registrant shall issue a Substantial Completion Form to establish the start date of the warranty period. This form may be the American Institute of Architects (AIA) form, or another equal form that is approved by the SFB staff.

## 16. Closeout Documents

16.1. The closeout documents must be submitted in an electronic (".pdf" format) with one bound hard copy to the District and the SFB and shall include at least the following:

16.1.1. A complete set of "as-built" documents describing location of all installed items and elements.

16.1.1.1. The contractor shall track all modifications to the original design and record those modifications in the record drawings for the project. The contractor shall provide those record drawings that include a complete and accurate description of work done that deviates from the requirements of the contract documents and the exact locations of all concealed work to the Professional Registrant at project completion. The Professional Registrant will then create as-built drawings from those record drawings.

16.1.1.2. The as-built drawings shall be provided in the form of hard copy and an electronic "pdf" format to the District and the SFB as part of the close out documentation.

16.1.2. The warranty signed by manufacturer with the start date of the warranty.

16.1.3. The written field records of all inspections, testing, construction administration and quality assurance / quality control site visits conducted during the installation of the system.

## 17. Preventative Maintenance Criteria

17.1. In order to maintain the roofing system, refer to the roofing task sheets on the SFB website at: <https://sfb.az.gov/sfb-programs/preventive-maintenance/preventive-forms>

17.1.1. Follow all manufacturer recommended preventative maintenance in the O & M manual.

17.1.2. Each inspection must document noticed deficiencies.

17.1.3. The roof shall have all debris cleared at each inspection.

17.1.4. Any requirements found in the system section of these specification.

Sample of Submittal Review Mark (as referenced in Part 2.1.7 above)

<b>Firm Name</b> <b>Address, City &amp; State</b>	
<b>SHOP DRAWING / SUBMITTAL REVIEW</b>	
<input type="checkbox"/> FURNISH AS SUBMITTED	
<input type="checkbox"/> FURNISH AS CORRECTED	
<input type="checkbox"/> REVISE & RESUBMIT	
<input type="checkbox"/> REJECTED, FURNISH AS SPECIFIED	
<p>Corrections or comments made on the shop drawings or submittal during this review does not relive the contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, coordinating that work with that work performed by other trades, and performing that work in a safe and satisfactory manner. Work is to conform to all local, state, national codes and standards, and laws.</p>	
<b>Reviewed By:</b>	<b>Date:</b>



## Asphalt Shingle Roofing (07 31 13)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of asphalt shingle roofs
  - 2.1. An asphalt shingle roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. Significant loss of surface granules.
    - 2.1.2. Visible fibers / felts from within the shingles.
    - 2.1.3. Curling edges on significant area of the roof.
    - 2.1.4. Splitting shingles.
    - 2.1.5. Valleys, hips, and ridges leaking beyond repair.
    - 2.1.6. Note all soft or springy deck areas of the existing roof.
    - 2.1.7. Failed underlayment constitutes a failed asphalt shingle roofing system.
  - 2.2. An asphalt shingle roofing system shall not be deemed failed when any of the following conditions exists:
    - 2.2.1. Damaged or missing drip edge on an otherwise good asphalt shingle roof shall be repaired / replaced.
    - 2.2.2. Damaged or missing fascia / barge boards on an otherwise good asphalt shingle roof shall be repaired / replaced.
    - 2.2.3. Damaged or missing gutters / rain diverters / snow (ice) guards on an otherwise good asphalt shingle roof shall be repaired / replaced.
    - 2.2.4. Leaking valleys / hips / ridges that can be repaired.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. An asphalt shingle roof can be used on the following roof slopes:
    - 3.1.1. High Slope
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the asphalt shingle system must be replaced, the existing asphalt shingle roofing shall be removed before any new roofing system is installed.
  - 4.3. Failed underlayment constitutes a failed asphalt shingle roofing system.

5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for asphalt shingle roofing systems.
6. Asphalt Shingle Roofing
  - 6.1. Materials shall meet the following standards and specifications:
    - 6.1.1. Asphalt shingles shall meet:
      - 6.1.1.1. ASTM D3018 – Standard Specification for Class A Asphalt Shingles Surface with Mineral Granules.
      - 6.1.1.2. ASTM D3462 – Standard Specification for Asphalt Shingles Made from Glass felt and Surfaced with Mineral Granules.
      - 6.1.1.3. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
      - 6.1.1.4. ASTM D3161 – Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
      - 6.1.1.5. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.
      - 6.1.1.6. Asphalt shingles may be either organic or fiberglass reinforced, having at least the following characteristics: dimensional shingle, weighing 200 – 300 pounds per roofing square (100 square feet) for a 20-year minimum performance, 36 – 40 inches in length, 12 – 13¼” in width, 5 – 5 5/8” exposure, ASTM Class A fire rating, ASTM wind resistance of 90 MPH minimum, and meet the IECC solar reflectance index (SRI) for the roof pitch and material.
      - 6.1.1.7. Asphalt shingles shall be nailed, not stapled.
    - 6.1.2. Underlayment shall meet:
      - 6.1.2.1. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, Type I or Type II
      - 6.1.2.2. ASTM D4869 – Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing, Type II or Type IV

6.1.2.3. Asphalt shingle underlayment shall be at least, as determined by the Professional Registrant and manufacturer's specifications and recommendations:

6.1.2.3.1. Single layer of ASTM D226 Type I, single layer of ASTM D4869 Type II, or

6.1.2.3.2. Double layer of ASTM D226 Type I, double layer of ASTM D4869 Type II, or

6.1.2.3.3. Single layer of ASTM D226 Type II, single layer of ASTM D4869 Type IV, (only use in hot climates and slopes less than 4:12) or

6.1.2.3.4. Self-adhered underlayment meeting ASTM D1970.

6.1.2.3.4.1. This underlayment shall be used in specific areas, not as an entire underlayment and have a minimum vapor permeance of 15. All bituminous membranes shall be of High Temperature type.

6.2. All fascia / barge boards to be protected from the environment in a manner that will provide a minimum 20-year performance and shall be sealed to prevent moisture penetration into any enclosed space at the eaves and soffits.

6.3. The edges of all asphalt shingle roofs shall have a metal drip that extends under the shingles not less than three (3) inches, at least two (2) inches in height, with a minimum 45° toe to prevent water from running down the face of the fascia / barge board.

6.4. Gutters/ rain diverters / snow (ice) guards shall be provided to prevent water / snow / ice from falling on people as they enter the building and shall not let anything falling into any walking surface below the roof line.

6.4.1. Gutters shall be installed below the level of the roofing to allow water to flow directly into the gutter and shall be sized in conformance to the code.

6.4.2. Downspouts shall be sized in accordance to the code.

- 6.5. All enclosed attic spaces below asphalt shingle roofs shall be vented to a net free area of a minimum of  $\frac{1}{150}$ <sup>th</sup> of the space ventilated, unless a code compliant cross-ventilation system is provided.
- 6.6. All valleys shall be an asphalt shingled hidden or woven valley with a metal flashing underlayment of a minimum 24" width centered on the valley.
- 6.7. All roof penetrations shall have weather sealing boots, integral curbs, saddles, etc. to insure that water is not trapped anywhere on the asphalt shingle roof or allowed to penetrate below the roof into the building.
- 6.8. Crickets at curbs, and other locations, wider than 24" shall be sheet metal. Curb heights shall be at least 8" above roof surface and at least 6" above the high point of the adjacent cricket.
7. Closeout Documents
  - 7.1. All items as found in Part 16, General Roofing Specification (07 30 00).
8. Preventative Maintenance Criteria
  - 8.1. All items as found in Part 17, General Roofing Specification (07 30 00).
9. Budgeting cost ranges
  - 9.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 9.2. Installation costs
    - 9.2.1. Installation of specified shingle system will be \$4.50 per square foot.
    - 9.2.2. In higher elevations where freeze / thaw cycles impact design and installation the cost would be \$5.00 per square foot.
    - 9.2.3. Demolition costs would be \$1.50 per square foot.
  - 9.3. Life cycle costing estimate for an asphalt shingle roof is \$1.50 per square foot per year.
10. Expected End of Life (EOL) for system
  - 10.1. The minimum expectant life for an asphalt shingle roof is 30 years.

## Metal Shingle Roofing (07 31 16)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of metal shingle / panel roofs
  - 2.1. A metal shingle / panel roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. Valleys, hips, and ridges leaking beyond repair.
    - 2.1.2. Note all soft or springy deck areas of the existing roof.
    - 2.1.3. Failed underlayment constitutes a failed metal shingle / panel roofing system.
  - 2.2. A metal shingle / panel roofing system shall not be deemed failed when any of the following conditions exists:
    - 2.2.1. Damaged or missing drip edge on an otherwise good metal shingle / panel roof shall be repaired / replaced.
    - 2.2.2. Damaged or missing fascia / barge boards on an otherwise good metal shingle / panel roof shall be repaired / replaced.
    - 2.2.3. Damaged or missing gutters / rain diverters / snow (ice) guards on an otherwise good metal shingle / panel roof shall be repaired / replaced.
    - 2.2.4. Leaking valleys / hips / ridges that can be repaired.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A metal shingle / panel roof can be used on the following roof slopes:
    - 3.1.1. High Slope
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. Failed underlayment constitutes a failed metal shingle / panel roofing system.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for metal shingle / panel roofing systems.
6. Metal Shingle / Panel Roofing
  - 6.1. Materials shall meet the following standards and specifications:

6.1.1. Metal shingle / panel shall meet:

6.1.1.1. ASTM A792 – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

6.1.1.2. UL 1897 and UL 580 – Wind Uplift Resistance of Roof Assemblies.

6.1.1.3. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.

6.1.1.4. Metal shingle / panel roofing shall have at least the following characteristics: ASTM Class A fire rating, ASTM wind resistance of 90 MPH minimum and meet the IECC solar reflectance index (SRI) for the roof pitch and material.

6.1.2. Underlayment shall meet:

6.1.2.1. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.1.2.2. Metal shingle / panel underlayment shall be at least, as determined by the Professional Registrant and manufacturer's specifications and recommendations:

6.1.2.2.1. Self-adhered underlayment meeting ASTM D1970.

6.1.2.2.1.1. This underlayment shall have a minimum vapor permeance of 15. All bituminous membranes shall be of High Temperature type.

6.2. All fasteners shall be compatible with all other metal materials used on the roof.

6.3. All fascia / barge boards to be protected from the environment in a manner that will provide a minimum 20-year performance and shall be sealed to prevent moisture penetration into any enclosed space at the eaves and soffits.

6.4. The edges of all metal shingle / panel roofs shall have a metal drip that extends under the shingles not less than three (3) inches, at least two (2) inches in height, with a minimum 45° toe to prevent water from running down the face of the fascia / barge board.

- 6.5. Gutters/ rain diverters / snow (ice) guards shall be provided to prevent water / snow / ice from falling on people as they enter the building and shall not let anything falling into any walking surface below the roof line.
  - 6.5.1. Gutters shall be installed below the level of the roofing to allow water to flow directly into the gutter and shall be sized in conformance to the code.
  - 6.5.2. Downspouts shall be sized in accordance to the code.
- 6.6. All enclosed attic spaces below metal shingle / panel roofs shall be vented to a net free area of a minimum of  $1/150^{\text{th}}$  of the space ventilated, unless a code compliant cross-ventilation system is provided.
- 6.7. All valleys shall be a metal flashing underlayment of a minimum 24" width centered on the valley.
- 6.8. All roof penetrations shall have weather sealing boots, integral curbs, saddles, etc. to ensure that water is not trapped anywhere on the metal shingle / panel roof or allowed to penetrate below the roof into the building.
- 6.9. Crickets at curbs, and other locations, wider than 24" shall be sheet metal. Curb heights shall be at least 8" above roof surface and at least 6" above the high point of the adjacent cricket.
7. Closeout Documents
  - 7.1. All items as found in Part 16, General Roofing Specification (07 30 00).
8. Preventative Maintenance Criteria
  - 8.1. All items as found in Part 17, General Roofing Specification (07 30 00).
9. Budgeting cost ranges
  - 9.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 9.2. Installation costs
    - 9.2.1. Installation of specified shingle system will be \$13.00 per square foot.
    - 9.2.2. Demolition costs would be \$1.50 per square foot.
  - 9.3. Life cycle costing estimate for a metal shingle roof is \$1.00 per square foot per year.

10. Expected End of Life (EOL) for system

10.1. The minimum expectant life for a metal shingle / panel roof is 30 years.

## Clay Tile Roofing (07 32 13)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of clay tile roofs
  - 2.1. A clay tile roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. Valleys, hips, and ridges leaking beyond repair.
    - 2.1.2. Note all soft or springy deck areas of the existing roof.
    - 2.1.3. Failed underlayment constitutes a failed clay tile roofing system.
  - 2.2. A clay tile roofing system shall not be deemed failed when any of the following conditions exists:
    - 2.2.1. Damaged or missing drip edge on an otherwise good clay tile roof shall be repaired / replaced.
    - 2.2.2. Damaged or missing fascia / barge boards on an otherwise good clay tile roof shall be repaired / replaced.
    - 2.2.3. Damaged or missing gutters / rain diverters / snow (ice) guards on an otherwise good clay tile roof shall be repaired / replaced.
    - 2.2.4. Leaking valleys / hips / ridges that can be repaired.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A clay tile roof can be used on the following roof slopes:
    - 3.1.1. High Slope, within manufacturer's maximum slope limits.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. Failed underlayment constitutes a failed clay tile roofing system.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for clay tile roofing systems.
6. Clay Tile Roofing
  - 6.1. Materials shall meet the following standards and specifications:

6.1.1. Clay tiles shall meet:

6.1.1.1. ASTM C1167 – Standard Specification for Clay Roof Tiles.

6.1.1.2. ASTM C1568 – Standard Test Method for Wind-Resistance of Concrete and Clay Roof Tiles (Mechanical Uplift Resistance Method).

6.1.1.3. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.1.1.4. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.

6.1.1.5. Clay tile roofing shall have at least the following characteristics: ASTM Class A fire rating, ASTM wind resistance of 90 MPH minimum and meet the IECC solar reflectance index (SRI) for the roof pitch and material.

6.1.1.6. Clay tile shall be nailed.

6.1.2. Underlayment shall meet:

6.1.2.1. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, Type II

6.1.2.2. ASTM D4869 – Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing, Type IV

6.1.2.3. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.1.2.4. Clay tile underlayment shall be at least, as determined by the Professional Registrant and manufacturer's specifications and recommendations:

6.1.2.4.1. Double layer of ASTM D226 Type II, double layer of ASTM D4869 Type IV, or

6.1.2.4.2. Self-adhered underlayment meeting ASTM D1970.

6.1.2.4.2.1. This underlayment shall be used in specific areas, not as an entire underlayment and have a minimum vapor

permeance of 15. All bituminous membranes shall be of High Temperature type.

- 6.2. All fasteners shall be copper or stainless steel and compatible with all other metal materials used on the roof, galvanized fasteners shall be prohibited.
- 6.3. Wood battens shall be used on all installations.
- 6.4. All fascia / barge boards to be protected from the environment in a manner that will provide a minimum 20-year performance and shall be sealed to prevent moisture penetration into any enclosed space at the eaves and soffits.
- 6.5. The edges of all clay tile roofs shall have a metal drip that extends under the shingles not less than three (3) inches, at least two (2) inches in height, with a minimum 45° toe to prevent water from running down the face of the fascia / barge board.
- 6.6. Gutters/ rain diverters / snow (ice) guards shall be provided to prevent water / snow / ice from falling on people as they enter the building and shall not let anything falling into any walking surface below the roof line.
  - 6.6.1. Gutters shall be installed below the level of the roofing to allow water to flow directly into the gutter and shall be sized in conformance to the code.
  - 6.6.2. Downspouts shall be sized in accordance to the code.
- 6.7. All enclosed attic spaces below clay tile roofs shall be vented to a net free area of a minimum of  $\frac{1}{150}$ <sup>th</sup> of the space ventilated, unless a code compliant cross-ventilation system is provided.
- 6.8. All valleys shall be a metal flashing underlayment of a minimum 24" width centered on the valley.
- 6.9. All roof penetrations shall have weather sealing boots, integral curbs, saddles, etc. to ensure that water is not trapped anywhere on the clay tile roof or allowed to penetrate below the roof into the building.
- 6.10. Crickets at curbs, and other locations, wider than 24" shall be sheet metal. Curb heights shall be at least 8" above roof surface and at least 6" above the high point of the adjacent cricket.

7. Closeout Documents
  - 7.1. All items as found in Part 16, General Roofing Specification (07 30 00).
8. Preventative Maintenance Criteria
  - 8.1. All items as found in Part 17, General Roofing Specification (07 30 00).
9. Budgeting cost ranges
  - 9.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 9.2. Installation costs
    - 9.2.1. Installation of specified clay tile system will be \$5.50 per square foot.
    - 9.2.2. If a synthetic underlayment is required the cost would be \$5.00 per square foot.
    - 9.2.3. Demolition costs would be \$1.50 per square foot.
      - 9.2.3.1. In rural areas disposal costs may be higher and required an adjustment to the overall demolition costs.
  - 9.3. Life cycle costing estimate for a clay tile roof is \$1.50 per square foot per year.
10. Expected End of Life (EOL) for system
  - 10.1. The minimum expectant life for a clay tile roof is 20 years.

## Concrete Tile Roofing (07 32 16)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of concrete tile roofs
  - 2.1. A concrete tile roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. Valleys, hips, and ridges leaking beyond repair.
    - 2.1.2. Note all soft or springy deck areas of the existing roof.
    - 2.1.3. Failed underlayment constitutes a failed concrete tile roofing system.
  - 2.2. A concrete tile roofing system shall not be deemed failed when any of the following conditions exists:
    - 2.2.1. Damaged or missing drip edge on an otherwise good concrete tile roof shall be repaired / replaced.
    - 2.2.2. Damaged or missing fascia / barge boards on an otherwise good concrete tile roof shall be repaired / replaced.
    - 2.2.3. Damaged or missing gutters / rain diverters / snow (ice) guards on an otherwise good concrete tile roof shall be repaired / replaced.
    - 2.2.4. Leaking valleys / hips / ridges that can be repaired.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A concrete tile roof can be used on the following roof slopes:
    - 3.1.1. High Slope, within manufacturer's maximum slope limits.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. Failed underlayment constitutes a failed concrete tile roofing system.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for concrete tile roofing systems.
6. Concrete Tile Roofing
  - 6.1. Materials shall meet the following standards and specifications:

6.1.1. Concrete tiles shall meet:

6.1.1.1. ASTM C1492 – Standard Specification for Concrete Roof Tiles.

6.1.1.2. ASTM C1568 – Standard Test Method for Wind-Resistance of Concrete and Clay Roof Tiles (Mechanical Uplift Resistance Method).

6.1.1.3. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.1.1.4. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.

6.1.1.5. Concrete tile roofing shall have at least the following characteristics: ASTM Class A fire rating, ASTM wind resistance of 90 MPH minimum and meet the IECC solar reflectance index (SRI) for the roof pitch and material.

6.1.1.6. Concrete tile shall be nailed.

6.1.2. Underlayment shall meet:

6.1.2.1. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, Type II

6.1.2.2. ASTM D4869 – Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing, Type IV

6.1.2.3. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.1.2.4. Concrete tile underlayment shall be at least, as determined by the Professional Registrant and manufacturer's specifications and recommendations:

6.1.2.4.1. Single layer of ASTM D226 Type II, single layer of ASTM D4869 Type IV, or

6.1.2.4.2. Self-adhered underlayment meeting ASTM D1970.

6.1.2.4.2.1. This underlayment shall be used in specific areas, not as an entire underlayment and have a minimum vapor

permeance of 15. All bituminous membranes shall be of High Temperature type.

- 6.2. All fasteners shall be copper or stainless steel and compatible with all other metal materials used on the roof, galvanized fasteners shall be prohibited.
- 6.3. Wood battens shall be used on all installations.
- 6.4. All fascia / barge boards to be protected from the environment in a manner that will provide a minimum 20-year performance and shall be sealed to prevent moisture penetration into any enclosed space at the eaves and soffits.
- 6.5. The edges of all concrete tile roofs shall have a metal drip that extends under the tiles not less than three (3) inches, at least two (2) inches in height, with a minimum 45° toe to prevent water from running down the face of the fascia / barge board.
- 6.6. Gutters/ rain diverters / snow (ice) guards shall be provided to prevent water / snow / ice from falling on people as they enter the building and shall not let anything falling into any walking surface below the roof line.
  - 6.6.1. Gutters shall be installed below the level of the roofing to allow water to flow directly into the gutter and shall be sized in conformance to the code.
  - 6.6.2. Downspouts shall be sized in accordance to the code.
- 6.7. All enclosed attic spaces below concrete tile roofs shall be vented to a net free area of a minimum of  $1/150^{\text{th}}$  of the space ventilated, unless a code compliant cross-ventilation system is provided.
- 6.8. All valleys shall be a metal flashing underlayment of a minimum 24" width centered on the valley.
- 6.9. All roof penetrations shall have weather sealing boots, integral curbs, saddles, etc. to ensure that water is not trapped anywhere on the concrete tile roof or allowed to penetrate below the roof into the building.
- 6.10. Crickets at curbs, and other locations, wider than 24" shall be sheet metal. Curb heights shall be at least 8" above roof surface and at least 6" above the high point of the adjacent cricket.

7. Closeout Documents
  - 7.1. All items as found in Part 16, General Roofing Specification (07 30 00).
8. Preventative Maintenance Criteria
  - 8.1. All items as found in Part 17, General Roofing Specification (07 30 00).
9. Budgeting cost ranges
  - 9.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 9.2. Installation costs
    - 9.2.1. Installation of specified clay tile system will be \$5.50 per square foot.
    - 9.2.2. If a synthetic underlayment is required the cost would be \$5.00 per square foot.
    - 9.2.3. Demolition costs would be \$1.50 per square foot.
      - 9.2.3.1. In rural areas disposal costs may be higher and required an adjustment to the overall demolition costs.
  - 9.3. Life cycle costing estimate for a concrete tile roof is \$1.50 per square foot per year.
10. Expected End of Life (EOL) for system
  - 10.1. The minimum expectant life for a concrete tile roof is 20 years.

## Metal Roof Panels – (07 41 13)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of Standing Seam Metal Roof Panels.
  - 2.1. A metal roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the underlayment is failed and / or baked out from UV.
    - 2.1.2. When there is existing moisture and leaks within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A standing seam metal roof can be used on the following roof slopes:
    - 3.1.1. Low Slope – not recommended but allowed based on design professional and manufactures recommendations.
    - 3.1.2. Transitional Slope with proper underlayment and fasteners.
    - 3.1.3. High Slope with proper underlayment and fasteners.
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The minimum slope for new building construction is 2.0 unit vertical in 12 units horizontal. Can be 0.5 unit vertical in 12 units horizontal with mechanical seamed panel.
    - 3.3.2. The recommended minimum slope for new roofing on existing buildings is 2 units vertical in 12 units horizontal, when possible.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is 0.5 unit vertical in 12 units horizontal with mechanical seamed panel.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation, then roof replacement is the only required and allowed action.
  - 4.2. If the metal roof system must be replaced, the existing metal roofing and underlayment shall be removed before any new roofing system is installed.
  - 4.3. Additional information regarding what constitutes a failed metal roofing system can be found in Part 2 of this section.

5. Demolition requirements
  - 5.1. Metal roof panels, fasteners, underlayment and insulation to be removed to the structural deck unless it is determined that the rigid insulation can be reused per section 8 below.
  - 5.2. Protection of interior surfaces is required.
  - 5.3. Verification of conduit or through deck fasteners for other systems is required.
  - 5.4. Verification of exposed interior structures is required to determine possible aesthetic issues form roof demolition and replacement.
6. Parapet/head wall at metal to wall and low slope transition
  - 6.1. flashing system at wall shall be sawcut or inlet when possible. Surface mounted design of flashing is acceptable if determined necessary by design professional.
  - 6.2. Transition from metal to low slope shall be detailed to allow for low slope roof replacement in the future if required and to prevent the removal of metal panels.
7. Components of a Standing Seam Metal Roofing System
  - 7.1. Rigid board insulation
    - 7.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by the Professional Registrant. R value will be determined based on the applicable building code.
  - 7.2. Coverboard
    - 7.2.1. A coverboard shall be used if required for fire rating or by manufacturer recommendations.
    - 7.2.2. Coverboards are required to provide the following functions:
      - 7.2.2.1. To separate incompatible material.
      - 7.2.2.2. To minimize thermal drift.
      - 7.2.2.3. To protect rigid board insulation and provide rigid support.
      - 7.2.2.4. For fire ratings.
    - 7.2.3. Acceptable types of coverboards will be:
      - 7.2.3.1. Gypsum Deck or high density polyisocyanurate board.

7.2.3.2. Composite 4-inch iso with plywood laminated to the insulation.

7.2.4. The metal roofing system is acceptable as an overlay over an existing rigid insulation, as determined by the Professional Registrant and allowed per the local building code.

### 7.3. Underlayment

7.3.1. No felt underlayment allowed.

7.3.2. Self-adhered and self-healing, high temp underlayment – 40 mil min thickness

7.3.3. Installed per manufactures requirements and shop drawings.

### 7.4. Metal Roof Panels

7.4.1. Metal panels minimum 24 gauge with striations, pencil lines or mesas.

7.4.2. Flashing, trim, metal closure, strips, caps, gutter, roof curbs, and similar components shall be the same gauge (min.) and finish minimum as the metal roof panels.

7.4.3. No end laps or splicing of panels.

7.4.4. Radius panels must be mechanical curved with no cutting or bending.

7.4.5. Installed per manufacturers shop drawings based on specific project design.

7.4.6. No private labeling of major components.

7.4.7. Metal panel maximum width of 18”.

### 7.5. Fasteners

7.5.1. Thermal fasteners shall be multipiece for expansion and contraction.

7.5.2. Fixed may be used when the manufacturer can substantiate the system can accommodate the thermal cyclic movement under live loads and thermal conditions.

7.5.3. Manufacturer to provide wind uplift and fastener patterns with shop drawings that are project specific based on pressures provided by the project design professional.

### 7.6. Sealants

7.6.1. Tape sealant need to provide 100% closure.

7.6.2. Joint sealant per manufacturers requirements.

7.6.3. Seam sealant required on slopes less than 2:12.

## 7.7. Roof mounted equipment / accessories

7.7.1. All materials to be compatible with the metal roofing system material.

## 7.8. Performance Requirements

7.8.1. Air infiltration – ASTM E 283 and E 1680

7.8.2. Water infiltration – ASTM E 331 and E 1646

7.8.3. Roof uplift testing - ASTM E 1592

7.8.4. Static water head – ASTM E2140

7.8.5. Roof uplift testing - UL 580

7.8.6. Underlayment – ASTM D1970

## 8. Closeout Documents

8.1. All items as found in Part 16, General Roofing Specification (07 30 00).

## 9. Preventative Maintenance Criteria

9.1. All items as found in Part 17, General Roofing Specification (07 30 00).

## 10. Budgeting cost ranges

10.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

10.2. Budget costing for the metal roofing system is as follows:

10.2.1. Low-range: \$10.00 - \$12.00 per square foot.

10.2.2. Mid-range: \$14.00 – \$16.00 per square foot.

10.2.3. High-range: \$16.00 - \$18.00 per square foot.

10.2.4. Mid-Range System assumption – metal deck with 4/12 slope, 3.5" iso, with hi-temperature ice and water shield. Minimal equipment 45,000SF roof area gutters and downspouts. Includes eave soffits. Does not include tear off. New construction prices are based on complexity of the roof. Assumes minimum under deck insulation.

10.3. Life cycle costing estimate for a metal shingle roof is \$1.00 per square foot per year.

11. Expected End of Life (EOL) for the specified metal roofing system should be no less than 20-years if properly maintained and inspected regularly.

## Built-Up Roofing (Modified) – (07 52 16)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of Built-Up Roof (BUR) (Modified) roofs
  - 2.1. A BUR roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is existing moisture within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If there is significant loss of ply adhesion.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A BUR (Modified) roof can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope with special fastening
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The minimum slope for new building construction is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.2. The recommended minimum slope for new roofing on existing buildings is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is “positive roof drainage”. Ponding in excess of 48 hours is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the BUR system must be replaced, the existing BUR roofing shall be removed to the structural deck before any new roofing system is installed.
  - 4.3. For existing BUR with tapered insulation that does not contain excessive moisture the Registered Professional has the option to remove the existing roofing to the insulation or to the deck, if the existing tapered insulation is in

good condition, dry and has properly been attached to the deck to meet wind uplift requirements it may remain and does not have to be removed.

- 4.4. Additional information regarding what constitutes a failed BUR roofing system can be found in Part 2 of this section.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for BUR roofing systems.
  - 5.3. Protection of interior surfaces is required.
  - 5.4. Verification of conduit or through deck fasteners at exposed structures.
6. Back of parapet treatment
  - 6.1. BUR system shall be adhesively applied to the back of parapets as required.
    - 6.1.1. Height of the BUR membrane system applied to the back of parapets shall not exceed manufacturer's specified requirements.
  - 6.2. At locations where the membrane does not extend for the full height of the parapet, the surface shall be sealed with materials suitable to the substrate. The surface shall be weather sealed in a fashion appropriate for that type of wall.
7. High wall treatment
  - 7.1. BUR system shall be adhesively applied to high walls as required by manufacturer.
    - 7.1.1. Height of the BUR membrane system on high walls shall not exceed manufacturer's specified requirements.
  - 7.2. The BUR membrane on high walls shall not extend to a height where the material can be seen from the ground.
  - 7.3. At locations where the membrane does not extend for the full height of the high wall, the surface shall be waterproofed with materials suitable to the substrate.
8. Components of a BUR system
  - 8.1. Rigid board insulation
    - 8.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by

the Professional Registrant. R value will be determined based on the IECC.

8.2. Coverboard

8.2.1. A coverboard shall be used in all BUR assemblies.

8.2.2. Coverboards are required to provide the following functions:

8.2.2.1. To separate incompatible material.

8.2.2.2. To minimize thermal drift.

8.2.2.3. To protect rigid board insulation and provide rigid support for the roof membrane.

8.2.2.4. To provide system fire rating if required.

8.2.3. Acceptable types of coverboards will be:

8.2.3.1. Gypsum based coverboard

8.2.3.2. High density wood fiber.

8.2.3.3. Paper faced gypsum board shall not be used as a cover board.

8.2.4. The BUR system is acceptable as an overlay over an existing roofing system, as determined by the Professional Registrant and allowed per the local building code.

8.3. Modified Built-Up Roofing Roofing

8.3.1. The Modified BUR system shall meet ASTM Standard Specification test methods – ASTM D5147 and ASTM D2523.

8.3.2. Performance Criteria: Tensile strength and tear strength are extremely important relative to the long term performance of low slope roofing systems in Arizona. Surfacing sheet information (data) available from participating manufactures tested per ASTM D5147 at 2 in./min @ 73.4 ±3.6° F, range from:

<b>Minimum</b>	Tensile Strength MD	Tensile Strength XMD
	40 lbf./in.	50 lbf.
<b>Minimum</b>	Tear Strength MD	Tear Strength XMD
	50 lbf./in.	50 lbf.
<b>Maximum</b>	Tensile Strength MD	Tensile Strength XMD

	1000 lbf./in.	1100 lbf.
<b>Maximum</b>	Tear Strength MD	Tear Strength XMD
	1750 lbf./in.	1800 lbf.

8.3.2.1. Given the tensile and tear performance range in the industry, it makes sense that the middle of the road performance would be good minimum criteria. This would result in 850 lbf. in Tear Strength and 500 lbf./in in Tensile Strength, for a single ply, which is consistent with other manufacturers that are developing these materials; if a manufacturer does not meet the minimum performance criteria established for a single ply, they would have the opportunity to provide multiple plies with combined performance that meets the minimum criteria. In a multi-ply BUR assembly, not to exceed three layers, the sum/composite of all layers must meet or exceed 1200 lbs of tear strength and 800 lbs of tensile strength in both machine direction (MD) and cross machine direction (XD) when tested per ASTM D5147 at 73.4 +/- 3.6 Degrees Fahrenheit, with no single layer being of less than 500 lbs. of tear strength and 340 lbs of tensile strength in both machine direction (MD) and cross machine direction (XD) when tested per ASTM D5147 at 73.4 +/- 3.6 Degrees Fahrenheit.

8.3.3. The BUR design, specification and installation shall provide a 20-year minimum life. Proper installation is particularly important to the life of this roofing system and will require both third part quality assurance and quality control inspections as well as enhanced manufacturer inspections during the construction.

8.3.4. A hot applied membrane is recommended, but attachment with cold process is to be determined on a project basis as determined by the Professional Registrant.

8.3.4.1. Fastener length for mechanically attached insulation or base sheet shall not exceed manufacturer requirements.

- 8.3.5. The BUR roofing system shall have a twenty (20) year, no dollar limit (NDL) material and labor warranty to be provided by the manufacturer.
- 8.3.6. A two year minimum material and labor warranty shall be provided by the Contractor.
- 8.3.7. All materials shall meet low VOC standards.
- 8.3.8. All products used shall not contain asbestos, lead, or other hazardous materials.
- 8.3.9. All penetrations, curb flashings and corner flashings to be factory-fabricated. No field fabricated components permitted.

#### 8.4. Roof mounted equipment / accessories

- 8.4.1. All materials to be compatible with the BUR roofing material.

#### 9. Closeout Documents

- 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).

#### 10. Preventative Maintenance Criteria

- 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).

#### 11. Budgeting cost ranges

- 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

#### 11.2. Budget costing for the Modified BUR roofing system is as follows:

- 11.2.1. Low-range: \$10.00 - \$14.00 per square foot.
- 11.2.2. Mid-range: \$14.00 – \$16.00 per square foot.
- 11.2.3. High-range: \$16.00 - \$18.00 per square foot.
- 11.2.4. System assumption – metal deck with ¼” min. slope, 6” iso, (mechanical fasten first layer and adhere the second layer) adhere 1/2” coverboard, multi-ply modified BUR roofing system covered with thermal coating. Minimal equipment, non-tapered insulation, 100,000 square feet of roof area, does not include interior roof drains. Does not include tear off. New construction prices are based on complexity of the roof. Assumes no under deck insulation.

- 11.3. Based on 100,000 square feet the life cycle cost would be \$1.23 per square foot per year.

12. Expected End of Life (EOL) for the specified BUR (Modified) system should be no less than 20-years if properly maintained and inspected regularly.

## Ethylene-Propylene-Diene-Monomer Roofing (EPDM) – (07 53 23)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of EPDM roofs
  - 2.1. An EPDM roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is existing moisture within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If there is significant loss of material over reinforcing scrim.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. An EPDM roof can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The minimum slope for new building construction is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.2. The recommended minimum slope for new roofing on existing buildings is  $\frac{1}{4}$  unit vertical in 12 units horizontal, when possible.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is "positive roof drainage". Ponding is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the EPDM system must be replaced, the existing EPDM roofing shall be removed before any new roofing system is installed.
  - 4.3. Additional information regarding what constitutes a failed EPDM roofing system can be found in Part 2 of this section.

5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for EPDM roofing systems.
6. Back of parapet treatment
  - 6.1. The EPDM system shall be adhesively applied to the back of parapets as required.
    - 6.1.1. Height of the EPDM membrane system applied to the back of parapets shall not exceed manufacturer's specified requirements.
  - 6.2. At locations where the membrane does not extend for the full height of the parapet, the surface shall be waterproofed with materials suitable to the substrate.
7. High wall treatment
  - 7.1. The EPDM system shall be adhesively applied to high walls as required.
  - 7.2. Height of the EPDM membrane system on high walls shall not exceed manufacturer's specified requirements.
  - 7.3. The EPDM membrane on high walls shall not be roofed to a height where the roof can be seen from the ground.
  - 7.4. At locations where the membrane does not extend for the full height of the high wall, the surface shall be waterproofed with materials suitable to the substrate.
8. Components of an EPDM membrane roofing system
  - 8.1. Rigid board insulation
    - 8.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by the Professional Registrant.
  - 8.2. Coverboard
    - 8.2.1. A coverboard shall be used in all EPDM membrane roof assemblies.
    - 8.2.2. Coverboards are required to provide the following functions:
      - 8.2.2.1. To separate incompatible material.
      - 8.2.2.2. To minimize thermal drift.

8.2.2.3. To protect rigid board insulation and provide rigid support for the roof membrane.

8.2.3. Acceptable types of coverboards will be:

8.2.3.1. Glass mat faced gypsum boards.

8.2.3.2. High density wood fiber.

8.2.3.3. High density polyisocyanurate board.

8.2.3.4. Paper faced gypsum board shall not be used as a cover board.

8.2.4. The EPDM roofing system is acceptable as an overlay over an existing roofing system, as determined by the Professional Registrant.

### 8.3. Ethylene-Propylene-Diene-Monomer Roofing (EPDM)

8.3.1. The EPDM system shall meet ASTM Standard Specification D-4637, 60 mil minimum thickness with pre-taped edges.

8.3.2. The EPDM design, specification and installation shall provide a 20-year minimum life. Proper installation is particularly important to the life of this roofing system and will require both third part quality assurance and quality control inspections as well as enhanced manufacturer inspections during the construction.

8.3.3. A fully adhered membrane is recommended, but attachment is to be determined on a project basis as determined by the Professional Registrant.

8.3.3.1. Fastener length for mechanically attached systems shall not exceed 10”.

8.3.4. The EPDM roofing system shall have a twenty (20) year, no dollar limit (NDL) material and labor warranty to be provided by the manufacturer.

8.3.5. A two year minimum material and labor warranty shall be provided by the Contractor.

8.3.6. All components of the roofing system shall be supplied by the roofing manufacturer in order to maintain the warranty and fire classification of the system.

8.3.7. All adhesives used shall be low VOC and free of any hazardous materials.

- 8.3.8. All penetrations, curb flashings and corner flashings to be factory-fabricated. No field fabricated components permitted.
- 8.3.9. The EPDM system is not to be used for installations in desert regions and locations.
- 8.4. Roof mounted equipment / accessories
  - 8.4.1. All materials to be compatible with the EPDM roofing material.
- 9. Closeout Documents
  - 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).
- 10. Preventative Maintenance Criteria
  - 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 11. Budgeting cost ranges
  - 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 11.2. Budget costing for the EPDM roofing system is as follows:
    - 11.2.1. Low-range: \$7.50 - \$10.50 per square foot.
    - 11.2.2. Mid-range: \$10.00 – \$13.00 per square foot.
    - 11.2.3. High-range: \$13.00 - \$25.00 per square foot.
  - 11.3. Life cycle costing estimate for an EPDM roof is \$3.50 per square foot per year.
- 12. Expected End of Life (EOL) for the specified EPDM roofing system should be no less than 20-years if properly maintained and inspected regularly.

## Ketone Ethylene Ester Roofing (KEE) – (07 54 16)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of KEE roofs
  - 2.1. A KEE roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is existing moisture within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If there is significant loss of material over reinforcing scrim.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A KEE roof can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The Minimum slope for new building construction is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.2. The Recommended minimum slope for new roofing on existing buildings is  $\frac{1}{4}$  unit vertical in 12 units horizontal, when possible.
    - 3.3.3. The Absolute minimum slope for new roofing on existing buildings is "positive roof drainage". Ponding is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the KEE system must be replaced, the existing KEE roofing shall be removed before any new roofing system is installed.
  - 4.3. Additional information regarding what constitutes a failed KEE roofing system can be found in Part 2 of this section.

5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for KEE roofing systems.
6. Back of parapet treatment
  - 6.1. The KEE system shall be adhesively applied to the back of parapets as required.
    - 6.1.1. Height of the KEE membrane system applied to the back of parapets shall not exceed manufacturer's specified requirements.
  - 6.2. At locations where the membrane does not extend for the full height of the parapet, the surface shall be waterproofed with materials suitable to the substrate.
7. High wall treatment
  - 7.1. The KEE system shall be adhesively applied to high walls as required.
  - 7.2. Height of the KEE membrane system on high walls shall not exceed manufacturer's specified requirements.
  - 7.3. The KEE membrane on high walls shall not be roofed to a height where the roof can be seen from the ground.
  - 7.4. At locations where the membrane does not extend for the full height of the high wall, the surface shall be waterproofed with materials suitable to the substrate.
8. Components of a KEE membrane roofing system
  - 8.1. Rigid board insulation
    - 8.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by the Professional Registrant.
  - 8.2. Coverboard
    - 8.2.1. A coverboard shall be used in all KEE membrane roof assemblies.
    - 8.2.2. Coverboards are required to provide the following functions:
      - 8.2.2.1. To separate incompatible material.
      - 8.2.2.2. To minimize thermal drift.

- 8.2.2.3. To protect rigid board insulation and provide rigid support for the roof membrane.
- 8.2.3. Acceptable types of coverboards will be:
  - 8.2.3.1. Glass mat faced gypsum boards.
  - 8.2.3.2. High density wood fiber.
  - 8.2.3.3. High density polyisocyanurate board.
  - 8.2.3.4. Paper faced gypsum board shall not be used as a cover board.
- 8.2.4. The KEE roofing system is acceptable as an overlay over an existing roofing system, as determined by the Professional Registrant.

### 8.3. Ketone Ethylene Ester Roofing (KEE)

- 8.3.1. The KEE system shall meet ASTM Standard Specification D6754, 45 mil minimum thickness. The KEE membrane shall contain more than 50% KEE polymer content.
- 8.3.2. The KEE design, specification and installation shall provide a 20-year minimum life.
- 8.3.3. A fully adhered membrane is recommended, but attachment is to be determined on a project basis as determined by the Professional Registrant.
  - 8.3.3.1. Fastener length for mechanically attached systems shall not exceed 10”.
- 8.3.4. The KEE roofing system shall have a twenty (20) year, no dollar limit (NDL) material and labor warranty to be provided by the manufacturer.
- 8.3.5. A two year minimum material and labor warranty shall be provided by the Contractor.
- 8.3.6. All components of the roofing system shall be supplied by the roofing manufacturer in order to maintain the warranty and fire classification of the system.
- 8.3.7. All adhesives used shall be low VOC and free of any hazardous materials.
  - 8.3.7.1. Low rise adhesive is recommended.
- 8.3.8. All penetrations, curb flashings and corner flashings to be factory-fabricated. No field fabricated components permitted.

- 8.4. Roof mounted equipment / accessories
  - 8.4.1. All materials to be compatible with the KEE roofing material.
- 9. Closeout Documents
  - 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).
- 10. Preventative Maintenance Criteria
  - 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 11. Budgeting cost ranges
  - 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else
  - 11.2. Budget costing for the KEE roofing system is as follows:
    - 11.2.1. Low-range: \$7.50 - \$10.50 per square foot.
    - 11.2.2. Mid-range: \$10.00 – \$13.00 per square foot.
    - 11.2.3. High-range: \$13.00 - \$25.00 per square foot.
  - 11.3. Life cycle costing estimate for a KEE roof is \$3.00 per square foot per year.
- 12. Expected End of Life (EOL) for the specified KEE roofing system should be no less than 20-years if properly maintained and inspected regularly.

## Polyvinyl- Chloride Roofing (PVC) – (07 54 19)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of PVC roofs
  - 2.1. A PVC roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is existing moisture within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If there is significant loss of material over reinforcing scrim.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A PVC roof can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The minimum slope for new building construction is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.2. The recommended minimum slope for new roofing on existing buildings is  $\frac{1}{4}$  unit vertical in 12 units horizontal, when possible.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is "positive roof drainage". Ponding is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the PVC system must be replaced, the existing PVC roofing shall be removed before any new roofing system is installed.
  - 4.3. Additional information regarding what constitutes a failed PVC roofing system can be found in Part 2 of this section.

5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for PVC roofing systems.
6. Back of parapet treatment
  - 6.1. The PVC system shall be adhesively applied to the back of parapets as required.
    - 6.1.1. Height of the PVC membrane system applied to the back of parapets shall not exceed manufacturer's specified requirements.
  - 6.2. At locations where the membrane does not extend for the full height of the parapet, the surface shall be waterproofed with materials suitable to the substrate.
7. High wall treatment
  - 7.1. The PVC system shall be adhesively applied to high walls as required.
  - 7.2. Height of the PVC membrane system on high walls shall not exceed manufacturer's specified requirements.
  - 7.3. The PVC membrane on high walls shall not be roofed to a height where the roof can be seen from the ground.
  - 7.4. At locations where the membrane does not extend for the full height of the high wall, the surface shall be waterproofed with materials suitable to the substrate.
8. Components of a PVC membrane roofing system
  - 8.1. Rigid board insulation
    - 8.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by the Professional Registrant.
  - 8.2. Coverboard
    - 8.2.1. A coverboard shall be used in all PVC membrane roof assemblies.
    - 8.2.2. Coverboards are required to provide the following functions:
      - 8.2.2.1. To separate incompatible material.
      - 8.2.2.2. To minimize thermal drift.

- 8.2.2.3. To protect rigid board insulation and provide rigid support for the roof membrane.
- 8.2.3. Acceptable types of coverboards will be:
  - 8.2.3.1. Glass mat faced gypsum boards.
  - 8.2.3.2. High density wood fiber.
  - 8.2.3.3. High density polyisocyanurate board.
  - 8.2.3.4. Paper faced gypsum board shall not be used as a cover board.
- 8.2.4. The PVC roofing system is acceptable as an overlay over an existing roofing system, as determined by the Professional Registrant.
- 8.3. Polyvinyl-Chloride Roofing (PVC)
  - 8.3.1. The PVC system shall meet ASTM Standard Specification D4434, 60 mil minimum thickness.
  - 8.3.2. The PVC design, specification and installation shall provide a 20-year minimum life.
  - 8.3.3. A fully adhered membrane is recommended, but attachment is to be determined on a project basis as determined by the Professional Registrant.
    - 8.3.3.1. Fastener length for mechanically attached systems shall not exceed 10”.
  - 8.3.4. The PVC roofing system shall have a twenty (20) year, no dollar limit (NDL) Material and labor warranty to be provided by the manufacturer.
  - 8.3.5. A two year minimum material and labor warranty shall be provided by the Contractor.
  - 8.3.6. All components of the roofing system shall be supplied by the roofing manufacturer in order to maintain the warranty and fire classification of the system.
  - 8.3.7. All adhesives used shall be low VOC and free of any hazardous materials.
    - 8.3.7.1. Low rise adhesive is recommended.
  - 8.3.8. All penetrations, curb flashings and corner flashings to be factory-fabricated. No field fabricated components permitted.

- 8.4. Roof mounted equipment / accessories
  - 8.4.1. All materials to be compatible with the PVC roofing material.
- 9. Closeout Documents
  - 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).
- 10. Preventative Maintenance Criteria
  - 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 11. Budgeting cost ranges
  - 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else
  - 11.2. Budget costing for the PVC roofing system is as follows:
    - 11.2.1. Low-range: \$7.50 - \$10.50 per square foot.
    - 11.2.2. Mid-range: \$10.00 – \$13.00 per square foot.
    - 11.2.3. High-range: \$13.00 - \$25.00 per square foot.
  - 11.3. Life cycle costing estimate for a PVC roof is \$2.00 per square foot per year.
- 12. Expected End of Life (EOL) for the specified PVC roofing system should be no less than 20-years if properly maintained and inspected regularly.

## Thermoplastic-Polyolefin Roofing (TPO) – (07 54 23)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of TPO roofs
  - 2.1. A TPO roofing system shall be determined as a failed roof when any of the following conditions exist:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is existing moisture within the system.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If there is significant loss of material over reinforcing scrim.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A TPO roof can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. All roof cricket slopes shall be twice that of the main roof slope, if possible.
  - 3.3. Special conditions for slope of system
    - 3.3.1. The minimum slope for new building construction is  $\frac{1}{4}$  unit vertical in 12 units horizontal.
    - 3.3.2. The recommended minimum slope for new roofing on existing buildings is  $\frac{1}{4}$  unit vertical in 12 units horizontal, when possible.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is “positive roof drainage”. Ponding is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
  - 4.2. If the TPO system must be replaced, the existing TPO roofing shall be removed before any new roofing system is installed.
  - 4.3. Additional information regarding what constitutes a failed TPO roofing system can be found in Part 2 of this section.

5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for TPO roofing systems.
6. Back of parapet treatment
  - 6.1. The TPO system shall be adhesively applied to the back of parapets as required.
    - 6.1.1. Height of the TPO membrane system applied to the back of parapets shall not exceed manufacturer's specified requirements.
  - 6.2. At locations where the membrane does not extend for the full height of the parapet, the surface shall be waterproofed with materials suitable to the substrate.
7. High wall treatment
  - 7.1. The TPO system shall be adhesively applied to high walls as required.
  - 7.2. Height of the TPO membrane system on high walls shall not exceed manufacturer's specified requirements.
  - 7.3. The TPO membrane on high walls shall not be roofed to a height where the roof can be seen from the ground.
  - 7.4. At locations where the membrane does not extend for the full height of the high wall, the surface shall be waterproofed with materials suitable to the substrate.
8. Components of a TPO membrane roofing system
  - 8.1. Rigid board insulation
    - 8.1.1. Acceptable types are polyisocyanurate foam board, polystyrene board insulation and composite board insulation, thickness as determined by the Professional Registrant.
  - 8.2. Coverboard
    - 8.2.1. A coverboard shall be used in all TPO membrane roof assemblies.
    - 8.2.2. Coverboards are required to provide the following functions:
      - 8.2.2.1. To separate incompatible material.
      - 8.2.2.2. To minimize thermal drift.

- 8.2.2.3. To protect rigid board insulation and provide rigid support for the roof membrane.
- 8.2.3. Acceptable types of coverboards will be:
  - 8.2.3.1. Glass mat faced gypsum boards.
  - 8.2.3.2. High density wood fiber.
  - 8.2.3.3. High density polyisocyanurate board.
  - 8.2.3.4. Paper faced gypsum board shall not be used as a cover board.
- 8.2.4. The TPO roofing system is acceptable as an overlay over an existing roofing system, as determined by the Professional Registrant.
- 8.3. Thermoplastic-Polyolefin Roofing (TPO)
  - 8.3.1. The TPO system shall meet ASTM Standard Specification D-6878, 80 mil minimum thickness.
  - 8.3.2. The TPO design, specification and installation shall provide a 20-year minimum life.
  - 8.3.3. A fully adhered membrane is recommended, but attachment is to be determined on a project basis as determined by the Professional Registrant.
    - 8.3.3.1. Fastener length for mechanically attached systems shall not exceed 10”.
  - 8.3.4. The TPO roofing system shall have a twenty (20) year, no dollar limit (NDL) material and labor warranty to be provided by the manufacturer.
  - 8.3.5. A two year minimum material and labor warranty shall be provided by the Contractor.
  - 8.3.6. All components of the roofing system shall be supplied by the roofing manufacturer in order to maintain the warranty and fire classification of the system.
  - 8.3.7. All adhesives used shall be low VOC and free of any hazardous materials.
    - 8.3.7.1. Low rise adhesive is recommended.
  - 8.3.8. All penetrations, curb flashings and corner flashings shall be factory-fabricated. No field fabricated components permitted.

- 8.4. Roof mounted equipment / accessories
  - 8.4.1. All materials to be compatible with the TPO roofing material.
- 9. Closeout Documents
  - 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).
- 10. Preventative Maintenance Criteria
  - 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 11. Budgeting cost ranges
  - 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else
  - 11.2. Budget costing for the TPO roofing system is as follows:
    - 11.2.1. Low-range: \$7.50 - \$10.50 per square foot.
    - 11.2.2. Mid-range: \$10.00 – \$13.00 per square foot.
    - 11.2.3. High-range: \$13.00 - \$25.00 per square foot.
  - 11.3. Life cycle costing estimate for a TPO roof is \$2.50 per square foot per year.
- 12. Expected End of Life (EOL) for the specified TPO roofing system should be no less than 20-years if properly maintained and inspected regularly.

# COOL ROOF COATING OVER MODIFIED BITUMEN ROOF SYSTEM – (07 56 10)

1. All applicable parts of the General Roofing Specification (07 30 00) shall be included within this section.
2. Assessment of Cool Roof Acrylic Coating over modified Bitumen Roof Systems
  - 2.1. A Cool Roof Acrylic Coating over modified Bitumen shall be determined as failed when any of the following conditions exist:
    - 2.1.1. When the Cool Roof Acrylic Coating loses adhesion to the modified bitumen roof system or between applications of Cool Roof Acrylic Coating.
    - 2.1.2. When the Cool Roof Acrylic Coating cracks, peels, flakes or delaminates in any other way due to faulty product.
    - 2.1.3. When the Cool Roof Acrylic Coating loses reflectivity properties due to color fade caused by faulty product or other environmental factors, such as surface contaminants. Aged Solar Reflective Index readings below 80 shall be considered loss of reflectivity.
    - 2.1.4. When coating blisters are present on the majority of the modified bitumen roof system.
  - 2.2. Roof coating manufacturer shall submit the following documents to the Registrant Professional for review prior to having their Cool Roof Acrylic Coating being specified:
    - 2.2.1. Product data and safety data sheets.
    - 2.2.2. Test Report from an independent ASTM accredited testing facility validating that the roof coating complies with ASTM D6083.
    - 2.2.3. Sample copy of roof coating manufacturer's 10-year no dollar limit (NDL) material and labor warranty stating that the roof coating will comply with all materials and labor to repair or remove and replace roofing materials that leak due to defective coating or faulty installation for the length of the warranty.
    - 2.2.4. Proof of current Energy Star Rating for the roof coating.
    - 2.2.5. Fire classification for the proposed coating comply with ASTM E108 per Underwriters Laboratories or another ASTM recognized fire testing facility.

- 2.2.6. A list of five (5) projects in Arizona where the proposed coating has been installed, including project name, project size, address, owner contact, and year applied.
        - 2.2.7. A letter from the Cool Roof Acrylic Coating Manufacturer stating that the Roofing Contractor is an authorized applicator of the roof coating system.
3. Roof Slope Use, as defined in Part 7, General Roofing Specification (07 30 00).
  - 3.1. The Cool Roof Acrylic Coating can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. The recommended minimum slope for Cool Roof Acrylic Roof Coating is  $\frac{1}{4}$ " per vertical unit 12 inches per unit horizontal when possible. The absolute minimum slope for elastomeric silicone coatings shall be "positive roof drainage". Ponding water is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If Cool Roof Acrylic Coating system does not meet the criteria established to be acceptable to receive a new Cool Roof Coating, then the replacement or overlay of the existing roof system with a new roof system is required.
  - 4.2. If a Cool Roof Acrylic Coating system is beyond repair, it shall be either removed or isolated with a recovery board before new roof system is installed.
  - 4.3. Additional information for constitutes a failed Cool Roof Acrylic Coating can be found in Part 2 of this Section.
5. Demolition Requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for removing the Cool Roof Acrylic Coating from the modified bitumen roof membrane other than to not damage the modified bitumen roof membrane.

## 6. Back of Parapet Wall Treatment

6.1. Cool Roof Coating shall be spray or roller applied to fully encapsulate any modified bitumen base or parapet wall flashing.

6.1.1. At locations where the modified bitumen membrane terminates less than the full height of the parapet wall, the back of the parapet wall shall be sealed with either a water repellent or waterproof product as directed by the SFB Professional Registrant.

6.1.2. At locations where the Coating System terminates less than the full height of the parapet wall, the back of the parapet wall surface shall be waterproofed with materials suitable to the substrate.

## 7. High Wall Treatment

7.1. Cool Roof Acrylic Coating shall be applied to any modified bitumen membrane applied to a high wall.

7.2. Areas where the Cool Roof Acrylic Coating over modified bitumen does not extend the full height of the high wall, the high wall shall be sealed with either a water repellent or waterproof material compatible with the substrate as designated by the Professional Registrant.

7.3. If the Coating System can be seen from the ground, custom matched color Elastomeric Acrylic Roof Coating shall be installed to match the surrounding substrate. If a color match is not practical, the Elastomeric Silicone Coating System shall be terminated at a height that is not visible from the ground.

7.4. Areas where the Elastomeric Acrylic Roof Coating System does not extend the full height of the high wall, the high wall shall be waterproofed with materials compatible with the substrate.

## 8. Components of Cool Roof Acrylic Coating System

8.1. Biodegradable Cleaner.

8.1.1. Biodegradable cleaner should be used in areas that have accumulated dirt or other contaminants before installing the coating. Follow manufacturer application instructions.

8.2. Cool Roof Acrylic Coating

8.2.1. The Cool Roof Acrylic Roof Coating shall be Energy Star Rated and listed on the Cool Roof Rating Council website, [www.coolroofs.org](http://www.coolroofs.org). The coating shall contain bleed block resin and meet ASTM D6083. Along with the following liquid and physical performance properties:

Elongation	250%	ASTM D2370
Tensile Strength	250 psi	ASTM D2370
Volume Solids	50%	ASTM D2697
Solar Reflective Index (Initial) >100		ASTM E1980
Solar Reflective Index (3 Year Aged) > 85		ASTM E1980
Adhesion Minimum 2.0 PLI		ASTM D903 or C794

8.2.2. No private label coating manufacturers allowed.

8.2.3. The Cool Roof Acrylic Coating shall not be considered part of the modified bitumen manufacturers' 20-year no dollar limit (NDL) material and labor warranty and the manufacturer of the modified bitumen roofing product must accept or approve the use of the Cool Roof Coating Product and that the Cool Roof Coating will not alter or void the modified bitumen product warranty in any way. A 10-year coating manufacturer product warranty may be requested Professional Registrant.

8.2.4. The Cool Roof Acrylic Roof Coating shall be spray or roller applied. If the coating is spray applied, the first coat shall also be back rolled, 25 dry mil coating thickness is required unless coating manufacturer or modified bitumen manufacturer requires greater dry mil thickness.

8.2.5. The Cool Roof Acrylic Coating Manufacturers' guide specification, product data sheets, safety data sheets and application instructions shall be considered part of this specification.

9. Closeout Documents

9.1. All items as found in Part 16, General Roofing Specification (07 30 00).

10. Preventive Maintenance Criteria

10.1. All items as found in Part 17, General Roofing Specification (07 30 00).

10.2. Roof Coating manufacturer shall provide District maintenance personnel training in the proper inspection and housekeeping procedures on an annual basis for the entire warranty period. Any deficiencies observed during the annual inspection shall be documented and reported in writing to the District for either warranty repair or third-party damage repair.

11. Budget Cost Range

11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

11.2. Budget Cost Range Cool Roof Acrylic Coating over Modified Bitumen

11.2.1. \$0.85 - \$1.25 per square foot

11.3. Budget Life Cycle Costs

11.3.1. \$0.01 per square foot per year to clear the roof coating of debris and repair minor nicks or damage to the roof coating.

11.3.2. Cleaning the roof coating by pressure washing will assist in maximizing the Solar Reflective Index of the coating, at a cost of \$0.10 per square foot per year as needed.

11.3.3. Cool Roof Acrylic Coatings are sustainable and can be recoated at the 10-year mark to provide additional reflectivity and UV protection for the modified bitumen membrane.

12. Expected Cool Roof Acrylic Coating End of Life

12.1. A properly installed and maintained Cool Roof Acrylic Coating can be sustained by making any repairs necessary and installing additional coating to receive an additional 10-year product warranty. Based on Cool Roof Acrylic Coating performance in Arizona, the service life of this coating with recoating every 10-13 years is 30+ years.



## ELASTOMERIC SILICONE COATING FOR RESTORING MODIFIED AND SMOOTH BUILT UP ROOFING MEMBRANES - (07 56 20)

1. All applicable parts of the General Roofing Specification (section 07 30 00) shall be included in this section.
2. Assessment of Elastomeric Silicone Roof Coating Systems
  - 2.1. An Elastomeric Silicone roof coating system shall be determined as failed when any of the following conditions exist and removing and correcting the deficiencies would be more than 50% of the cost to remove the existing roof system and install a new 20-year approved roofing system.
    - 2.1.1. When the coating system loses adhesion to the substrate to which it has been installed or between application of coats of coating.
    - 2.1.2. When the coating system surface cracks due to faulty coating materials or improper installation of the coating system.
    - 2.1.3. When the coating system allows water to pass through it and no longer serves to protect the existing roof from moisture intrusion.
    - 2.1.4. When coating blisters are present on a sizable portion of the roof area.
  - 2.2. Roof coating manufacturer shall submit the following documents to the Professional Registrant for review to have their roof coating considered for use.
    - 2.2.1. Product data and safety data sheets.
    - 2.2.2. Test Report from an independent ASTM accredited testing facility validating that the roof coating complies with ASTM D6694.
    - 2.2.3. Sample copy of roof coating manufacturer's 10-year no dollar limit (NDL) material and labor warranty stating that the roof coating will comply with all materials and labor to repair or remove and replace roofing materials that leak due to defective coating or faulty installation for the length of the warranty.
    - 2.2.4. Fire classification for the proposed coating comply with ASTM E108 per Underwriters Laboratories or another ASTM recognized fire testing facility.
    - 2.2.5. A list of 5 projects in Arizona where the proposed coating has been installed, including project name, project size, address, owner contact, and year applied.

- 2.2.6. A letter from the Elastomeric Silicone Roof Coating Manufacturer stating that the Roofing Contractor is an authorized applicator of the roof coating system.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A Roof Coating System can be used on any of the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. The recommended minimum slope for Elastomeric Silicone Roof Coating is  $\frac{1}{4}$ " per vertical unit 12 inches per unit horizontal when possible. The absolute minimum slope for elastomeric silicone coatings shall be "positive roof drainage". Ponding water is not acceptable.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If an existing Silicone Roof Coating system does not meet the criteria established to be acceptable to receive a new elastomeric silicone roof coating, then the replacement or overlay of the existing roof system with a new roof system is required.
  - 4.2. If a Silicone Roof Coating system is beyond repair, it shall be either removed or isolated with a recovery board before new roof system is installed.
  - 4.3. Additional information for what constitutes a failed Silicone Roof Coating system can be found in Part 2 of this Section.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for Silicone Roof Coating systems.
6. Back of Parapet Wall Treatment
  - 6.1. Elastomeric Silicone Roof Coating System to the back of parapet walls shall be spray or roller applied to the back of parapet walls as required within this section and by the Roofing Manufacturer.

- 6.1.1. Height of Coating System to the back of parapet walls shall be determined by the type of parapet wall surface. Coating may be terminated beneath the metal wall counter flashing or extend up the back of the parapet wall. If the back of the parapet wall is stucco or a synthetic wall system, the coating shall be either terminate beneath the metal parapet wall counter flashing of extend up the full height of the back of the parapet wall.
- 6.1.2. At locations where the Coating System terminates less than the full height of the parapet wall, the back of the parapet wall surface shall be waterproofed with materials suitable to the substrate.

## 7. High Wall Treatment

- 7.1. Coating System shall be spray or roller applied to properly prepared high wall substrate.
- 7.2. Height of coating system on high walls is unlimited.
- 7.3. If the Coating System can be seen from the ground, custom matched color Elastomeric Silicone Roof Coating shall be installed to match the surrounding substrate. If a color match is not practical, the Elastomeric Silicone Coating System shall be terminated at a height that is not visible from the ground.
- 7.4. Areas where the Elastomeric Silicone Roof Coating System does not extend the full height of the high wall, the high wall shall be waterproofed with materials compatible with the substrate.

## 8. Components of Elastomeric Silicone Roof Coating System

- 8.1. Biodegradable Cleaner
  - 8.1.1. Biodegradable cleaner to be used where required to ensure the existing roof surface is in a clean condition to receive the new Roof Coating System.
- 8.2. Fabric adhesive and bleed block primer (if required by coating manufacturer)
  - 8.2.1. Fabric adhesive and bleed block primer to be used on asphaltic surfaces to increase the adhesion of the new coating system and to prevent asphalt bleed from the existing roof system through the new coating system.

### 8.3. Primer to Other Substrates

8.3.1. Primer as required by coating manufacturer to provide greater adhesion to aluminized asphalt, metal, concrete masonry units (CMU), or other surfaces to receive the Elastomeric Silicone Roof Coating System.

### 8.4. Self-Flashing SPF Roof Insulation

8.4.1. Self-Flashing SPF Roof Insulation is an option to three coursing with silicone/polyester /silicone that may be used to seal parapet walls, pipe penetrations, curbs, and other roof top penetrations. SPF shall be UL723 fire rated and 50 PSI compressive strength.

### 8.5. Construction Grade Sealant

8.5.1. Silicone sealant, as approved by the coating manufacturer, for in filling cracks, splits or voids and for sealing reglet counter flashing

### 8.6. Reinforcement Fabric

8.6.1. Stich bonded polyester fabric, as supplied by the coating manufacturer, for reinforcement at drains / scupper areas, valley lines, pipe penetrations, curbs, split seams, flashings, tears, perimeter areas or for the full reinforcement of the new Coating System where specified.

### 8.7. Fluid Applied Elastomeric Silicone Sealant

8.7.1. Silicone sealant to be used as an option to stich bonded fabric on certain detail areas, leveling small rough textured areas and for reinforcing metal flanges at drip edges.

### 8.8. Elastomeric Silicone Roof Coating

8.8.1. Elastomeric silicone roof coating shall be internally plasticized to provide a permanently flexible waterproof coating system that is fire classified by Underwriters Laboratories or a recognized fire testing agency to comply with ASTM E108 Class A or Class B as required. The Elastomeric Silicone coating shall meet all requirements of ASTM D6604 and comply with the following physical property requirements:

Volume Solids 90% Content Minimum SBV

170% Minimum Elongation

160 psi Tensile Strength  
Greater than 20 lbs. per inch Tear Resistance  
Solar Reflective Index greater than 100 Initial  
Adhesion Minimum 2.0 PLI

- 8.8.2. No private label coating manufacturers allowed.
- 8.8.3. The Elastomeric Silicone Roof Coating System shall have a minimum ten (10) year, no dollar limit (NDL) written material and labor warranty to be provided by the Roof Coating manufacturer. Fifteen (15) and twenty (20) year no dollar limit (NDL) warranties are available when agreed upon in writing by the SFB Professional Registrant and the Coating Manufacturer.
- 8.8.4. The minimum dry mil thickness of the Elastomeric Silicone Roof Coating shall be 35 or greater if required by the Coating Manufacturer for a ten (10) year no dollar (NDL) manufacturer warranty. Fifteen (15) year warranty shall be a minimum 40 dry mil thickness and twenty (20) shall be 45 dry mil thickness or greater if required by the Coating Manufacturer.
- 8.8.5. The Roof Coating manufacturer's guide specification for the proper repairs of the existing roof system, surface preparation and installation of the Roof Coating System components shall be considered an integral part of this Section. If there is a discrepancy between the SFB and the Coating manufacturer's requirements, the more stringent requirement will prevail when approved by the Professional Registrant.

## 9. Closeout Documents

- 9.1. All items as found in Part 16, General Roofing Specification (07 30 00).

## 10. Preventative Maintenance Criteria

- 10.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 10.2. Roof Coating manufacturer shall provide District maintenance personnel training in the proper inspection and housekeeping procedures on an annual basis for the entire warranty period. Any deficiencies observed during the

annual inspection shall be documented and reported in writing to the District for either warranty repair or third-party damage repair.

## 11. Budgeting cost ranges

11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

### 11.2. Budget Cost Range Elastomeric Silicone Roof Coating Preservation System

11.2.1. 10-year Manufacturer NDL \$3.00-\$3.50 per square foot (Basis of Design)

11.2.2. 15-year Manufacturer NDL \$3.50 - \$4.00 per square foot (Optional)

11.2.3. 20-year Manufacturer NDL \$5.00 - \$6.00 per square foot (Optional)

### 11.3. Budget Life Cycle Cost Estimates

11.3.1. Roof Manufacturer to provide no cost inspection on an annual basis for the term of the warranty.

11.3.2. Roof Coating System Maintenance to clear the roof of debris and repair minor nicks or damage to the roof system = .01 per square foot per year.

11.3.3. Roof Coatings are sustainable and can be re-coated after the warranty period expires. Re-coating budget is \$2.00 - \$3.50 per square foot to receive a new Roof Coating Manufacturer 10 Year NDL Warranty.

## 12. Expected Roof Coating End of Life

12.1. A properly installed and maintained Elastomeric Silicone Roof Coating System can be sustained at the end of the warranty period by making any repairs needed and installing additional coating to receive a new Roof Coating Manufacturer 10 Year NDL Warranty. Based on local roof coating performance of greater than 30 years, the expected End of Life (EOL) of an Elastomeric Silicone Roof Coating System with recoats at a 10-15 year time frame is 30 years.

# HIGH TENSILE ACRYLIC ROOF COATING – (07 56 30)

1. All applicable parts of the General Roofing Specification (07 30 00) shall be included in this section.
2. Assessment of High Tensile Acrylic Roof Coating Systems
  - 2.1. A High Tensile Acrylic Roof Coating restoration or preservation system shall be determined as failed when any of the following conditions exist:
    - 2.1.1. When the coating system loses adhesion to the substrate to which it has been installed or between application of coats of coating.
    - 2.1.2. When the coating system surface cracks due to faulty products within the coating system or improper installation of the coating system.
    - 2.1.3. When the coating systems allows water to pass through it and no longer serves to protect the existing roof from moisture intrusion.
    - 2.1.4. When coating blisters are present on sizeable areas of the roof.
  - 2.2. Roof coating manufacturer shall submit the following documents to the Registrant Professional for review prior to having their High Tensile Acrylic Roof Coating being specified:
    - 2.2.1. Product data and safety data sheets.
    - 2.2.2. Test report from independent ASTM accredited testing facility validating compliance of the coating with ASTM D6083.
    - 2.2.3. Sample Copy of 10-year no dollar limit (NDL) warranty stating that manufacturer will cover all materials and labor to repair or remove and replace roofing materials that leak due to defective coating or faulty installation for the length of the warranty.
    - 2.2.4. Fire classification for the proposed coating complying with ASTM E108 per Underwriters Laboratories or another ASTM recognized fire testing facility.
    - 2.2.5. A list of five (5) projects in Arizona where the proposed coating has been installed, including project name, project size, address, owner contact, and year applied.
    - 2.2.6. A letter from the High Tensile Acrylic Roof Coating Manufacturer stating that the Roofing Contractor is an authorized applicator of the roof coating system.

3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A Roof Coating System can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. The recommended minimum slope for High Tensile Acrylic Roof Coatings is  $\frac{1}{4}$ " per unit vertical and 12 inches per unit horizontal when possible. The absolute minimum slope for new High Tensile Acrylic Roof Coatings shall be "positive roof drainage". Ponding water is not acceptable.
4. Repair or replacement of existing roof system, not to contradict Part 6, General Roofing Specification (07 30 00).
  - 4.1. If High Tensile Acrylic Roof Coating system does not meet the criteria established to be acceptable to receive a new High Tensile Acrylic Roof Coating, then the replacement or overlay of the existing roof system with a new roof system is required.
  - 4.2. If an existing High Tensile Acrylic Coating System is beyond repair, the existing Coating System shall either be removed or isolated with a recovery board before a new roof system is installed.
  - 4.3. Additional information for what constitutes a failed High Tensile Acrylic Roof Coating Restoration or Preservation System can be found in Part 2 of this Section.
5. Demolition Requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for High Tensile Acrylic Roof Coating Systems.
6. Back of Parapet Wall Treatment
  - 6.1. High Tensile Acrylic Roof Coating System shall be spray or roller applied to the parapet walls as required within this Section and by the High Tensile Acrylic Roof Coating Manufacturer.

- 6.1.1. Height of High Tensile Acrylic Coating System to the back of parapet walls shall be determined by the type of parapet wall surface. High Tensile Acrylic Coating may be terminated beneath the metal wall counter flashing or extend up the back of the parapet wall. If the back of the parapet wall is stucco or a synthetic wall system, the coating shall either terminate beneath the metal parapet wall counter flashing or extend the full height of the back of the parapet wall.
- 6.1.2. At locations where the High Tensile Acrylic Coating System terminates less than the full height of the parapet wall, the back of the parapet wall surface shall be waterproofed with materials suitable to the substrate.

## 7. High Wall Treatment

- 7.1. High Tensile Acrylic Coating System shall be spray or roller applied to properly prepare high wall substrate.
- 7.2. Height of High Tensile Acrylic Coating System on high walls is unlimited.
- 7.3. If the High Tensile Acrylic Coating System can be seen from the ground, custom color High Tensile Acrylic Roof Coating shall be installed to match the surrounding substrate color. If a color match is not practical, the Coating System shall be terminated to a height where the High Tensile Acrylic Coating System cannot be seen from the ground.
- 7.4. Areas where the High Tensile Acrylic Coating System does not extend the full height of the high wall, the high wall surface shall be waterproofed with materials compatible with the substrate.

## 8. Components of High Tensile Acrylic Roof Coating System

### 8.1. Biodegradable Cleaner

- 8.1.1. Biodegradable cleaner to be used where required to ensure the existing roof surface is in clean condition to receive the new High Tensile Acrylic Coating System.

### 8.2. Fabric Adhesive & Bleed Block Primer

- 8.2.1. Fabric Adhesive & Bleed Block Primer to be used on asphaltic surfaces to increase the adhesion of the new High Tensile Acrylic Coating System

and prevent asphalt bleed from the existing roof system through the new High Tensile Acrylic Coating System.

### 8.3. Primer for Other Substrates

8.3.1. Primer as required by High Tensile Acrylic Coating Manufacturer to provide greater adhesion to aluminized asphalt, metal, concrete masonry units (CMU) or other surfaces to receive the High Tensile Acrylic Roof Coating System.

### 8.4. Self-Flashing SPF Roof Insulation

8.4.1. Self-flashing SPF Roof Insulation is an option to be used to seal parapet walls, pipe penetrations, curbs and other roof top penetrations. SPF shall UL 723 fire rated and 50 psi compressive strength.

### 8.5. Construction Grade Sealant

8.5.1. Polyurethane sealant, as approved by the coating manufacturer, for use in filling cracks, splits or voids and for sealing reglet counter flashing

### 8.6. Reinforcement Fabric

8.6.1. Stitch bonded polyester fabric, as supplied by High Tensile Acrylic Coating Manufacturer, for reinforcement at drain/scupper areas, valley lines, pipe penetrations, curbs, split seams, flashings, tears, perimeter areas or for the full reinforcement of the new High Tensile Acrylic Coating System where specified.

### 8.7. Fluid Applied Reinforcement Acrylic Sealant

8.7.1. Acrylic sealant to be used as an option to stitch bonded fabric on certain detail areas, leveling small rough textured areas and for reinforcing metal flanges at drip edges.

### 8.8. High Tensile Acrylic Roof Coating

8.8.1. High tensile acrylic coating shall be internally plasticized to provide a permanently flexible waterproof coating system that is fire classified by Underwriters Laboratories or a recognized fire testing agency to comply with ASTM E108 Class A or Class B as required. The high tensile acrylic coating shall meet all requirements of ASTM D6083 and comply with the following physical property requirements:

Volume Solids >50%	ASTM D2697
Initial Elongation 340% minimum	ASTM D2370
Initial Tensile Strength 350 PSI	ASTM D2370
Final % Elongation >100%	ASTM D2370
Tear Resistance >100 lb/in.	ASTM D624
Solar Reflective Index (Initial) >100	ASTM E1980
Solar Reflective Index (3 Year Aged) > 85	ASTM E1980
Adhesion Minimum 2.0 PLI	ASTM D903 or C794

8.8.2. No private label coating manufacturers allowed.

8.8.3. The High Tensile Acrylic Roof Coating System shall have a minimum ten (10) year, no dollar limit (NDL) material and labor warranty to be provided by the Roof Coating manufacturer. Fifteen (15) and twenty (20) year no dollar limit (NDL) material and labor warranties are available when required by the Professional Registrant and the Coating Manufacturer.

8.8.4. The minimum dry mil thickness of the High Tensile Acrylic Roof Coating shall be 35 or greater if required by the High Tensile Acrylic Roof Coating Manufacturer for a ten (10) year no dollar limit (NDL) manufacturer material and labor warranty. Fifteen (15) year material and labor warranty shall be a minimum 40 dry mil thickness and twenty (20) year material and labor warranty shall be 45 dry mil thickness or greater if required by the Coating Manufacturer.

8.8.5. The High Tensile Acrylic Roof Coating Manufacturer's guide specification for the proper repairs of the existing roof system, surface preparation and installation of the High Tensile Acrylic Roof Coating System components shall be considered an integral part of this Section. If there is a discrepancy between the specifications and High Tensile Acrylic Roof Coating Manufacturer's requirements, the more stringent requirement will prevail when approved by the Professional Registrant.

## 9. Closeout Documents

9.1. All items found in Part 16, General Roofing Specification (07 30 00).

## 10. Preventive Maintenance Criteria

10.1. All items found in Part 17, General Roofing Specification (07 30 00).

10.2. Roof Coating manufacturer shall provide District maintenance personnel training in the proper inspection and housekeeping procedures on an annual basis for the entire warranty period. Any deficiencies observed during the annual inspection shall be documented and reported in writing to the District for either warranty repair or third-party damage repair.

## 11. Budget Cost Range

11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

11.2. Budget Cost Range High Tensile Acrylic Roof Coating Restoration (Full Fabric System) over Existing Granulated Modified Bitumen or BUR

11.2.1. 10 Year Manufacturer NDL \$2.50 - \$3.50 per square foot (Basis of Design)

11.2.2. 15 Year Manufacturer NDL \$2.75 - \$3.75 per square foot (Optional)

11.2.3. 20 Year Manufacturer NDL \$3.00 - \$4.00 per square foot (Optional)

11.3. Budget Cost Range High Tensile Acrylic Roof Coating Preservation System (Fabric at Targeted Areas) over Existing Granulated Modified Bitumen or BUR

11.3.1. 10 Year Manufacturer NDL \$2.00 - \$3.00 per square foot

11.3.2. 15 Year Manufacturer NDL \$2.25 - \$3.25 per square foot

11.3.3. 20 Year Manufacturer NDL \$2.50 - \$3.50 per square foot

11.4. Budget Life Cycle Cost Estimates

11.4.1. Roof Coating Manufacturer to provide no cost inspection on an annual basis for the term of the warranty.

11.4.2. Roof Coating System Maintenance to clear the roof of debris and repair minor nicks and damage the roof system = .01 per square foot per year.

11.4.3. Roof Coatings are sustainable and can be recoated after the warranty period expires. Recoating budget is \$1.00 - \$1.25 per square foot to receive a new Roof Coating Manufacturer 10 Year NDL Warranty.

## 12. Expected Roof Coating End of Life

12.1. A properly installed and maintained High Tensile Acrylic Coating System can be sustained at the end of the warranty period by making any repairs needed and installing additional coating to receive another 10 Year Roof Coating Manufacturer NDL Warranty. Based on local roof coating performance of greater than 30 years, the expected End of Life (EOL) of a High Tensile Acrylic Coating Roof System with recoats at the 10-15-year time frame is 30 years or longer.



# POLYURETHANE COATING FOR RESTORING MODIFIED AND SMOOTH BUILT UP ROOFING MEMBRANES (07 56 40)

1. All applicable parts of the General Roofing Specification (07 30 00) shall be included within this section.
2. Assessment of Polyurethane Roof Coating Systems
  - 2.1. A Polyurethane Roof Coating System shall be determined as failed when any of the following conditions exist and removing and correcting the deficiencies would be more than 50% of the cost to remove the existing roof system and install a new roof system.
    - 2.1.1. When the Polyurethane Roof Coating System loses adhesion to the substrate to which it has been applied or between application of coats of coating.
    - 2.1.2. When the Polyurethane Roof Coating System surface cracks due to faulty products within the Polyurethane Roof Coating System or improper installation of the Polyurethane Roof Coating System.
    - 2.1.3. When the Polyurethane Roof Coating System allow water to pass through it and no longer serves to protect the existing roof system from moisture intrusion.
    - 2.1.4. When coating blisters are present on a sizable portion of the roof.
  - 2.2. Polyurethane Roof Coating Manufacturer shall submit the following documents to the Registrant Professional for review to have their Polyurethane Roof Coating being specified:
    - 2.2.1. Product data and safety data sheets.
    - 2.2.2. Test report from and independent ASTM accredited testing facility validating that the roof coating complies with ASTM D6947.
    - 2.2.3. Sample copy of Polyurethane Roof Coating Manufacturer's 10-year no dollar limit (NDL) warranty stating that the roof coating will comply with all labor and materials to repair or remove and replace roofing materials that leak due to defective coating or faulty installation for the length of the warranty.
    - 2.2.4. Fire classification for the proposed coating comply with ASTM E108 per Underwriters Laboratories or another ASTM recognized fire testing facility.

- 2.2.5. A list of five (5) projects in Arizona where the proposed coating has been installed, including project name, project size, address, owner contact, and year applied.
  - 2.2.6. A letter from the Polyurethane Roof Coating Manufacturer stating that the Roofing Contractor is an authorized applicator of the roof coating system.
- 3. Roof Slope Use, as defined in Part 7, General Roofing Specification (07 30 00).
  - 3.1. The Polyurethane Roof Coating can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
  - 3.2. The recommended minimum slope for Polyurethane Roof Coatings is  $\frac{1}{4}$ " per vertical unit 12 inches per unit horizontal when possible. The absolute minimum slope for elastomeric silicone coatings shall be "positive roof drainage". Ponding water is not acceptable.
- 4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If an existing roof system does not meet the criteria established to be acceptable to receive a new Polyurethane Roof Coating System, then the replacement or overlay of the existing roof system with a new roof system is required.
  - 4.2. If a Polyurethane Roof Coating System is beyond repair, it shall be either removed or isolated with a recovery board before new roof system is installed.
  - 4.3. Additional information for what constitutes a failed Polyurethane Roof Coating System can be found in Part 2 of this Section.
- 5. Demolition Requirements for Polyurethane Roof Coating Systems
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for Polyurethane Roof Coating Systems.
- 6. Back of Parapet Wall Treatment

- 6.1. Polyurethane Roof Coating System on the back of parapet walls shall be spray or roller applied as required within this section and by the Polyurethane Roof Coating Manufacturer.
  - 6.1.1. Height of Coating System to the back of parapet walls shall be determined by the type of parapet wall surface. Coating may be terminated beneath the metal wall counterflashing or extend up the back of the parapet wall. If the back of the parapet wall is stucco or a synthetic wall system, the coating shall be either terminate beneath the metal parapet wall counterflashing or extend up the full height of the back of the parapet wall.
  - 6.1.2. At locations where the Polyurethane Roof Coating system terminates less than the full height of the parapet wall, the back of the parapet wall surface shall be waterproofed with materials suitable to the substrate.
7. High Wall Treatment
  - 7.1. Polyurethane Roof Coating system shall be spray or roller applied to properly prepared high wall substrate.
  - 7.2. Height of coating system on high walls is unlimited.
  - 7.3. If the Polyurethane Roof Coating system can be seen from the ground, custom matched color Polyurethane Roof Coating shall be installed to match the surrounding substrate. If a color match is not practical, the Polyurethane Coating system shall be terminated at a height that is not visible from the ground.
  - 7.4. Areas where the Polyurethane Roof Coating system does not extend the full height of the high wall, the high wall shall be waterproofed with materials compatible with the substrate.
8. Components of Cool Roof Acrylic Coating System
  - 8.1. Biodegradable Cleaner (where required by Manufacturer)
    - 8.1.1. Biodegradable cleaner to be used where required to ensure the existing roof surface is in a clean condition to receive the Polyurethane Roof Coating system.
  - 8.2. Fabric Adhesive and Bleed Block Primer (where required by Manufacturer)

- 8.2.1. Fabric Adhesive and Bleed Block Primer to be used on asphaltic surfaces to increase the adhesion of the Polyurethane Roof Coating system and to prevent asphalt bleed from the existing roof system through the Polyurethane Roof Coating system.
- 8.3. Primer to Other Substrates
  - 8.3.1. Primer as required by Polyurethane Roof Coating Manufacturer to provide greater adhesion to aluminized asphalt, metal, concrete masonry units (CMU), or other surfaces to receive the Polyurethane Roof Coating system.
- 8.4. Self-flashing SPF Roof Insulation (Optional Reinforcement Flashing)
  - 8.4.1. Self-flashing SPF Roof Insulation is an option to be used to seal parapet walls, pipe penetrations, curbs, and other roof top penetrations. SPF shall be UL 723 fire rated and 50 psi compressive strength.
- 8.5. Construction Grade Sealant
  - 8.5.1. Polyurethane sealant, as approved by the Polyurethane Roof Coating Manufacturer, for in filling cracks, splits or voids and for sealing reglet counterflashing
- 8.6. Reinforcement Fabric
  - 8.6.1. Stich bonded polyester fabric, as supplied by the Polyurethane Roof Coating Manufacturer, for reinforcement at drains / scupper areas, valley lines, pipe penetrations, curbs, split seams, flashings, tears, perimeter areas or for the full reinforcement of the Polyurethane Roof Coating System where specified.
- 8.7. Fluid Applied Polyurethane Sealant
  - 8.7.1. Polyurethane sealant to be used as an option to stich bonded fabric on certain detail areas, leveling small rough textured areas and for reinforcing metal flanges at drip edges.
- 8.8. Polyurethane Roof Coating
  - 8.8.1. Polyurethane Roof Coating shall be a single component moisture cure product that is fire classified by Underwriters Laboratories or a recognized fire testing agency to comply with ASTM E108 Class A or

Class B as required. The Polyurethane Roof Coating shall meet all requirements of ASTM C957; ASTM D6947 or ASTM D7311 and comply with the following physical property requirements:

Volume Solids 80% Content Minimum SBV

350% Minimum Elongation

2100 PSI Tensile Strength

Greater than 360 lbs / inch tear resistance

Adhesion Minimum 2.0 pli

8.8.2. No private label coating manufacturers allowed.

8.8.3. The Polyurethane Coating System shall have a minimum ten (10) year, no dollar limit (NDL) material and labor warranty to be provided by the Polyurethane Roof Coating Manufacturer.

8.8.4. The minimum dry mil thickness of the Polyurethane Roof Coating shall be 35 mil or greater if required by the Coating Manufacturer for a ten (10) year no dollar (NDL) manufacturer warranty.

8.8.5. The Polyurethane Roof Coating manufacturer's guide specification for the proper repairs of the existing roof system, surface preparation and installation of the Polyurethane Roof Coating system components shall be considered an integral part of this Section.

## 9. Closeout Documents

9.1. All items found in Part 16, General Roofing Specification (07 50 00).

## 10. Preventive Maintenance Criteria

10.1. All items found in Part 17, General Roofing Specification (07 50 00).

10.2. Roof Coating manufacturer shall provide District maintenance personnel training in the proper inspection and housekeeping procedures on an annual basis for the entire warranty period. Any deficiencies observed during the annual inspection shall be documented and reported in writing to the District for either warranty repair or third-party damage repair.

## 11. Budget Cost Range

11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else

11.2. Budget Cost Range Polyurethane Roof Coating Restoration

11.2.1. 10 Year Manufacturer NDL \$5.00 - \$8.00 per square foot (Basis of Design)

11.3. Budget Life Cycle Costs

11.3.1. Roof Manufacturer to provide no cost inspection on an annual basis for the term of the warranty.

11.3.2. Roof Coating System Maintenance to clear the roof of debris and repair minor nicks or damage to the roof system = .01 per square foot per year.

11.3.3. Roof Coatings are sustainable and can be re-coated after the warranty period expires. Re-coating budget is \$3.50 - \$5.50 per square foot to receive a new Roof Coating Manufacturer 10 Year NDL Warranty.

12. Expected Roof Coating End of Life

12.1. A properly installed and maintained Polyurethane Roof Coating System can be sustained at the end of the warranty period by making any repairs needed and installing additional coating to receive a new Roof Coating Manufacturer 10 Year NDL Warranty. Based on local roof coating performance of greater than 20 years, the expected End of Life (EOL) of a Polyurethane Roof Coating System with recoats at the 10-15 year time frame is 30 years.

# REPAIR & RECOAT OF EXISTING SPF CEMENTITIOUS ROOF SYSTEM – (07 56 50)

1. All applicable parts of the General Roofing Specification (07 30 00) shall be included in this section.
2. Assessment of Spray Polyurethane Foam (SPF) Cementitious Roof System
  - 2.1. A SPF Cementitious Roof System shall be determined as failed when any of the following deficiency conditions exist and removing and correcting the deficiencies would be more than 50% of the cost to overlay the existing SPF Cementitious Roof System with a new roofing system or to remove the existing roof system and install a new roofing system:
    - 2.1.1. The SPF roof insulation and / or Protective Coating have lost adhesion to the substrate to which they were applied.
    - 2.1.2. The SPF roof insulation and / or Protective Coating has any of the conditions described in the four (4) listed items of the “Roof Preparation, Procedures, and Considerations” section of the Spray Polyurethane Foam Alliance (SPFA) technical document SPFA-122.
    - 2.1.3. The Cementitious Traffic Topping is cracked down to roof coating, spalling / shearing within itself or from the crushed roofing aggregate to which it is installed, become a chalky / powder topping or has surface contamination.
  - 2.2. Roof Coating Manufacturer shall submit the following documents to the Registrant Professional for review prior to having their Roof Coating system being specified:
    - 2.2.1. Product data and safety data sheets.
    - 2.2.2. Test Report from an independent ASTM accredited testing facility validating that the roof coating complies with ASTM D6083.
    - 2.2.3. Sample Copy of Roof Coating Manufacturers’ 10-year no dollar limit (NDL) warranty stating that the roof coating manufacturer will cover all materials and labor to repair or remove and replace roofing materials that leak due to defective coating or faulty installation for the length of the warranty.

- 2.2.4. Fire classification for the proposed roof coating per ASTM E108, as tested by Underwriters Laboratories or another ASTM E108 accredited testing facility.
    - 2.2.5. A list of five (5) projects in Arizona where the proposed coating has been installed, including project name, project size, address, owner contact, and year applied.
    - 2.2.6. A letter from the SPF Cementitious Roof Coating Manufacturer stating that the Roofing Contractor is an authorized applicator of the roof coating system.
  3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
    - 3.1. A Roof Coating System can be used on any of the following roof slopes:
      - 3.1.1. Low Slope
      - 3.1.2. Transitional Slope
      - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
    - 3.2. The recommended minimum slope for high tensile acrylic coatings is  $\frac{1}{4}$ " per vertical unit per 12 inches horizontal when possible. The absolute minimum slope for high tensile acrylic coatings shall be "positive roof drainage".  
Ponding water is not acceptable.
  4. Repair or replacement of existing roof system not to contradict Part 6, General Roofing Specification (07 30 00).
    - 4.1. If the existing roof system does not meet the criteria established to be acceptable to receive a new High Tensile Acrylic Roof Coating, then replacement or overlay of the existing roof system with a new roof system is recommended.
    - 4.2. If an existing Cementitious SPF Roof System is beyond repair, it shall be either removed or isolated with a recovery board before a new roof system is installed.
    - 4.3. Additional information for what constitutes a failed Cementitious SPF Roof System can be found in Part 2 of this Section.
  5. Demolition Requirements for Cementitious SPF Roof Systems

- 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
- 5.2. No special demolition requirements for Cementitious SPF Roof Systems
- 5.3. Remove, transport and dispose of in compliance with OSHA, DOT and EPA requirements, as well as any other prevailing regulations or statutes.
6. Back of Parapet Treatment
  - 6.1. High Tensile Acrylic Roof Coating System shall be spray or roller applied to the back of parapet walls as required within this section and by the Roof Coating Manufacturer.
    - 6.1.1. Height of the new High Tensile Acrylic Roof Coating to the back of parapet walls shall be determined by the existing SPF roof system height and condition, in addition to the condition of the parapet wall.
    - 6.1.2. At locations where the High Tensile Acrylic Roof Coating System terminates less than the full height of the parapet wall, the back of the parapet wall surface shall be sealed with water repellant or waterproofing materials compatible with the parapet wall substrate.
7. High Wall Treatment
  - 7.1. High Tensile Acrylic Roof Coating shall be spray or roller applied to the high wall as required within this Section and by the Roof Coating Manufacturer.
  - 7.2. Height of High Tensile Acrylic Roof Coating on high wall is unlimited.
  - 7.3. If the new High Tensile Acrylic Roof Coating can be seen from the ground, custom matched color High Tensile Acrylic Roof Coating shall be installed to match the surrounding substrate color. If a color match is not practical, the High Tensile Acrylic Roof Coating System shall be terminated at a height that is not visible from the ground.
  - 7.4. Areas where the High Tensile Acrylic Roof Coating System does not extend the full height of the high wall shall be sealed with either a water repellant or waterproof material that is compatible with the existing high wall substrate.
8. Components of High Tensile Acrylic Roof Coating System for Repairing & Recoating existing Cementitious SPF Roof Systems:
  - 8.1. SPF Roof Insulation (Blister Repairs, Replacement Material):

8.2. SPF Roof Insulation shall contain a zero-ozone depleting blowing agent and be specifically formulated for roof insulation. The SPF Roof Insulation shall meet the following:

Density	ASTM D1622	2.8 lbs. per cubic foot
Compressive Strength	ASTM D1621	45 psi minimum
Closed Cell Content	ASTM D2856	90% minimum
R-Value	ASTM C518, C177, C1029	6.4 per inch
Flammability**	ASTM E84	≤ 75 FSI

\*\* This standard is used solely to measure and describe properties of products in response to heat and flame under controlled laboratory conditions. This numerical flame spread rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

8.3. Surface Primer

8.3.1. Surface primer shall be as required by Coating Manufacturer for all Substrates to receive new SPF Roof Insulation, High Tensile Acrylic Roof Coating and Roof Coating Manufacturer Roof Sealant.

8.4. Biodegradable Surface Cleaner

8.4.1. Biodegradable Surface Cleaner to be used where required on existing cementitious traffic topping, protective coating and other non-SPF Roof Insulation surfaces to receive new surface primer.

8.5. High Tensile Acrylic Roof Coating

8.5.1. High Tensile Acrylic Roof Coating shall be internally plasticized to provide a permanently flexible waterproof coating that is fire classified to meet ASTM E-108 Class A or Class B as required. The coating shall meet all requirements of ASTM D 6083 and comply with the following physical property requirements:

Property	Results	ASTM Test Method
Volume Solids	>50%	D2697
Initial Tensile Strength	350 psi min.	D2370
Initial Elongation	340 %	D2370
Final % Elongation	100 %	D2370
Tear Resistance	> 100 lbf/in.	D624

Solar Reflective Index	>100 Initial	E1980
Solar Reflective Index	> 85 3 Yr. Aged	E1980
Adhesion	> 2.0 PLI	D903 or C794

8.5.2. No private label coating manufacturers allowed.

8.5.3. The High Tensile Acrylic Roof Coating System shall have a Minimum 10 Year No Dollar Limit Warranty issued by the Roof Coating Manufacturer. 15 and 20 Year NDL Warranties are available when agreed upon in writing by the SFB Professional Registrant and the Roof Coating Manufacturer.

8.5.4. The minimum dry mil thickness of High Tensile Acrylic Roof Coating required is 35 for a 10-year Warranty, 40 for a 15-year warranty and 45 for a 20-year warranty or greater mil thickness if required by the Roof Coating Manufacturer to receive the Warranty.

#### 8.6. Construction Grade Sealant

8.6.1. Polyurethane or Acrylic Sealant, as approved by the Roof Coating Manufacturer, for use in filling cracks, splits, voids or tears in the existing Cementitious SPF Roof System.

#### 8.7. Reinforcement Fabric

8.7.1. Stitch bonded polyester fabric as recommended by the Roof Coating Manufacturer for use in reinforcing SPF blister repairs, drain/scuppers, pipe penetrations or other areas as directed by the Roof Coating Manufacturer.

#### 8.8. Roof Coating Manufacturers' Guide Specification & Details

8.8.1. The Roof Coating Manufacturer shall provide a guide specification and details for this project for review by the Professional Registrant. The guide specification shall communicate the execution of work required for repairs to the existing roof system, surface preparation and proper installation of all products to be used within this project. If a discrepancy exists between the Professional Registrants and Roof Coating Manufacturers guide specifications or details, the more stringent

requirement will prevail when approved by the Professional Registrant and accepted as part of the Warranty by Roof Coating Manufacturer.

8.9. Application of any diisocyanate cannot occur while a building is occupied by a teacher or student (A.R.S. §15-156).

9. Close Out Documents

9.1. All items found in Part 16 of the General Roofing Specification (07 30 00).

10. Preventive Maintenance Criteria

10.1. All items found in Part 17, General Roofing Specification (07 30 00).

10.2. Roof Coating manufacturer shall provide District maintenance personnel training in the proper inspection and housekeeping procedures on an annual basis for the entire warranty period. Any deficiencies observed during the annual inspection shall be documented and reported in writing to the District for either warranty repair or third-party damage repair.

11. Budget Cost Range

11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.

11.2. Budget Cost Range High Tensile Acrylic Roof Coating Repair & Recoat of Existing Cementitious SPF Roof Systems

11.2.1. Low Range	10 Year	\$2.50 - \$3.50 per square foot
	15 Year	\$3.00 - \$4.00 per square foot
	20 Year	\$3.50 - \$4.50 per square foot
Middle Range	10 Year	\$3.00 - \$4.00 per square foot
	15 Year	\$3.50 - \$4.50 per square foot
	20 Year	\$4.00 - \$6.00 per square foot

11.3. Budget Life Cycle Cost Estimates

11.3.1. Roof Coating Manufacturer to provide no cost annual inspections for the term of the warranty.

11.3.2. Roof Coating System Maintenance to clear roof of debris and repair SPF insulation or High Tensile Acrylic Coating defects = .02 per square foot per year.

- 11.3.3. High Tensile Acrylic Roof Coatings are sustainable and can be recoated with additional High Tensile Acrylic Roof Coating at the end of the warranty period to receive an additional Roof Coating Manufacturer NDL Warranty.
- 12. Expected High Tensile Acrylic Roof Coating End of Service Life
  - 12.1. A properly installed and maintained High Tensile Acrylic Roof Coating System can be sustained at the end of the warranty period by making any repairs needed and installing additional High Tensile Acrylic Roof Coating to receive another Roof Coating Manufacturers' 10 Year NDL Warranty.
  - 12.2. Based on local acrylic roof coating performance greater than 30 years, the End of Service Life of High Tensile Acrylic Roof Coatings is greater than 30 years, with repairs and recoating at the end of warranty periods.
- 13. New system installation requirements
  - 13.1. Components of system, e.g. ASTM, strengths, etc.
  - 13.2. Underlayment
    - 13.2.1. Type 15, type 30, 2 layers of type 15
    - 13.2.2. Stick down vs. stapled
  - 13.3. Roof mounted equipment / accessories
- 14. Closeout Documents
  - 14.1. All items as found in Part 17, General Roofing Specification (07 30 00).
- 15. Preventative Maintenance Criteria
  - 15.1. All items as found in Part 18, General Roofing Specification (07 30 00).
  - 15.2. Roof coating manufacturer shall provide its roof coating care and maintenance manuals in the closeout documents.
- 16. Budgeting cost ranges
  - 16.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else.
  - 16.2. Budget costing for the SPF coating roofing system is as follows:
    - 16.2.1. Low-range: \$4.00 - \$5.00 per square foot.
    - 16.2.2. Mid-range: \$4.00 – \$5.00 per square foot.
    - 16.2.3. High-range: \$4.50 - \$5.50 per square foot.

16.3. Life cycle costing estimates for SPF coating system is \$0.20 per square foot per year with a re-coat at the end of the warranty period is estimated at \$1.00 - \$1.50 per square foot.

## Roof Restoration – (07 56 60)

1. All applicable parts of the General Roofing Specification (Section 07 30 00) shall be included in this section.
2. Assessment of existing roofs
  - 2.1. A roofing system shall be determined as restorable by the Professional Registrant when any of the following conditions exist:
    - 2.1.1. When the existing roof is determined to be in fair condition.
    - 2.1.2. When only minor repairs are needed.
    - 2.1.3. When existing roof has not presented unreasonable roof leaks.
    - 2.1.4. If no significant surface damage has occurred to roof.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. Restoration can be used on the following roof slopes:
    - 3.1.1. Low Slope
    - 3.1.2. Transitional Slope
    - 3.1.3. High Slope, in accordance with the manufacturer's limitations and testing data.
4. Repair or replacement of roof, not to contradict Part 6, General Roofing Specification (07 30 00)
  - 4.1. If a roof does not meet condition(s) for repair / restore / rejuvenation then roof replacement is the only required and allowed action.
5. Demolition requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for roof restorations.
6. Repair of Existing Roof
  - 6.1. Determine if the roof is covered by a manufacturer's warranty.
    - 6.1.1. Contact local manufacturer's representative for directive regarding repairs to maintain warranty coverage.
  - 6.2. If no manufacturer's warranty, then all repairs will be made with "like" materials of existing roof following manufacturer's installation requirements.
  - 6.3. All work shall comply with National Roofing Contractors Association (NRCA) recommendations.

## 7. Smooth Surface Built Up Roof

- 7.1. Substrate preparation as required by coating manufacturer for warranty.
- 7.2. An approved fluid applied roof coating system shall be used in accordance to the selected roof coating system in compliance with other sections of these specifications.
- 7.3. Coating system to be applied shall incorporate one ply of polyester fabric.
- 7.4. Coating manufacturer to provide 10 year no dollar limit (NDL) labor and material warranty.
- 7.5. A two year minimum material and labor warranty shall be provided by the Contractor.

## 8. Granulated Cap Sheet Built Up Roof

- 8.1. Substrate preparation as required by coating manufacturer for warranty.
- 8.2. An approved fluid applied roof coating system shall be used in accordance to the selected roof coating system in compliance with other sections of these specifications.
- 8.3. Coating system to be applied shall incorporate one ply of polyester fabric.
- 8.4. Coating manufacturer to provide 10 year no dollar limit (NDL) material and labor warranty.
- 8.5. A two year minimum material and labor warranty shall be provided by the Contractor.

## 9. Single Ply Membrane

- 9.1. Substrate preparation as required by coating manufacturer for warranty.
- 9.2. An approved fluid applied roof coating system shall be used in accordance to the selected roof coating system in compliance with other sections of these specifications.
- 9.3. Coating manufacturer to provide 10 year no dollar limit (NDL) labor and material warranty. Coating system to be applied shall incorporate one ply of polyester fabric.
- 9.4. Coating manufacturer to provide 10 year no dollar limit (NDL) labor and material warranty.

10. Closeout Documents

10.1. All items as found in Part 16, General Roofing Specification (07 30 00).

11. Preventative Maintenance Criteria

11.1. All items as found in Part 17, General Roofing Specification (07 30 00).

12. Budgeting cost ranges

12.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else

12.2. Budget costing for Roof Restoration system is as follows:

12.2.1. Low-range: \$3.00 - \$3.50 per square foot.

12.2.2. Mid-range: \$3.50 – \$4.25 per square foot.

12.2.3. High-range: \$4.25 - \$5.50 per square foot.

12.3. Life cycle costing estimates (per year per SF)

12.3.1. There are no life cycle costs in this part as too many variables exist to quantify.

13. Expected End of Life (EOL) for roof restorations should be no less than 10-years if properly maintained and inspected regularly.



## Spray Applied Polyurethane Foam Roofing – (07 57 13)

1. All applicable parts of the General Roofing Specification (Section 07 30 00) shall be included in this section.
2. Assessment of Sprayed Applied Foam (SPF) Roofs
  - 2.1. A SPF Roof shall be determined as a failed roof when any of the following conditions exist throughout the roof system:
    - 2.1.1. When the existing structure is overstressed.
    - 2.1.2. When there is greater than 15% moisture within the SPF roof.
    - 2.1.3. When there is damage to the existing roof deck – rust, rot, spalling, etc.
    - 2.1.4. If the SPF roof insulation or protective coating loses adhesion to the substrate to which it is applied.
    - 2.1.5. If the protective coating turns brittle and is cracked and the SPF insulation beneath it is also cracked.
    - 2.1.6. If there is a significant loss of protective coating and the SPF insulation has severe UV damage to it.
3. Roof Slope Use as defined in Part 7, General Roofing Specification (07 30 00)
  - 3.1. A SPF roof can be used on the following slopes:
    - 3.1.1. Low slope
    - 3.1.2. Transitional slope
    - 3.1.3. High Slope, in accordance with manufacturer's limitations and testing data.
  - 3.2. All roof cricket slopes shall be twice the slope of the main roof, if possible. The roof crickets shall be constructed of polyiso insulation board.
  - 3.3. Special Conditions for slope of roof system
    - 3.3.1. The minimum slope for new building construction is ¼" unit vertical in 12" unit horizontal.
    - 3.3.2. The recommended roof slope for new roofing on existing buildings are ¼" unit vertical in 12" unit horizontal, when possible.
    - 3.3.3. The absolute minimum slope for new roofing on existing buildings is "positive roof drainage". Ponding is not acceptable. SPF insulation shall

be used to fill in low areas on existing roofs before installing the specified SPF roof system.

4. Repair or replacement of roof shall not contradict Part 6, General Roofing Specification (07 30 00).
  - 4.1. If roof does not meet condition(s) for repair, restoration or rejuvenation, a SPF roof system may be installed over the existing roof system when the following conditions are present in the existing roof system:
    - 4.1.1. There is only one roof system in place.
    - 4.1.2. There is less than 15% moisture present in the existing roof.
    - 4.1.3. The existing roof system meets wind uplift requirements. If the existing wind uplift rating is unknown, approved plates and fasteners may be installed to fasten the existing roof to the steel or plywood roof deck to achieve the required wind uplift for the existing roof system.
  - 4.2. If the SPF roof system must be replaced, the Professional Registrant shall determine if the existing SPF roof system shall be removed or can remain to save the existing R Value and have an isolation board attached over it before receiving a new roof system.
  - 4.3. Additional information, regarding what constitutes a failed SPF roof system can be found in Part 2 of this Section.
5. Demolition Requirements
  - 5.1. All items as found in Part 10, General Roofing Specification (07 30 00).
  - 5.2. No special demolition requirements for SPF roof systems.
6. Back of Parapet Wall Treatment
  - 6.1. SPF roof systems shall be spray applied to the back of parapets as required.
  - 6.2. There are no height restrictions for applying SPF roof systems to the back of parapet walls.
  - 6.3. The SPF roof insulation thickness on the back of parapets shall be one (1) inch minimum.
  - 6.4. CMU or CIP concrete parapets do not require metal counter-flashing. The SPF roof system is a self-flashing roof system.

- 6.5. Existing roofs with metal wall counterflashing shall either have the SPF terminate under the counter-flashing or fully encapsulate the metal wall flashing a minimum of four inches above the top of the parapet wall counter-flashing.
- 6.6. Back of parapet walls with stucco or synthetic wall systems shall be separated from the SPF roof system with metal flashing that counter flashes the SPF roof system.
7. High Wall Treatment
  - 7.1. SPF roof system shall be spray applied to high walls as required.
  - 7.2. There are no height limitations of SPF roof systems on high walls.
  - 7.3. If the SPF roof system is installed to a height that can be seen from the ground, the final top coat color of the protective coating shall match or blend in with existing high wall and surrounding colors.
8. SPF Roof System Components
  - 8.1. Rigid Insulation Board (Optional)
    - 8.1.1. Acceptable types are polyisocyanurate foam board and composite insulation board, thickness to be determined by the Professional Registrant. Boards may be attached by mechanically fastening or adhering the boards with low rise adhesive.
    - 8.1.2. Rigid Insulation Board is optional for use over various types of roof decks. A minimum ½" thermal barrier board shall be installed over steel decks and a minimum ¼" thermal barrier board over combustible decks before installing rigid insulation board.
  - 8.2. Thermal Barrier Board
    - 8.2.1. A thermal barrier board shall be installed over combustible deck installations where a Class A fire rating is required. Direct to combustible deck application of SPF roof system is approved if a Class B fire rating is acceptable.
    - 8.2.2. A minimum ½" thermal barrier board shall be installed over steel roof deck construction before the installation of either insulation board or SPF roof insulation.

- 8.2.3. Thermal barrier boards are not required but are optional in SPF roof system applications over existing BUR, Modified Bitumen, Metal Panel or SPF roof systems. Thermal barrier boards are not required over concrete roof decks. Thermal barrier boards are required when SPF roof systems are installed over existing Single Ply roof systems.

### 8.3. Substrate Primer

- 8.3.1. All roof top surfaces to receive the SPF roof system, with the exception of rigid insulation and factory primed thermal barrier boards shall receive substrate primer prior to the installation of SPF roof insulation or protective coating direct to the substrate.
- 8.3.2. The primer shall be as required by the roofing manufacturer issuing the roof warranty for the project and installed per manufacturer's published application instructions.

### 8.4. SPF Roof Insulation

- 8.4.1. The SPF roof insulation shall comply with ASTM C1029 Type III. The SPF roof insulation shall have a minimum Compressive Strength of 50 psi and have a flame spread of less than 75.
- 8.4.2. The SPF roof insulation shall be fire classified as part of the SPF composite roof system Class A or Class B fire rating.
- 8.4.3. The SPF roof insulation shall contain only zero ozone depleting blowing agents.
- 8.4.4. The SPF roof insulation shall be installed at a minimum thickness of 2 inches over rigids insulation board and a minimum 1.5 inches over all other horizontal roof surfaces. Vertical substrates shall receive 1-inch minimum thickness. The Professional Registrant determine the final minimum thickness to be installed.
- 8.4.5. SPF roof insulation shall be stored, transported and installed in compliance with manufacturer's instructions and prevailing statues and regulations.

### 8.5. High Tensile Acrylic Roof Coating

8.5.1. High tensile acrylic roof coating shall be internally plasticized to provide a permanently flexible waterproof coating that is fire classified by Underwriters Laboratories or a recognized fire testing agency to comply with UL 790 or ASTM E-108 Class A or Class B as required. The high tensile acrylic coating shall meet all the requirements of ASTM D6083 and comply with the following physical performance property requirements:

Volume Solids >50%	ASTM D2697
Initial Elongation 340% minimum	ASTM D2370
Initial Tensile Strength 350 psi minimum	ASTM D2370
Final % Elongation 100%	ASTM D2370
Tear Resistance >100 lbf/in.	ASTM D624
Solar Reflective Index (Initial) >100	ASTM E1980
Solar Reflective Index (3 Year) >85	ASTM E1980
Adhesion 2.0 PLI minimum	ASTM D903 or C794

8.5.2. No Private Label Products or Manufacturers allowed.

8.5.3. The SPF High Tensile Single Lock Granule roof system shall have a minimum twenty (20) year, no dollar limit (NDL) material and labor warranty to be provided by the roofing manufacturer.

8.5.4. A two (2) year minimum material and labor warranty shall be provided by the Roofing Contractor.

8.5.5. The minimum dry mil thickness of the high tensile acrylic roof shall be 40 on both horizontal and vertical surfaces. The coating shall be applied in a minimum of 4 separate applications. Each successive coat shall be applied in a direction perpendicular to the previous coat. The first coat and second shall be applied to achieve 24 dry mils. # 11 size roofing granules shall be broadcast into the wet second coat at the rate of 35 lbs. per 100 square feet. Once the second coat has cured, any loose granules shall be removed and the third coat spray applied and back rolled at 12 dry mil thickness. The fourth application shall be applied to achieve 8 dry mils. Third and fourth coats shall be white in color.

Coating shall terminate a minimum of 2 inches past the termination of the SPF roof insulation.

- 8.5.6. Roof top areas at egress points, walkways and around roof top equipment to be serviced shall receive a double lock granule system. The additional material to be installed on top of the completed single lock SPF roof system shall consist of an additional 8 dry mils of coating with 35 lbs. per 100 square feet of # 11 granules broadcast into the wet coating. Once the coating has cured, any loose granules shall be removed and two additional applications of coating installed to fully encapsulate the second layer of granules. The encapsulation coats shall result in 20 dry-mil thickness of coating over the second layer of granules.

#### 8.6. Roof Mounted Equipment / Accessories

- 8.6.1. All materials to be compatible with SPF roof system materials.
- 8.6.2. All roof top mounted curbs and penetrations shall be a minimum of 8 inches above the height of the finished roof surface.

#### 9. Closeout Documents

- 9.1. All items found in Part 16, General Roofing Specification (07 30 00).

#### 10. Preventative Maintenance Criteria

- 10.1. All items found in Part 17, General Roofing Specification (07 30 00).
- 10.2. Roof System Manufacturer shall provide school roof maintenance personnel training in the proper inspection and housekeeping procedures for the SPF roof system on an annual basis for the entire warranty period. Any deficiency observed during the annual inspection shall be documented and reported in writing to the SFB for either warranty or non-warranty repair.

#### 11. Budgeting Cost Ranges

- 11.1. This part shall apply only to SFB budgeting and economic projections and analysis. Not to be used for anything else
- 11.2. Budget Cost Range
  - 11.2.1. Low-Range \$5.50 - \$7.50 per square foot
  - 11.2.2. Mid-Range \$7.00 - \$9.00 per square foot

11.2.3. High-Range \$8.00 - \$20.00 per square foot

11.3. Life Cycle Costing Estimates (per year per SF)

11.3.1. Years 0 – 5 \$0.00

Years 5 – 10 \$.005 per square foot per year

Years 11-20 \$.01 per square foot per year

Recoat at 20 Years \$2.00 - \$3.50 per square foot for a new 10 – 20 Year

Manufacturer NDL Warranty

12. Expected End of Life (EOL) for SPF Roof System exceeds 40 Years based on historical data for SPF Roof Systems installed in Arizona

13. PM Criteria for SPF Roof Systems

13.1. In addition to the PM Criteria described in the General Roofing Specification (07 30 00), the roof shall be inspected one time per year by the roof manufacturer for the length of the warranty.

