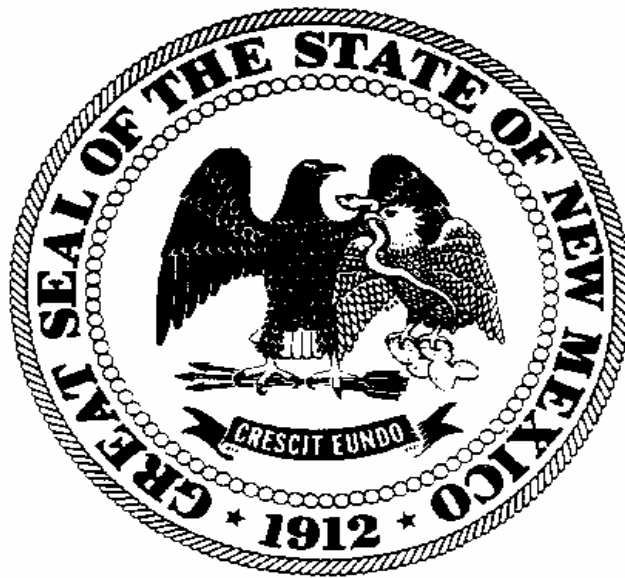




# **State of New Mexico Public School Facilities Authority Roofing Program Handbook**



**For New Roofing, Re-roofing, and Roofing Repair Projects**

**January 1st, 2021**





**Table of Contents**

**I.** INTRODUCTION.....5

**II.** DEFINITIONS & CAPITALIZATION.....6

**III.** ROOFING CONSULTANT SERVICES – GENERAL.....8

**IV.** MANUFACTURERS ACCEPTANCE INTO THE PSFA ROOFING PROGRAM.....9  
 Table 1 – Manufacturer’s Acceptance into PSFA Roofing Program Procedures.....12

**V.** MANUFACTURER’S CERTIFICATION OF INDIVIDUAL PROJECTS.....13

**VI.** PRE-DESIGN PHASE .....14  
 Table 2 – Pre-Design Phase Procedures.....16

**VII.** DESIGN DEVELOPMENT & CONSTRUCTION DOCUMENT PHASE.....17  
 Table 3 – Design Development & Construction Phase Procedures.....20

**VIII.** BID & CONSTRUCTION ADMINISTRATION PHASE.....21  
 Table 4 - Bid & Construction Administration Phase Procedures.....23

**IX.** OTHER RELEVANT ROOFING ISSUES.....24  
 Environmental and health issues  
 Asbestos  
 Mold VOCs  
 Roofing odor  
 Sustainable design  
 Highly-reflective roofs  
 Green roofs  
 Solar collectors

**X.** CODES AND STANDARDS.....25  
 Codes  
 Standards

**XI.** DESIGN CRITERIA.....26  
 Introduction  
 Roofing assembly and system components  
 Roof decks (PSFA Guide Specifications)  
 Metal deck  
 Light-Weight Concrete (LWC)



- Cementitious Wood Fiber (CWF)
  - Wood Deck
  - Roof deck (Others)
  - Air barrier
  - Vapor retarder
  - Rigid insulation
    - Perlite
    - Polyisocyanurate
    - Molded Expanded Polystyrene (EPS)
    - Extruded Expanded Polystyrene (XEPS)
    - Composite boards
  - Non-rigid insulation Low-slope roof coverings
    - Built-up roofs (BUR) Modified bitumen (MB)
    - Single-ply – Ethylene propylene diene monomer (EPDM)
    - Single-ply – Polyvinyl chloride (PVC)
    - Single-ply – Thermoplastic polyolefin (TPO)
  - Steep-slope roof coverings
    - Standing seam sheet metal roofing
- System selection criteria
  - System degradation and failure
  - Nearby school roofs
  - Life-cycle cost
  - Warranty Sustainable roof design
- Specific design recommendations
  - Slope
- HVAC equipment
- Roof-mounted solar panels
  - Penetrations
  - Parapet coping
  - Interior gutters
  - Roof drain discharge
  - Walkway pads
  - Pipes & conduits
  - Access ladders
  - Exposed steel

**XII. ADDITIONAL RESOURCES.....34**

- Manuals
- Periodicals



## I. INTRODUCTION

- A.** This PSFA Roofing Program Handbook, referred to throughout as the “Handbook” outlines the Public School Facilities Authority’s (PSFA) requirements, procedures, and design criteria for roof construction on new and existing buildings. The goals of the PSFA Roofing Program are the following:
1. Ensure proper roof design
  2. Ensure proper construction documentation
  3. Achieve correct installation
  4. Obtain valid warranties from installer and manufacturer.
- B.** Revisions to the handbook will be noted on the Record of Changes page as they occur. It is the Design Professional’s responsibility to use the most current version of the Roofing Program Handbook and to check for revisions prior to issuing the final bid documents.



## II. DEFINITIONS & CAPITALIZATION

- A. For purposes of this Handbook, the following definitions shall apply throughout and to all attachments incorporated herein, unless otherwise noted:
1. **Adequacy Planning Guide:** The companion document to the Public School Capital Outlay Council Statewide Adequacy Standards (6.27.30 NMAC) provided by the state of New Mexico for use in the programming and design of new projects to meet adequacy (document available at [www.nmpsfa.org](http://www.nmpsfa.org)).
  2. **Agreement:** The Agreement Between the Owner and the Design Professional applicable to the Project
  3. **CIMS:** PSFA's Internet/Web-based Construction Information Management System.
  4. **Design Professional (DP):** The legal entity qualified to do business in State of New Mexico that employs an individual or individuals licensed to practice the discipline or disciplines for the services to be performed under the Agreement.
  5. **HVAC & Controls Performance Assurance Program:** The PSFA program integrated into all phases of the Project with an Owner-provided contractor, for assurance and documented verification that HVAC and control systems for a school facility meet PSFA standards for acceptability, are installed and operating properly, and fulfill the functional and performance requirements of the design intent (document available at [www.nmpsfa.org](http://www.nmpsfa.org)).
  6. **Owner:** The Owner, when referred to as if singular in number in this Handbook, shall be interpreted as meaning both the School District and the Public School Facilities Authority (PSFA).
  7. **Regional Manager (RM):** PSFA project manager assigned to the District and representing PSFA Owner on the project. The RM initiates Roof Consultant proposals for the project and acts as the contractual liaison between the Roofing Consultant, all parties of the Agreement, and the contractor.
  8. **Request for Approval of School Construction (PSFA Form RASC):** The phased construction documents approval process with each phase required to be approved prior to proceeding to next appropriate design phase and finally PSFA Approval of School Construction (ASC), required prior to the Central Purchasing Office advertisement to bid or purchase of the project.
  9. **Roofing Consultant (RC):** The Owner's separate consultant providing



optional pre- design services, optional design review services, and routine field observation services on the Project scope of work involving roofing.

10. **Roofing Guide Specifications:** The PSFA Roofing Guide Specifications are provided by PSFA to the Design Professional on PSCOC-funded roofing projects. They are intended to be edited by the Design Professional for each project (documents available at [www.nmpsfa.org](http://www.nmpsfa.org)).
  11. **Roofing Manufacturer (MFR):** Also referred to as the “manufacturer”, is any one of the acceptable roofing system manufacturers listed on the PSFA website ([www.nmpsfa.org](http://www.nmpsfa.org)).
  12. **Roofing Production Rates:** Number of consecutive calendar days by which the Contractor is obligated to complete all roofing work on the project, including punch list. The number of days is included on the Bid Form for the project by the Design Professional and is only applicable to re-roofing projects.
  13. **Roofing Program:** The PSFA Roofing Program is the system of complementary procedures, specifications, forms, and guidelines, including this Handbook that shall be utilized by the Design Professional, Roofing Consultants, and Owner on PSCOC-funded roofing projects. The Contractor’s responsibilities are specified in the Contract Documents.
  14. **Roofing System Manufacturer’s Certificate (PSFA Form RSMC):** An acknowledgement signed by the authorized representative of each manufacturer listed in a specification that their technical staff has reviewed drawings and specifications submitted by the Design Professional during the design phase for an individual project, and that they comply with the manufacturer’s requirements for signing the RSMW. The RSMW is included as the final page of each PSFA roofing guide specification section *for the Design Professional’s use*.
  15. **Roofing System Manufacturer’s Warranty (PSFA Form RSMW):** A special PSFA warranty form signed by manufacturers participating in the PSFA Roofing Program. It provides a standard warranty on all PSFA roofing work for a period of 20 years. The RSMW form is included at the end of each PSFA roofing guide specification section for the Design Professional’s use.
- B.** Terms capitalized in this Handbook include those which are (1) specifically defined, (2) the titles of numbered sections or (3) the titles of other documents published by PSFA.



### III. ROOFING CONSULTANT SERVICES – GENERAL

- A. The PSFA has contracted several roofing consulting firms to provide roofing consultation and construction observation services on PSCOC-funded projects. A list of these consultants appears on the PSFA web site, [www.nmpsfa.org](http://www.nmpsfa.org) along with region map and contact information. PSFA solicits proposals from the Roofing Consultants assigned to the region in which the project is located and contracts for their services as needed for the project and as generally described in the Handbook.
- B. Basic responsibilities of the Design Professional related to Owner-provided consultants, including the Roofing Consultant are addressed within the standard PSFA Owner - Design Professional Agreement and within this Handbook. Contractor's responsibilities are covered within the current version of PSFA's standard Division 00 and Division 01 contract documents. The typical role of the Roofing Consultant as applied to a normal project is outlined in this Handbook and is governed by their applicable professional services contract with PSFA.
- C. Owner's separate contracting of Roofing Consultant and observation services on the Project does not release the Design Professional from the rights or responsibilities established by the Agreement Between the Owner and the Design Professional applicable to the Project. The Design Professional must apply professional judgment in considering the recommendations made by the Roofing Consultant and observations of the Roofing Observer, and act in accordance with the Agreement.





#### IV. MANUFACTURERS ACCEPTANCE INTO THE PSFA ROOFING PROGRAM

- A. PSFA maintains the current list of manufacturers whose systems and products have been generally accepted for use in the PSFA Roofing Program. The current list is located on the PSFA website, [www.nmpsfa.org](http://www.nmpsfa.org).
- B. PSFA will semi-annually review current and new manufacturers, their systems and products, for inclusion on the list. The list will be updated when appropriate.
- C. Only manufacturers named on the current approved list shall be considered acceptable for inclusion within the Contract Documents unless the following conditions exist on an individual project:
  1. The manufacturer declines to certify that his system and products will meet the warranty requirements due to the individual project conditions, circumstances, or design, OR:
  2. The Design Professional provides in writing, to the Owner, detailed reasons related to the Design Professional's professional judgment, for not specifying the manufacturer's system on the project, OR:
  3. The District Owner or PSFA develop concerns about specifying the manufacturer on the individual project;  
*AND, IF #1, #2 OR #3 APPLY:*
  4. The District Owner and PSFA mutually make the decision that the manufacturer should be removed from the list for this individual project, which the Design Professional documents accordingly within the project record.
- D. Manufacturer's acceptance into the PSFA Roofing Program is contingent upon the following criteria:
  1. The manufacturer, if accepted, and in good faith, agrees to be removed from the current approved list upon default on any of the acceptance criteria of this section.
  2. Roofing systems(s) proposed by the manufacturer for standard use on PSFA projects are evaluated and accepted by PSFA based, at minimum, on the following submittals provided by manufacturer.
    - a. Referenced by specification section number, provide manufacturer's guide specifications, standard details and standard installation instruction for the roof system(s) proposed
    - b. Referenced by specification section number and paragraph number, provide;
      - Material product data sheets for each product(s) proposed
      - Evidence that the proposed product(s) meet the specified product standard(s)
      - MSDS for each product(s) proposed



3. The manufacturer shall have at least the minimum amount of experience in production of the system in compliance with the standard PSFA guide specification requirements.
4. The manufacturer provides sufficient training and oversight for their approved installers and has approved installers available for work to be performed within the State of New Mexico. These installers shall have at minimum the level of installation experience required by the standard PSFA guide specifications.
5. The manufacturer provides basic preventive maintenance instruction to District maintenance personnel at final acceptance of project.
6. The manufacturer has staff to review plans and specifications.
7. The manufacturer agrees to have a technical representative available to perform required inspections of roofs during installation and at completion.
8. The manufacturer reviews and accepts language of standard PSFA guide specification section(s) related to the generic system(s) they provide, including, but not limited to the PSFA standard section for sheet metal flashing and trim.
9. The manufacturer reviews and accepts the contents of the PSFA Roofing Program Handbook and agrees to cooperate in the area of manufacturer's responsibilities.
10. The manufacturer agrees to sign the PSFA "Roofing System Manufacturer's Warranty" (RSMW) on projects that receive their certification
11. The manufacturer has proven capacity and agrees to respond promptly and effectively to warranty repair and defect notifications.
12. The manufacturer agrees to utilize the PSFA CIMS Internet/Web based Construction Information Management System to the greatest extent possible in accordance with Paragraph IV-E below.

**E.** Communication utilizing the PSFA Internet/Web-based Construction Information Management (CIMS) System is a requirement of manufacturer's acceptance into the PSFA Roofing Program. The approved manufacturer shall, if needed, and within seven (7) days of notification of approval for listing in the Program, schedule PSFA training of technical department personnel on the use of PSFA-CIMS for the review of ninety-five percent complete contract documents on individual projects. The manufacturer will also be required to use PSFA-CIMS for relevant communications during the general development of the contract documents and for project administration during construction of the project along with the contractor, Design Professional, Roof Consultant, and Owner. The manufacturer shall:

1. perform all roofing related project communications through the PSFA-CIMS and load all roofing-related design and construction documents into PSFA-CIMS;



2. have access to the Internet and an Internet e-mail address, of their own choice, and provide to the PSFA the names, positions, and e-mail addresses of all individuals who will have access to the PSFA-CIMS;
3. have adequate computing hardware to run PSFA-CIMS and;
4. have installed Adobe Acrobat 7.0 or higher, pdf converter or equal; and,
5. optionally have, but not required to have, the ability to send images as an email attachment.

For PSFA-CIMS information on installation and use of the PSFA-CIMS or for scheduling training contact the PSFA-CIMS administrator at (505)843-6272 or e-mail question to techsupport@nmpsfa.org and include 'PSFA-CIMS support' in subject line.

- F.** The initial general acceptance of manufacturers by PSFA and the establishment of a list of such manufacturers do not release the Design Professional from any rights or responsibilities established by the Agreement Between the Owner and the Design Professional applicable to the Project. The Design Professional must apply professional judgment in verifying the acceptability of each manufacturer listed for each system specified on the Project and act or make recommendations to the Owner in accordance with the Agreement.
- G.** A manufacturer's final acceptance within a project specification is contingent upon the final decision of the Design Professional, District Owner, and PSFA. A manufacturer's initial listing as an acceptable manufacturer does not constitute or imply PSFA's blanket endorsement of the manufacturer's systems or products. The manufacturer is not permitted to publish statements that indicate or imply PSFA blanket endorsement of their systems or products.
- H.** Table 1 lists the interactions and responsibilities between parties involved in the manufacturer acceptance process. Responsibilities are designated "**L**ead" for the entity with primary responsibility for the activity; "**S**upport" for other parties who are to provide active cooperation, technical advice, and defined assistance to the Lead entity; and "**P**articipate" for others who are involved in the process on an as-needed basis and are to be kept informed of progress and decisions.

(See next page for Table 1)



**Table 1 – Manufacturer’s Acceptance into PSFA Roofing Program Procedures**

**Key:**

**L = Lead**

**S = Support**

**P = Participate**

	<b>Task / Deliverable</b>	<b>PSFA</b>	<b>District</b>	<b>DP</b>	<b>R C</b>	<b>MFR</b>	<b>Contr.</b>
1	Submit required documentation to PSFA to be accepted into program.	S			P	L	
2	Review application(s), request additional info. and recommend PSFA action	S			P		
3	Respond to any requests for additional information from PSFA.	S			S	L	
4	Obtain final decision on acceptance and communicate in writing to mfr.	L			S		
5	Revise PSFA current list of accepted manufacturers as necessary.	L			S		
6	Manage compliance with requirements of PSFA roofing program.	L	P	S	S	S	
7	Refer future requests from manufacturers for acceptance into program to PSFA.	P	S	S	S	P	



## V. MANUFACTURER'S CERTIFICATION ON INDIVIDUAL PROJECTS

- A. Manufacturer's responsibilities (General):** To be listed in the final specification on any PSFA project, PSFA-listed manufacturers will be responsible for approving the following:
1. Design Professional's roofing drawings and specifications prior to bidding.
  2. Roof system components necessary to meet warranty requirements.
  3. Roof system installers.
  4. Roofing-related shop drawings submitted by contractor.
  5. Installation prior to issuance of final warranty.
- B. Manufacturer's responsibilities (RSMC):** See Section VII for specific certification procedures for individual projects to be followed prior to bid.



## VI. PRE-DESIGN PHASE

- A. Initiating Roofing Consultant services:** It is the PSFA RM's responsibility to solicit a proposal from the Roofing Consultant if one is to be employed during this phase by the Owner for the project. The RM will furnish necessary RC contact information to the Design Professional after the Agreement is executed and the RC is under contract.
- B. Review of PSFA Roofing Program documents and related information:** The Design Professional must obtain and review the most current complete copies of the PSFA Roofing Program documents prior to designing the roof. Consult "Appendix B – PSFA Design Guidelines for HVAC and Controls" in the PSFA HVAC & Controls Performance Assurance Program Manual for roof-mounted HVAC equipment commentary.
- C. Investigation and sampling for re-roofing projects:** Re-roofing projects will require that a diligent examination and analysis of existing conditions related to roofing be performed. Roofing Consultant, if employed by the Owner for this phase shall, under the direction of the Design Professional and with the assistance of the Owner, perform a thorough on-site survey to document existing design conditions, including:
1. Identification and assessment of membrane, insulation, deck, location of blisters, splits, bare felts, open flashings, or seams, and other defects. **Note: Roofing Consultant is responsible for making test cuts at the direction of the Design Professional and providing a written analysis to the Design Professional and Owner.**
  2. Determination of existing deck general capacity to serve as substrate for attachment of new system components. **Note: Roofing Consultant is responsible for performing pull-out tests at the direction of the Design Professional and providing a written analysis to the Design Professional and Owner.**
  3. Determination of existing slope and location of areas lacking positive drainage.
  4. Description and condition of all items penetrating through, or lying on roof such as pipes, ducts, and conduit.
  5. Description and condition of drains, scuppers, gutters and downspouts.
  6. Description and condition of curbs and equipment.
  7. Description and condition of wall surfaces above and adjacent to roof, counter flashings, reglets, coping, expansion joints, windows, and other components that might contribute to existing or future leaks into the roofing system below.
- D. Test cuts and Roofing Consultant report:** PSFA requires test cuts on existing roof systems prior to design on re-roofing projects. The party making the test cuts shall be responsible for repairing the subsequent holes. The Design Professional



shall decide on approximately where and how many test cuts are to be made. The test cuts must be performed under the supervision of the Design Professional and executed by Owner's maintenance personnel, roofing contractor, or consultant to determine the following about the existing roof system:

1. Type of roofing material and number of roofing systems in place.
  2. Condition of existing system, including moisture content, insulation attachment method and condition, and membrane attachment to insulation.
  3. Insulation type, thickness, and number of layers.
  4. Type and condition of deck.
  5. Estimate of quantities of damaged or otherwise unsuitable insulation and decking.
  6. Condition of wood nailers, edge blocking, and curb, and estimate of amount requiring replacement.
- E.** The Design Professional shall determine allowable roof system load on existing roof deck and structure on re-roofing projects.
- F.** On re-roofing projects, the Design Professional shall do pre-design investigation to determine the condition of all roof top HVAC and electrical equipment, ductwork, conduits, piping, vents, etc. in terms of functionality, water-tightness, code issues, mounting heights and flashing conditions. Adjacent wall surfaces, windows, etc. above the roofing surface shall be inspected for their potential as sources of leaks. Existing conditions in these areas shall be addressed as necessary by the design to ensure that they do not ultimately impact the new roofing or the existing operability of functioning building systems in a negative manner.
- G.** Table 2 lists the interactions and responsibilities between parties who are part of the project team. Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**S**upport” for other parties who are to provide active cooperation, technical advice, and defined assistance to the Lead entity; and “**P**articipate” for others who are involved in the process on an as-needed basis and are to be kept informed of progress and decisions. **Note: If Owner's Roofing Consultant has performed pre-design evaluation of existing roof prior to contracting the Design Professional, the Design Professional shall have the opportunity to order further investigation prior to design.**

(See next page for Table 2)



**Table 2 – Pre-Design Phase Procedures**

**Key:**

**L = Lead**

**S = Support**

**P = Participate**

	<b>Task / Deliverable</b>	<b>PSFA</b>	<b>District</b>	<b>DP</b>	<b>R C (if req'd)</b>	<b>MFR</b>	<b>Contr.</b>
1	Solicit proposal from and contract with Roof Consultant (if required for this phase)	L	P	S	S		
2	Review latest PSFA guidelines and standard documents related to roofing	S	P	L	S		
3	Coordinate existing conditions investigation and direct sampling on re-roof projects	S	P	L	S		
4	Issue roof condition reports to project team on re-roof projects	P	P	S	L		





## VII. DESIGN DEVELOPMENT & CONSTRUCTION DOCUMENT PHASE

- A. System selection:** The Design Professional shall select the system that best fits the building, deck type and slope, project requirements, project conditions, and budget. Promptly notify the RM if the generic system recommended is not one for which standard PSFA roofing guide specifications are written.
- B. PSFA standard documents:** Verify with PSFA that you have a current PSFA Roofing Program Handbook and a current copy of the standard PSFA guide specifications applicable to system selected. Obtain advance PSFA approval to proceed with specification of generic system type(s) not covered by PSFA standard roofing guide specifications.
- C. Project contract documents:** The contractor's responsibilities for the construction are defined by the contract documents. The development of project specifications and drawings by the Design Professional needs to consider the following:
1. **Specifications:** Special standard provisions are contained within PSFA Divisions 00, 01, and 07 guide specification sections which pertain to coordination and scheduling of roof observation services provided by Owner, roofing production rates required by contract, and other criteria related to the PSFA Roofing Program. Edit specification section(s) for project and in accordance with guide text contained in document. Submit to Owner for review at each design submittal review phase. Incorporate Owner comments as necessary or provide written explanation to Owner why comments and recommendations cannot be complied with.
  2. **Drawings:** The Design Professional must determine what details are needed and design them appropriately for project conditions. A properly drawn set of drawings should include the following:
    - a. **Roof plan:** The roof plan should be drawn at a scale large enough to clearly convey information. It should show all penetrations, expansion/control joints, rooftop equipment, slope, and reference all details. Fastener patterns for specific wind-uplift areas need to be indicated.
    - b. **Details:** Details should be drawn to scale large enough to convey the necessary information. Typical and unique conditions where the roof terminates at an edge or at other surfaces need to be detailed. Details where roof intersects walls or parapets or other items need to accommodate insulation at points of highest thickness. All typical and special flashing conditions related to curbs, pipe penetrations, supports, etc. require detailing. Standard details from manufacturer must be modified to address actual design conditions. *The NRCA Roofing and Waterproofing Manual* and *The Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)* provide standard details that are widely accepted and can be used or adapted for a variety of conditions.



**D. Design Professional’s responsibilities (RSMC):** The Design Professional shall electronically upload *.pdf* roofing drawings, specifications, and a “Roofing System Manufacturer’s Certificate” (PSFA Form RSMC) with the heading filled in, for review by each manufacturer’s technical review department. Use the current list of the PSFA Roster of Accepted Manufacturers for a list of the manufacturers of the generic system specified and notify each manufacturer listed that the documents are available for review on the specific project. Note: Submissions and all review communications shall be filed electronically through the PSFA CIMS Internet/Web-based Construction Information Management System.

1. After receiving 95% construction document review comments from Owner, expedite completion of roofing contract documents ahead of all other areas of work unless instructed otherwise by PSFA. Submit the review package containing all pertinent roofing information, including necessary corrections to the manufacturers’ technical departments through PSFA CIMS.
2. Have Owner review any requested changes to construction documents requested by manufacturer(s) on RSMC. Make all changes mutually agreed to and re-submit revised construction documents for approval by manufacturer(s) within 7 calendar days after receipt of manufacturers’ comments. All other reviewing manufacturers, RM, and Roof Consultant shall be copied on final changes to the documents. The Design Professional shall have approved RSMCs from a minimum of three manufacturers listed in specification prior to release of construction documents for bid. The RM shall be notified promptly if this appears unlikely to be accomplished. All communications shall be performed through PSFA CIMS.
3. Include all manufacturers into the project specifications who have returned fully-executed RSMC forms prior to bid (See also “Bid and Construction Administration Phase”).

**E. Manufacturer’s responsibilities (RSMC):** On an individual project, the PSFA-listed manufacturer shall be responsible for the following prior to bidding:

1. Indicate clearly on PSFA Form RSMC all construction document modifications or additional information necessary in order to conform to the manufacturer’s requirements, and forward to Design Professional as “requiring action”.
2. When all necessary revisions have been made to the construction documents, state that they meet the manufacturer’s project requirements and that if installed properly by an approved contractor, a PSFA Form RSMW will be executed as the warranty.
3. When review is complete, return the executed RSMC form(s) to the Design Professional within 10 calendar days after receipt of the package. Copy the Owner’s RM. The completed form(s) shall be submitted both



electronically and by hard copy with original signature.

- F. Roofing production rates:** On re-roofing projects, the Design Professional is required to state in the contract documents the maximum number of consecutive days by which all roofing is to be completed by the contractor. This quantity is to be included on the bid form.
- G. Owner's Roofing Consultant:** The Owner, at his option, may choose to employ a Roofing Consultant for services related to any portion of this phase of the project. The Design Professional shall cooperate with the Roofing Consultant and ensure their participation in design reviews and other project communications to the extent communicated to them by the Owner and covered by the Agreement.
- H.** Table 3 lists the interactions and responsibilities between parties who are part of the project team. Responsibilities are designated "**L**ead" for the entity with primary responsibility for the activity; "**S**upport" for other parties who are to provide active cooperation, technical advice, and defined assistance to the Lead entity; and "**P**articipate" for others who are involved in the process on an as-needed basis and are to be kept informed of progress and decisions.

(See next page for Table 3)



**Table 3 – Design Development (DD) & Construction Document Phase Procedures**

**KEY:**

**L = Lead**

**S = Support**

**P = Participate**

	<b>Task / Deliverable</b>	<b>PSFA</b>	<b>District</b>	<b>DP</b>	<b>R C (if req'd.)</b>	<b>MFR</b>	<b>Contr.</b>
1	Select system type(s) for use on project.	P	P	L	S		
2	Obtain current list of PSFA-listed manufacturers	S	P	L	S		
3	Obtain current PSFA standard guide specification for roof system(s).	S	P	L	S		
4	Develop roof drawings & details.	P	P	L	S		
5	Edit standard PSFA guide specs for roofing on project.	P	P	L	S		
6	Submit 95% roofing contract documents to Owner for review. Make necessary revs.	S	S	L	S		
7	Submit corrected 95% contract doc package with RSMC form to all manufacturers listed for system(s) specified.	P	P	L	S	S	
8	Review 95% contract doc package & return approved RSMC to DP & RM.	P	P	S	S	L	
9	Revise and re-submit 95% roofing contract doc package to manufacturer(s), if necessary for RSMC approval by mfr.	P	P	L	S	S	
10	Finalize list of manufacturers in project specifications based on approved RSMCs.	P	P	L	S	P	
11	Make final check that changes required by spec'd manufacturers are incorporated prior to bidding.	P	P	L	S	P	
12	Include on Bid Form the project 'Roofing Production Rate' (re-roof projects)	P	P	L	S	P	



## VIII. BID & CONSTRUCTION ADMINISTRATION PHASE

### I. Manufacturer's certification during bid period:

1. Approved RSMCs received from PSFA- listed manufacturers during bid period and before deadline for receiving requests for prior approvals shall qualify the manufacturer to be included within an addendum.
2. No requests for prior approvals submitted by non-PSFA-listed manufacturers shall be considered during the bid phase. The Design Professional shall return the request for prior approval to the submitting manufacturer without action. Design Professional may direct non-listed manufacturers to PSFA for information on the manufacturer acceptance process.

### J. Field Observation: The Owner will contract with a Roofing Consultant to provide field observation services on the project. The degree and frequency of these services will be established by an agreement between the Owner and the consultant and will vary depending on the type of roofing project and its complexity. The roof observer should:

1. Be provided by the Design Professional with complete field set of contract documents.
2. Be provided with a copy of all roofing submittals sent in by the contractor for review, and a final copy of these same submittals after approval by Design Professional. These shall include submittals that are related to roof top accessories, skylights, and mechanical and electrical equipment items which are to be mounted, flashed, or otherwise accommodated into the roofing system.
3. Be provided with copies of all contract changes related to the roof.
4. Attend the pre-roofing conference and all job meetings during roofing.
5. Verify that materials delivered to site are those identified by approved submittals, and that all required labels are on materials as specified.
6. Verify that any fastener pull-out tests are performed properly and that results are acceptable.
7. Notify contractor immediately if any stored materials or wheel loads on the roof appear to exceed acceptable limits.
8. Notify Design Professional directly if contractor is noticed making field changes contrary to the contract documents. Inform contractor that Design Professional is being notified and reasons for notification.
9. Write daily reports and give them promptly to the contractor and Design Professional. Copy Owner.

### K. Table 4 lists the interactions and responsibilities between parties who are part of the project team. Responsibilities are designated “**L**ead” for the entity with primary responsibility for the activity; “**S**upport” for other parties who are to provide active cooperation, technical advice, and defined assistance to the Lead entity;



and “**P**articipate” for others who are involved in the process on an as- needed basis and are to be kept informed of progress and decisions.

(See next page for Table 4)



**Table 4 – Bid & Construction Administration Phase Procedures**

**KEY:**

**L = Lead**

**S = Support**

**P = Participate**

	<b>Task / Deliverable</b>	<b>PSFA</b>	<b>District</b>	<b>DP</b>	<b>R C</b>	<b>MFR</b>	<b>Contr.</b>
1	Revise roofing contract docs via addendum when appropriate	P	P	L	S	P	P
2	Refer prior approval requests from non-PSFA listed roofing mfrs to PSFA.	S	P	L	S	P	P
3	Respond to prior approval requests from non-PSFA listed roofing mfrs.	S	P	L	S		
4	Analyze bids and recommend regarding acceptability of roofing portion of bid to PSFA & District	P	P	L	S	P	P
5	Organize and participate in Pre-Construction Conference.	P	P	L	P	P	S
6	Request proposals from RC for roofing observation services	L	P	S	P		S
7	Review contractor’s submittals for roofing	P	P	L	S	S	S
8	Organize & participate in Pre-Roofing Conference	P	P	S	S	S	L
9	Provide enhanced level of roofing observation services per contract with Owner	S	P	S	L	P	P
10	Administer roofing observation services contract performed by RC for Owner	L	P	S	P		
11	Perform required mfr. inspections during installation	P	P	P	P	L	S
12	Perform final inspection for warranty acceptance	P	P	S	S	L	S
13	Complete project closeout requirements as specified in contract documents	P	P	P	P	S	L
14	Provide basic preventive maintenance training to Owner’s personnel for roof system.	P	P	P	P	L	S



## IX. OTHER RELEVANT ROOFING ISSUES

### A. Environmental and health issues:

1. Asbestos-containing roofing materials: If, during the investigation and sampling of existing roofing, suspected asbestos-containing materials are encountered, coordinate with Owner for proper inspection and sampling of such materials.
2. VOCs: Volatile organic compounds (VOCs) within roofing products such as solvents have been reduced over recent years due to environmental concerns. It is incumbent upon the designer to research the different characteristics and be aware of application requirements for water-based materials that have replaced VOC-containing roofing products.
3. Roofing odor: Odors from hot asphalt and other roofing adhesives are typical cause of complaints from building occupants on school re-roofing projects. It is important that roofing kettles be located away from open windows, ventilation intakes, and doorways when school is in operation. Specifying low-odor asphalt or using appropriate non-adhered systems may be considered when roofing during the school year is unavoidable.
4. Sustainable roofing: The recent trends towards environmental sustainability and related programs such as LEED have impacted the area of roofing as with most building systems and components. Highly reflective roofing and green roofs are all developments which affect the roof system design. Although green roofs are not typically used on New Mexico K-12 schools, highly-reflective roofs are not uncommon and there is growing potential for the installation of roof-mounted solar panels. In specifying highly-reflective roofs, the designer shall ensure that the climatic conditions of the school location are factored into the decision to use such a roof. Some colder locations in the state do not necessarily benefit significantly from such roofs due to the amount of heating required during the school year.





## X. CODES AND STANDARDS

- A. Codes:** The State of New Mexico has adopted the 2015 version of the *International Building Code (IBC)*. The code has many provisions related to roof systems, including some for re-roofing projects. The roof designer must carefully consider the requirements of the building code which may vary from or exceed those of the roof system manufacturer. *IBC* has construction documentation requirements in sections 106.1.1 and 1603.1.4 (2015 edition).
- B. Standards:**
1. ASTM: Many standards pertaining to roofing systems are by *ASTM*. These *ASTM* standards primarily cover test methods (laboratory and field) and products.
  2. ANSI: *ANSI* standards exist for mainly wind design, testing, and performance of certain roof system components. Design roof edge systems in accordance with *ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems* as referenced by the building code.
  3. Underwriters Laboratory (UL): *UL* has developed a number of standards pertaining to test methods for roofing systems.
  4. FM Global: Although *FM Global* ‘standards’ have become regularly included on past roofing projects, *PSFA* does not now include them in the standard *PSFA* guide roofing specifications. Conformance with *FM* requirements is not necessary on New Mexico public school district-owned buildings.



## XI. DESIGN CRITERIA

**A. Introduction:** The purpose of this section is to provide design guidance to architects designing low and steep-slope roof assemblies on New Mexico K-12 public school buildings.

Low-sloped roofs are defined as those roofs with a slope less than or equal to 3:12 (25 percent). With the exception of metal roofs, most low-slope roofs have a slope at, or close to ¼:12 (2 percent) minimum. Steep-slope roofs are defined as those sloped greater than 3:12 (25 percent). Some materials can be used on both low- and steep-sloped roofs, while others are limited by slope criteria.

1. **Scope:** The following sections cover a range of roofing topics and are intended to help guide the designer in selecting the appropriate system, developing proper contract documents, and considering related issues. This guide only gives a relatively brief overview of roofing design while concentrating on special criteria applicable to New Mexico K-12 public school buildings. The Design Professional on PSFA projects has the advantage of utilizing the owner-provided Roofing Consultant as a resource; however it does not eliminate the need for having a basic understanding of roof assembly components and system options. It is hoped that the Design Professional doing roofing design work for PSFA will strive to expand their roofing knowledge and skills on their own.
2. **Process:** The initial phase of a roofing project is concentrated on selecting the appropriate system(s). The specifics of the selected system then must be communicated through the development of correct, clear, complete, and concise contract documents. Once the project is in the construction phase, efficient and effective construction administration is essential to a successful result in the roofing work.

**B. Roofing assembly and system components:** The term *roof assembly* refers to the combination of roof deck, air or vapor retarder (if existent or required), roof insulation (if existent or required), and the roof covering. The term *roof system* refers to the air barrier or vapor retarder (if existent or required), roof insulation (if existent or required), and the roof covering. The following is a brief discussion of the components which comprise roof assemblies and systems typical for most New Mexico K-12 public schools:

1. **Roof decks (PSFA Guide Specifications):** The PSFA guide roofing specifications are developed around four basic roof deck types:
  - a. **Metal Deck:** Steel decking is one of the most common types of decking for new construction on school facilities. It is also frequently encountered on re-roofing projects. It is important that any new decking be corrosion-resistant (galvanized) and that the method of attachment between panels be secure and reliable. Determine the condition of existing decking on re-roofing projects as best as possible in order to estimate an amount of deteriorated areas to be removed and replaced under the base contract. A unit price to add or deduct from



- the amount established in the base bid should be requested on the bid form.
- b. **Light-Weight Concrete (LWC):** This type of decking facilitates the creation of slope, especially on roofs with dead- level structure and sub-decking. Removal of existing roofing from LWC substrate is a challenge due to its relative fragility. Pull-out tests for mechanical fastener attachment are extremely important to determine the strength of new or existing LWC substrate and its ability to accept a new roof system. If the pull-out tests indicate values less than required the Design Professional shall provide an appropriately revised fastening pattern for the new roof system. Replacing deteriorated areas of existing LWC on re-roof projects must be dealt with similar to metal deck (see “a.” above). Limited patching of existing LWC may only be required depending on conditions.
  - c. **Cementitious Wood Fiber (CWF):** CWF decking has been commonly specified on school building projects in the state for years. This is mainly due to the combination of its decking properties with good acoustical absorption on surfaces exposed to interior spaces. CWF is better known by the Tectum brand name which is proprietary to only one manufacturer. Certain precautions need to be taken when re-roofing buildings with CWF panel decking. As with most decking, prolonged exposure to water infiltration can deteriorate a panel and diminish its structural properties. The need for pull-out tests on CWF to determine its ability to accept mechanical fastening is similar to that of LWC. If the pull-out tests indicate values less than required the Design Professional shall provide an appropriately revised fastening pattern for the new roof system. Replacement of deteriorated areas of existing CWF on re-roof projects must be dealt with similar to metal deck (see “a.” above).
  - d. **Wood deck:** It is not uncommon to find or use wood deck on school facility roofs. This is usually on smaller buildings and can vary from dimensional lumber to plywood or OSB panels. Like most roof deck, it is susceptible to deterioration under conditions of prolonged water exposure. Code considerations pertaining to fire resistance need also to be considered. Replacement of deteriorated areas of existing wood deck on re- roof projects must be dealt with similar to metal deck (see “a.” above).
2. **Roof decks (Other):** Although PSFA does not encourage the use of reinforced concrete decking on new construction it is possible that existing concrete deck may be encountered on re-roofing projects. Concrete deck is difficult to attach to with mechanical fasteners. There is a risk of spalling on the underside of concrete deck caused by the application of fasteners for wood blocking, nailers, etc. Particular care must be given to the selection of a new roof system and the method of attachment to existing concrete decks.



3. **Air barrier:** Some specification sections require an air barrier. These are typically specified to address wind performance in systems such as mechanically-attached single ply membranes and consist of 6 mil polyethylene sheet material.
4. **Vapor retarder:** Vapor retarders can help address the problem of moisture transmission and condensation in the roof system. These are sometimes used to prevent condensation on the bottom of metal roof panels.
5. **Rigid Insulation:** Rigid insulation boards are typically used in low- slope roofing applications. The PSFA guide roofing specifications mention specific insulation types recommended for use with the systems. Various other types are available that may be used if approved by PSFA. Common types of insulation are:
  - a. **Perlite:** With a relatively low R-value, perlite is often used as a cover board placed over the primary thermal insulation layer. Some types of cover boards are used as thermal barriers or for fire protection when installed directly over steel roof decks. Other types of cover boards are wood fiber board and glass mat gypsum roof board. Perlite and wood fiber board lose their compressive resistance when subjected to water exposure from leaks.
  - b. **Polyisocyanurate:** This high R-value insulation is made from plastic foam with a facer material and is commonly used on low-slope roofs. NRCA recommends that a suitable cover board be installed over Polyisocyanurate insulation, especially in BUR applications.
  - c. **Molded Expanded Polystyrene (EPS):** Cover boards are usually specified over EPS to protect against heat from black membranes and direct contact with solvent-based adhesives. EPS is relatively inexpensive and can sometimes be used in combination with light-weight concrete in a hybrid insulated deck system. It is not very resistant to water vapor.
  - d. **Extruded Expanded Polystyrene (XEPS):** This is a high R- value insulation with good water resistance and high compressive strength. It should not be directly exposed to solvents, hot asphalt, or very high temperatures.
  - e. **Composite boards:** These typically consist of two different types of rigid insulation that are factory-laminated together. The primary insulation is commonly Polyisocyanurate or EPS. The secondary layer is usually a type of cover board, plywood, OSB, or gypsum board. A plywood or OSB top layer usually serves as a nail base. The degree of attachment between primary and secondary layers must be substantial enough to prevent delamination.
6. **Non-rigid insulation:** Non-rigid batt, blanket, or blown-in insulation is typically used in attic spaces. Blanket insulation is commonly used to



insulate the underside of pre-engineered metal building roofs.

7. Low-slope roof coverings: The following membranes are generally preferred by PSFA for use on low-slope roofs, although some may be used on steeper slopes under certain restrictions:

- a. ***Built-up asphalt roofs (BUR):*** The typical PSFA specification for built-up membrane systems consists of alternating layers of hot-applied asphalt bitumen and fiberglass felts. A fiberglass cap sheet is adhered in hot asphalt over the four plies of felts. The plies are hot-mopped to either a cover board or base sheet, depending on deck type.
- b. ***Modified Bitumen (MB):*** The typical PSFA specification for modified bitumen membrane systems consists of alternating layers of hot-applied asphalt bitumen and two plies of SBS polymer modified bitumen membrane. An SBS polymer MB cap sheet is adhered in hot asphalt over the two plies of felts. The plies are hot-mopped to either a cover board or base sheet, depending on deck type.
- c. ***Single-ply – Ethylene propylene diene monomer (EPDM):*** The typical PSFA specification for EPDM single-ply membrane systems consists of a single ply of 60-mil black EPDM sheet material *adhered* or *mechanically-fastened* to the substrate. This system is recommended for use with metal decking only.

EPDM is susceptible to damage when exposed to certain solvents and compounds, especially animal and vegetable oils including those that are expelled from school kitchen vent hoods on the roof. Verify with manufacturer any added treatment necessary around roof top vents to prevent deterioration of EPDM.

White EPDM may be used if calculations by the designer prove it beneficial in terms of energy conservation. Research any potential reduction in reflectivity of white EPDM over time and lesser resistance to weathering.

- d. ***Single-ply – Polyvinyl chloride (PVC):*** The typical PSFA specification for PVC single-ply membrane systems consists of a single ply of 60-mil Energy Star-rated white sheet material *adhered* or *mechanically-fastened* to the substrate. This system is recommended for use with metal decking only.

PVC can deteriorate if in direct contact with certain materials like polystyrene insulation and asphalt. A proper separation between materials is required.

- e. ***Single-ply – Thermoplastic polyolefin (TPO):*** The typical PSFA specification for TPO single-ply membrane systems consists of a single ply of 60-mil, reinforced, Energy Star-rated white sheet material *adhered* or *mechanically-fastened* to the substrate. This system is recommended for use with metal decking only.



8. Steep-slope roof coverings: Standing seam sheet metal systems are generally preferred by PSFA for use on steep-slope roofs, although some membrane systems mentioned above may be used under certain restrictions.
  - a. ***Standing seam sheet metal roofing:*** The typical PSFA specification for a standing seam sheet metal system consists of 24 ga. Galvalume structural panels with full double lock seam side laps when installed. Partial double lock seams, lapped seams, or friction fit are not acceptable. Pre-finished panels require a 90% fluoropolymer coating applied to the pre-treated steel. A structural steel support system is typically required.

**C. System selection criteria:** Since the Design Professional is responsible for making the final determination of roofing system(s) to be used, it is important that they have a general understanding of the generic systems described in the preceding sections. After performing due diligence necessary and consulting with the Roofing Consultant, consideration of the following technical and non-technical criteria can result in an appropriate final decision from the Design Professional regarding which system(s) and details to use for a project:

1. System degradation and failure: The first consideration in system selection is to anticipate potential causes for the eventual degradation of the new roof over time or possible failure from catastrophic conditions. An example would be particular weather events common to the location such as hailstorms that might cause severe damage to a certain type of roof. Another might be a large number of rooftop HVAC units that require frequent foot traffic by maintenance personnel. Location of buildings in areas susceptible to forest fires might influence the system selection. The designer must then eliminate systems from consideration that might be more susceptible than others to such causes of degradation or failure.
2. Nearby school roofs: The designer should ask the District and PSFA about any experience they have had with system types in the local area. If a specific system has performed well, then it may be a contender for being used on the project unless there are distinct differences in the project building features that would preclude this. The District's familiarity with and ability to normally maintain certain types of systems should also be considered.
3. Life-cycle cost: A Life Cycle Cost Analysis (LCCA) should be performed to compare overall costs of different roof systems. The LCCA should include initial cost, and maintenance and repairs over its service life. Disposal costs at the end of the roof system's life should also be included. A reasonable estimate of service life should not exceed 20 years for low-slope roofing. An LCCA also factors in difference in heating and cooling costs between systems. Refer to ASTM E 917, *Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems* for more information on LCCA.



4. **Warranty:** The PSFA guide roofing specifications contain a standard manufacturer's warranty that has been accepted by all manufacturers listed as initially qualified by PSFA. Also included is a separate two- year roofing contractor's warranty that is standard on all projects. The terms of these warranties must not be modified without the mutual approval of Owner and manufacturer.
5. **Sustainable roofing design:** If specific sustainable design goals are part of the project, then roof system selection may be impacted. All roof systems should be thermally-efficient and durable. Special or enhanced sustainable characteristics of particular systems need to be considered while keeping the main purpose of the roof in mind – to keep elements, primarily water out of the building. A leaking or a less-than durable roof system negates any benefits gained by incorporating energy conserving or sustainable features.

**D. Specific design recommendations:** The following are specific recommendations from PSFA regarding roof system design which should be considered:

1. **Slope:** PSFA requires that new roof and re-roofing projects incorporate a roof slope which ensures that there is no ponding water remaining 48 hours after a rain. Ideally, all roofs should be steep- sloped (above 3:12) when the budget allows. A properly designed steep-slope roof obviously benefits greatly from improved water- shedding properties and lessens, but does not eliminate problems of leaks. A properly designed low-slope roof can be as effective as a steep-sloped one if properly specified and detailed but is more reliant on interior roof drainage for large expanses of roof. As a result, routine maintenance is required more often on low-slope roofs to clear roof drains and to maintain flashings. Incorporate steep-slope roof systems when possible and ensure proper detailing and roof drainage design for all roofs, especially low-slope systems.
2. **HVAC equipment:** PSFA discourages the installation of large amounts of HVAC equipment on roofs. The elimination or reduction of rooftop equipment helps lessen maintenance traffic on the roof and prevents damage from equipment maintenance activities at the units. A roof clear of such equipment allows for consideration of durable steep- slope systems such as metal roofing panels which are preferred when possible. Large units above the roof are generally acceptable if completely enclosed within a penthouse. **On re-roof jobs,** make sure the contract documents require a pre-construction inspection of HVAC units on the roof with the contractor and owner to determine their operational condition. At minimum, specify that all units be returned to their original operational condition after the roofing work is complete. Make sure that all critical rooftop equipment issues identified in the Pre-Design investigation are addressed and corrected by the contract documents. Consult "Appendix B – PSFA Design Guidelines for HVAC and Controls" in the PSFA HVAC & Controls



- Performance Assurance Program Manual for roof-mounted HVAC equipment commentary.
3. Roof-mounted solar panels: Any rooftop mounted electrical equipment, including solar panels require an effort to minimize penetrations, incorporate proper flashing details, and address related structural loads. Such installations must not obstruct the maintenance of the roof areas in which they are located or jeopardize warranties on existing roofs.
  4. Penetrations: Efforts must be made to minimize roof penetrations on the roof. They must be installed with proper clearances between each other and other flashed objects such as walls, parapets, etc. A minimum distance of 18 inches is generally recommended. An 8 inch minimum flashing height is generally required for all flashings under normal conditions.
  5. Parapet coping: Metal parapet coping is recommended for tops of all parapets. It shall be properly designed for wind uplift resistance, expansion, and contraction. Intersections with vertical wall surfaces shall be properly counter-flashed to wall and detailed on the contract documents in accordance with SMACNA standards. Termination of coping end at wall by sealing with sealant only is not acceptable.
  6. Interior gutters: Interior sheet-metal gutters between two inward sloped roof areas shall be avoided in the design. These are a prime cause of roof leaks. Properly sloped crickets or roof valleys are recommended to drain water from areas where two downward slopes join.
  7. Roof drain discharge: Strive to keep the discharge outlets of roof drains and downspouts away from paved walk paths on the north side of the building where freezing is possible. Locate overflow drain outlets where their activity is noticeable. Permanently identify overflow drain outlets with labeling, small plaque signage, engraved lettering, or other effective and aesthetically-appropriate means.
  8. Walkway pads: Walkway pads are not required between rooftop equipment units but are needed at the service side of equipment, at the bottom of access ladders, and in front of roof access hatches and doors.
  9. Pipes & conduits: Piping and conduit on rooftop require proper mounting in accordance with NRCA details. On re-roof projects, have owner assist in identification of functioning or abandoned conduit and pipes and make sure that work to remove/repair/re-support such items is included in the work.
  10. Access ladders: Provide and appropriately locate roof access ladders and hatches. Permanent steel ladders are required to be attached to structure where needed to safely access different roof levels for maintenance. Make sure there is proper clearance between bottom of ladder landings and top of roof surface, wall flashings, and copings.





11. Exposed steel: Prep and paint all unfinished or poorly finished ferrous steel items on roof exposed to weather (pipes, ladders, etc.)
12. Adjacent surfaces: On re-roofing projects or additions, make sure that all adjacent wall surfaces, windows, etc. above the roof and identified as potential sources of leaks during Pre-Design investigation are addressed by the design and in the contract documents.



## **XII. ADDITIONAL RESOURCES**

### **Manuals:**

*Whole Building Design Guide* – Building Envelope Design Guide – Roofing Systems; [www.wbdg.org](http://www.wbdg.org)

*The NRCA Roofing and Waterproofing Manual*. Published by the National Roofing Contractors Association.

*Low-Slope Roofing Materials Guide* and *Steep-Slope Roofing Materials Guide*. Published by the National Roofing Contractors Association.

*Architectural Sheet Metal Manual*. Published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

### **Periodicals:**

*Professional Roofing*: [www.nrca.net](http://www.nrca.net)

*Roofing Contractor*: [www.roofingcontractor.com](http://www.roofingcontractor.com)