



BI-THDE-GS

Section 07 21 00

Building Insulation

For best results, display hidden notes to specifier.

PART 1 GENERAL**1.1 SECTION INCLUDES**

- A. Thermal insulation in exterior walls, ceilings, and roofs.
- B. Acoustical insulation.

1.2 RELATED SECTIONS

- A. Section 07 24 00 - Exterior Insulation and Finish Systems: Insulation that is part of the finish system assembly.
- B. Section 07 26 00 - Vapor Retarders: Vapor retarders that are separate from insulation.
- C. Section 07 41 13 - Metal Roof Panels: Insulation factory-installed in panels.
- D. Section 07 51 00 - Built-Up Bituminous Roofing: Roof insulation.
- E. Section 07 53 00 - Elastomeric Membrane Roofing: Roof insulation.
- F. Section 07 55 00 - Protected Membrane Roofing: Roof insulation.
- G. Section 23 07 13 - Duct Insulation: Duct liner and duct wrap.
- H. Section 23 07 16 - HVAC Equipment Insulation: Insulation on mechanical equipment.
- I. Section 23 31 16.13 – Glass Mineral Wool Ducts.

1.3 REFERENCES

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.
- F. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- I. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- J. NAIMA - Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass Building Insulation; North American Insulation Manufacturers Association.
- K. NAIMA - Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass Loose Fill Insulation; North American Insulation Manufacturers Association.
- L. TAPPI T 803 - Puncture Resistance of Container Board; TAPPI.
- M. EPD: Environmental Product Declaration. A third party verified document that reports environmental data of products based on the Life Cycle Assessment (LCA) and other relevant information, and in accordance with the International Standard ISO 14025 (Type III Environmental Declarations).



1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Submit manufacturer's literature describing the products to be used, showing compliance with specified requirements; include installation instructions.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit MR 5 Regional Materials: For products and materials to comply with requirements for regional materials, provide documentation indicating location of product or material manufacturing location and the point of extraction, harvest, or recovery for each raw material. Include distance to Project, contractor cost for each regional material, and percent by weight that is considered regional.
 - 3. LEED v 4, Product Data for Credit EA 2: For products and materials significant to the energy performance of a structure, provide documentation indicating that insulation levels are significant to increasing the level of energy performance beyond the prerequisite standard.
 - 4. LEED v 4, Product Data for Credit MR 2: For products and materials to comply with Building Product Disclosure & Optimization, provide data/evidence that substantiates Environmental Product Declaration and Multi Attribute Optimization requirements.
 - 5. LEED v 4, Product Data for Credit MR 3: For products and materials to comply with requirements for regional materials, provide documentation indicating location of product or material manufacturing location and the point of extraction, harvest, or recovery for each raw material. Include distance to Project, contractor cost for each regional material, and percent by weight that is considered regional.
 - 6. LEED v 4, Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
 - 7. LEED v 4, Product Data for Credit EQ 2: For products and materials to comply with low emittance standards, provide documentation substantiating that insulation products comply with requisite low emittance standards.
 - 8. LEED v 4, Product Data for Credit EQ 5: For products and materials to meet the standard for both thermal comfort design and thermal comfort control, provide data to support that insulation products are significant to thermal comfort design and thermal comfort control.
 - 9. LEED v 4, Product Data for Credit EQ 9: For products and materials that contribute to the design and performance of workspaces that promote occupants well-being, productivity and communication, provide data/documentation supporting acoustical benefits of Glass Mineral Wool insulation products.
- D. EPD Submittals: As Certified by UL Environment.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Label insulation packages to include material name, production date and/or product code.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing protocol required to achieve UL Classified rating. Identify products with appropriate markings of Underwriters Laboratories.
- B. Formaldehyde Free: 3rd Party Certified with UL Environmental Validation.
- C. Third Party Validation UL Environment Required for Minimum 50% Recycled Content and Formaldehyde Free.
- D. EUCEB Exonerated Fiber
- E. EPD Declarations when available.



PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Knauf Insulation, which is located at: One Knauf Dr.; Shelbyville, IN 46176; Toll Free Tel: 800-825-4434; Fax: 317-398-3675; Email: info.us@knaufinsulation.com; Web: www.knaufinsulation.us.
- B. Substitutions: Must be pre-approved
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 APPLICATIONS/SCOPE

- A. Exterior Stud Walls: Batt type.
 - 1. R-Value: _____.
 - 2. Vapor Retarder: FSK-25 facing.
 - 3. Vapor Retarder: Kraft facing.
 - 4. Vapor Retarder: Separate.
- B. Exterior Concrete and Masonry Walls: Rigid board type applied to interior face.
 - 1. R-Value: _____.
 - 2. Vapor Retarder: FSK facing.
 - 3. Vapor Retarder: ASJ facing.
- C. Basement Walls:
 - 1. R-Value: _____.
 - 2. Type: Extra wide batt type applied to interior face.
 - 3. Type: Batt type applied between furring strips.
- D. Roof Rafters, With No Covering: Batt type.
 - 1. R-Value: _____.
 - 2. Vapor Retarder: FSK-25 facing.
- E. Floor Joists Over Crawl Space: Batt type.
 - 1. R-Value: _____.
 - 2. Vapor Retarder: FSK-25 facing, with facing up (on warm side).
 - 3. Vapor Retarder: Kraft facing, with facing up (on warm side).
- F. Cathedral Ceilings (Gypsum Board Covering): High density batt type.
 - 1. R-Value: _____.
 - 2. Vapor Retarder: Kraft facing.
 - 3. Vapor Retarder: None.
- G. Above Soffits: Batt type.
 - 1. R-Value: _____.
- H. Interior Partitions Indicated with STC Rating: Batt type.
- I. Above Interior Ceilings: Batt type.
 - 1. Thickness: _____.
- J. Theater - On Exposed Ceilings and Walls; Above 8' (2440 mm) Above Floor Level: Black acoustical insulation.
 - 1. Type: Batt type.
 - 2. Type: Board type.
 - 3. Thickness: _____.



2.3 GLASS MINERAL WOOL

- A. Rigid Board Insulation: Glass Mineral Wool thermal insulation; UL/ULC Classified per UL 723, complying with ASTM C612, Type 1A or 1B; insulation exclusive of facing non-combustible when tested in accordance with ASTM E136; Earthwool Insulation Board with ECOSE® Technology.
1. R-value as indicated when tested in accordance with ASTM C518.
 2. 1" (25 mm) Thickness: R-value of 4.3.
 3. 1½" (38 mm) Thickness: R-value of 6.5.
 4. 2" (51 mm) Thickness: R-value of 8.7.
 5. 2½" (64 mm) Thickness: R-value of 10.9.
 6. 3" (76 mm) Thickness: R-value of 13.0.
 7. 3½" (89 mm) Thickness: R-value of 15.2.
 8. 4" (102 mm) Thickness: R-value of 17.4.
 9. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 10. Density: 2.25 lb/ft³ (36 kg/m³) minimum.
 11. Density: 3.0 lb/ft³ (48 kg/m³) minimum.
 12. Density: 4.25 lb/ft³ (68 kg/m³) minimum.
 13. Density: 6.0 lb/ft³ (96 kg/m³) minimum.
 14. Dimensional Stability: Linear shrinkage less than 0.3 percent.
 15. Facing: None, unfaced.
 - a. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with UL 723.
 - b. Noise Reduction Coefficient: 1.00, when tested on 2 inch (50 mm) samples in accordance with ASTM C 423.
 16. Facing: Foil-Scrim-Kraft (FSK) vapor retarder faced.
 - a. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with UL 723.
 - b. Noise Reduction Coefficient of 3.0 pcf (48 kg/m³) Density Product: 0.75, when tested on 2" (50 mm) samples in accordance with ASTM C423.
 - c. Noise Reduction Coefficient of 6.0 pcf (96 kg/m³) Density Product: 0.60, when tested on 2" (50 mm) samples in accordance with ASTM C423.
 - d. Vapor Retarder Perm Rating: Maximum 0.02 perms (1.1 ng/(Pa s m²)) when tested in accordance with ASTM C 1136.
 - e. Puncture Resistance: 25, when tested in accordance with TAPPI T 803.
 17. Facing: All Service Jacket Plus (ASJ+) or All Service Jacket (ASJ) vapor retarder faced.
 - a. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with UL 723.
 - b. Noise Reduction Coefficient of 3.0 pcf (48 kg/m³) Density Product: 0.65, when tested on 2" (50 mm) samples in accordance with ASTM C423.
 - c. Noise Reduction Coefficient of 6.0 pcf (96 kg/m³) Density Product: 0.50, when tested on 2" (50 mm) samples in accordance with ASTM C423.
 - d. Vapor Retarder Perm Rating: Maximum 0.02 perms (1.1 ng/(Pa s m²)) when tested in accordance with ASTM C1136.
 - e. Puncture Resistance: 50, when tested in accordance with TAPPI T 803.
 18. Free of Formaldehyde: Insulation is manufactured with bio-based binder; containing no formaldehyde.
 19. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 20. Recycled Content: Minimum of 50% recycled material.
 21. Product Transparency and Ingredient Disclosure-Declare Red List Free



- B. Foil-Faced Batt Insulation:** Everbilt batt Glass Mineral Wool thermal insulation; complying with ASTM C665; insulation exclusive of facing non-combustible when tested in accordance with ASTM E136; extra wide stapling flanges.
1. R-value as indicated when tested in accordance with ASTM C518.
 2. 3½" (89 mm) Thickness: R-value of 11.
 3. 3½" (89 mm) Thickness: R-value of 13.
 4. 6¼" (159 mm) Thickness: R-value of 19.
 5. 10" (254 mm) Thickness: R-value of 30.
 6. 12" (305 mm) Thickness: R-value of 38.
 7. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 8. Width for Metal Framing Application: Same as framing center to center dimension.
 9. Width for Wood Framing Application: Maximum of 1" (25 mm) less than framing center to center dimension.
 10. Facing: Foil-Scrim-Kraft (FSK-25) vapor retarder faced; ASTM C665, Type III, Class A, Category 1; insulation exclusive of facing non-combustible when tested in accordance with ASTM E136.
 - a. Surface Burning Characteristics: Maximum flame spread of 25, maximum smoke developed of 50, when tested in accordance with ASTM E84.
 - b. Vapor Retarder Perm Rating: Maximum 0.04 perms (2.3 ng/(Pa s m²)) when tested in accordance with ASTM C1136.
 11. Facing: Foil vapor retarder faced; ASTM C665, Type III, Class B.
 - a. Vapor Retarder Perm Rating: Maximum 0.05 perms (2.9 ng/(Pa s m²)) when tested in accordance with ASTM C1136.
 12. Free of Formaldehyde: Insulation is manufactured with bio-based binder; containing no formaldehyde.
 13. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 14. Recycled Content: Minimum 50% recycled material.
 15. Product Transparency and Ingredient Disclosure-Declare Red List Free
- C. Kraft Faced Batt Insulation:** Everbilt batt Glass Mineral Wool thermal insulation; EPD Certified by UL Environment, complying with ASTM C665, Type II, Class C, Category 1; insulation exclusive of facing non-combustible when tested in accordance with ASTM E136; extra wide stapling flanges.
1. R-value as indicated when tested in accordance with ASTM C518.
 2. 3½" (89 mm) Thickness: R-value of 11.
 3. 3½" (89 mm) Thickness: R-value of 13 (high density).
 4. 3½" (89 mm) Thickness: R-value of 15 (high density).
 5. 5½" (140 mm) Thickness: R-value of 21 (high density).
 6. 6¼" (159 mm) Thickness: R-value of 19.
 7. 6½" (165 mm) Thickness: R-value of 22.
 8. 8¼" (210 mm) Thickness: R-value of 30 (high density).
 9. 9" (229 mm) Thickness: R-value of 26.
 10. 10" (254 mm) Thickness: R-value of 30.
 11. 10¼" (261 mm) Thickness: R-value of 38 (high density).
 12. 12" (305 mm) Thickness: R-value of 38.
 13. 13¾" (349 mm) Thickness; R-value of 49.
 14. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 15. Width for Metal Framing Application: Same as framing center to center dimension.
 16. Width for Wood Framing Application: Maximum of 1" (25 mm) less than framing center to center dimension.



17. Vapor Retarder Perm Rating: Maximum 1.0 perms (57 ng/(Pa s m²)) when tested in accordance with ASTM E96.
 18. Free of Formaldehyde: Insulation is manufactured with bio-based binder: containing no formaldehyde.
 19. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 20. Recycled Content: Minimum 50% recycled material.
 21. Product Transparency and Ingredient Disclosure-Declare Red List Free and UL Environment EPD (Environmental Product Declarations)
- D. Unfaced Batt Insulation: Everbilt batt Glass Mineral Wool thermal insulation; EPD Certified by UL Environment, complying with ASTM C665, Type I, Class A; non-combustible when tested in accordance with ASTM E136.
1. R-value as indicated when tested in accordance with ASTM C518.
 2. ¾" (19 mm) Thickness: R-value of 3.
 3. 1½" (38 mm) Thickness: R-value of 5.
 4. 3½" (89 mm) Thickness: R-value of 11.
 5. 3½" (89 mm) Thickness: R-value of 13 (high density).
 6. 3½" (89 mm) Thickness: R-value of 15 (high density).
 7. 5½" (140 mm) Thickness: R-value of 21 (high density).
 8. 6¼" (159 mm) Thickness: R-value of 19.
 9. 6½" (165 mm) Thickness: R-value of 22.
 10. 8¼" (210 mm) Thickness: R-value of 30 (high density).
 11. 8½" (216 mm) Thickness: R-value of 25.
 12. 9" (229 mm) Thickness: R-value of 26.
 13. 10" (254 mm) Thickness: R-value of 30.
 14. 10¼" (261 mm) Thickness: R-value of 38 (high density).
 15. 12" (305 mm) Thickness: R-value of 38.
 16. 13¾" (349 mm) Thickness: R-value of 49.
 17. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 18. Width for Metal Framing Application: Same as framing center to center dimension.
 19. Width for Wood Framing Application: Maximum of 1" (25 mm) less than framing center to center dimension.
 20. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with ASTM E84.
 21. Free of Formaldehyde: Insulation is manufactured with bio-based binder;
 22. containing no formaldehyde.
 23. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 24. Recycled Content: Minimum 50% recycled material.
 25. Product Transparency and Ingredient Disclosure-Declare Red List Free and UL Environment-EPD (Environmental Product Declarations)
- E. Acoustical Batt Insulation: Everbilt batt Glass Mineral Wool insulation; EPD Certified by UL Environment, complying with ASTM C665; non-combustible when tested in accordance with ASTM E136; Knauf Quiet Therm.
1. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 2. Stud Walls and Rafter Spaces: Thickness to nominally fill cavity.
 3. Over Ceilings: Minimum thickness of _____.



4. Facing: None (unfaced); ASTM C665, Type I, Class A.
 - a. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with ASTM E84.
 - b. Noise Reduction Coefficient: 1.00, when tested on 2" (50 mm) samples in accordance with ASTM C423.
 5. Facing: Kraft paper faced; ASTM C665, Type II, Class C; extra wide stapling flanges.
 6. Free of Formaldehyde: Insulation is manufactured with bio-based binder; containing no formaldehyde.
 7. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 8. Recycled Content: Minimum 50% recycled material.
 9. Product Transparency and ingredient Disclosure – Declare Red List Free and UL Environment EPD (Environmental Product Declarations)
- F. Black Acoustical Insulation: Glass Mineral Wool insulation with smooth black facing; insulation exclusive of facing non-combustible when tested in accordance with ASTM E136.
1. Blanket Insulation: ASTM C665, Type I, Class A; Knauf Wall and Ceiling Liner M with ECOSE Technology.
 - a. Noise Reduction Coefficient of 1.5 pcf (24 kg/m³) Density Product: 0.90, when tested on 2 inch (50 mm) samples in accordance with ASTM C 423.
 - b. Thickness: ½" (13 mm), 1.5 lb/ft³ (24 kg/m³) density.
 - c. Thickness: 1" (25 mm), 1.0 lb/ft³ (16 kg/m³) density.
 - d. Thickness: 1" (25 mm), 1.5 lb/ft³ (24 kg/m³) density.
 - e. Thickness: 1" (25 mm), 2.0 lb/ft³ (32 kg/m³) density.
 - f. Thickness: 1½" (38 mm), 1.0 lb/ft³ (16 kg/m³) density.
 - g. Thickness: 1½" (38 mm), 1.5 lb/ft³ (24 kg/m³) density.
 - h. Thickness: 2" (51 mm), 1.0 lb/ft³ (16 kg/m³) density.
 - i. Thickness: 2" (51 mm), 1.5 lb/ft³ (24 kg/m³) density.
 2. Board Insulation: ASTM C612, Type 1A or 1B; Knauf Black Acoustical Board with ECOSE Technology.
 - a. Maximum Air Velocity In Plenums: 4000 ft/min (1219 m/min).
 - b. Thickness: 1" (25 mm), 3.0 lb/ft³ (48 kg/m³) density.
 - c. Thickness: 1½" (38 mm), 3.0 lb/ft³ (48 kg/m³) density.
 - d. Thickness: 2" (51 mm), 2.25 lb/ft³ (36 kg/m³) density.
 - e. Thickness: 2" (51 mm), 3.0 lb/ft³ (48 kg/m³) density.
 3. Surface Burning Characteristics: Maximum Flame Spread of 25, maximum Smoke Developed of 50, when tested in accordance with ASTM E84.
 4. Water Vapor Sorption: Less than 3 percent by weight when tested in accordance with ASTM C1104.
 5. Free of Formaldehyde: Insulation is manufactured with bio-based binder; containing no formaldehyde.
 6. VOC Emission: Low VOC emission certified by UL Environment GREENGUARD Gold (formerly GREENGUARD Children and Schools)
 7. Recycled Content: Minimum 50% recycled material.
- G. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of insulation, whether specified or not
- H. Separate Vapor Retarders: As specified in Section 07 26 00.



PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which work of this section will be installed.
- B. Verify that adjacent materials are dry and ready to receive insulation.
- C. Verify mechanical and electrical services within walls have been tested and inspected.
- D. Notify Architect in writing of conditions detrimental to performance of work in this section.
- E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION - BATTS, BLANKETS, AND BOARDS

- A. Install in accordance with NAIMA "Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass Building Insulation" and manufacturer's instructions.
- B. Glass Mineral Wool or Rock Mineral Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Comply with NAIMA's "Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass" (www.NAIMA.org), or manufacturer's written instructions, whichever is more stringent.
 3. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 4. Glass Mineral Wool insulation shall be installed in six sided cavities, meaning that no surface of the insulation shall be left exposed.
 5. Maintain 3" (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 6. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 7. For metal-framed wall cavities where cavity heights exceed 96" (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 8. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
 - f. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members. When using staple free (no stapling flanges) kraft-faced blankets, insert the product into the cavity to produce a friction fit between the edges of the insulation and adjoining framing members.
 - g. With faced blankets having stapling flanges and the preferred application is to face staple the flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 9. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - h. Exterior Walls: Set units with facing placed toward [exterior of construction] [interior of construction] [as indicated on Drawings].
 - i. Interior Walls: Set units with facing placed [toward areas of high humidity] [as indicated on Drawings] <Insert location>.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Loose-Fill Insulation in Closed Cavities: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/ft³ (40 kg/m³).
 2. Glass Mineral Wool Blankets: Measure and cut to desired measurement so as to fill gap completely with contact on all sides of surrounding insulation and no compression to finished thickness of material.



3.3 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where Glass Mineral Wool blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48" (1219 mm) up either side of applicable partitions.

3.4 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install Glass Mineral Wool board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
 - 1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
 - 2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.6 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 - 1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16" (406 mm) oc.
 - 2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
 - 3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 PROTECTION

- A. Protect insulation from damage and from becoming wet before, during and after installation.