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TECHNICAL GUIDANCE
FOR
ROOFING AND BUILDING ENVELOPE DESIGN

Prepared by
Roofing and Building Envelope Team

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1. INTRODUCTIONINTRODUCTION

Penetration of water within the building envelope is one of the most significant problems experienced with the design and construction of buildings. Problems created by water penetration generally aren't recognized until after a building has been occupied and correcting these problems is often expensive, time consuming, and extremely frustrating to the occupants. SOUTHNAVFACENGCOM has developed the following design guidelines, based upon years of experience, to ensure the integrity of the building envelope. In some respects these guidelines may result in a more conservative design than a comparable private sector building, however, they should be followed on all projects administered by SOUTHNAVFACENGCOM. The following is intended to provide basic guidance from which to work in developing effective and constructible roof, wall and floor designs. Various basic needs, design aids, and items of special attention are noted regarding preliminary design investigation, repair methods, roof and wall system selection, specification and detail guidance, and incorporation of unit pricing for items of indeterminate quantity. Sources of referenced literature are noted at the end of this document. For answers to questions concerning these guidelines contact any member of the SOUTHNAVFACENGCOM Roofing and Building Envelope Team or the Code 07 Building Envelope Team.

2. SUBMITTAL REQUIREMENTSSUBMITTAL REQUIREMENTS

1. SCHEMATICSCHEMATIC

1. Graphic wall, roof, and floor typical section or verbal description of same.

2. 35% OR OTHER INTERIM SUBMITTAL% OR OTHER INTERIM SUBMITTAL:

1. Proposed wall, roof, and floor components, flashing details, typical sections indicating insulation R-values corresponding to the energy analysis, and location of any required vapor retarders.

2. Show roof and wall details on the next drawing sheet immediately following the plan or section in which they occur or group wall details together and roof details together.

3. Energy calculations.

3. 100% SUBMITTAL% SUBMITTAL:

1. Complete typical and special wall, roof and floor sections and details showing all required components, flashing and sealant details for weatherproof construction.

2. Calculations and related sketches showing required R-value, dew point location and placement of vapor retarder/s for all exterior and special wall, roof, and slab/floor conditions as related to the energy calculations.

3. Isometric diagram/sketch the wind induced pressures as determined by ASCE 7-95 for wall and roof cladding.

4. FINALFINAL:

1. Incorporate all the above and any prior review comments and/or the transcript of the resolution discussions with the reviewer documenting why the comments were not incorporated.

3. WALL AND SLAB DESIGN GUIDELINESWALL AND SLAB DESIGN GUIDELINES

1. DESIGN GUIDANCEDESIGN GUIDANCE:

1. REFERENCESREFERENCES: The following standard industry references and design guides can assist in preparing wall and slab plans and specifications:

1. NRCA Roofing and Waterproofing Manual, 4th Ed., Waterproofing and Dampproofing Section.

2. Brick Institute of America publications.(BIA)

3. Exterior Insulation Manufacturers' Association. (EIMA)

4. Manufacturer's technical literature.

2. MASONRY WALLSMASONRY WALLS:

1. Definitions: Cavity walls are defined as walls in which both wythes forming the cavity are separately reinforced and designed as independent structural walls. Veneered walls are defined as walls with a masonry facing secured by joint reinforcement or wall ties to an interior backup wythe. Only the interior wythe is structural in a veneered wall system. Veneered walls are used more commonly than cavity walls, however, both are acceptable systems.

2. Cavity/veneer wall systems are preferred for exterior walls of buildings which have HVAC or humidity control. Single wythe concrete masonry unit walls will normally be restricted to utility or service buildings without environmental controls.

3. Do not use composite masonry walls; i.e. two wythes of masonry units in which the collar joint between is filled solidly with grout, unless written approval is obtained from SOUTHNAVFACENGCOM Codes 071 and 075. If approved, vertical reinforcing will not normally be allowed within the collar joint. Also make sure the specifications do not allow the high lift grouting method.

4. All cavity/veneer walls shall have a minimum 2 inch air space, not including insulation space. Take precautions to preclude insulation from reducing this minimum requirement by showing a R- value and a maximum rigid insulation thickness on the drawings. Distances between wythes shall not exceed 4 inches unless a detailed wall tie analysis is performed. The exception to this requirement is that in seismic zones 2 and higher the maximum space between wythes for veneer walls is 2 inches (per NAVFAC P- 355) including insulation space.

5. Provide a note on the drawings requiring the contractor to keep the mortar cleaned out of the cavity as construction progresses. Multi-wythe walls shall be designed in accordance with Section 5.8 of ACI 530-92/ASCE 5-92, "Building Code Requirements for Masonry Structures" and NAVFAC P-355, "Seismic Design For Buildings".

6. Provide damp-proofing on the exterior face of the interior wythe for all masonry cavity walls.

7. For single wythe walls, provide through wall flashing at vertical obstructions, i.e. bond beams, lintels, concrete tie beams, etc.

8. Mortar joints in single wythe walls should be tooled concave on both sides. Tool exterior joints of the interior wythe of cavity/veneer walls for a denser and more moisture resistant joint. Never use raked joints.

3. WALLS, GENERALWALLS, GENERAL:

1. Avoid using metal stud exterior ***bearing*** walls with masonry veneer.

2. Exercise extreme caution in the design of Exterior Insulation and Finish System (EIFS) walls, soffits, and fascia. Contact a Code 07 Building Envelope Team (BET) member prior to design.

3. Provide calculations showing vapor condensation risk for each exterior wall type for facilities that require close tolerance environmental control such as computer rooms, temperature and humidity controlled warehouses, flight simulators, weapons systems buildings, and other buildings housing sensitive electronic equipment. The Brick Institute of America Technical Note 7D includes a method for assessing the possibility of condensation occurring in a wall section. This method should be modified to account for higher exterior wall temperatures that occur with dark colored wall surfaces.

4. Use of vinyl wall covering and impervious paint on exterior walls is discouraged, especially in humid areas. Impervious wall coverings may trap water vapor within the wall.

5. Glass block may not be used in exterior walls unless written justification is submitted to SOUTHNAVFACENGCOM Code 071 for approval.

6. Do not use roll-up doors on exterior walls of conditioned spaces. Vertical lift, overhead sectional or swing leaf doors are acceptable substitutes.

4. SLABS/FLOORSSLABS/FLOORS:

1. Do not rely on polyethylene under floor slabs as a permanent moisture barrier. Polyethylene is acceptable to retain water in freshly placed concrete, however, it will become punctured during installation and over time the polyethylene will deteriorate. When protection against hydrostatic pressure or conditions of excessive dampness is needed specify an elastomeric waterproofing material per NFGS 07132 or a laminated foil vapor barrier.

2. Provide slab ledgers and base flashing lower than the finish floor for exterior walls and provide exterior walks/slabs that are lower than the finish floor elevation at doorways.

3. Do not rely on sealant as the sole means of providing waterproofing for any building component.

4. Provide conservative positive slopes of exterior pavements away from doorways and building walls. Establish finish floor elevations at least 6" above grade at the perimeter of buildings.

5. DESIGN DETAILSDESIGN DETAILS:

1. All required flashing must be indicated on the drawings. Flashing details shall be drawn at 3" = 1'- 0" or larger scale. Isometric views shall be provided for complicated flashing situations.

2. Flashing at windows, above doors, etc. shall be dammed at each end to divert water to the exterior.

3. Provide expansion/control joint details at 3" = 1'-0" or greater scale.

4. Barracks and other buildings with exterior walkways or balconies: Walkways or balconies abutting exterior walls shall be lower than the finish floor elevation and shall have conservative positive slopes away from the building.

5. When using exterior Portland cement stucco and Exterior Insulation and Finish Systems (EIFS) provide a means to prevent wicking of water through the walls. Also provide complete joint locations and details.

6. Provide details on the drawings for outside closure strips on corrugated metal decks. Do not rely solely on the specifications to cover closure strip requirement.

6. SPECIFICATIONSSPECIFICATIONS:

1. Specify water repellent additives in mortar and block in all exterior single wythe walls. Use only normal weight aggregate CMU meeting requirements of ASTM C-33 and ASTM C-90, Grade N, Type I for single wythe walls.

2. Specify metal brick ties with cavity drips. Spacing of ties shall be in accordance with ACI 530-88 paragraph 5.8.1.5 and 5.8.2.2.

3. Through-wall flashing shall be made of only those materials allowed by NFGS-04200 with the following exceptions: (a) plastic and embossed membrane flashing are prohibited, (b) minimum weights for metal flashing should be 10 oz. sheet copper or 0.01 inch thick stainless steel.

4. Specify sample masonry wall panels (preferably portions of the building which will remain in place) for approval by the Contracting Officer showing workmanship, coursing, through wall flashing installation including lap conditions, weep holes, tooling of joints, cavity width, etc.

5. Specify sealing of joints in rigid insulation within cavity/veneer walls for additional moisture protection.

6. Ensure that the specifications are coordinated with the drawings, energy calculations, and roof/wall survey data.

7. The designer should recommend site visits to inspect wall systems at appropriate

points during construction.

4. ROOF DESIGN GUIDELINESROOF DESIGN GUIDELINES

1. INTRODUCTIONINTRODUCTION:

1. The following is intended to provide basic guidance from which to work in developing effective and constructible roof designs. Various basic needs, design aids, and items of special attention are noted regarding preliminary design investigation, repair methods, roof system selection, specification and detail guidance, and incorporation of unit pricing for items of indeterminate quantity. Sources of referenced literature are noted at the end of this document.

2. Water shedding roofs are preferred over low slope waterproofing systems whenever possible. Water shedding roofs are defined as those of minimum slope of 3 inches per foot except that pre-engineered metal buildings with 1 inch per foot slope is acceptable. Because the Navy must utilize low slope waterproofing systems in many instances, these guidelines and recommendations have been developed in order to eliminate some of the common design and construction problems and inadequacies that have arisen in the past.

2. PRELIMINARY DESIGN INVESTIGATIONPRELIMINARY DESIGN INVESTIGATION:

1. Roof repair and replacement design requires the designer to perform a thorough field investigation of existing construction and conditions to determine their effect on the repair or replacement work. Do not rely on drawing reviews alone. In addition to identifying the existing roof composition and attachment, existing materials must be positively identified and their condition assessed for suitability to accept, and compatibility with, repair or reroofing materials to be used. This may include an examination and evaluation of the support decking to identify safety concerns and any deck removal or repairs necessary. Investigation may require destructive and nondestructive methods along with a thorough visual examination (e.g., core sampling, fastener pull tests, moisture survey/evaluation, etc.).

2. Items to address might include:

    1. Conditions impacting demolition operations such as mechanical attachment of existing components into concrete decking, double pour of aggregate surfacing, presence of asbestos materials, etc.

    2. Effect of adjacent construction and clearances on desired roof design and construction.

    3. Need to repair or replace lightweight insulating concrete or gypsum decking materials due to deterioration or inadequate pull-out resistance. Note that extensive damage can be expected during demolition if existing roofing materials are mopped directly to lightweight insulating concrete or gypsum decking. Visual inspection, pull tests, and core cuts are essential in determining soundness of these deck materials and there ability to accept new roofing attachments.

    4. Steel deck corrosion: This is of particular concern when phenolic foam insulation is present in the existing construction.

5. Practical aspects of sequencing demolition and "put back" operations.

6. Suitability of sheet metal items for reuse considering required removal and reinstallation practices.

7. Positive identification of existing bitumen or generic type of single ply membrane to allow for proper selection of compatible repair materials.

3. ROOF REPAIR METHODSROOF REPAIR METHODS:

1. Navy guide specs do not address basic and unique roof repair materials or methods that may be necessary for various roof membranes. Such repair work requires customized attention to assure effectiveness and compatibility with the existing materials. Refer to the following basic guides for assistance in specifying proper roof repair methods:

    1. NRCA/ARMA Manual of Roof Maintenance and Roof Repair - Generic guidance on built-up roof repairs.

    2. RIEI Roof Maintenance Manual - Generic guidance on built-up roofing, modified bitumen, single plies, and sprayed polyurethane foam roof repairs.

    3. U.S. Army Corps of Engineers, Construction Engineering Research Laboratory Technical Report M-89/04, Handbook for Repairing Nonconventional Roofing Systems (dtd Dec. 1988) - Generic guidance on single ply repairs.

    4. Membrane manufacturer's technical literature.

2. Specified repair methods must completely address materials to be used, preparation methods, and application. Specification language to require only "application in accordance with manufacturer's recommendations" is inadequate.

3. Roof system warranty status should be checked with Base personnel before designing roof repairs.

4. SYSTEM SELECTIONSYSTEM SELECTION:

1. Do not introduce new membrane systems to the Base without consultation with appropriate Base and SOUTHNAVFACENGCOM personnel. Provide rationale for the selected system with the 35% design submittal.

2. For reroofing work, in the absence of other specific preferences dictated by Base personnel, consider low slope roofing systems in the order of precedence listed below considering that steep roofing systems (slope > 3" per foot) are preferred whenever possible. Final system selection must consider roof/building characteristics, conditions, environment, ease of maintenance, and life-cycle costs.

    1. Low slope roofing systems in the order of preference:

        (1) Hot mopped bituminous membrane systems due to their waterproofing redundancy and relative ease of maintenance and repair. These systems include traditional built-up roofing and modified bitumen membrane systems.

(2) Single Ply Membranes giving priority to fully adhered membrane systems.

3. Do not design new roofing membrane over an existing membrane system to remain without the approval of SOUTHNAVFACENGCOM. Preliminary information upon which approval/disapproval will be based shall include, as a minimum, the required field investigation to identify the existing system composition, a thorough evaluation of the existing conditions to note all wet or damaged materials, and proposed overlay materials and attachments.

4. There are limited uses for the application of sprayed in place polyurethane foam (PUF) and the coating systems used for PUF. Do not design for PUF systems without the approval of SOUTHNAVFACENGCOM

5. DESIGN GUIDANCEDESIGN GUIDANCE:

1. The following standard industry references and design guides can assist in preparing roofing plans and specifications:

    1. ANSI/ASCE 7-95 (formerly ANSI A58.1), Minimum Design Loads for Buildings and Other Structures

    2. ARMA Residential Asphalt Roofing Manual

    3. FM Approval Guide and Loss Prevention Data Sheets (LPDS) listed below. These LPDS should be used only as a guide in developing the design. Some aspects of their recommendations may not lead to practical installation practice for a specific project.

        (1) FM Roofing Products Approval Guide (current edition)

        (2) FM LPDS

            (1) 1-7 Wind Forces on Buildings and Other Structures
            (2) 1-28 Insulated Steel Deck
            (3) 1-29 Adhered and Mechanically Attached Single Plies
            (4) 1-30 Repair of Wind Damaged Roof Systems
            (5) 1-49 Perimeter Flashing

    4. NRCA Roofing and Waterproofing Manual, 4th Ed., including NRCA Construction Details.

    5. SMACNA Architectural Sheet Metal Manual

    6. SPRI - Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes.

    7. UL Roofing Materials and Systems Directory - specific wind and fire-rated construction listings for metal roof systems and others.

    8. Manufacturer's technical literature.

2. Assure designed system can meet any specified wind uplift ratings (e.g., FM I-90, UL 580 Class 90, etc.). Note that wind uplift ratings do not directly correspond to a specific wind speed. Such ratings are dependent on other factors. Calculated uplift pressures greater than 45 psf may require special attachment design.

3. Realize the wind resistance is one of several performance factors of concern for the roof system. When wind is a primary concern, other aspects of the design may have to be sacrificed. The designer must assure conflicts do not exist among the specified requirements.

4. The roofing industry has not yet specifically addressed loads on perimeter roof flashing. However, roof system design cannot ignore edge conditions and their attachment. Suggested references for edge detailing and design are FM Loss Prevention Data Sheet 1-49, Perimeter Flashing, the SMACNA Architectural Sheet Metal Manual, NRCA Construction Details, and details in this guide.

5. Assure the roof system design can meet any applicable fire safety criteria, when possible. Avoid conflicts in the specified system construction and referenced fire safety criteria. Do not specify criteria that cannot physically be met. In roof replacement design, assure the existing structure in combination with the new roof system design can attain any specified fire rating.

6. NAVFAC/SOUTHDIV requirements for slope on new construction is 2 inch per foot (min.) built into the structure. Slope requirements for re-roofing projects are based on various factors. While a slope of 2" is desirable, it is realized that this is not always practical, so, for re-roofing a minimum of 3 inch per foot may be allowed when justification is provided. At slopes less than 3 inch per foot, consider only coal tar built-up roofing systems, which require a gravel surfacing.

7. The use of vapor retarder in the southeastern United States is typically not required nor desired while in the upper Midwest the vapor retarder may be a necessary component of the roof system. The designer is responsible for the design and justification of vapor retarders. Vapor retarder design guidance can be found in the current ASHRAE Handbook, in "Vapor Retarders for Membrane Roof Systems", by Wayne Tobiasson of U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), and very general guidance in the NRCA Roofing and Waterproofing Manual. See also Part III, Section B, item 3.

8. Consider the use of air retarders within the roof system as necessary to reduce the billowing and flutter effects of wind action and interior building pressures on the roof membrane. Air retarders can be especially effective in high wind areas involving mechanically attached membrane systems installed over air permeable decks and in buildings with large door openings that can create excessive interior building pressure. Additionally, they can improve the uplift resistance of ballasted single ply systems. Vapor retarders, when used, also serve as an air retarder.

9. Consult SODIV - TG - 1003, Technical Guidance for Mechanical Design, for building insulation requirements. Whenever possible in warm summer climates limit R-value directly below the roof membrane to maximum of R-20 to minimize heat reflectance back up into the roof membrane.

10. Insure the insulation specified is compatible with the application method required and the other materials of the roofing system. When designing fully adhered single ply membranes, assure an insulation board/facer compatible with the fully adhered application is included in the specification.

11. For most roofing systems insulation should be installed in at least two layers with joints staggered and offset between layers.

12. Specify minimum " perlite when asphalt is to be applied to the top and bottom surfaces.

13. Recommend specifying 4'x4' perlite and wood fiber insulation boards (versus allowing 4'x8') to avoid potential bowing and buckling associated with the larger boards. Other insulation boards may be provided in sizes recommended by the manufacturer.

14. Do not use lightweight insulating concrete 20-40 lb. per cubic foot density), gypsum fill, or asphaltic perlite fill materials in new construction. These materials present problems both during and after construction. There are only very limited uses of these materials in reroofing work where they might already exist. Do not specify these materials for reroofing work without the prior approval of SOUTHNAVFACENGCOM.

15. The heights of existing penetrations, parapet walls, and the thickness of existing insulation must be considered and addressed in the design of reroofing projects. If tapered insulation is to be used, determine how it will effect the existing penetrations, parapet wall, adjoining roof sections, roof mounted equipment, etc.

16. Use crickets, saddles, and edge strips, to direct water flow away from penetrations and parapet walls. Provide 2 times the roof slope to ensure resulting finished surfaces are sloped, not flat. Maintain reasonable and constructible cricket layouts and show on the roof plan.

17. Check with membrane manufacturers regarding membrane resistance to known contaminants and pollutants present in the vicinity of the building. Do not specify EPDM membranes over kitchens or other areas where grease or oils are present.

18. Specify only scrim reinforced material for mechanically fastened single ply membranes.

19. Avoid mechanical attachments into concrete decking materials whenever possible due to spalling potential, engagement problems, labor expense, and future tear off expense and damage to decking. When concrete decks are involved, give first consideration to asphalt or adhesive attached roof insulation and membrane systems.

20. Slope conversions from low slope to steep roofing systems must specifically address temporary waterproofing protection where new framing connections penetrate the existing low slope system.

21. Metal roof systems require special design attention to assure requirements are communicated and a solid basis for acceptance or denial of contractor submitted systems is provided. Details of all roof penetration, perimeter, termination, and closure flashing conditions must be provided.

22. Size primary and secondary drainage systems in accordance with SODIV - TG - 1003, Technical Guidelines for Mechanical Design.

23. Locate interior drains at mid-spans and low points of the roof slope. Do not locate drains at columns. Flash drains by tapering insulation from 24 inches out. Extend membrane, 4 lb. lead flashing, and strip flashing under the drain bowl clamping ring. Do not use exposed lead sump details. Avoid interior gutters.

24. Before designating sheet metal items for reuse in reroofing work, assure component can withstand removal, reinstallation, bending, or resetting without damage and as necessary to perform its intended function.

25. Avoid silicone based sealants on Kynar finished metals. Specify non-curing, non-skinning butyl based sealants and tapes for concealed locations such as within laps and under eaves. Polyurethane and curing butyl elastomeric sealants should be specified for exposed locations such as along top edge of surface mounted counter flashings.

6. DESIGN DETAILSDESIGN DETAILS

1. Refer to the following for standard detail guidance:

    1. ARMA Residential Asphalt Roofing Manual

    2. NRCA Construction Details. 4th Edition

    3. SMACNA Architectural Sheet Metal Manual

    4. Details contained in this guide.

    5. Manufacturer's Literature

2. Metal roof systems may require the designer to provide generic design details for the various panel and flashing conditions of the specific project. Thorough details indicating all required detail conditions, necessary detail components, and key elements of detail are necessary to provide a generic basis for acceptance or rejection of contractor submittals. Provide flashing details for standing seam metal roof systems to indicate attachments, folds, joints and laps, closures and terminations, and sealant requirements, etc., to maintain watertight integrity while accommodating thermal movements. Typical details necessary include, but are not limited to, ridge caps and closures, head wall and sidewall flashing, eave conditions, and details for each type of penetration to be flashed into the roof panels.

3. Clearly show on drawings all demolition, existing materials to remain, and new materials and construction.

4. Minimize use of roof penetrations to the greatest extent possible. Maintain proper clearance between penetrations to allow for flashing installation and do not install penetrations in valleys or near drains or scuppers.

5. Maintain a minimum distance of 12 inches between penetrations.

6. Show all penetrations on the roof plan and provide applicable details including detail references keyed on the roof plan or to legend. Clearly show all details of the construction requirements for the deck, insulation, membrane, curbing, base flashing and counter flashing, etc., in insure proper waterproofing. Isometric details are often

necessary to completely communicate requirements.

7. Assure sheet metal terminations, corners, transitions, joints, and laps are sufficiently detailed to indicate a watertight condition. These conditions are typically not addressed in available industry standard details.

8. Assure all penetration flashing extends a minimum of 8 inches above the finished roof surface. Use round shapes to construct equipment supports. Equipment supports should be raised a minimum of 14 inches, but not less than shown below. Note that these minimums apply at the end of the equipment support on the up slope side of the framing

Width of Equipment	Height of Legs*
Up to 25"	14"
25" to 37"	18"
37" to 49"	24"
49" to 61"	30"
61" and wider	48"

*NOTE: Clear dimension from finish roof surface to bottom of equipment support.

9. Avoid embedded metal details in built-up roof systems when possible. For gravel stops which do not allow drainage to the perimeter, use the raised edge detail included herein. For gravel stops which do drain to the perimeter, use light gauge metals such as 24 Ga. galvanized, 0.04 aluminum, or 16 oz. copper. Nail at 3 inches on center in two staggered rows. Strip flash with modified bitumen when specifying built-up roofing systems.

10. When existing pitch pans cannot be avoided and must be utilized, insure pitch pan is a preformed pan with minimum 4 inch height and 2 inch flange with 2 inch clearance on all sides of the penetration. Fill bottom 1/3 with non-shrink grout. Fill remainder with pourable elastomeric sealer sloped to drain. Require a metal umbrella cap clamped to the penetration when possible.

11. Show lightening protection arrester locations on roof plan and provide attachment details. Assure connections are in accordance with the latest editions of NFPA 78, Lightening Protection Code, and UL 96A, Installation Requirements for Lightening Protection Systems.

7. SPECIFICATIONSSPECIFICATIONS

1. Obtain and incorporate current SOUTHNAVFACENGCOM regional revisions to the project specifications, as appropriate. Current revisions can be obtained electronically on the SOUTHNAVFACENGCOM web site at www.navy.mil/homepages/navfac_southdiv, or by contacting SOUTHNAVFACENGCOM Specifications Engineering Division at (803)820-7461.

2. Navy guide specifications require a degree of editing and modification when developing the project specification. Assure nonapplicable or non-desirable materials and procedures are deleted and necessary additions and modifications are included in the final project specification. Final specification should clearly communicate only the desired and intended material and application.

3. Navy guide specifications are written for new roof work and must be carefully edited and modified for repair and reroofing work. It is the designer's responsibility to modify as necessary for the specific project. This could require drafting of new specification sections, language, or requirements to be inserted into the project specification. Additionally, Navy guide specification sections related to roofing (i.e., nailers, insulation, sheet metal, etc.) were originally written for Built- Up roof systems and, again, careful modification is necessary when used with single ply membrane systems.

4. Be aware of the various criteria notes contained in each guide specification that assist in technical editing.

5. Assure coordination of the various spec sections that relate to the roofing work. These may include 02220, "Site Demolition", Various Deck Specifications, 06100 "Rough Carpentry", 07220 "Roof and Deck Insulation", 075xx (Roof Membrane Specs), 0761x (Standing Seam Roof Specs), 07600 "Flashing and Sheet Metal", and 07920 "Joint Sealants".

6. Navy guide specification 07220, "Roof and Deck Insulation", was originally written for built-up roofing applications. When used with single ply membrane, careful editing and modification is required to assure compatibility.

7. The designer is responsible for proper and complete specification. Specification statements such as "application in accordance with manufacturer's recommendations" are unsatisfactory.

8. UNIT PRICINGUNIT PRICING

1. Occasionally roof repair or replacement work includes items of indeterminate quantity like embedded nailers requiring replacement, square feet of deck repair, or total area of wet insulation to be removed for isolated repairs. Such items can be addressed by incorporating unit price items in the Basis of Bid Statement. For guidance see SOUTHNAVFACENGCOM Specification Instruction 00010, Instructions for Preparing Basis of Bid Statement with Unit-Price Items.

2. Roof repair contracts involving various types of repairs on one or multiple buildings can be developed in which the specification addresses the various types of repairs required and a Unit Price Basis of Bid Schedule for each type of repair is used work. Plans indicate general areas of work and general working details are provided. The unit price schedule provides a basis for negotiating any changes in quantities necessary. However, careful estimating of quantities to be included in the unit price schedule, based on observed field conditions, is critical to effective utilization of such a contract. Prior to preparing such contract documents, Base Public Works and ROICC personnel shall be contacted regarding administration of the construction work and the means/responsibility for tracking quantities of work in place. Such contracts shall not be prepared without Base approval and notification to ROICC of any involvement that may be required.

5. REFERENCESREFERENCES

American Concrete Institute (ACI)
22400 W. Seven Mile Road
Box 19150 , Redford Station
Detroit, MI 48219
(315)532-2600

Asphalt Roofing Manufacturer's Association (ARMA)
6000 Executive Boulevard, Suite 201
Rockville, MD 20852-3803
(301)231-9050

Brick Institute of America (BIA)
11490 Commerce Park Dr.
Suite 300
Reston, VA 22091-1525
(703)620-0010

Exterior Insulation Manufacturers Association (EIMA)
2759 State Road 580, Suite 112
Clearwater, FL 34621
(813)726-64877

Factory Mutual Engineering and Research (FM)
1151 Boston-Providence Turnpike
P. O. Box 9102
Norwood, MA 02062
(617)255-4682

National Roofing Contractors Association (NRCA)
O'Hare International Center
10255 Higgins Road
Suite 600
Rosemont, IL 60018-5607
(708)299-9070

Roofing Industry Educational Institute (RIEI)
14 Inverness Drive East
Building H, Suite 110
Englewood, CO 80112
(303)790-7200
Sheet Metal and Air Conditioning Contractors' National
Association, Inc. (SMACNA)
P.O. Box 221230
Chantilly, VA 22022-1230
(703)803-2980

Single Ply Roofing Institute (SPRI)
175 Highland Ave.
Needham, MA 02194
(617)444-0242

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096
(708)272-8800

6. DETAILSDETAILS

1. Hard copyHard copy

1. Hard copies of details may be obtained by contacting SOUTHNAVFACENGCOM Specifications Engineering Division at (803)820-7461.

2. Electronic copyElectronic copy

1. Details will soon be available electronically. Isometric details based on BIA, EIMA, NRCA, and SMACNA; tailored for specific project conditions; may be used until electronic details are available.