Preparing Activity: NAVFAC

Superseding
UFGS-07 21 16 (November 2011)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 07 21 16

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08/23

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION
08/23

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

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(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: Design must meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to ASHRAE 90.1 and IgCC governing energy efficiency and requirements for the components of building envelope design including moisture control and thermal performance.

****

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.

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NOTE: Attic Ventilation

1. Provide net, unobstructed ventilation areas to attics over insulated ceilings as recommended by International Building Code (IBC) paragraph 1202.2 Roof Ventilation, UFC 1-200-02 High Performance and Sustainable Building Requirements, "Optimize Energy Performance" and "Enhance Indoor Environmental Quality", 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 a minimum 50 mm 2 inch air space between upper face of insulation and underside of roof deck for ventilation. Provide ventilation openings at the bottom and top of ventilation cavity; show depth of ventilation cavity and identify locations for bottom and top ventilation on drawings.

****

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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 Reference Identifier (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 C665	(2023) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D3575	(2020) Standard Test Methods for Flexible Cellular Materials Made from Olefin Polymers
ASTM D3833/D3833M	(1996; R 2019) Standard Test Method for Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D5359	(1998; R 2021) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building

	Materials
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E136	(2022) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2021) National Fuel Gas Code
NFPA 70	(2023) National Electrical Code
NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T803 OM	(2010) Puncture Test of Container Board

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation; G[, [_____]]

Recycled Content for Insulation Materials; S

Energy Star Label for Insulation Materials; S

[Sill Sealer Insulation

][Vapor Retarder

] Pressure Sensitive Tape

Accessories

SD-07 Certificates

[Indoor Air Quality for Insulation Materials; S

] Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Insulation

1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1 Insulation Products

Provide product certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification from certification body.

1.3.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

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 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

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 UFC 3-600-01, "Fire Protection Engineering for Facilities" 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 C665, 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/cm2 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 E84.

****

NOTE: Design must meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to ASHRAE 90.1 and IgCC documents governing energy efficiency and requirements for the components of building envelope design including thermal performance.

Select R-Value for Thermal Insulation required to meet the energy target/budget. Show R-Value on Drawings.

****

Provide insulation with R-Value as indicated on drawings

2.1.1 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

a. Fiberglass: 20 percent glass cullet complying with ASTM D5359

b. Mineral wool: 75 percent recovered materials content from slag

Provide data identifying percentage of recycled content for insulation materials.

2.1.2 Energy Star

Provide insulation materials that are Energy Star labeled. Provide data identifying Energy Star label for insulation materials.

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

[2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

****
NOTE: Include this paragraph when utilizing a fiberglass batt insulation, for which Greenguard certified products are widely available through national manufacturers. For use of mineral wool insulation, for which certified products are not as widely available, editor must first confirm the availability of Greenguard certified products prior to including this paragraph.
****

Provide certification of indoor air quality for insulation materials.

][2.2 SILL SEALER INSULATION

****
NOTE: Polyethylene foam sill sealer can be used to reduce air leakage between the foundation wall and sill plate. The sill sealer can also be used as a seal around window and door frames.
****

Provide polyethylene foam sill sealer [89] [139] [190] [241] millimeters [3.5] [5.5] [7.5] [9.5] inches in width with the following characteristics:.

Physical Properties	Test Method	Measurement
Nominal Thickness	ASTM D3575	4.76 mm 3/16 inch
Compressive Strength	ASTM D3575	8.27 kPa 1.2 psi
- Vertical Direction	Suffix D	

Physical Properties	Test Method	Measurement
Tensile Strength	ASTM D3575	220 kPa 32 psi
	Suffix T	

]2.3 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 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 as required by UFC 3-101-01 Architecture. For guidance, see ASHRAE Handbook of Fundamentals, Chapter 25, "Heat, Air, and Moisture Control in Building Assemblies - Fundamentals;" Chapter 26 "Heat, Air, and Moisture Control in Building Assemblies - Material Properties"; and ASTM C755, "Selection of Vapor Retarders for Thermal Insulations". The need for a vapor retarder and its' permeance must be evaluated in the moisture analysis with the Air and Moisture Barrier system specified. 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 one 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, or foil-faced gypsum board. Specify these in Section 09 90 00 PAINTS AND COATINGS 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 D4397 and having a water vapor permeance of 57.2 ng/(Pa * s * m2) one perm or less when tested in accordance with ASTM E96/E96M.

][b. Membrane with the following properties:

[Water Vapor Permeance: ASTM E96/E96M: 57.2 ng/(Pa * s * m2) [1] [_____] perm

][Maximum Flame Spread: ASTM E84: [25] [50] [_____]

][Combustion Characteristics: Passing ASTM E136

][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 57.2 ng/(Pa * s * m2) one perm or less when tested in accordance with ASTM D3833/D3833M.

2.6 ACCESSORIES

2.6.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

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 surfaces 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, passes ASTM E136, in addition to meeting 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. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. 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 conductors, that are not installed in conduit, 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

****
NOTE: Include this paragraph in ASHRAE climate zones 4 and higher, as identified in ASHRAE 90.1.
****

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 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 --