

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and Divisions 00 and 01, apply to this Section.
- B. Related Sections:
 - 1. Division 07.
 - 2. Division 23.

1.2 SUMMARY

- A. This Section includes semirigid and flexible duct and plenum, insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

- A. General: See Section 23 05 00 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Mineral Fiber Board Insulation.
 - 2. Mineral Fiber Blanket Insulation.
 - 3. Aluminum Jackets.
 - 4. Fire Barrier Duct Wrap with UL classification documentation.
- C. Shop Drawings: None required.
- D. Reports and Certificates: None required.

1.4 CODES AND STANDARDS

- A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory labeled insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.
- B. Underwriters Laboratories Inc (UL)

1. UL 723, surface burning characteristic per ASTM E 84
 2. UL 1978, Standards for Grease Ducts
 3. UL 1479, Through-Penetration firestop test.
- C. National Fire Code: NFPA 96: Ventilation Control and Fire Protection of Commercial Cooking Operations
- D. American Society for Testing and Materials (ASTM):
1. ASTM E119, Standard Method of Fire Tests of Building Construction and Materials.
 2. ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- 1.7 COORDINATION
- A. Coordinate clearance requirements with duct Installer for insulation application.
- 1.8 SCHEDULING
- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 – PRODUCTS

2.1 INSULATION MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Manson.
 2. Knauf FiberGlass GmbH.
 3. Owens-Corning Fiberglas Corp.
 4. Johns Manville.
 5. Or Approved Equal
- B. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- C. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.2 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: Sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness is scheduled at the end of this Section.

1. Finish: Embossed finish.
2. Thickness: 0.04-inch thick.

2.3 ACCESSORIES AND ATTACHMENTS

- A. Bands: 3/4-inch wide, aluminum band, minimum 0.007-inch thick.
- B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
 1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

2.4 VAPOR RETARDERS

- A. Vapor-Barrier Coatings: Fire-and water-resistive, vapor-barrier coatings for indoor applications. Comply with MIL-C-19565C, Type II and be QPL Listed. Water Vapor Permeance: ASTM E 96 Procedure B, 0.02 (Prior to FSK lamination) perms at 43 mils dry. Materials shall be compatible with insulation materials, jackets, and substrates.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers CP-38
 - b. Foster 30-80
 - c. Vimasco 749
 - d. Or Approved Equal

2.5 FIRE BARRIER DUCT WRAP

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. 3M Fire Barrier.
 2. Pyroscat Duct Wrap.
 3. Unifrax FyreWrap.
 4. Or Approved Equal.
- B. UL Classified Fire resistant flexible wrap consisting of high temperature, non-asbestos inorganic blanket encapsulated with a scrim-reinforced foil rated for use with commercial grease stainless steel exhaust ducts. Installed system shall allow for zero clearance to combustibles and provide a 2-hour fire resistive enclosure system.
- C. Insulation Pins: 12 Gauge stainless steel pins with round or square clips.
- D. Banding Straps: Minimum 1/2-inch wide Type 302 Stainless Steel bands
- E. Firestopping Material: UL classified, noncombustible

2.6 FIRE BARRIER WRAP ACCESS DOORS

- A. Fire barrier grease duct access door shall be rated for use with fire barrier wrap complete with extension kit. Coordinate opening sizes and locations with Division 15 Section "Metal Ducts" and "Duct Accessories." Installed access assembly shall be rated no less than the fire resistive protection rating to that of grease duct fire barrier wrap. Provide extension kit to allow duct wrap layers to mechanically fastened to cover plate for ease of removal and re-installation without the use of a tool. Label "ACCESS PANEL. DO NOT BLOCK" on exterior of access door assembly.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Joints and Seams: Cover with tape and vapor barrier coating to maintain vapor seal.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.
- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier coating. Apply insulation continuously through hangers and around anchor attachments.

- K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- L. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- M. Install vapor-barrier coating on supply air, outside air, and dishwasher hood exhaust air ducts and plenums.
 - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-barrier coating and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or coating to maintain vapor-retarder seal.
 - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
 - 3. Vapor-Barrier Coatings: Where vapor retarders are indicated, apply coating on seams and joints and at ends adjacent to duct flanges and fittings.
- N. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
 - 1. Seal penetrations with vapor-barrier coating.
 - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 - 3. Seal insulation to roof flashing with vapor-barrier coating.
- O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- Q. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
 - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-barrier coating.

3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with anchor pins and speed washers.
 - 1. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

- c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 2. Impale insulation over anchors and attach speed washers.
 3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
 6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
 8. Apply vapor-barrier coating to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
- B. Board Applications for Ducts and Plenums: Secure board insulation with anchor pins and speed washers.
 1. Space anchor pins as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 2. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 3. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
 4. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 5. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
 6. Apply vapor-barrier coating to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIRE BARRIER DUCT WRAP APPLICATION

- A. Install fire barrier duct wrap and components in accordance with manufacturer's instructions.
- B. Coordinate installation and spatial requirements with Division 15 Sections "Metal Ducts" and "Duct Accessories."
- C. Install hangers and supports insulation to maintain fire resistive rating.
- D. Install firestopping system at rated penetrations (wall, floors, ceilings, roof).
- E. Verify duct access openings are not obstructed.

3.6 FIELD-APPLIED JACKET APPLICATION

- A. Apply jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
 - 1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 - 2. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
 - 3. Seal outdoor jacket watertight with metal jacketing sealant.
 - 4. Round Ducts: Overlap seams 45 degrees from bottom.

3.7 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
 - 1. Supply-, return-, and outside-air ductwork.
 - 2. Outside-air ductwork and exhaust-air ductwork shall be insulated from isolation damper to the exterior of the building.
 - 3. Grease hood exhaust duct.
 - 4. Vapor hood exhaust duct.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Metal ducts with duct liner, unless required to meet the Energy Code requirements.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 4. Flexible connectors.
 - 5. Vibration-control devices.
 - 6. Testing agency labels and stamps.
 - 7. Nameplates and data plates.
 - 8. Access panels and doors in air-distribution systems.
 - 9. Toilet exhaust ducts in conditioned spaces.
 - 10. General exhaust ducts in conditioned spaces.
 - 11. Exposed ducts within a space that serves that space only.

3.8 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Supply -air ducts, concealed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 1-1/2-inch.
 - 3. Minimum Installed Insulation R-Value: 3.3.

- B. Service: Round, supply -air ducts, exposed.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 1-1/2-inch.
 - 3. Minimum Installed Insulation R-Value: 3.3.

- C. Service: Rectangular, supply -air ducts, exposed.
 - 1. Material: Mineral-fiber board.
 - 2. Thickness: 1-inch.
 - 3. Minimum Installed Insulation R-Value: 3.3.

- D. Service: Round, outside-air ducts, upstream of damper; Round, exhaust-air ducts, downstream of damper.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: Layers as required to maintain minimum envelope R-Value.
 - 3. Minimum Installed Insulation R-Value: 19.

- E. Service: Rectangular, outside-air ducts and plenums upstream of damper; Rectangular, exhaust-air duct, downstream of damper.
 - 1. Material: Mineral-fiber board.
 - 2. Thickness: Layers as required to maintain minimum envelope R-Value.
 - 3. Minimum Installed Insulation R-Value: 19.

- F. Service: Grease Hood Exhaust Duct.
 - 1. Material: Fire barrier duct wrap system.

- G. Service: Dishwasher hood exhaust air ducts.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 1/2-inch.

3.9 DUCT AND PLENUM APPLICATION SCHEDULE LOCATED IN UNCONDITIONED SPACES.

- A. Service: Round, supply and return-air ducts.
 - 1. Material: Mineral-fiber blanket.
 - 2. Thickness: 3-inches.
 - 3. Field-Applied Jacket: Aluminum.
 - 4. Minimum Installed Insulation R-Value: 6.

- B. Service: Rectangular, supply and return-air ducts.

1. Material: Mineral-fiber board.
2. Thickness: 2-inches.
3. Field-Applied Jacket: Aluminum.
4. Minimum Installed Insulation R-Value: 6.

3.10 OUTDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Round, supply and return-air ducts.
1. Material: Mineral-fiber blanket.
 2. Thickness: 3-inches.
 3. Field-Applied Jacket: Aluminum.
 4. Minimum Installed Insulation R-Value: 8.
- B. Service: Rectangular, supply and return-air ducts.
1. Material: Mineral-fiber board.
 2. Thickness: 2-inches.
 3. Field-Applied Jacket: Aluminum.
 4. Minimum Installed Insulation R-Value: 8.

END OF SECTION