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NAVFAC PTS-B30 (June 2023)  
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Preparing Activity: NAVFAC SUPERSEDING PTS-B30 (September 2022)  
  
PERFORMANCE TECHNICAL SPECIFICATION  
  
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SECTION B30

ROOFING  
06/23

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NOTE: This section is intended to be used as a guide and contains requirements that are common to many different types of facilities. In addition, there may be special requirements for a particular project that are not addressed at all. The RFP preparer will need to incorporate additional information to address these special requirements in this PTS and corresponding Part 3 ESR. If the RFP Preparer chooses to delete building elements that are not required for the project, do not change the remaining Uniformat paragraph designations (example A102001). Uniformat designations are unique to the products they are assigned to. However, the subparagraphs numerical extension (example – 1.2 or a,b,c of the Uniformat designations may change if subparagraphs are deleted).  
  
This guide specification is formatted utilizing Uniformat II, an industry recognized standard, ASTM E 1557. When the RFP preparer chooses to add a paragraph that does not apply to an existing building element already included in the specification, refer to the Uniformat/WBS located on the NAVFAC Design-Build Website for a listing of Uniformat II designations and definitions.  
  
NOTE: The RFP preparer may view or hide the criteria notes in this PTS section by modifying the WORD preferences for "Hidden text". To view the criteria notes, choose "File" then "Option". Click "Display" then check the "Hidden text" box under "Always show these formatting marks on the screen". In the same section, check the box for "Print hidden text" under "Printing options" to print the criteria notes.  
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**B30 GENERAL**

RFP Part 3 including the Engineering System Requirements (ESR) provide project specific requirements. The RFP Part 4, Performance Technical Sections (PTS) provide generalized technical requirements that apply to multiple facility types and include more requirements than are applicable to any one project. Therefore, only the RFP Part 4 requirements that apply to the project and further define the RFP Part 3 project specific requirements are required.

**B30 1.1 DESIGN GUIDANCE**

Provide the design and installation in accordance with the following references. This Performance Technical Specification (PTS) adds clarification to the fundamental requirements contained in the following Government Standards. The general requirements of this PTS section are located in PTS Section Z10, *General Performance Technical Specification*.

Industry standards, codes, and Government standards that are referenced in the section text that are not found in the [Unified Master Reference List (UMRL)](http://www.wbdg.org/ffc/dod/unified-master-reference) in the [Federal Facility Criteria (FFC)](http://www.wbdg.org/ffc/federal-facility-criteria) at the [Whole Building Design Guide (WBDG)](http://www.wbdg.org/) website, are listed below for basic designation identification. Comply with the required and advisory portions of the current edition of the standard at the time of contract award.

**B30 1.1.1 Government Standards**

UNIFIED FACILITIES CRITERIA (UFC)

|  |  |
| --- | --- |
| UFC 1-200-01 | DoD Building Code (A reference in this PTS section to UFC 1-200-01 requires compliance with the Tri-Service Core UFCs that are listed therein, which includes the following significant UFC(s): UFC 3-101-01 Architecture UFC 3-110-03 Roofing) |
| UFC 1-200-02 | High Performance and Sustainable Building Requirements |

**B30 1.1.2 Design Requirements**

Wind Uplift Resistance: Determine the required wind uplift resistance based on American Society of Civil Engineers (ASCE) ASCE/SEI 7 wind loading calculations or applicable building code requirements and UFC 3-101-01 *Architecture* and UFC 3-110-03 *Roofing*. The specified Factory Mutual (FM) rating incorporates a safety factor of 2 over the maximum calculated uplift pressure. Therefore, a FM rating of 1-90 correlates to a maximum uplift calculation of 2.2 kPa, 45 psf. When a rated system is specified, ensure the specified roof system is capable of meeting the wind uplift resistance specified. Where non-rated systems may be allowed and used, delineate calculated values in the roof specification or drawings. Utilize independently tested and rated roof systems, such as Factory Mutual (FM), Underwriters Laboratory (UL), and Single Ply Roofing Industry (SPRI).

The complete roof system assembly must be rated and installed to resist wind loads calculated in accordance with ASCE/SEI 7 and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Non-rated systems must not be installed, except as approved by the Contracting Officer. Submit licensed engineer's wind uplift calculations and substantiating data to validate any non-rated roof system.

**B30 1.2 PERFORMANCE VERIFICATION AND ACCEPTANCE TESTING**

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NOTE: This paragraph lists tests to be performed by the Contractor as required by the Designer of Record (DOR).  
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Provide verification of satisfactory roofing system performance via Performance Verification Testing, and by field inspection as detailed in this section of the RFP. All performance and acceptance testing including final/warranty inspections must be witnessed by the Contracting Officer on all significant roof projects.

A significant roof is defined as a single or group of buildings with greater than 15,000 square feet (1,400 m2) of roof area; or a roof with area that is allocated to energy generating equipment such as solar hot water panels or photovoltaic panels; or where building equipment (excluding HVAC), use, or safety causes multiple roof penetrations.

**B30 1.2.1 Pre-Roofing Design Conference**

If the project roof meets the definition of a significant roof above, provide a Pre-Roofing Design Conference. Schedule this conference prior to the roof design and roof layout of the facility. Required attendees include the Designer of Record (DOR), Design Quality Control (DQC) Manager, Roof Design Assurance Consultant (if applicable), Commissioning Authority, and Subcontractors directly responsible for installing the roof and equipment that will be mounted on the roof. Discuss and coordinate the following as a minimum:

a. Renewable energy systems to be mounted on the roof and interface with building systems and utilities,

b. Allocation of space on the roof for different functions,

c. Impact of renewable energy systems and building orientation to the suns path,

d. Waterproofing, flashing, and future reroofing considerations of the facility resulting from renewable energy systems inclusion on the roof,

e. Measures taken to eliminate penetration of the roof membrane. National Roofing Contractors Association (NRCA) roof details proposed for each necessary penetration,

f. Structural requirements to support roof mounted equipment,

g. Aesthetic impact of roof mounted equipment on the facility and measures taken to mitigate negative appearances of equipment.

h. Maintenance and Commissioning requirements of the roof and roof mounted equipment to facilitate final testing and provide proper access and roof membrane protection.

**B30 1.2.2 Pre-Roofing Conference**

Prior to beginning roofing work, hold a Pre-Roofing Conference with the Contracting Officer. Required attendees include personnel directly responsible for the roofing systems design and construction, DQC Manager, Commissioning Authority, as well as the roofing manufacturer's technical representative, and Roof Design Consultant (if applicable). At this time the Contractor will address any conflicts between the proposed roofing system, the design documents, and the scheduling of work / workers (trades) to assure a watertight roofing installation. Resolutions will be obtained and documented in writing prior to the start of roofing work. A quality assurance/quality control plan must also be established at this time, inclusive of the roofing manufacturer's recommended testing and inspections procedures, and in accordance with industry standard guidelines.

Contractor must provide the following additional information at the pre-roofing conference: Procedure for the roof manufacturer’s technical representative's onsite inspection and acceptance of the roofing substrate, roof insulation, and installation of the roofing in accordance with the roof system warranty, the name of the manufacturer's technical representatives, the frequency of the onsite visits, copies of the roof status reports from the technical representatives to the roof manufacturer, and pertinent structural details to the roofing system.

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NOTE: If a Roof Design Assurance Consultant is needed, consider using a Registered Roof Observer as a QC specialist in Part 2 Section 01 45 00, *Quality Control*.  
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**B30 1.2.3 Roof Design Assurance**

If the project roof meets the definition of a significant roof above, the Contractor must utilize the services of a Registered Roof Consultant (RRC) certified by the Roof Consultant Institute, or a Registered Professional Architect or Engineer who specializes in roofing, to approve the roof design. The roof consultant must derive his or her principal income from roofing design on the quality control staff of the Design or Design-Build team. The roof consultant must verify in writing that the design for the project is in accordance with the current edition of NRCA *Roofing and Waterproofing Manual*, UFC 3-110-03, the RFP, and standard industry practices and building codes.

**B30 1.2.4 Tests for Surface Dryness**

Prior to application of roofing materials, perform surface dryness tests in presence of DOR. Asphalt of 350 to 400 degrees F (177 to 204 degrees C) must not foam upon contact with substrate. After foaming test is performed, test for strippability (adherence).

**B30 1.2.5 Quality Control Program**

Establish a quality control program to assure adherence to NRCA recommended Quality Control Guidelines for the Application of Roofing Systems and other specified application requirements. Compliance with Part 2 Section 01 45 00, *Quality Control*, is required.

**B30 1.3 DESIGN SUBMITTALS**

Provide design submittals in accordance with PTS Section Z10, *General Performance Technical Specifications*, Part 2 Section 01 33 10.05 20, *Design Submittal Procedures*, Facilities Criteria (FC) 1-300-09N, *Navy and Marine Corps Design Procedures,* UFC 3-101-01, *Architecture* and UFC 3-110-03, *Roofing*.

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NOTE: NAVFAC has made every effort to use commercial standards in the PTS sections. This PTS section is designed to only use commercial standards. If project requirements dictate the use of a UFGS sections as a standard, add a paragraph here listing the required UFGS section. State in the paragraph that the DOR must edit this UFGS section in accordance with PTS Z10 and submit it as a part of the design submittal.  
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**B30 1.4 CONSTRUCTION SUBMITTALS**

Submit construction submittals in accordance with PTS Section Z10, *General Performance Technical Specifications*. In addition to the Z10 requirements, the Designer of Record (DOR) must approve the following submittals as a minimum:

Test reports, color samples, certificates of conformance, warranties, close out documentation, and manufacturer's instructions for application and installation on all products used on the roof. Products used on the roof consist of but are not limited to structural deck, insulation, membrane or panels, Standing Seam Metal Roofing (SSMR), flashing, fasteners, nailers, accessories and equipment support curbs or equipment support stands for solar equipment, equipment roof plan, maintenance access and paths.

**B3010 ROOF COVERINGS**

Roof coverings must comply with the requirements of UFC 3-110-03, *Roofing*, and NRCA, *Roofing and Waterproofing Manual* found at <http://www.nrca.net/rp/technical/manual/manual.aspx> as the primary NAVFAC roofing criteria. Determine wind uplift using wind speed in accordance with ASCE/SEI 7.

Submit the INFORMATION CARD (see "Form 1" at the end of this section) Provide a typewritten card, laminated in plastic and framed in a weather-tight frame, or a photoengraved 0.032-inch (0.81 mm) thick aluminum card for the roof. This card must be a minimum size of 8 1/2 x 11 inch (216 x 280 mm) and contain information listed in the attached Form 1. Install the card where directed. Furnish framed card and a duplicate card to the Designer of Record.

**B301001 STEEP SLOPE ROOF SYSTEMS**

**B301001 1.1 METAL ROOF PANELS (ARCHITECTURAL STANDING SEAM METAL ROOFS ON SUPPORTED SUBSTRATE)**

**B301001 1.1.1 Manufactured Sheet Metal Roofing**

Provide galvanized steel or aluminum-zinc coated steel or aluminum panels formed at the manufacturing plant and conditioned for flatness. Determine panel thickness by the requirements of NRCA, *Roofing and Waterproofing Manual*, but not less than 24 gauge for panels less than 16 inches wide (400 mm), and 22 gauge for panels 16 inches (400 mm) wide or greater. All panels greater than 12 inches (300 mm) wide must have preformed reinforcing ribs or embossed for stiffening. The minimum gauge for aluminum panels must be 20-gauge, .032 inch thick (.8 mm thick) or greater. Roofing design must meet deflection and wind load requirements per building code.

The SSMR system covered under this specification must include the entire roofing system; the standing seam metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with ASTM E 1592. In addition, the system must consist of panel finishes, slip sheet, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, curbs, skylights; interior or exterior gutters and downspouts; eaves, ridge, hip, valley, rake, gable, wall, or other roof system flashings installed and any other components specified within this contract to provide a weathertight roof system.

a. Provide inverted "L" Standing Seam shape roofing panels.

b. Panel Protection - Treat exposed cut edges with compatible coating comparable to the factory applied coating system for corrosion protection.

c. Sealants - Provide non-curing, non-skinning butyl based sealants and tapes for concealed locations such as within laps and under eaves. Provide polyurethane and curing butyl elastomeric sealants for exposed locations such as along top edge of surface mounted counter flashings.

d. Factory Color Finish - Provide factory applied, baked coating to the exterior and interior of metal wall panels and metal accessories. Provide exterior finish top coat of 70 percent polyvinylidene fluoride resin with not less than 0.8 mil dry film thickness. Provide exterior primer standard with panel manufacturer with not less than 0.8 mil dry film thickness. Interior finish must consist of 0.5 mil dry film thick backer coat if permanently concealed from view by construction or the same coating and dry film thickness as the exterior coating if the panel interior side will be exposed. Provide factory-applied clear 70 percent polyvinylidene fluoride (PVF), 0.8 mil top coat and edge coating on all factory-cut or unfinished panel edges for projects within 300 feet (91 meters) of the ocean or industrial environments.

e. Warranty - Furnish manufacturer's no dollar limit materials and workmanship warranty for the roofing system. The warranty period must not be less than 20 years from the date of Government acceptance of the work. The warranty must be issued directly to the Government. The warranty must provide that if within the warranty period the metal roofing system becomes non-watertight or shows evidence of corrosion, perforation, peeling paint, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or workmanship the repair or replacement of the defective materials and correction of the defective workmanship must be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty must be performed within 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. Provide a 2-year contractor installation warranty. Coating must not show a color change greater than 5 NBS color units in accordance with ASTM D2244, and not show chalking in excess of 10 in accordance with ASTM D4214.

f. Wind Uplift - Metal roofing systems must be designed and attached to resist wind uplift pressures calculated in accordance with ASCE/SEI 7. Uplift resistance must be validated by applicable Factory Mutual (FM), Underwriters Laboratories (UL), or ASTM uplift resistance test procedures.

**B301001 1.1.2 Metal Roof Design Requirements**

Design the SSMR system as a complete system. Roof panels, components, transitions, accessories, and assemblies must be supplied by the same roofing system manufacturer. Provide to the DOR a design analysis signed by a Registered Professional Engineer employed by the SSMR manufacturer. The design analysis must include a list of the design loads, and complete calculations for the roofing system and its components; valley designs, gutter/downspout calculations, screw pullout test results, and indicate how expected thermal movements are accommodated.

**B301001 1.1.3 Accessories**

Provide other sheet metal flashings, trim moldings, closure strips, caps and other preformed metal panel accessories, of the same material, thickness and finish as panels, except accessories that are concealed after installation, and are aluminum or zinc-coated steel may be provided unfinished. Provide molded closure strips of closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configurations of preformed metal panels. All accessories must be manufactured or approved by the roof panel manufacturer.

**B301001 1.1.4 Fasteners**

Provide concealed fasteners for attaching panels to structural supports and to adjoining panels as approved and in accordance with printed manufacturer's recommendations.

**B301001 1.1.5 Field Quality Control**

Install in accordance with the approved manufacturer's erection instructions, shop drawings, and diagrams. Panels must be in full and firm contact with attachment clips. Where prefinished panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they must, after necessary repairs have been made with material of the same color as the weather coating, be approved before being installed. Seal openings through panels. Correct defects or errors in the materials. Replace materials which cannot be corrected in an approved manner with nondefective materials. Provide molded closure strips where necessary to provide weathertight construction. Use shims as required to ensure attachment clip line is true. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened. Provide 30-pound layer of asphalt-saturated felt placed perpendicular to roof slope, covered by a slip sheet. Overlap side and end laps 75 mm 3 inches, offset seams in building paper with seams in felt.

Apply roofing panels with the standing seams parallel to the slope of the roof. Provide roofing panels in longest practical lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, and similar openings. Install flashing to assure positive water drainage away from roof penetrations. Locate panel end laps such that fasteners do not engage supports or otherwise restrain the longitudinal thermal movement of panels. Attach panels to the structure with concealed clips incorporated into panel seams. Clip attachment must allow roof to move independently of the structure, except at fixed points as necessary.

**B301003 ROOF INSULATION & FILL**

Coordinate the insulation system with the mechanical design to suit the energy requirements of the facility.

**B301003 1.1 MINERAL FIBER BLANKET INSULATION**

This paragraph covers the requirements for mineral fiber blanket thermal insulation in attics and above ceilings.

**B301003 1.1.1 Products**

a. Blanket Insulation - ASTM C 665, Type I, II, or III, as appropriate for the installation, Class A, membrane-faced surface with a flame spread of 25 or less; and a smoke developed rating of 150 or less when tested in accordance with ASTM E 84. Indicate insulation R-values on the design drawings.

b. Blocking – Treated wood, metal, un-faced mineral fiber blankets in accordance with ASTM C665, Type I. Blocking around chimneys and other heat producing devices must be non-combustible and meet the requirements of ASTM E 136.

c. Vapor Retarder - 6 mil (minimum) thick polyethylene sheeting conforming to ASTM D 4397, with a water permeance value of 1 perm or less when tested according with ASTM E 96.

**B301003 1.2 ROOF AND DECK INSULATION**

This paragraph covers the requirements for insulation materials used below metal roofing systems.

**B301003 1.2.1 Insulation Types**

Roof insulation must have an R-value determined in accordance with American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90.1 and meet project energy goals and be one or an assembly of a maximum of three of the following materials and compatible with attachment methods for the specified insulation and metal roof system: Polyisocyanurate Board – ASTM C 1289, with a minimum compressive strength of 138 kPa (20 psi), unless overlaid with another board with a comparable or greater compressive strength. Use insulation facer as recommended by the roofing material manufacturer. Board size is restricted to 4' by 4' when applied in direct contact with concrete deck.

**B301003 1.2.2 Glass Mat Gypsum Roof Board**

ASTM C 1177, with a 0 Flame Spread and 0 Smoke Developed when tested in accordance with ASTM E 84, 500 psi (2450 kPA), Class A.

**B301003 1.2.3 Underlayment**

a. Asphalt-Saturated Felt Base Sheet for Single Layer Application - ASTM D 4869, Type II or ASTM D 226, Type II (30 pounds).

b. Polymer-Modified Self-Adhering Bitumen Sheet, 40 mil (1.1 mm) minimum thickness. Provide at roof perimeter, valley and roof penetration locations as a minimum.

**B301003 1.2.4 Seal at Penetrations**

Provide pre-manufactured flashing components for use in roofing applications. Seal laps and penetrations to prevent moisture vapor penetration. Adhesives, sealants, prefabricated components and spray foam products may be required.

**B301003 1.2.5 Fasteners**

Fasteners must be flat, round or hexagonal steel (not less than 1-3/8"(35 mm) diameter) and 28 gage, or plastic plates (not less than 3 inches (75 mm) in diameter).

Fasteners in lightweight cellular concrete decks must penetrate at least 1 inch (25 mm) but not more than 1-1/2 inches (32 mm) into the deck. Withdrawal resistance from lightweight cellular concrete deck must not be less than 40 lbs.(18 kg) each, or 120 lbs. (54 kg) each in metal deck.

Fasteners in steel decks must be hardened fasteners or screws conforming to FM A/S4470 and listed in FM P7825 for Class I roof deck construction.

Fasteners must be place to withstand an uplift pressure required by the project program in the field of the roof and FM Loss Prevention Data Sheets (LPDS) 1-49 for perimeter component and flashing attachment.

Roofing Nails - Provide corrosion resistant ring shank nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into wood nailers or so as to provide appropriate embedment in substrate below. Fasteners must conform to FM A/S4470, and be placed to withstand an uplift pressure of 90 psf (4.3 kPa) conforming to FM P7825, and FM 1-49 for perimeter fasteners.

**B301003 1.2.6 Wood Nailers**

Wood nailers must be pressure-preservative-treated in accordance with AWPA M2 Standards, permanently marked or branded, and installed flush with the top of the adjacent insulation board. Separate treated wood nailers from roofing metals with underlayment.

**B301003 1.2.6.1 Fasteners**

Provide stainless steel, double hot-dipped galvanized or other corrosion resistant fasteners recommended by the treatment manufacturer for use with treated wood.

**B301004 FLASHINGS & TRIM**

**B301004 1.1 FLASHING AND SHEET METAL**

This paragraph covers the requirements for flashing and sheet metal work including scuppers, splash pans, and sheet metal roofing. Provide flashing and sheet metal in accordance with roof manufacturer’s printed installation instructions and in compliance with NRCA and SMACNA recommendations.

**B301004 1.1.1 Materials**

Furnish sheet metal items in minimum 8 to 10 foot (2.44 to 3.05 meter) lengths. Sheet metal items include the following: gutters, including hangers; downspouts; counter-flashings; gravel stops and fascias; cap, valley, stepped, base and eave flashings and related accessories.

a. Provide flashing and trim in same materials and finish as roof panels.

b. Fasteners - Fasteners must be of the same or compatible metal with the item being fastened. Stainless steel fasteners must be used to fasten dissimilar materials.

**B301004 1.1.2 Field Quality Control**

Fabrication and installation of sheet metal items must be as follows:

a. Install work with watertight and hairline joints, without waves, warps, buckles, fastening stresses, or distortion, allowing for expansion and contraction.

b. Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry and free of defects and projections that could affect the application.

c. Provide sheet metal flashing in angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

d. Provide prefabricated inside and outside corners at all sheet metal intersection pieces. Minimum leg length must be 12 inches (300 mm), maximum length must be 18 inches (450 mm).

e. Fabricate sheet metal to conform to the contours of surfaces to which applied.

f. All sheet metal cap flashings must have waterproof membrane underlayment installed behind or below the metal components.

g. Provide conforming sheet metal closures at all flashing termination conditions.

h. Provide fastenings and accessories as required to provide a securely attached, watertight construction. Cleats must be a minimum of one gage heavier than the component to be attached.

i. Where sheet metal components are to be embedded in the roofing system, prime both sides of all metal flanges prior to installation.

**B301005 GUTTERS AND DOWNSPOUTS**

Provide gutters and downspouts compatible with roofing material and finish. Concealed (interior) gutters and downspouts are prohibited. The primary and secondary drainage systems must be sized in accordance with applicable Plumbing and Building Codes. Finish must be baked-on factory applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating with a minimum thickness of 0.8 to 1.3 mils.

**B301090 OTHER ROOFING**

**B301090 1.1 LIGHTNING PROTECTION**

Lightning protection component penetrations and attachments must be sealed and flashed and anchored in a permanent manner and in a manner to avoid the degradation of the watertight integrity of the roof system. Do not cut or otherwise disturb the roof membrane. Mastic seals in the plane of the roof are unacceptable. Anchor plates set in mastic must be set on roof surface cleaned of aggregate and loose material prior to mastic application.

**B301090 1.2 VEGETATED ROOFS**

Where vegetated roofs are specified, provide additional technical specification for Government approval. Refer to UFC 3-110-03 and Whole Building Design Guide section titled "[Vegetated Roof Covering](https://www.wbdg.org/ffc/epa/federal-green-construction-guide-specifiers/07-33-63) ".

-- End of Section --