07100. WATERPROOFING

07110. MEMBRANE WATERPROOFING: The following are minimum requirements to assure adequately designed waterproofed floors for machine and equipment rooms and other areas subject to flooding from equipment failure or seepage from exterior sources:

07110.1 DRAWINGS shall fully detail the installation of the membrane. Continuous membrane risers shall be provided above the finished floor surface at vertical walls, pads, curbs, pipes, and ducts through the slab. Risers shall be at least as high as the lowest curb and shall be bonded to the vertical surface. Concrete foundation walls around elevator pits and around basements, from grade to footings, shall be treated with sixty (60) mil minimum membrane waterproofing. When elevators open into areas subject to flooding, opening sills must be above membrane riser height to keep flood water out of elevator shaft. If water is present, construction of work slab (mud slab) is recommended, to receive water proofing membrane.

07110.2 SPECIFICATIONS shall provide for a heavy duty, permanent waterproofing type of membrane capable of adjusting to building movements without breaking the membrane seal. When rubber or plastic membranes are specified, a ten (10) year installer experience clause with written documentation shall be required by the specification.

07110.3 TIMING OF INSTALLATIONS: When surface applied membrane waterproofing is specified, the specification must prohibit scheduling of installation until after the majority of work of all other trades has been completed. Inaccessible surfaces under equipment and housing foundations, pads, and curbs may be waterproofed in advance of floor areas. Surface membrane must be protected until acceptance of the space by the University. Surface applied membrane, except under equipment, must be accessible for repair.

07110.4 TESTING: Specifications shall provide for the testing of waterproofed membrane floors by flooding. Floors shall be filled with water to within ¼ inches of top of lowest curb for a period of 6 hours and closely inspected for leaks; tests shall be witnessed by designated representatives of the University. The test shall not relieve the contractor of maintaining a leak free floor until the end of the warranty period.

07110.5 MAINTENANCE GUARANTEE: The General Contractor, manufacturer and installing subcontractor shall furnish a written three (3) year guarantee on the complete membrane waterproofing installation. Submit the guarantee in triplicate. The guarantee shall begin at substantial completion and accepted for use by the Owner.

The guarantee shall cover, at no cost to the Owner, all labor, materials, and equipment required for repair or replacement to correct leaks, faulty materials or workmanship, and reestablishing all conditions and finishes equal to condition prior to repair.

07150. DAMPPROOFING

07160. BITUMINOUS TYPE: Surfaces of exterior walls and walls below grade, which will receive an applied finish, shall be primed and coated with bituminous dampproofing prior to installation of furring.
07200. INSULATION

07210. BUILDING INSULATION: Meet Florida State Energy Code Requirements and submit calculations to the University. Do not use loose fill type insulation. Ventilate attic spaces, crawl spaces, and air cavities. Provide wall assembly details identifying size, type and placement of insulation; type and location of air barrier and vapor retarder.

07220. ROOF DECK INSULATION: All insulating materials shall be non-hygroscopic. Provide a vapor barrier under insulation whenever the possibility of condensation exists. Compatibility with roofing materials or separation is mandatory for wood, treated wood, fibrous materials, insulation, etc.

07270. FIRESTOPPING

07271. Provide rated through-penetration firestop systems with ratings indicated by ASTM E814.

07272. Provide fire-resistive joint sealants with fire-resistance ratings as determined per ASTM E119.

07300. SHINGLES AND ROOFING TILES

07301. GENERAL REQUIREMENTS: Follow SUS Standard Practice for roofing systems, included at the end of this section.

07311. ASPHALT ROOF SHINGLES: Specify only wind resistant type. Fire-resistant rating shall be UL Class A.

07400. PREFORMED ROOFING AND SIDING

07401. GENERAL REQUIREMENTS: Follow SUS Standard Practice for roofing systems, included at the end of this Division 7.

07410. PREFORMED WALL AND ROOF PANELS: Finish materials and colors for roof structures and rooftop equipment screens are subject to the approval of the University Architect.

07500. MEMBRANE ROOFING

07501. GENERAL REQUIREMENTS:

07501.1 DESIGN REQUIREMENTS FOR MEMBRANE ROOFING: Follow SUS Standard Practice for roofing systems, included at the end of this section. Roof decks must be built with a slope of at least ¼-inch per foot toward drains. Dead level roofs are prohibited. Scupper openings shall be provided through parapet walls. Insure that drains are truly at low points of roofed area. Install “crickets or saddles” to divert water flow around curbs so as to avoid interference with designed drainage system. Reroofing projects will require individual assessment for design to provide adequate drainage slope.

07501.2 OBSERVATION OF INSTALLATION BY UNIVERSITY PERSONNEL: The University shall be given two (2) weeks advance notice of intent to start installation of roofing materials. Designated University personnel must be permitted to perform a pre-installation inspection of roofing materials and equipment, to be present throughout roofing installation to observe installation techniques for compliance with specifications and to participate in final inspection. A pre-roofing conference should be included in specifications.
07501.2.1 **CUTTING OF TEST PANELS:** The University reserves the right to cut test panels from the finished roof in order to determine that minimum requirements have been met. The roofer shall repair, at his own expense, the roof where test panels were taken.

07501.3 **COORDINATION OF INSTALLATIONS:** The roofer shall install all flashings required to make a complete waterproof installation. For this reason, it is preferred that specifications for roofing, flashing, and sheet metal work be combined into one section. Although certain counterflashings or similar materials may be provided by other contractors, the roofer shall be made responsible for their proper installation.

07501.4 **ROOFING AND FLASHING GUARANTEE:** The General Contractor, Roofing Subcontractor and the manufacturer(s) of materials used shall jointly furnish a written 20-year guarantee on the complete roof installation. Submit the guarantee in triplicate. The guarantee shall begin when the project is completed and accepted by the Owner.

The guarantee shall cover, at no cost to the Owner, all labor and materials required to repair or replace roofing, flashings, sheet metal and copings as necessary to fully correct leaks, faulty workmanship or defective materials.

07501.5 **STORAGE OF MATERIALS:** Roofing felts, membranes and insulation are to be stored in a dry trailer or inside a dry building. Exterior storage on skids or tarpaulin coverage is unacceptable. Asphalt or coal tar pitch may be stored outside if kept under a tarpaulin or plastic film.

07501.6 **WET MATERIALS:** Roofing felts or insulation which became wet before or after installation must be removed and replaced. Wet materials shall not be dried or used. Wetted membrane materials must be thoroughly evaluated to determine the effect on adhesion, lap seals or blister potential. Remove any such material if there is any possibility of failure.

07501.7 **ROOF MOISTURE SURVEY:** Conduct infrared scan before and after completion of existing membrane reroofs.

07501.8 **CLEAN UP:** Emphasize that debris not be allowed to accumulate on roof during construction. All debris to be totally removed at completion of project.

07502. **PERFORMANCE REQUIREMENTS:**

07502.1 **FM LISTING:** Provide modified membrane roofing, base flashing, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM’s “Approval Guide” for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

07502.2 **ROOFING SYSTEM SHALL COMPLY WITH THE FOLLOWING:**

07502.2.1 Fire/Windstorm Classification: FM Class 1A-90.

07502.2.2 FM 1-49 Loss Prevention Data Sheet for Perimeter Flashing.

07502.2.3 FM 1-28 Loss Prevention Data Sheet for Wind Loads to Roof Systems and Roof Deck Securement.

07502.2.4 FM 1-29 Loss Prevention Data Sheet Above Deck Roof Components.
07502.2.5 NRCA Manual for Low-Slope Roofing Construction Details (Last Edition).
07502.2.6 SMACNA Manual (Last Edition).
07502.2.7 ASCE 7, Chapter 6.

07503. SUBMITTALS:

07503.1 SHOP DRAWINGS: Include plans, sections, details in compliance with above referenced Performance Requirements and attachments to other work, for the following:

07503.1.1 Base flashings, cants, and membrane terminations.
07503.1.2 Cellular insulating concrete, including slopes.
07503.1.3 Crickets, saddles, and tapered edge strips, including slopes.

07504. QUALITY ASSURANCE:

07504.1 TECHNICAL INSPECTOR QUALIFICATIONS: Engage a technical inspector to supervise installation of roof system.

07510. BUILT-UP BITUMINOUS ROOFING: No less than four (4) ply construction may be specified. Conform strictly with the manufacturer’s recommendations for installation.

07520. ELASTIC SHEET ROOFING: EPDM (Ethylene Propylene Diene Monomer) consult the University Architect before designing such roof.

07530. MODIFIED BITUMEN SHEET ROOFING: Systems composed of at least three (3) plies, one of which can be a heavy base sheet, are preferred. Mineral (granule) surface capsheets are required.

07540. FLUID APPLIED ROOFING: Consult the University Architect before designing such roofs.

07550. TOTALLY ADHERED MEMBRANE ROOFING: Shall not be used over lightweight concrete decks.

07570. TRAFFIC COATINGS

07570.1 This section includes the following:

07570.1.1 Pedestrian and vehicular traffic coatings for application to the specific type of deck indicated on the drawings.

07570.2 Description of the system:

07570.2.1 The pedestrian and vehicular deck coatings shall be a complete system of compatible materials including cold liquid applied elastomeric coatings supplied by an approved manufacturer to create a seamless waterproof membrane.

07570.3 Quality Assurance:

07570.3.1 The pedestrian and vehicular traffic coatings shall be rated Class “A” by Underwriter Laboratories (ASTM E108/UL790), containers to bear Underwriters label.

07570.3.2 Materials used in both coating systems shall meet existing VOC regulations.
07570.4 Preparation:

07570.4.1 Apply coatings over previously cleaned, etched surfaces. Treat crack and joints as directed by the manufacturer’s written instructions.

07570.5 Application:

07570.5.1 Apply primer, base coat, wearing surface coat, and previously graded, broadcasted, hard aggregate at the rates recommended by the manufacturer’s written instructions. Provide the required system’s dry film thickness.

07600. FLASHING AND SHEET METAL

07601. GENERAL REQUIREMENTS:

07601.1 MAINTENANCE GUARANTEE requirements apply to this work. Refer to paragraph 07501.4.

07602. MATERIALS:

07602.1 METAL FLASHING AND COUNTER FLASHING: Copper, aluminum or soft temper stainless steel. No galvanized steel.

07602.2 GUTTERS AND DOWNSPOUTS: Copper, aluminum or stainless steel. No galvanized steel.

07602.3 FASCIAS AND GRAVEL STOPS: Aluminum, copper, or stainless steel. Aluminum sections, if used, must be extruded, be for appearance, and not function as part of the weatherproofing. Expansion/contraction rate of aluminum is the problem.

07602.4 PITCH PAN OR POCKETS: Use of pitch pans or pockets is prohibited! Items penetrating roofing must be flashed with sheet metal secured with clamps or with ten (10) inches high box curbs welded, or otherwise secured, to the penetrating items. See flashing materials above for acceptable metals. Provide continuous cleats (FM 1-49).

07700. ROOF SPECIALTIES AND ACCESSORIES:

07700.1 WALKWAYS: Provide additional three (3) foot (3’-0”) wide adhered layer of roofing.

07800. SKYLIGHTS

07801. SKYLIGHTS are prohibited unless special permission is received from the University Architect.

07900. SEALANTS

07901. GENERAL REQUIREMENTS: The following conditions shall be included in the specifications:

07901.1 GUARANTEE: provide written guarantee that the General Contractor and sealant installer jointly guarantee to replace, at no cost to the University, any or all joints which fail within 5-years after acceptance.

07901.2 QUALIFICATIONS OF APPLICATOR: Sealants shall be applied by specialists in the application of sealants; minimum 5-years experience required. Applicator is subject to the Associate’s approval.
07901.3 RESPONSIBILITY FOR SATISFACTORY APPLICATION: Inspect work of other trades prior to application of sealing material. If any joint or space cannot be put into proper condition to receive the material by specified methods, immediately notify the Associate in writing, or assume responsibility for and rectify unsatisfactory results from improper application.

07901.4 TIME AND TEMPERATURE REQUIREMENTS: Apply sealants as late as possible in the construction, preceding painting, and following cleaning operations. Do not apply sealants when air temperature is below 40 degrees F.

07901.5 DO NOT SAY CAULK OR CAULKING NOR USE THOSE MATERIALS.

07901.6 QUALITY ASSURANCE: Joint sealers are required to establish and maintain air tight and waterproof continuous seals on a permanent basis.

07920. SEALANTS: Provide schedule indicating type of joints to be sealed. (i.e., precast panel to precast panel, masonry joints, etc.)

07920.1 INTERIOR: Use acrylic type suitable for application of paint.

07920.2 EXTERIOR: Use two-part polyurethane, or as approved.
Roof System Components. The roof system includes the following basic components: roof deck or substrate, insulation, waterproofing membrane, protective surfacing, flashing, counter flashing, roof cants where applicable, caps and copings, perimeter fascia/gravel stops, sealants, roof expansion and control joints, roof walkway systems, roof hatches, skylights, roof drains, emergency overflow protection, roof drain flashing, scuppers, gutters, downspouts, and ballast material where applicable. These components and all types of roofing material, including metal and tile, are subject to the requirements of this Chancellor’s Memorandum (CM). Patios and decks constructed on roofs require special design consideration and shall not violate the roofing requirements of this CM.

Approved roofing materials. The selection of roofing materials shall be limited to those manufacturers with a fifteen (15) year history of satisfactory manufacture and installation of at least 250,000 squares of their roof system, and who provide a minimum twenty (20) year unlimited warranty/guarantee for labor and materials, including metal finishes.

Registered Architect or Engineer Required. All new, repair, and replacement roofing projects shall have plans and specifications developed by a registered architect or engineer licensed by the State of Florida. The engineer shall be a professional engineer, with a minimum of ten (10) years direct experience in design and analysis of roof systems, and certified as a registered roof consultant by the Roof Consultants Institute.

Steep Slope Roofing. Steep slope roofing includes slate, tile and metal roof systems. Steep slope roofing shall not be utilized on University facilities on slopes less than four (4) inches per foot unless a waterproof underlayment system is utilized beneath the steep roofing components. Under no circumstances shall slate or tile be installed at slopes less than two (2) inches per foot.

Energy Management. Roof system design shall be consistent with energy management requirements of the State University System, Florida Statutes and applicable Codes. Insulating values of the finished roof system shall be designed on the basis of economic life cycle return on investment when evaluated against fuel costs.

Roofing Work Carried Out By University Personnel. Roofing projects carried out by University personnel shall be performed in a manner approved by the roof system manufacturer or one of its licensed roofing contractors. Repairs to low slope roofs shall be accomplished in accordance with the National Roofing Contractors Association Repair Manual for Low-Slope Membrane Roof Systems or manufacturer’s requirements to maintain warranty.

Roof Membrane Penetrations. All penetrations of the roof membrane shall be detailed according to the recommended procedures provided in the latest National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual and installed per manufacturer’s instructions. The details in the Manual show standard conditions which should be adapted to suit each individual project.

Expansion Joints. Structural expansion joints occurring in new construction shall be located at high points in the structure or roof insulation to the maximum extent practicable to allow water to flow away from them on the roof surface. Under no circumstances are expansion joints to be placed such that roof water must flow across them to reach drains.

Utility Supply Lines. Utility supply lines (electrical, water, gas, etc.) to roof-mounted equipment shall be installed within the supporting curb of that equipment.

Through-Wall Flashings. Architects/Engineers designing new facilities shall be cautioned to carefully locate through-wall flashings at sufficient elevation above anticipated finished roof level to ensure minimum base flashing heights as defined herein can be met. Elevations and accessibility of other components shall also be considered for their impact on roofing installation, including re-roofing of the facility. Such components as siding, window sills (above roof level), equipment supports, stucco facades,
etc. can greatly hamper appropriate installation of roofing components and thus have a significant impact on the costs and feasibility of reroofing.

**Emergency Overflow Protection.** All roof systems shall have a secondary means of evacuating water from the surface of the roof in the event the primary drainage system is blocked. The secondary system shall be totally independent of the primary system and may consist of overflow scuppers through walls, an independent internal overflow drainage system, or other suitable means. The structural components of a roof system shall be reviewed by a licensed professional structural engineer to ensure that any water, which accumulates on a roof system in the event of failure of the primary system will not overstress the structure. Water shall not be allowed to accumulate to a depth greater than four (4) inches.

**Internal Gutters.** Internal gutters are prohibited on new facilities. Internal gutters on existing facilities shall be eliminated during reproofing projects to the extent practicable.

**Roof Access.** All roof areas shall be permanently equipped with a reasonable means of access for purposes of maintenance of the roof system and any roof mounted equipment. Access can be in the form of internal roof scuttles. External wall mounted ladders may only be considered if no other means of access is available and only where safety and security can be maintained.

**Roof-Mounted Equipment.** Roof-mounted equipment is not acceptable if other locations for replacement can be found. All roof-mounted equipment shall be provided with roof surface walkway access to allow ease of maintenance and minimize roof surface damage.

Roof-mounted antenna, lightning protection anchorage, lab equipment, or scientific devices shall be located in areas specifically designed for that purpose. Roof loads, walking surfaces, anchoring devices, mounting pads, curbs, or utility needs shall be designed and provided using appropriate details, adapted as required, from the NRCA Roofing and Waterproofing Manual.

**Pitch Pockets Prohibited.** Pitch pockets are not permitted, including those filled with a urethane, butyl robber, or similar pourable caulking, and bituminous materials.

**Roof Coatings.** Specific spray-applied polyurethane foam roof systems and specific roof coatings shall be considered for new and re-roofing projects where the Architect/Engineer and the University demonstrates that their use is appropriate and when specific and acceptable monitoring and control measures are carried out throughout the design and construction periods.

When replacement of a roof is required, criteria for the replacement roof shall be in full compliance with this CM.

**Minimum Slope.** A minimum slope of ¼ inch per foot shall be required on all areas of a new roof system before final acceptance of that roof system by the university. On existing roofs where it is impractical to attain the required ¼ inch slope, a minimum slope of 1/8 inch may be permitted if other provisions are made to ensure that the integrity of the roof and drainage systems are maintained. Built-up roofs constructed with coal tar pitch as the interply mopping and surfacing may be applied on “dead flat” areas where existing conditions prohibit installation of tapered materials and the roof system manufacturer will issue the required warranty with no exclusion for standing water. Overflow protection shall be provided.

**Base Flashing.** All base flashing shall extend a minimum of ten (10) inches up the vertical surface of curbs, walls, or roof penetrations. The dimension is from the top of the membrane (or ballast) to the top of the base flashing.

**Cants.** Four (4) inch pressure treated wood cants shall be required around all vertical interruptions of the roof system, such as curbs or walls. In certain circumstances, where their use is justified, fiber cants are permitted.
Access Door Thresholds. Access door thresholds to the roof or roof hatches shall be twelve (12) inches above the adjacent roof surface. An acceptable walking surface shall be installed immediately outside the access door threshold on the roof system.

Roofing Contractors. All roofing contractors working on university facilities shall have a current State of Florida license and be certified/approved as a roofing contractor by the manufacturer for the system being installed or repaired.

Roofing contracting firms shall have a minimum of five (5) years of experience installing the type of system specified. Experience shall have been earned by the firm proposing the work, not by individual employees. In addition, the job site superintendent shall have a minimum of five (5) years of experience installing the type of system specified.

Roofing Over Existing Roofs. The application of new roof materials over an existing roof will not be permitted until a nuclear or infrared scan (or other acceptable method of moisture detection) of that roof has been completed and all wet areas detected by that scan/method have been removed. After the new roof is installed, roof scans are to be made to record the condition of the new roof and compliance with specifications.

Roof Scans. All new roofing shall require acceptable roof scans to ensure satisfactory compliance with specifications.

Insulating Light-Weight Concrete. Insulating light-weight concrete over vented (perforated) metal roof decking is permitted. Insulating light-weight concrete over structural concrete slabs as part of the roof system or over existing roof assemblies is acceptable provided:

A. Insulating light-weight fill thickness (over substrate or insulation board) is a minimum one (1) inch, not to exceed one and a half (1 ½) inches, and

B. Insulating light-weight concrete is aggregate based and has a minimum compressive strength of 300 psi.

Roof vents through the membrane will be acceptable provided they are insulated, spun aluminum roof vents having a one-way valve design. Roof vents constructed of PVC are not acceptable.

A. Tested by Underwriters Laboratories in accordance with the procedures of ASTM E 119 and listed in the most recent Underwriters Laboratories Fire Resistance Directory;

B. Tested by Factory Mutual Research and listed in the most recent Factory Mutual Approval Guide as non-combustible or Class 1; and

C. Tested by Factory Mutual Research for windstorm classification I-120 and listed in the most recent Factory Mutual Approval Guide.

Resaturants. Resaturants are not acceptable for rejuvenation of an existing built-up roofing system.

Galvanized Metal Flashing. The use of galvanized metal flashing is not acceptable.

Asbestos. The use of roofing materials containing asbestos is prohibited in the installation of new or the repair of existing roof systems.

The removal of roofing containing asbestos shall be carried out by State certified roofing contractors. Asbestos roofing removal shall be conducted in accordance with all requirements of Environmental Protection Agency, Occupational Safety and Health Administration, and Florida Statutes; and all applicable rules of the Department of Business and Professional Regulation, Department of Environmental Protection, Department of Labor and Employment Security, or other state agencies having jurisdictional authority.
Codes and Standards. The university shall ensure that all architects, engineers, specifiers, consultants, inspectors, installers, and University maintenance personnel utilize the following resources: the latest edition of all applicable Building Codes, the Factory Mutual Systems Approval Guide; the Underwriters Laboratory (UL) Building Materials Directory; the UL Fire Resistance Directory; the American Society for Testing and Materials Board of Standards Volume for Roofing, Waterproofing and Bituminous Materials; the Architectural Sheet Metal Manual by the Sheet Metal and Air Conditioning Contractors’ National Association; recommended standards and technical details of the Metal Roofing System Association; and, the NRCA Roofing and Waterproofing Manual.

The University shall emphasize to the Architect/Engineer the need to design roof systems to resist extreme wind forces. Structural analyses shall be required to verify the integrity of all roof components. Wind uplift design shall comply with the most stringent requirements of applicable codes and the latest edition of American Society of Civil Engineers – Minimum Design Loads for Buildings and Other Structures (ASCE 7-98). The Architect/Engineer shall also be required to consider long-term serviceability in the design of all roof systems.

Plan Review. The university offices of Facilities Planning and Physical Plant shall review plans and specifications for compliance with State University System roofing standards and ensure that the requirements of this CM are met.

Alternative Roof Systems. If the Architect/Engineer proposes a specific alternative roof system, i.e. a unique or non-traditional system, the University Offices of Facilities Planning and Physical Plant shall conduct a preliminary evaluation of the system and make the necessary recommendations to the State University System Office of Facilities Planning (SUSOFP). A request to install an alternative roof system shall be in writing and include justification data. The SUSOFP will advise the University whether or not the request is approved.

Pre-Construction Conferences. The university shall ensure that a roofing preconstruction conference is conducted for all new and re-roofing projects at which the university offices of Facilities Planning and Physical Plant, architect/engineer, general contractor, roofing contractor, roofing manufacturer’s representative, and other related trades representatives are present.

Protection Plans. The University shall require a specific protection plan for all new and re-roofing projects to describe the means of maintaining the building in a safe and watertight condition throughout the construction period. Existing and newly installed roof systems shall be considered in the protection plan to ensure roofing operations do not damage them. Areas where the roof deck/structure are (or may be) damaged or deteriorated shall only be reroofed when the occupied spaces below are unoccupied. Other potential phases of re-roofing operations can be hazardous to the facility and its occupants and shall be carefully reviewed with the Architect/Engineer during design, with prospective contractors during bidding, and at appropriate phases during construction.

Inspection of Installation. The University shall provide full-time inspection whenever the roof system is being installed (roofing, flashing, gravel, etc.). The inspector shall be knowledgeable in roofing specifications and appropriate installation or repair procedures. The inspector shall be required to issue written reports on a daily basis which include, at a minimum: the name, address, and phone number of the roofing contractor, the name of the roofing foreman/superintendent, description of the day’s weather, number of roofers/sheet metal mechanics on project, location of the day’s work, description of work accomplished, deficiencies observed in the work requiring correction, a description of materials incorporated into the work and those stored for later use, and a quantitative summary of unit price items incorporated into the day’s work. Roof system installation inspection may be acquired as professional services from project funds. The University shall require the Architect/Engineer to include in the project specifications the requirement that the roof membrane manufacturer make a minimum of three (3) visits during application and one visit at the time of the substantial completion inspection with a written report of each visit to the Architect/Engineer and Owner. Manufacturer inspections shall be accomplished by technical representatives with a minimum of five (5) years direct working experience with the technical department of that manufacturer.
Warranties/Guarantees. The University shall maintain copies of all roof warranties/guarantees and records of all roof maintenance work. The effective date of warranties is the date of substantial completion by Owner.

Comprehensive Roof Management Program. The university shall establish a comprehensive roof management program for each facility to include:

a. **Historic Records and Roof Asset Information** – Listing the Architect/Engineer, general contractor, roofing contractor, manufacturer and supplier, type of roof system including all individual components, warranty/guarantee dates and data, history of repairs, regular surveys and inspections data, preventive and planned maintenance procedures, projected replacement and budget needs.

b. **Periodic Roofing Inspections and Checklist** – At least one inspection per roof area per year by qualified independent roof technicians who are not affiliated with roofing contractors, roof system manufacturers or suppliers including descriptions of roof related defects in the surfacing, membrane, membrane flashings, metal flashings, penetrations, equipment, walls, etc.

c. **Action Required** – Itemized descriptions of remedial work requirements with itemized cost estimates for each necessary to restore the integrity of the defective area to the service level of the overall roof system. A roof plan for each roof area or group of roof areas indicating the precise location of each remedial action necessary and the non-destructive testing results. A cumulative summary of all maintenance and repair costs.

d. **Projected University Cost Summary** – An overall repair/replacement budget in tabular form summarizing the derived repair costs per facility. As part of this summary, maintenance costs are to be projected five (5) years from date of each inspection to provide anticipated budget requirements well in advance. Costs for roof replacement versus roof repair shall be included with respective costs by year.