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Preparing Activity:    NASA                      Superseding  
   UFGS-07 22 00.00 40 (October 2006)  
   NASA-07220S (December 2005)  
   UFGS-07220 (June 2005)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

Latest change indicated by CHG tags

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SECTION 07 22 00.00 40

ROOF AND DECK INSULATION  
01/07

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers roof vapor barriers (where required), thermal insulation (or underlayment) applied to roof decking systems as required by the project.

Drawings must indicate the following:

Location and extent of roof insulation (or underlayment) work required.

Nominal thickness and name of insulation (or underlayment), as required.

Roof insulation (or underlayment) venting systems.

Vents are specified in Section 07 53 23  
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING.

Vapor barriers must be indicated for high-humidity areas and wherever the winter fresh-air make-up is less than 1 cubic meter per minute 30 cfm per occupant. Vapor barriers must be applied to the winter-heated side of the construction.

Where vapor barriers are used, design details must provide for continuous venting of the barrier-insulation-membrane sandwich at the entire periphery, at all curbs, and at other places as required by the project.

Insulated metal panels are specified in Section  
07 40 00.00 40 ROOFING AND SIDING PANELS.

Thermal insulation for plumbing, heating, ventilating, and air-conditioning systems is specified in Division 15, "Mechanical."

Vapor barriers are not required on steel decks. When a vapor barrier is mopped on the deck, asphalt primer must be used; bituminous plastic cement must be used at eaves and rakes.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 1177/C 1177M

(2004e1) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

ASTM C 1289	(2005) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM C 150	(2005) Standard Specification for Portland Cement
ASTM C 208	(1995; R 2001) Standard Specification for Cellulosic Fiber Insulating Board
ASTM C 209	(1998) Standard Test Methods for Cellulosic Fiber Insulating Board
ASTM C 317/C 317M	(2000) Standard Specification for Gypsum Concrete
ASTM C 332	(1999) Standard Specification for Lightweight Aggregates for Insulating Concrete
ASTM C 552	(2003) Standard Specification for Cellular Glass Thermal Insulation
ASTM C 726	(2005) Standard Specification for Mineral Fiber Roof Insulation Board
ASTM C 728	(2005) Standard Specification for Perlite Thermal Insulation Board
ASTM D 1190	(1997) Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1227	(1995; R 2000) Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM D 1751	(2004) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(2004a) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D 2178	(2004) Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM D 226	(2005) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 227	(2003) Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing

ASTM D 2626	(2004) Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing
ASTM D 2822	(2005) Standard Specification for Asphalt Roof Cement
ASTM D 312	(2005) Standard Specification for Asphalt Used in Roofing
ASTM D 41	(2005) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 450	(1996; R 2000e1) Standard Specification for Coal-Tar Pitch used in Roofing, Dampproofing, and Waterproofing
ASTM E 84	(2005e1) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96	(2005) Standard Test Methods for Water Vapor Transmission of Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-200	(1993e) Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement
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## 1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes

following the "G" typically are not used for Navy,  
Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force  
and NASA projects, or choose the second bracketed  
item for Army projects.

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Government approval is required for submittals with a "G" designation;  
submittals not having a "G" designation are [for Contractor Quality Control  
approval.] [for information only. When used, a designation following the  
"G" designation identifies the office that will review the submittal for  
the Government.] Submit the following in accordance with Section 01 33 00  
SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

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NOTE: Specify shop drawings for wood nailers when  
nailers are required for securing insulation on  
roofs sloped **one in 24 1/8 inch per foot** or more.

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[Wood Nailers]

[Tapered Roof Insulation system] [; G] [; G, [\_\_\_\_]]

[Tapered Cants and Crickets] [; G] [; G, [\_\_\_\_]]

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NOTE: Include requirement for backnailing felts  
when backnailing of felts is specified for built-up  
roofing. Include bracketed second and third  
sentences when tapered insulation is specified.

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[Show location and spacing of wood nailers that are required for  
securing insulation [and for backnailing of roofing felts]].

[Show a complete description of the procedures for the  
installation of each phase of the system indicating the type of  
materials, thicknesses, identity codes, sequence of laying  
insulation, location of ridges and valleys, special methods for  
cutting and fitting of insulation, and special precautions. The  
drawings must be based on field measurements.]

#### SD-03 Product Data

Submit manufacturer's data indicating percentage of recycle  
material in **Roof and Deck Insulation** to verify affirmative  
procurement compliance.

Submit total weight and volume quantities of roof and deck  
insulation with recycle material.

Submit manufacturer's catalog data for the following items:

**Thermal Insulation Materials** [; G] [; G, [\_\_\_\_]]

**Glass Mat Gypsum Substrate**

**Sheathing Paper**

Vapor Barrier  
Fastening Materials[; G][; G, [\_\_\_\_]]  
Bituminous Plastic Cement  
Asphalt-Base Emulsion

#### SD-04 Samples

Submit the following samples:

Three of each type of Fasteners

Three 1 liter 1-quart containers of Adhesives.

Three pieces, full thickness by 300 millimeter 12 inches by the width of roll of Vapor Barrier and Insulation (or underlayment).

After approval, full-sized samples may be used in the construction, provided each sample is clearly identified and its location recorded.

#### SD-06 Test Reports

Submit test reports for water resistance and permeance for Vapor Barrier.

#### SD-07 Certificates

Submit certificates for all materials that are identified by a referenced specification standard. Submit certificates which exactly identify each item by the designation which will appear on the packaging for the following items:

Fiberboard Roof Insulation  
Glass Mat Gypsum Substrate  
Qualifications for installation  
Gypsum Board With (Without) Fiber Roof Insulation  
Mineral-Fiber Roof Insulation  
Fibrous-Glass Roof Insulation  
Expanded-Perlite Roof Insulation  
Polyisocyanurate Roof Insulation  
Phenolic Roof Insulation  
Concrete Roof Insulation  
Expansion Joint Filler Strips  
Compound  
Polyvinylchloride Sheet Vapor Barriers  
Roofing Felts  
Base Sheet  
Asphalt Primer  
Steep Asphalt  
Coal-Tar Pitch  
Bituminous Plastic Cement  
Asphalt-Base Emulsion

#### SD-08 Manufacturer's Instructions

Manufacturer's instructions for the following items must indicate fastener and adhesive instructions for each type of installation.

Vapor Barrier

Roof Insulation  
Fiberboard Roof Insulation

SD-11 Closeout Submittals

Warranty

1.3 QUALIFICATIONS FOR ROOF AND DECK INSULATION WORK

Personnel installing roof and deck insulation must be certified by the insulation manufacturer to install their products.

Insulating concrete Contractor must be certified in the application of the materials by the aggregate manufacturer.

1.4 DELIVERY AND STORAGE OF MATERIALS

Deliver materials to the project site in their original, unopened packages or containers bearing labels identifying the manufacturer's name, brand name, material, and other information.

Store materials in their original, unbroken packages or containers in a weathertight and dry area and protected from damage until needed for use.

PART 2 PRODUCTS

2.1 AFFIRMATIVE PROCUREMENT

Glass-Fiber and Mineral Wool/Fiber are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (<http://www.epa.gov/cpg/>)

EPA's recommended Recovered Materials Content Levels for building insulation.

Product	Material	Percent Of Post Consumer Materials	Percent Of Total Recovered Materials
Rock Wool	Slag		75
Fiberglass	Glass Cullet		20-25
Cellulose Loose Fill & Spray-on	Post Consumer Paper	75	75
Perlite Composite Board	Post Consumer Paper	23	23
Plastic Rigid Foam, Polyisocyanurate/Polyurethane			
Rigid Foam			9
Foam-in-Place			5
Glass Fiber Reinforced			6
Phenolic			5

Product	Material	Percent Of Post Consumer Materials	Percent Of Total Recovered Materials
Rigid Foam			
Plastic, Non- Woven Batt	Recovered and /or Post Consumer Plastics		100

The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.

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**NOTE:** If the Architect/Engineer determines that use of certain materials meeting the CPG content standards and guidelines would result in inadequate competition, do not meet quality/performance specifications, are available at an unreasonable price or are not available within a reasonable time frame, the Architect/Engineer may submit to Contracting Officer a written justification and supporting documentation for not procuring designated items containing recovered material using the Recovered Materials Determination Form.  
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For informational purposes, a list of known sources for roof and deck insulation using recycled material is provided in the EPA/CPG Supplier database at [http://www.ergweb2.com/cpg4review/user/cpg\\_search.cfm](http://www.ergweb2.com/cpg4review/user/cpg_search.cfm).

Note that the Contractor is not limited to these sources. A product meeting CPG recycle requirements from other sources may be submitted for the Government's approval.

Submit recycled material content data for **roof and deck insulation** indicating compliance with affirmative procurement.

Submit total weight and volume quantities of **roof and deck insulation** with recycle material.

## 2.2 THERMAL INSULATION MATERIALS (OR UNDERLAYMENT)

### 2.2.1 Rigid Board

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**NOTE:** Specify glass mat gypsum roof board as a contractor's option to wood fiberboard, expanded perlite, or other suitable material, when an underlayment or overlayment is required for the roof insulation board.  
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[Glass Mat Gypsum Substrate, conforming to **ASTM C 1177/C 1177M**, 0 Flame Spread and 0 Smoke Developed when tested in accordance with **ASTM E 84**, 3450 kPa 500 psi, Class A, non-combustible, [6] [13] [16] mm [1/4] [1/2] [5/8] inch thick, 1220 by 2440 mm 4 by 8 feet board size.]

[Fiberboard roof insulation, rigid type, must conform to **ASTM C 208** and **ASTM C 209**, with a maximum thermal conductance value of [\_\_\_\_].]

[Mineral-wool or mineral-fiber roof insulation, rigid type, must conform to

ASTM C 726, with a maximum thermal conductance value of [\_\_\_\_].]

[Fibrous-glass roof insulation must conform to ASTM C 726, with a maximum thermal conductance value of [\_\_\_\_].]

[Expanded-perlite roof insulation, rigid type, must conform to ASTM C 728, with a maximum thermal conductance value of [\_\_\_\_].]

[Cellular-glass insulation must conform to ASTM C 552.]

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NOTE: Polyisocyanurate roof insulation is one of the materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (<http://www.epa.gov/cpg/>). If the Architect/Engineer determines that use of certain materials meeting the CPG content standards and guidelines would result in inadequate competition, do not meet quality/ performance specifications, are available at an unreasonable price or are not available within a reasonable time frame, the Architect/Engineer may submit written justification and supporting documentation for not procuring designated items containing recovered material. Written justification may be submitted on a Request for Waiver Form to the NASA Environmental Program Manager for approval. The Request for Waiver Form is located in the NASA Procedures and Guidelines (NPG 8830.1) (<http://nodis3.gsfc.nasa.gov>)

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[Polyisocyanurate roof insulation must conform to ASTM C 1289, with a maximum thermal conductance value of [\_\_\_\_].]

Polyisocyanurate roof insulation must contain a minimum content of 9 percent of recovered materials.

Submit certificate from the insulation manufacturer attesting that the installer has the proper [Qualifications](#) for installing [Tapered roof insulation](#) systems. Installation must conform to approved shop drawings as for all [tapered cants and crickets](#).

Certificate attesting that the expanded perlite or polyisocyanurate insulation contains recovered material and showing estimated percent of recovered material. Certificates of compliance for felt materials.

#### 2.2.2 Poured [Insulation](#)

[Gypsum concrete roof must conform to ASTM C 317/C 317M, Class A, with a maximum thermal conductance value of [\_\_\_\_]. Water must be potable.]

[Lightweight-concrete roof insulation must have a maximum thermal conductance value of [\_\_\_\_]. Aggregates must conform to ASTM C 332, Group I; portland cement must conform to ASTM C 150, Type IA or IIIA; water must be potable. Lightweight-concrete design mix must be 1 bag (43 kilopascal) (94 pounds) of portland cement to 1-1/2 bags (0.2 cubic meter) (6 cubic feet) of aggregate, and with a minimum compressive strength of 860 kilopascal 125 psi at 28 calendar days.]

Phenolic roof insulation and gypsum board with (without) fiber roof insulation must meet referenced standards within this section.

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NOTE: Bituminous type joint fillers are suitable for use with both hot-applied elastic and cold-applied mastic joint-sealing compound. Nonbituminous joint fillers are preferred for use with cold-applied elastomeric polymer sealing compound.  
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[Expansion-joint filler strips must be the nonextruding and resilient bituminous type conforming to ASTM D 1751.]

[Expansion-joint filler strips must be the nonextruding and resilient nonbituminous type conforming to ASTM D 1752, Type I or II.]

\*\*\*\*\*  
NOTE: Choose one of the following paragraphs as applicable. Cold-applied mastic costs less.  
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[Compound must be hot-poured elastic, conforming to ASTM D 1190.]

[Compound must be cold-applied, two-component, elastomeric polymer, conforming to FS SS-S-200.]

## 2.3 SHEATHING PAPER

Sheathing paper must be [rosin-sized weighing not less than 2.5 kilogram per 10 square meter 5 pounds per 100 square feet] [unsaturated felt weighing approximately 3.5 kilogram per 10 square meter 7-1/2 pounds per 100 square feet].

## 2.4 VAPOR BARRIER

### 2.4.1 Polyvinylchloride Sheet

Polyvinylchloride sheet vapor barriers must be unplasticized virgin polyvinylchloride, not less than 0.10 millimeter 0.004 inch thick, with water vapor permeance of not more than 0.06 nanogram per pascal-second square meter 0.10 on a spot-by-spot basis, not as an average. Permeance must be measured in accordance with ASTM E 96, Water Method.

### 2.4.2 Roofing Felts

Roofing felt must be [asphalt-saturated organic felt conforming to ASTM D 226, No. 15 [plain] [perforated].] [coal tar-saturated organic felt conforming to ASTM D 227] [asphalt-impregnated glass fiber conforming to ASTM D 2178, Type [\_\_\_\_]].]

### 2.4.3 Base Sheet

Base sheet must be [asphalt-saturated and asphalt-coated organic felt conforming to ASTM D 2626.] [asphalt-impregnated glass-fiber felt, conforming to ASTM D 2178.]

## 2.5 FASTENING MATERIALS

### 2.5.1 Adhesives

#### 2.5.1.1 Insulation or Underlayment

Adhesive for application of insulation or underlayment to steel decks must be nonflammable and meet the requirements of the Underwriters Laboratories, Inc., for a metal roof-deck construction assembly; the Contractor must submit proof of such conformance. Label of the Underwriters Laboratories, Inc., will be acceptable evidence. In lieu of the label, the Contractor may submit a written certificate from any approved nationally recognized testing organization adequately equipped and competent to perform such services, stating that the adhesive conforms to the requirements, including methods of testing, of the Underwriters Laboratories, Inc.

#### 2.5.1.2 Polyvinyl-Sheet

Adhesive for application of film polyvinyl-sheet vapor barriers must be rubber-base water-resistant material with a nontoxic vehicle especially prepared for application of polyvinyl-sheet membrane to roof decks. Holding power of the adhesive must be 670 kilopascal 100 psi or greater. Adhesive must be certified by the manufacturer on the basis of tests by an independent testing laboratory to have a tunnel flame spread of not more than 10 when applied to a noncombustible surface.

#### 2.5.1.3 Felt or Base Sheet

[Asphalt primer must conform to ASTM D 41.]

[Steep asphalt must conform to ASTM D 312, Type III.]

[Coal-tar pitch must conform to ASTM D 450, Type I [modified to meet air-pollution control requirements].]

### 2.5.2 Fasteners

Roofing nails must be [nonferrous] [cement-coated] [galvanized] with [\_\_\_\_\_] millimeter inch diameter head [annular or spiral threaded for plywood deck] of sufficient length for maximum penetration into deck or wood nailer.

Self-clinching nails must have a minimum holding capacity of 90 newton 20 pounds per fastener, when driven.

Insulation holddown clips must be as recommended by the insulation manufacturer and approved prior to installation.

## 2.6 BITUMINOUS PLASTIC CEMENT

Plastic cement must conform to ASTM D 2822 Type I, Class [\_\_\_\_\_] for asphalt-saturated felts and Type II, Class [\_\_\_\_\_] for coal-tar-saturated felts.

## 2.7 ASPHALT-BASE EMULSION

Asphalt-base emulsion must conform to ASTM D 1227, Type I, Class [\_\_\_\_\_] .

## [2.8 WOOD NAILERS

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NOTE: When roof slope exceeds **one in 24 1/2 inch per foot**, insulating materials beneath built-up roofing should be both mopped and held in place by treated wood nailers. Non-nailable decks should be provided with surface-applied nailing strips of same thickness as insulation. See built-up bituminous roofing specifications for requirements on nailing of roofing felts. For all insulated roof decks, treated wood nailers should be applied at eave edgings and sides of roofs and around curbs and elsewhere as necessary to provide nailing for gravel stops and flashings. Refer to FM Loss Prevention Data Sheet 1-49 for method of attachment of nailers. A water-borne preservative treatment should be specified in Section 06 10 00 for wood which will be in contact with bituminous materials.

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Pressure-preservative-treated as specified in Section 06 10 00 ROUGH CARPENTRY.

## ]PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

Install **roof insulation** in accordance with approved descriptive data and as specified in Section 07 52 00 MODIFIED BITUMINOUS MEMBRANE ROOFING.

Prior to installation of underlayment or roof insulation, verify that all work is completed which penetrates the roof or requires traversing by men and equipment.

Examine deck surfaces for inadequate anchorage, foreign material, moisture, and unevenness, any condition which would prevent the execution and quality of application of underlayment or roof insulation system as specified and correct all defects before proceeding with underlayment or insulation application.

Install insulation only after building construction has progressed to the point that inclement weather will not damage or wet the insulation material.

Starting work designates acceptance of the surfaces by the Contractor.

Cut and fit underlayment or insulation material as necessary to fully insulate small areas and to accommodate piping, scuttles, skylights, vents, and other construction penetrating the insulation material.

Install vapor barriers to provide a continuous vapor-barrier seal. Repair all tears, breaks, or ruptures that might interfere with effectiveness of the vapor barrier.

### 3.2 PREPARATION

#### 3.2.1 Protection of Property

Locate and use flame-heated equipment so it will not endanger the structure

or other materials on the site or adjacent property. Provide and maintain fire extinguishers of an appropriate approved type.

Placement of flame-heated equipment on the roof of any structure is prohibited.

Before starting work, protect paving and faces of building walls adjacent to hoist and kettles and maintain for duration of work.

### 3.2.2 Preparation of Surfaces

Surfaces on which thermal insulation materials are to be applied must be clean, smooth, dry, and free from projections which might puncture the vapor barriers. Condition of surfaces must be inspected and approved [by the Contracting Officer] prior to the start of roof insulation work.

## 3.3 APPLICATION

### 3.3.1 General Procedures

Provide continuous installation of underlayment or insulation, with all operations proceeding together.

Before cessation of work on each working day or when work is interrupted due to rainfall or other causes, seal the roof against intrusion of water. Do not leave insulation or underlayment exposed during rainfall or overnight.

Provide traffic planks over partially or completely finished underlayment or insulation plywood not less than 16 millimeter 5/8-inch thick and 600 millimeter 2-feet wide.

Distribute materials temporarily stored on the roof to stay within the live-load limits of the roof, which is [\_\_\_\_\_] pascal psf. Provide ample bases under equipment to distribute the weight to conform to the live-load limits.

### 3.3.2 Heating Bitumens

Heat and apply asphalt at its respective Equiviscous Temperature (EVT) plus or minus 14 degrees C 25 degrees F.

Contractor must provide thermostatic controls and visible thermometer on the kettle and maintain them in working order and keep them calibrated.

Foreman must carry immersion thermometers accurate within plus or minus 1 degrees C 2 degrees F and frequently check temperatures. If the temperature of the bitumens in the applicators is below specified amounts, removal and replacement of the effected roofing may be required.

### 3.3.3 Vapor-Barrier Application

Polyvinylchloride sheet vapor barriers must be applied as follows:

[Vapor barriers must be applied to the deck by adhesive applied in ribbons at a minimum rate of 1.6 liter per 10 square meter 0.4 gallon per 100 square feet in accordance with the printed instructions of the manufacturer.]

[Vapor-barrier seaming may be either by heat welding or by adhesive bonding as recommended by the manufacturer. Application of adhesive must be by a multiple-nozzle wheeled applicator.]

Vapor-barrier installation must proceed progressively directly ahead of the advancing insulation installation. Organize work to eliminate walking over the vapor barrier; traffic over the installed vapor barrier must be confined to areas where plywood sheets have been laid to protect the vapor barrier.

Felt-type vapor barriers must be as follows:

[Vapor barriers must be two layers of No. 15 asphalt-saturated felt. Lap plies must be 480 millimeter 19 inches. Embed first ply with the edges lapped in full hot application of steep asphalt.]

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NOTE: The following must be included for nailable  
decks.  
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[Each ply must be nailed 100 millimeter and 400 millimeter 4 inches and 16 inches from bottom to edge; nails must be staggered. Broom in each ply to complete embedment.]

[Vapor barrier must be one layer of base sheet. Lap plies must be 100 millimeter 4 inches at edges and 150 millimeter 6 inches at ends. Base sheet and lapped edges and ends must be embedded in full hot application of steep asphalt.]

On gypsum: Directly over the gypsum surface, the first vapor-barrier ply must be laid dry with edges lapped 50 millimeter 2 inches and nailed on 300 millimeter 12-inch centers with M45 1-3/4-inch headed square-cut nails or flatheaded bright nails through metal disks. Second ply must be solidly mopped over the first ply with joints broken between plies. In addition to mopping, the edges must be lapped 50 millimeter 2 inches and nailed as specified for the first ply. Other fastening devices may be used, provided the minimum holding force is 90 newton 20 pounds each in the deck when driven.

On concrete: Where asphalt-saturated felts are used over poured-in-place concrete, the first ply must be channel- or spot-mopped in place over asphalt primer. Where coal-tar-saturated felts are used, the first ply must be channel- or felt-mopped directly over the concrete deck. Channel mopping must be done in one direction with approximately 150 millimeter 6-inch spacing between strips and with ends left open. Spots in spot-mopping must be spaced uniformly, without closed pockets between spots.

On decks composed of precast units: Hot bitumen must be channel-mopped to not less than 75 millimeter 3 inches and not more than 100 millimeter 4 inches away from joints in the deck. Plies must be lapped 480 millimeter 19 inches and solid-mopped between plies.

#### 3.3.4 Insulation Application

Install insulation in accordance with the manufacturer's requirements and as specified below. Method of holddown used by the manufacturer in areas subject to hurricane velocity winds must be subject to approval prior to

installation.

Total nominal thickness must be installed in [\_\_\_\_\_] layer(s). Do not rupture the vapor barrier during installation of insulation. Do not install more insulation at one time than can be protected from wetting or other damage by installation of roofing membranes on the same day or prior to rain or dew.

Layer to receive the roofing membrane must be installed with longitudinal joints parallel to the short dimension of the roof. Joints must be staggered in each layer. First layer and between layers must be solid-mopped. Lay membrane with edges in moderate contact, but not forced into place. End joints must be staggered.

Vapor-barrier felts must be laid perpendicular to the roof slope.

Joints of insulation board must be taped, if required by manufacturers of insulation and roofing.

Install temporary water cutoffs at the completion of each day's work and removed upon resumption of work.

#### 3.4 ACCEPTANCE

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NOTE: Following a minimum of 90 calendar days operation (or installation), but no later than one year, the Systems Engineer/Condition Monitoring Office/Predictive Testing Group should inspect the installation using advanced monitoring technologies such as Infrared Imaging or Ultrasonic mapping. These technologies can identify insulation voids, insulation settling, and areas of moisture intrusion. Identification of insulation materials and locations is required to effectively identify these types of problems. The Systems Engineer/Condition Monitoring Office/Predictive Testing Group needs to know the warranty expiration date, if there is a warranty, in order to perform the inspections within the prescribed time frame.  
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Prior to final acceptance, the Contractor must provide construction (as-built) details [and [warranty](#) information] to the Contracting Officer. Construction details must include, by building area, the material type, amount, and installation method. An illustration or map of the building may serve this purpose. Include with data a cover letter/sheet clearly marked with the system name, date, and the words "As built insulation/material." Forward as-built [and warranty] information to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database.

-- End of Section --