Roofing - General Information

Division 070000-1 Thermal and Moisture Protection

General Standards:

1.1 New Construction:

- New construction requires forethought if the new roof will be used as a work surface for other trades. If so, then a temporary roof should be considered.
- Building movement that could affect the roofing system must be identified and accommodated with roof expansion joints.
- **Note: Mechanical equipment is not allowed to be located on the roof unless authorized by the Division of Engineering and Contract Administration.** If mechanical equipment is allowed on the roof then supports must be high enough (Minimum of 30 inches above finish roof) so that a repairman can work on the roof underneath the unit.
- The roof system shall have a UL Class A surface fire rating.

1.2 Existing Construction:

- Building movement shall be identified and accommodated with expansion joints.
- Mechanical equipment and supports shall be high enough (Minimum of 30 inches above finish roof) so that a repairman can work on the roof underneath.
- The roof system shall have a UL Class A surface fire rating.
- The Architect-Engineer shall coordinate testing for asbestos in existing construction with the Hazardous Materials Coordinator and the Project Manager. See Section 00 212.
- The Contractor shall remove existing roof material and dispose off-site in an appropriate landfill.

1.3 Quality Materials: Materials chosen shall be appropriate to the design and construction of the facility. Materials shall be selected on time proven quality of a roof assembly with proper design rather than solely on economic considerations or length of Warranty.

1.4 Quality Workmanship:

- The roof materials shall be assembled together on the roof structure.
- Project managers, superintendents, foremen and journeymen roofers must be experienced in the installation with a proven track record for the selected roof system.
- Projects of similar size, scope of work and materials must have been installed successfully by the awarded contractor with 5 years of successful performance.

Design:

1.5 Deck and Structural Design:

- The deck must be inspected on existing facilities where a re-roofing project is under way. It is recommended, in most cases, to completely remove and dispose of the existing roof properly.
- Roof decks must be designed with a minimum slope of 1/2 inch per foot slope built into the structure to provide positive drainage.
- Expansion joints and/or area dividers shall be placed to allow the roof system to perform

well.

- Proper attachment methods for the deck type shall be in accordance with the materials manufacturer's recommendation.
- The Architect-Engineer shall research the possibility of high humidity from the building operations and select a roof deck that is appropriate for the conditions.
- The attachment of the roof deck must be checked before the installation of the roof system for proper securing. This effort must be documented as a specific step in quality control. A pull out test shall be performed to verify the attachment. Also during this phase the deck must be clean, smooth, and dry prior to the installation of the roof system.
- The Contractor shall verify before the attachment of the new roof system if any conduit and /or piping is tight to the bottom of the deck that would interfere with the installation.
- On re-roof projects, unit costs for hidden conditions must be established at the time of bidding. The unit costs must be reviewed and approved with the apparent low bidder to be close to historic and reasonable units compared to the other projects with similar roof decks and conditions.

1.6 Factory Mutual Research (FM) and Underwriters Laboratories (UL) Inc.:

- UL and FM requirements change over time due to testing and field performance. The Architect-Engineer should always check for current document releases.
- The design criteria for a roof assembly and attachment of the assembly shall comply with FM-I90 requirements (current recommendations).
- The flashing, membrane and surfacing shall comply with UL Class A ratings (current recommendations).

1.7 Mechanical Curbs, Penetrations and Piping:

- Mechanical curbs and penetrations shall be a minimum of 12" above the finished plane of the roofing membrane and surfacing.
- Mechanical curbs and projections shall be kept a minimum of 48" or the minimum OSHA required distance away from adjacent walls, parapet walls, other curbs, projections and/or roof edges.
- Flashings shall be secured at the top of all curbs and sealed against weather with a continuous termination bar and caulk. Counter flashing shall be installed over the top of the termination bar to shed water and act as secondary protection.
- Tapered insulation crickets shall be designed on the uphill side of a curb to shed water around a curb on a sloped roof.
- All curbs shall be anchored to the roof deck and never to the roof insulation. New curbs shall be set on wood nailers the same height as the specified insulation thickness. Wood nailers shall be anchored to the deck.
- Exposed piping and or conduit on the roof shall be supported by the Roof System Manufacturers recommended support system. In no case shall exposed treated lumber be allowed on the roof.

1.8 Cant Strip, Curbs, Nailers and Flashings:

Cant Strip: Cant strip are utilized to modify a 90º bend to two 45º bends for flashing systems. It is recommended for asphalt roofs, and most modified bitumen

application. Thermoplastic and thermosetting roof systems generally do not require the installation of cant strips and the bend can be 90º. Consult manufacturer's latest requirements. Most roof leaks occur at the details where waterproofing changes from the horizontal plane to the vertical plane. Proper research of the Roof Manufacturer's System and appropriate documentation in both drawings and specifications is required.

Curbs: Curbs must have their top edge a minimum of 12" above the finished roof. If prefabricated curbs are utilized, then they must be set on wood nailers, firmly anchored to the roof deck, and set at the height of the new roof insulation.

Nailers: Wood nailers are set at exposed perimeter edges and at curb openings. Wood nailers are anchored with fasteners in a staggered fashion at 12" O.C. Fasteners shall be appropriate to secure wood nailers to the existing roof deck. Wood nailers must be provided at the top of all curbs to allow the opportunity of a positive attachment for flashing systems.

Flashings: Membrane base flashings make the transition from horizontal to vertical waterproofing. They should be firmly anchored at the top. Where feasible, membrane base flashings shall be anchored with a continuous termination bar anchored at 9" O.C. The flashing shall be trimmed off at the top, anchored with a continuous termination bar and caulked as a temporary protection. Metal counterflashing shall be installed over the termination bar. All flashings where possible shall be a minimum height of 12" above finished roof.

Metal Counterflashing: Metal counterflashing and coping cap flashing work shall comply with the latest recommendations of SMACNA. Metal counter flashings are preferred to be installed in reglet cut and caulked joints. Otherwise install surface mounted counter flashing. Coping caps shall have a continuous wind cleat. The coping cap system shall slope slightly to the inside of the roof set over a wood nailer firmly anchored to the parapet wall. The base flashing material shall run up the wall and under the coping cap on top of the wood nailer. The coping cap joints shall be raised "drive slides". Materials used shall be compatible with surroundings both esthetically and functionally. Gauge of metal shall comply with SMACNA latest guidelines but shall be no less than 24 gauge.

Metal counterflashing shall be 2 piece. A receiver set into a reglet 12" above the finished roof system, then a termination bar installed and caulked continuous. The final piece is the metal counter flashing installed in the receiver and anchored properly. The reason for the two-piece metal counter flashing is that it can be easily removed and replaced in a re-roofing scenario at a later time.

Metal components such as pitch pans and plumbing leads shall be installed on top of the roof membrane. Their flanges shall be properly secured and prepared: i.e., primed with asphaltic primer in bituminous systems. Then compatible roofing materials shall be utilized to properly strip the flanges to the new watertight membrane.

Pitch pans shall be filled with a pourable sealer. The top of the projection over the pitch pan should have a water shedding skirt if possible. The skirt shall have a draw band and lip for caulk.

1.9 Temporary Roof System Requirements: If the Project requires a temporary roof due to weather, scheduling or other requirements, then the temporary roof should be considered in the original design to comply with the Manufacturers technical requirements. All components must be included in a temporary roof system including protection of any flashing of parapet walls to protect the interior finishes and roofing substrate. When the permanent roof system is installed the final installation shall comply with the design and the manufacturer's requirements.

At the completion of usage of the temporary roof, it must be inspected for damage. Any damage, including wet insulation (if roof insulation was required in the temporary roof), must be repaired before proceeding forward with the installation of the permanent roof assembly. The chosen roof system-Manufacturer should be involved in the above review of the temporary roof and forward a letter stating that the temporary roof has passed their inspection and is ready for their finished warranted roof assembly.

1.10 Lightning Protection System:

Existing Lightning Protection System including cables, air terminals, conductors, fasteners, cable connectors, grounding, etc., shall be removed, stored and reinstalled after the roofing project is complete.

Keep materials under cover and dry. Protect from damage during construction.

The existing lightning protection system shall be installed in compliance with the provisions of the latest "Code for Protection Against Lightning" for buildings as adopted by the National Label System.

All new materials and/or equipment used in this re-installation shall be labeled or listed by Underwriters Laboratories, Inc. for use in Master Labeling lightning protection systems.

All materials shall match existing type and shall comply in weight, size and composition with the material requirements of NFPA 780 and UL96A. Class I materials shall be used for systems on structures not exceeding 75 feet in height and Class II materials shall be used for systems on structures exceeding 75 feet above grade.

If any departures from the existing system are deemed necessary by the contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable to the Architect-Engineer for approval. No such departures shall be made without the prior approval of the Project Manager.

A Lightning Protection Contractor who specializes in this field shall install the Lightning Protection System. The lightning protection installer shall be an experienced installer who is NRTL (nationally recognized testing laboratory) listed or who is certified by Lightning Protection Institute (LHI) as a Master Installer/Designer. Re-certification of existing and certification of new lightning protection systems are required and provided to the Owner through the Architect-Engineer's office. Cost to certify or re-certify the lightning protection system shall be borne by the lightning protection contractor.

Equipment installed shall be compatible with new or existing roofing materials. All equipment shall be installed in accordance with the Roofing System Manufacturer's latest recommendations and in compliance with the Kentucky Building Code.

All Metal Bodies such as ventilators stacks, pipes, antennas, water pipes, ladders, metal edges, and other similar metal shall be interconnected to the main conductor system. Incoming electric and telephone service shall have a common ground with the Lightning Protection System.

Conduits that penetrate the roof shall comply with Roof System Manufacturer's latest recommendations to comply with their watertight warranty.

Application of the Lightning Protection System shall be inspected to determine conformance with NFPA 780 - Standard for the Installation of Lightning Protection Systems and UL 96A - Installation Requirements for Lightning Protection Systems. No part of the system shall be concealed until inspected. In addition the Underwriters' Laboratories Master Label "C" certification shall be delivered to the Owner through the Architect-Engineer's office.

The Lightning Protection Contractor shall deliver the warranty as per manufacturer's requirements and industry standards for Lightning Protection Systems, plus a certification of installed Lightning Protection System to the Architect-Engineer who will provide it to the Owner.

Bidding:

1.11 Pre-bid Conference: A pre-bid conference shall be conducted prior to the Project bid. The date, time and location of the pre-bid conference will be determined by the Division of Engineering and Contract Administration Project Manager. The pre-bid conference agenda shall include:

- Bid date, time and location shall be established by the Contracting Officer.
- Prevailing wages rates if Bid exceeds $250,000 shall be required.
- Bid Bond/ Performance Bond requirements shall be provided by the Contracting Officer.
- Access to the site and site contacts shall be identified.
- Delivery, storage, parking and set up areas shall be located.
- Accessibility 24/7 for emergency vehicles shall be discussed.
- Safety requirements and security requirements shall be delineated.
- Procedures for questions of clarification shall be discussed with deadlines for submittals of inquiry.
- Hours of construction operation shall be established.
- Days of the week available for construction work shall also be established.
- The scope of work for the Project shall be reviewed for the benefit of the prospective bidders.
- Prospective bidders shall be notified that all required State paperwork must be included with a legitimate bid.
- The Bidder must recognize in writing any Addenda.

This Pre-bid agenda outline above in Section 1204.1.11 is in addition and shall be coordinated with Section 704 Pre-Bid Conference.

Construction:

1.12 Pre-Roofing Conference: Once the Contract is awarded or prior to performing the roofing work a Pre-Roofing conference shall be held. The following are items to be discussed.

Administrative Issues:

- Review the Contract and establish the beginning and ending dates for construction.
- Discuss any days that may be "black out" days in which the Contractor may not work.
- Create awareness that the Contractor must be on site to receive any delivered materials.
- Ensure that materials are to be delivered to the site in dry, new unopened and well-marked containers.
- Identify that materials must be protected from the elements with new clean tarps.
- Identify that materials are to be handled to protect them from bending, tearing or

breaking.

- Require that the project foreman, superintendent and project manager are to be named for the duration of the Project. Contractor points of contact shall be established for 24 hour 7 days week accessibility by phone. Office phone, home phone and cell phone numbers in writing must be provided for the following:
    - Company Owner
    - Project Manager
    - Superintendent
    - Foreman

Submittal requirements shall include but not limited to the following:

- Schedule of values
- Daily reports
- Payment requests
- Shop drawings
- Progress schedule
- Material samples
- Sample warranty

Construction Operations:

- Review delivery, storage and handling of materials procedure.
- Review safety and security requirements.
- Review hours of permissible construction work and the days per week available to work.
- Review the scope of the construction work.
- Establish a progress meeting schedule of dates, time and location.
- Review the requirement that the grounds and the roof are to be cleaned and made secure on a daily basis. All debris shall be removed from the site on a daily basis.

1.13 Material Storage and Handling Procedures:

- Materials are to arrive on site in dry condition and undamaged. Either condition shall because for immediate rejection.
- Materials arriving on site must be well marked with all pertinent data including but not limited to UL Ratings, warning labels, coverage requirements, physical properties, Manufacturer's name, address and phone number, etc.
- All materials shall comply with the written technical specifications.
- All materials shall have their MSDS (Material Safety Data Sheets) reviewed through the submittal process.
- The Contractor shall be required to be on site to accept the delivery and oversee the safe unloading at the accepted and designated locations.
- Care shall be required in all material handling situations to avoid bending, breaking, puncturing, etc. of the new materials.

- All materials shall be properly stored above the ground (minimum pallet height) away from extreme humidity, rain, ice, show, frost and sunlight.
- All materials shall be secured to protect from windstorms.
- Tarps shall be utilized to cover materials in lieu of plastic wrappings. If plastic or non-breathable tarps are utilized then they must be vented on a daily basis.
- If below freezing temperatures are expected, then water based and freezable materials must be stored in a heat-conditioned area.
- All bituminous roll goods are to be stored on their ends in a standing position. Roll goods are never to be stored in a laying position. Any rolls that become flattened and /or creased are to be rejected and replaced.
- Roofing materials shall not be stored on the roof deck that overloads or damages the roof deck.

1.14 Weather Conditions:

Application Consideration: A roof system is dramatically involved with the weather conditions during installation and curing more than any other building component. A roof system is literally manufactured in place and on the roof structure.

Cold Temperatures: Typically the temperature should be 40º and rising to install roofs properly. Cold temperatures affect mastics, solvents, metal, metal components and the chilling of hot asphalt. Some warming of materials at the point of application are acceptable if done safely and in compliance with Manufacturer's guidelines.

Hot Temperatures: High humidity and hot temperatures (above 90º F) can have a drastic effect on curing time with certain materials. Hot bitumen will cure slowly. Evaporation can occur more quickly affecting solvents, mastics and adhesives. Consult with Manufacturers if construction is anticipated in hot weather above 90º F.

Wind: Safety issues become a great concern as the wind blows harder. For example, hot materials can blow upon workers, material membranes and insulation can be damaged and coatings can become airborne. The contractor shall make provisions on windy days to secure the operations safely or shut down the job and secure the roof. All materials on the ground shall also be secured.

Precipitation: No work should occur in the presence of moisture. Moisture is the natural enemy of proper roof installation. Moisture can enter materials in transportation, storage and before the installation of the roof is completed. Any wet material shall be rejected. NOTE: Remove only as much roof as can be replaced before the onset of inclement weather or the end of the day, whichever is less. This is the sole responsibility of the Contractor.

1.14 Temporary Water Cutoffs, Night Ties and Weather Protection: Water cut offs shall be installed so that moisture cannot seep under the new or existing construction. Night ties shall be utilized to seal the new roof membrane and keep it watertight until the next day's work. If the existing roof insulation being removed is wet, then both a water cutoff and a night tie shall be utilized.

All night ties and water cut offs must be removed at the beginning of the next day's work.

Weather protection of the roof work includes the daily shut down, securing of the grounds, building and roof. All material on both ground and roof shall be secured and weather protected appropriately. Debris shall be removed from the job site. All channels of drainage (scuppers, gutters, downspouts and roof drains) shall be functioning at shut down.

1.15 Post Installation Concerns: These concerns are primarily for new construction roof projects. When a roof is completed ahead of the rest of the construction projects then it shall be monitored and protected so that the new assembly is not used as a work surface.

When construction activity is anticipated on a roof area; then a temporary roof is the best solution. After construction is completed, then the permanent and finished roof shall be installed.

Quality Assurance:

1.16 Quality Assurance – Test Cuts – Infrared Surveys: The best solution to quality assurance is a continuous and /or ongoing visual inspection and documentation of the roof assembly.

Test cuts can be taken at the end of a job but these are very limited in the information that they provide. A test cut gives information only at the point of the test cut. It does not take into account how the roof and its components have been assembled; i.e. roof drains, projections, curb flashings, wall flashings, etc.

Infrared surveys can be conducted if the roof assembly contains insulation that may have been contaminated with moisture. It is a good option because the infrared survey is non-destructive to the roof system.

1.17 Inspections: .The Architect-Engineer shall host Progress Meetings a minimum of every two weeks for the duration of the roofing application. The Architect-Engineer shall make additional visits to the site as necessary.

The ideal condition is to have a Resident Observer on the Project site if the Project size and scope warrants.

Progress meetings are to have in attendance the following: representatives from the Architect-Engineer, Contractor, all appropriate Subcontractors, Manufacturers, Project Manager and the Using Agency Representative.

Punch List and Final Inspection shall be attended by the following: Architect-Engineer, Contractor, all appropriate Subcontractors, Manufacturers Representative, Project Manager and the Using Agency Representative.

The agenda for the Final Inspection shall include at a minimum:

- Technical Review
- Punch List
- Warranty Review
- Delivery of Maintenance Information
- Contractor's Warranty
- Manufacturer's Warranty
- Final Pay Request
- Final Affidavit

One year after Substantial Completion an on-site review shall be scheduled. The inspection shall be attended by the following: Architect-Engineer, Contractor, all appropriate Subcontractors, Manufacturers' Representatives, Project Manager and the Using Agency Representative. All Warranties shall be reviewed. Any maintenance issues shall be discussed
An onsite inspection must be conducted to check the following at a minimum:

- Coping Caps
- Edge Metals
- Through wall scuppers

- Roof Drains
- Gutters
- Downspouts
- Membrane
- Flashing
- Metal Counter Flashing
- Projections
- Surfacing
- Expansion Joints
- Area Dividers
- Masonry
- Mechanical Equipment Support

The Architect-Engineer shall document the findings of the one-year review. The contractor shall respond immediately to any issues impeding either roof system performance or Warranty.

1.18 Warranties: The Architect-Engineer shall not select a roof system solely on the length of its warranty. The roof system must be selected for compatibility and long-term performance.

Roof Warranties shall cover the roof system for a period of 20 years from Owner's acceptance of the Project.

Roof warranties shall be NO DOLLAR LIMIT (NDL) and total systems warranties, which includes flashings and projections (components). It shall cover faulty materials and /or workmanship and include but not be limited to leaks, blisters, slippage, shrinkage, splitting and other obvious deficiencies that impede the performance of the roof system.

If a Roof Systems Manufacturer does not offer a NDL and total systems warranty then the manufacturer shall include by separate endorsement the following:

- Roof Insulation
- Flashing Systems
- Components and Projections (including roof accessories; i.e. expansion joints)

NOTE: These endorsements shall be incorporated into the base roof warranty by a written addendum from the manufacturer and signed by the CEO/President of the Roof Systems Manufacturing Company.

"Manufacturer's Warranty shall cover wind speeds up to 72 MPH". This must be included in the narrative of the Manufacturer's Warranty or included in the procedures for the endorsement section of the Guidelines if the Manufacturer does not have it in their Warranty narrative.

A sample submittal copy of the roof warranty and any required authorized endorsements shall be reviewed and agreed to by the Architect-Engineer and Project Manager during the bid review period and prior to contract award.

1.19 Maintenance: Inspections shall be performed by the Using Agency twice per year after substantial inspection and after any major storm. Roof inspections and preventative maintenance shall be documented by the Using Agency per the terms and conditions of the manufacturer's Warranty. The Using Agency Representative shall notify the manufacturer and the Project Manager of any damage. The original Warranty shall be kept on file in the Division of Engineering and Contract Administration. A copy is to be kept on file by the Using Agency.