
USACE / NAVFAC / AFCEA / NASA UFGS-07 21 16 (August 2010)

Preparing Activity: NAVFAC Superseding
UFGS-07 21 16 (February 2010)
UFGS-07 21 16 (April 2006)
UFGS-07212 (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2011

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 21 16

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08/10

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION 08/10

NOTE: This guide specification covers the requirements for mineral fiber blanket thermal insulation in attics, ceilings, walls, and floors.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: This guide specification is intended for both retrofit of existing buildings and new construction.

NOTE: On the drawings, show:

1. Locations where insulation will be used.
2. Thermal resistance value (R-Value) for each location.
3. Location of vapor retarder, if required.
4. Location and size of attic ventilation openings where required.

NOTE: Attic Ventilation

1. Provide net, unobstructed ventilation areas to attics over insulated ceilings as recommended by ASHRAE Handbook of Fundamentals, Chapter 21 and as follows:
2. For attics with vapor retarder, provide 0.1 square meter one square foot of net ventilation area for each 30 square meters 300 square feet of attic floor area.
3. For attics without vapor retarder, provide 0.1 square meter one square foot of net ventilation area for each 15 square meters 150 square feet of attic floor area.
4. For insulation of cathedral ceilings, provide at least a 50 mm 2 inch gap between upper face of insulation and underside of roof sheathing. Provide ventilation openings at bottom and top of ventilated cavity; show on drawings.

NOTE: Develop and specify density, type of material, and thickness of mineral fiber blanket insulation used for sound control based on acoustic analysis. For reduction of sound transmission through walls, select a blanket thickness 13 mm 1/2 inch greater than the wall cavity. Edit this specification accordingly.

PART 1 GENERAL

1.1 REFERENCES

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.

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 665 | (2006) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing |
| ASTM C 930 | (2005) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories |
| ASTM D 3833/D 3833M | (1996; R 2006) Water Vapor Transmission of Pressure-Sensitive Tapes |
| ASTM D 4397 | (2010) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E 136 | (2009b) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C |
| ASTM E 84 | (2010b) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E 96/E 96M | (2005) Standard Test Methods for Water Vapor Transmission of Materials |

GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)

| | |
|-----|--|
| GEI | Greenguard Standards for Low Emitting Products |
|-----|--|

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|----------|--|
| NFPA 211 | (2010) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances |
| NFPA 31 | (2006; Errata 06-1; Errata 07-2; Errata 10-3) Standard for the Installation of Oil-Burning Equipment |
| NFPA 54 | (2009; TIA 10-3) National Fuel Gas Code |
| NFPA 70 | (2011) National Electrical Code |

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

| | |
|-----|---|
| SCS | Scientific Certification Systems (SCS) Indoor Advantage |
|-----|---|

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

| | |
|---------------|---|
| TAPPI T803 OM | (2010) Puncture Test of Container Board |
|---------------|---|

1.2 SUBMITTALS

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.

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.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket insulation

Sill sealer insulation

Vapor retarder

Pressure sensitive tape

Accessories

Certification

SD-08 Manufacturer's Instructions

Insulation

[1.3 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified by **GEI** Greenguard Indoor Air Quality Certified, **SCS** Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.]

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.5 SAFETY PRECAUTIONS

1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with **29 CFR 1910.134**.

1.5.2 Smoking

Do not smoke during installation of blanket thermal insulation.

1.5.3 Other Safety Concerns

Consider other safety concerns and measures as outlined in **ASTM C 930**.

PART 2 PRODUCTS

2.1 BLANKET INSULATION

NOTE: Fire Safety Requirements

1. Most vapor retarder materials and the binder used in some mineral fiber insulations are combustible. Do not leave such material exposed to accessible spaces, but cover with fire retardant finish.

2. See MIL-HDBK-1008, and local building code for fire retardant classifications required, flame spread and smoke developed ratings, and other fire protection requirements, such as finish materials required in various occupancies.

ASTM C 665, Type [I, blankets without membrane coverings] [and] [II, blankets with non-reflecting coverings] [and] [III, blankets with reflective coverings]; Class [A, membrane-faced surface with a flame spread of 25 or less] [B, membrane-faced surface with a flame propagation resistance; critical radiant flux of 0.12 W/m² 0.11 Btu/ft² or greater], except a flame spread rating of [25] [75] [100] or less [and a smoke developed rating of 150 or less] when tested in accordance with ASTM E 84.

2.1.1 Thermal Resistance Value (R-VALUE)

NOTE: Select R-Value for Thermal Insulation required to meet the energy target/budget as indicated in MIL-HDBK-1190, Facility Planning Design Guide. Preferably show R-Value on drawings. If R-Values are not shown on drawings, specify here.

As indicated

2.1.2 Recycled Materials

Provide Thermal Insulation containing recycled materials to the extent practicable, provided the material meets all other requirements of this section. The minimum required recycled materials content by weight are:

Rock Wool: 75 percent slag
Fiberglass: 20 to 25 percent glass cullet

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

[2.2 SILL SEALER INSULATION

ASTM C 665, Type I.

] 2.3 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C 665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E 136 for blocking around chimneys and heat producing devices.

[2.4 VAPOR RETARDER

NOTE:

1. Determine the need for a water vapor retarder and its required permeance value based on a project

and climate specific moisture analysis. For guidance see ASHRAE Handbook of Fundamentals, Chapter 20, "Thermal Insulations and Vapor Retarders;" ASTM C 755, "Selection of Vapor Retarders for Thermal Insulations;" and UFC 3-440-05N, "Tropical Engineering" (for humid climates). The computer Program "MOIST" is a user friendly tool based on hourly weather data that provides information on moisture content of materials and on the duration of high moisture content excursions. Traditionally, vapor retarders were considered materials having a permeance of 5.72 by 10-8 g/Pa.s.m2 1 perm (grain/h*ft2*in.Hg) or less. However, that value may not be adequate for the particular construction or climate and in some instances a much lower value should be specified.

2. Vapor retarders, where required, can be provided as membranes or, alternatively, vapor retardant finishes labeled by manufacturer as having a water vapor permeance of no more than the required value can be used. Alternate materials include: Paints, vinyl wall coverings, or foil-faced gypsum board. Specify these in Sections 09 90 00, PAINTS AND COATINGS, Section 09 72 00, WALLCOVERINGS, or Section 09 29 00, GYPSUM BOARD, respectively and delete all paragraphs and references relating to vapor retarders from this section.

3. A vapor retarder is only effective if it prevents diffusion of water vapor as well as the passage of moisture laden air through openings and around material. Accordingly, proper installation to assure air tightness by sealing of joints, tears, and around utility penetrations is as important as proper selection of water vapor retarder materials.

4. Vapor retarders not only retard movement of water vapor into building envelope cavities, but also retard drying out of moisture that may have infiltrated the cavity. Accordingly, use vapor retarders only where their need is indicated by the moisture analysis.

[a. 0.15 mm 6 mil thick polyethylene sheeting conforming to ASTM D 4397 and having a water vapor permeance of 5.72 by 10-8g/Pa.s.m2 1 perm or less when tested in accordance with ASTM E 96/E 96M.]

[b. Membrane with the following properties:

Water Vapor Permeance: ASTM E 96/E 96M: [5.72 by 10-8] [_____] g/Pa.s.m2 [1] [_____] perm
[Maximum Flame Spread: ASTM E 84: [25] [50] [_____]]
[Combustion Characteristics: Passing ASTM E 136]
[Puncture Resistance: TAPPI T803 OM: [15] [25] [50]]]

]2.5 PRESSURE SENSITIVE TAPE

As recommended by the vapor retarder manufacturer and having a water vapor permeance rating of 5.72 by 10⁻⁸ g/Pa.s.m² one perm or less when tested in accordance with ASTM D 3833/D 3833M.

2.6 ACCESSORIES

2.6.1 Adhesive

As recommended by the insulation manufacturer.

2.6.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.6.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Note: For retrofit projects, inspect facility to determine conditions which may adversely affect execution of work or create safety hazard. Identify relevant conditions on the drawings and, if required, develop additional specification sections for corrective actions. Conditions that warrant investigation:

1. Discolorations or mold growth indicating previous water leaks.
2. Heat producing devices, such as recessed lighting fixtures, chimneys, and flues.
3. Faulty electrical systems:
 - (a) Lights dimming or flickering
 - (b) Fuses blowing
 - (c) Circuit breakers tripping frequently
 - (d) Electrical sparks and "glowing" from receptacles
 - (e) Cover plates on switches and outlets warm to touch.

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking at Attic Vents and Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from slipping over, clogging, or restricting air flow through soffit vents at eaves. [Install permanent blocking around attic trap doors.] [Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.]

3.2.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 75 mm 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 600 mm 24 inches above fixture.
- b. Masonry chimneys or masonry enclosing a flue: 50 mm 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by NFPA 211.
- c. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.
- d. Gas Fired Appliances: Clearances as required in NFPA 54.
- e. Oil Fired Appliances: Clearances as required in NFPA 31.

Blocking around flues and chimneys is not required when insulation blanket, including any attached vapor retarder, passed ASTM E 136, in addition to meeting all other requirements stipulated in Part 2. Blocking is also not required if the chimneys are certified by the manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions.

[Where insulation required is thicker than depth of joist, provide full width blankets to cover across top of joists.] Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Installation at Bridging and Cross Bracing

**NOTE: Specify only unfaced blankets in
installations with bridging and cross bracing. If a
vapor retarder is required, specify a separate vapor
retarder.**

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

[3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

] [3.3.1.5 Insulation Blanket with Affixed Vapor Retarder

Locate vapor retarder as indicated. Do not install blankets with affixed vapor retarders unless so specified. Unless the insulation manufacturer's instructions specifically recommend not to staple the flanges of the vapor retarder facing, staple flanges of vapor retarder at 150 mm 6 inch intervals flush with face or set in the side of truss, joist, or stud. Avoid gaps and bulges in insulation and "fishmouth" in vapor retarders. Overlap both flanges when using face method. Seal joints and edges of vapor retarder with pressure sensitive tape. Stuff pieces of insulation into small cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers. Cover these insulated cracks with vapor retarder material and tape all joints with pressure sensitive tape to provide air and vapor tightness.

] [3.3.1.6 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

] 3.3.1.7 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

[3.3.1.8 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through soffit vents. [Attach insulation to attic door by adhesive or staples.]

] [3.3.1.9 Installation of Sill Sealer

Size sill sealer insulation and place insulation over top of masonry or concrete perimeter walls or concrete perimeter floor slab on grade. Fasten sill plate over insulation.

] [3.3.1.10 Special Requirements for Floors

Hold insulation in place with corrosion resistant wire mesh, wire fasteners, or wire lacing.

] [3.3.1.11 Access Panels and Doors

Affix blanket insulation to access panels greater than one square foot and access doors in insulated floors and ceilings. Use insulation with same R-Value as that for floor or ceiling.

] [3.3.2 Installation of Separate Vapor Retarder

Apply continuous vapor retarder as indicated. Overlap joints at least 150 mm 6 inches and seal with pressure sensitive tape. Seal at sill, header, windows, doors and utility penetrations. Repair punctures or tears with pressure sensitive tape.

] -- End of Section --