



SECTION 23 07 13

FIRE RATED DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section 23 07 13 - Duct Insulation.

1.2 RELATED SECTIONS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 07 84 00 – Firestopping.
- C. Section 09 21 16 - Gypsum Board Assemblies.
- D. Section 23 31 13 – Metal Ducts.
- E. Section 23 32 00 - Air Plenums and Chases.

1.3 REFERENCES

- A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E 119 (UL 263) - Standard Test Methods for Fire Tests of Building Construction and Materials.
- D. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750C.
- E. ASTM E 814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- F. ASTM E 2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.
- G. International Code Congress (ICC):
 - 1. International Building Code (IBC).
 - 2. International Mechanical Code (IMC)
 - 3. International Residential Code (IRC).
- H. International Association of Plumbing and Mechanical Officials (IAPMO)
 - 1. Uniform Mechanical Code (UMC).

- I. ISO 6944: Fire Resistive Tests - Ventilation Ducts; 1985.
- J. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- K. NFPA 262 (UL 910) - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

1.4 PERFORMANCE REQUIREMENTS

- A. Listing Agency: Provide products that are listed by at least one the following:
 - 1. Underwriters Laboratories Inc. (UL), in "Fire Resistance Directory" category HNLJ, HNMF or XHEZ as appropriate.
 - 2. Intertek Testing Services (ITS) (formerly Omega Point Laboratories (OPL)), in "Intertek Directory of Listed Products."
 - 3. International Code Council, Evaluation Services (ICC-ES). See report ESR-1255.
 - 4. Any other qualified independent testing and inspection agency that conducts periodic follow-up inspections and is acceptable to authorities having jurisdiction.
- B. Furnish products identical to those tested for classification by listing agency.
- C. Mark product packing with classification marking of listing agency.
- D. Firestopping Exposed to View: Provide products with flame spread index of less than 25 and smoke developed index of less than 450, when tested in accordance with ASTM E 84.
- E. Materials: Use only products specifically listed for use in listed systems.
- F. Compatibility: Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.
- G. Firestopping material must be asbestos-free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM and UL standards cited in this section.
- H. Firestopping materials must meet and be acceptable for use by all building codes and NFPA codes cited in this section.
- I. Materials must be suitable for the firestopping of penetrations made by steel or duct wrap insulation.
- J. Fire-resistant Enclosure Listings:
 - Commercial Cooking Exhaust Duct (Grease) Duct:
 - Intertek 3MU/FRD 120-18, 3MU/FRD 120-19
 - ICC-ES ESR-1255
 - Chemical Fume Duct:
 - Intertek 3MU/FRD 120-10, 3MU/FRD 120-11

Ventilation Duct:

Intertek 3MU/DI 60-01, 3MU/DI 120-01

UL: HNLJ.V-27

- K. Firestop Listings: The following is only a partial list of ASTM E 814 tested through-penetration designs. Consult with the manufacturer for more information.
 - 1. UL: W-L-7180, W-J-7104, C-AJ-7096, F-C-7054.
 - 2. Intertek (formerly Omega Point Laboratories): Note: Intertek Design Listings for fire-resistant enclosures contain the information about firestopping the ducts where they penetrate a fire rated assembly; they are stand-alone listings which do not require an additional firestop listing.
- L. Fire Rating (Ventilation Air Duct): All duct wraps must be One (1) hour rated, but in no case less than the rating of any time-rated assemblies which are penetrated.
- M. Fire Rating (Ventilation Air Duct): All duct wraps must be Two (2) hour rated, but in no case less than the rating of any time-rated assemblies which are penetrated.
- N. Fire Rating (Grease Duct): All duct wraps must be compliant to all five (5) sections of ASTM E 2336. All duct wraps must be a minimum one (1) hour rated, but in no case less than the rating of any time-rated assemblies which are penetrated.
- O. Fire Rating (Plenum Rated): All plenum wraps must be compliant to NFPA 262 (electrical cables) and/or UL 1887 (non-metallic pipe).

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Shop Drawings: For each different flexible wrap configuration, provide the following:
 - 1. Listing agency's detailed drawing showing items within wrap enclosure (e.g. duct gauge and size, duct reinforcement and supports, wrap installation method) and through penetration firestop design (if applicable) identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
 - 2. For ducts penetrating a fire-rated assembly, identify applicable listed through penetrations.
 - 3. Any installation instructions that are not included on the detailed drawing.
 - 4. For proposed systems that do not conform strictly to the listing, submit written instructions showing modifications and approved by manufacturer..
- C. Product Certificates: Submit certificates signed by fire-resistive flexible wrap enclosure manufacturer certifying that materials furnished comply with requirements.
- D. Product Data: Manufacturer's data sheets on each material to be used in fire-resistive flexible wrap enclosures, including:
 - 1. Product characteristics and Material Safety Data Sheets.
 - 2. Listing numbers of systems in which each product is to be used.
 - 3. Preparation instructions and recommendations.
 - 4. Storage and handling requirements and recommendations.
 - 5. Installation methods.
- E. Installer's Qualification Documentation.

- F. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

- A. General: All fire-resistive flexible wrap enclosures shall be installed with approved methods using materials that have been tested and classified to produce an approved assembly.
- B. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of twenty five (25) years experience.
- C. Installer Qualifications: Firm must be qualified by having experience, staff, and training to install the specified products, and meets the following criteria:
 1. Contractor is a 3M Master Contractor.
 2. Contractor is a Certified 3M Trained contractor.
 3. Contractor is acceptable to or licensed by manufacturer.
 4. Contractor is acceptable to or licensed by Authority Having Jurisdiction.
 5. Contractor has completed the manufacturer's certified product installation training.
 6. Contractor must provide a list of completed projects as evidence of experience; include project name and address, Owner's name and address, and Architect's name and phone number.
- D. Codes: Where manufacturer's application procedures are in conflict with those of the local Authority Having Jurisdiction, the more strict guidelines will prevail.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products until ready for installation in manufacturer's original unopened packaging, legibly marked with manufacturer's name and product identification, date of manufacture, lot number, shelf life (if applicable), listing agency's classification marking, curing time (if applicable), and mixing instructions (if applicable).
- B. Store and handle in such a manner as to prevent deterioration or damage due to moisture, temperature changes, contaminants, and other causes; follow manufacturer's instructions.
- C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Coordinate construction of duct support hangars to allow rod length and trapeze width to account for the thickness of the fire-resistive duct wrap insulation once applied to the duct (taking application method, material thickness and number of layers into account).
- B. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including sizing, sleeves, and penetrating items.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install firestopping under environmental conditions outside manufacturer's absolute limits.

- D. Provide ventilation as required by firestopping manufacturer, including mechanical ventilation if required.

1.9 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: 3M Fire Protection Products; 3M Center Bldg. 223-2N-21, St. Paul, MN 55144-1000. ASD. Toll Free Tel: (800) 328-1687. Fax: (651) 736-1644. Web: <http://www.3m.com/firestop> and www.3m.com/ductwrap
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 SCOPE/APPLICATION

- A. Provide fire protection to grease and air ducts as a shaft alternative.
- B. Provide plenum rating to products with flame and smoke evolution in plenum areas.
- C. Provide installed firestopping that limits the spread of fire, heat, smoke, and gasses through otherwise unprotected openings in rated assemblies, including walls, partitions, floors, roof/ceilings, etc.

2.3 FIRE RATED DUCT WRAP INSULATION

- A. 3M Fire Barrier Duct Wrap 615+: Lightweight, non-asbestos, high temperature, bio-soluble, calcium-magnesium-silicate (CMS) non-woven blanket, encapsulated in a scrim-reinforced foil, blanket thickness of 1.5 inches (38 mm) for ventilation and grease duct applications.
 1. Color: White blanket, aluminum foil encapsulated.
 2. Weight: 0.9 psf (4.38 kg/m²).
 3. Density: 6 pcf nominal.
 4. Thermal Conductivity (k-value) at 500 Degrees F (260 Degrees C) (ASTM C411, ASTM C518): 0.48 Btu/(ft² × h × F) (0.07 W/(m × K)).
 5. R-Value per ASTM C 518 at ambient (77 F/ 25 C): at least 6.3 (F-ft²-hr / Btu)
 6. Service range up to 2000°F (1093°C)
 7. Fire Resistance: For use in 1 hour fire resistant systems.
 8. Fire Resistance: For use in 2 hour fire resistant systems.
 9. Product complies with ASTM E 2336 test standard.
 10. Product complies with ISO 6944 test standard.
 11. Through-penetration per ASTM E 814 (UL 1479)
 12. Flame and smoke spread index of <25/<50
 13. Non-combustible per ASTM E 136

- B. 3M Fire Barrier Plenum Wrap 5A+: Lightweight, non-asbestos, high temperature, bio-soluble, calcium-magnesium-silicate (CMS) non-woven blanket, encapsulated in a scrim-reinforced foil, blanket thickness of 0.5 inches (13 mm) for protection of items within a plenum area.
 - 1. Color: White blanket, aluminum foil encapsulated.
 - 2. Weight: 0.25 psf (1.22 kg/m²).
 - 3. Density: 6 pcf nominal.
 - 4. Thermal Conductivity (k-value) at 500 Degrees F (260 Degrees C) (ASTM C411, ASTM C518): 0.48 Btu/(ft² × h × F) (0.07 W/(m × K)).
 - 5. Service range up to 2000°F (1093°C)
 - 6. Plenum Rating (electrical cables): Product complies with NFPA 262 (UL 910).
 - 7. Plenum Rating (non-metallic pipe): Product complies with UL 1887.
 - 8. Flame and smoke spread index of <25/<50
 - 9. Non-combustible per ASTM E 136

2.4 RELATED DUCT WRAP PRODUCTS

- A. Tape:
 - 1. High performance filament tape, 3M No. 898 1 inch (25 mm) wide.
 - 2. 3M FSK Facing Tape 3320 with aluminum foil, fiberglass scrim, kraft paper backing: nominal 3 inches (76 mm) or 4 inches (102 mm) wide (for sealing cut blanket edges and seams), 3M No. 3320.
- B. Banding Material: Stainless or carbon steel banding: 1/2 inch (13 mm) wide X 0.015 inch (0.4 mm) thick, as stated in duct wrap Design Listing.
- C. Insulation pins and clips:
 - 1. Copper-coated steel pins, 12 gauge with a minimum length of 4 inches (102 mm) with square galvanized steel speed clips: 2.5 inch (64 mm). .
 - 2. 12 gauge insulated cup head steel pins.
- D. Through-penetration firestop materials:
 - 1. Packing materials: Pieces of 3M Fire Barrier Duct Wrap, or 4 pcf mineral wool.
 - 2. Sealants: 3M Fire Barrier Water Tight Sealant 1000 NS: non-slump silicone sealant, 1003 SL self-leveling silicone sealant, 3M Fire Barrier Sealant 2000+: non-slump silicone sealant, or CP 25WB+: high-performance, intumescent water-based sealant, as stated in firestop Design Listing.

PART 3 EXECUTION

- A. Do not begin installation until substrates have been properly prepared.
- B. Conduct tests according to manufacturer's written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt and other foreign substances capable of impairing bond of firestopping.
- C. Verify that items penetrating fire rated assemblies are securely attached, including sleeves, supports, hangers, and clips.

- D. Verify that openings and adjacent areas are not obstructed by construction that would interfere with installation of firestopping, including ducts, piping, equipment, and other suspended construction.
- E. Verify that environmental conditions are safe and suitable for installation of firestopping.
- F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
- B. Install masking and temporary coverings as required to prevent contamination or defacement of adjacent surfaces due to firestopping installation.

3.3 FIRE RATED DUCT WRAP INSULATION (1 AND 2 HR. ENCLOSURES)

- A. Kitchen Exhaust Grease Ducts: Install fire-resistive duct wrap insulation in direct contact with ductwork to Manufacturer's instructions and referenced standards, to applicable Intertek design numbers, including listed penetration firestop system.
 1. For kitchen exhaust grease ducts, regardless of fire rating, provide two layers of 3M Fire Barrier Duct Wrap 615+ per layer with 3 inch (76mm) overlaps.
- B. Kitchen Exhaust Ductwork: Inner layer material perimeter and longitudinal joints may either be tightly butted or minimum 3 inch (76 mm) overlaps. Outer layer overlap requirements are minimum 3 inch (76 mm) perimeter and longitudinal overlaps. If required, tape seams using minimum 3 inch (76 mm) wide aluminium foil adhesive tape.
- C. Ventilation Air Ducts (1 and 2 hr. Enclosure): Install fire-resistive duct wrap insulation in direct contact with ductwork to Manufacturer's instructions and referenced standards, including Listed penetration firestop system.
 1. Apply fire-resistive duct wrap insulation continuously to ductwork as indicated on Drawings. For ventilation air ducts, provide one layer of 3M Fire Barrier Duct Wrap 615+ with 3 inch (76 mm) overlaps for 1 and 2 hour applications. Observe requirements for additional duct wrap material required at firestop, when required.
- D. Ventilation Ductwork (1 and 2 hr. applications): overlap perimeter and longitudinal joints 3 inches (76 mm). If required, tape seams using minimum 3 inch (76 mm) wide aluminium foil adhesive tape.
- E. Filament tape may be used as a temporary securing measure during application of duct wrap. Finish installation using 1/2 inch (13 mm) wide by 0.015 inch (0.4 mm) steel banding on exterior layer of wrap. Spacing 10.5 inches (267 mm) on center and within 1.5 inches (39 mm) of all overlapped seams. Consult individual listings for approved banding type.
- F. Duct Widths Greater than 24 Inches (610 mm): Weld insulation pins to bottom of horizontal ducts on a 12 inch (305 mm) by 10.5 inch (267 mm) maximum grid spacing. Welded insulation pins to one of the wider sides of all vertical ducts on a 12 inch (305 mm) by 10.5 inch (267 mm) maximum grid spacing. Impale duct wrap insulation over pins and secure with speed clips.

- G. Duct Access Doors: Install duct wrap to Manufacturer's instructions and procedures.
- H. Firestopping At Fire Separations:
 - 1. Firestop all wrapped ductwork penetrating fire rated concrete floors, gypsum board, block and concrete wall assemblies and gypsum board shaft wall assemblies using UL and/or Intertek firestop system Listings appropriate for the applicable duct wrap system .
 - 2. Kitchen exhaust grease ducts: Fire resistive duct wrap insulation to be continuous through wall or floor penetrations. Minimum 0.5 inch (13 mm), maximum 4.5 inch (114 mm) clearance permitted between outer layer of duct wrap insulation and edge of opening. Fill annular space between edge of opening and wrapped duct with pieces of 3M duct wrap insulation or mineral wool insulation firmly packed into opening. Compress to percentage stated and minimum depth stated in firestop listing. Recess packing material below surface on both sides of walls or top side only for floors to depth stated in firestop listing. Seal over packing material using 3M firestop sealant to depth stated in firestop listing, flush with top side of floor and both sides of wall surfaces.
 - 3. Ventilation ducts: Fire resistive insulation may pass continuously through fire rated wall or floor penetrations or may tightly butt to both sides of fire rated separations. Minimum 1 inch (25 mm), maximum 3 inch (76 mm) clearance permitted around unwrapped duct in opening or from edge of opening to outer layer of duct wrap. Consult individual Listed firestop systems for specific requirements.
 - a. Option A: Terminate wrap at fire separation. Fill space around unwrapped duct where it passes through a fire-rated wall or floor with pieces of 3M duct wrap insulation or mineral wool insulation firmly packed into opening. Compress to the percentage stated in the firestop listing to full depth of floor or wall. Recess packing on both sides of walls or top side of floor to depth stated in firestop listing. Seal over packing material using 3M Fire Barrier Sealant to depth stated in firestop listing, flush with top side of floor and both sides of wall surfaces. Tightly butt fire resistive duct wrap insulation to each side of wall or floor assembly and seal interface with a continuous bead of 3M Fire Barrier Sealant.
 - b. Option B: Wrap continuous through fire separation. Fill space around continuously wrapped duct where it passes through fire rated wall or floor with pieces of 3M duct wrap insulation or mineral wool insulation firmly packed into opening and compress to the percentage stated in the firestop listing to a minimum depth of 4 inches (102 mm). Recess packing material below surface on both sides of wall or top side of floor to depth stated in firestop listing. Seal over packing material using 3M Fire Barrier Sealant to depth stated in firestop listing, flush with top side of floor and both sides of wall surfaces.
- I. Where kitchen exhaust hoods are located within a fire rated area or zone, begin application of duct wrap insulation inside fire rated area 6 inches (152 mm) from face of fire rated wall or ceiling assembly for non-combustible fire separations, and 18 inches (457 mm) from face of wall or ceiling surface inside fire rated area for combustible fire separations, or as indicated on the Drawings. Apply two layers of duct wrap continuously to ductwork through fire separation for distance indicated on the Drawings.

3.4 INSTALLATION – THROUGH PENETRATION FIRESTOP

- A. Install in strict accordance with manufacturer's detailed installation instructions and procedures.

- B. Install so that openings are completely filled and material is securely adhered.
- C. Where firestopping surface will be exposed to view, finish to a smooth, uniform surface flush with adjacent surfaces.
- D. After installation is complete, remove combustible forming materials and accessories that are not part of the listed system.
- E. Repair or replace defective installations to comply with requirements.
- F. At each through penetration, attach identification labels on both sides in location where label will be visible to anyone seeking to remove penetrating items or firestopping.
- G. Clean firestop materials off surfaces adjacent to openings as work progresses, using methods and cleaning materials approved in writing by firestop system manufacturer and which will not damage the surfaces being cleaned.
- H. Notify authority having jurisdiction when firestopping installation is ready for inspection; obtain advance approval of anticipated inspection dates and phasing, if any, required to allow subsequent construction to proceed.
- I. Do not cover firestopping with other construction until approval of authority having jurisdiction has been received.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing agency to inspect installed duct wrap and firestopping and to prepare reports indicating whether the installed work complies with the contract documents.
- B. Notify testing agency at least 7 days prior to date when duct wrap and firestopping installation will be ready for inspection; obtain advance approval of general schedule and phasing, if any, required to allow subsequent construction to proceed.

3.6 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect fire-resistive product(s) before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Install identification Labels for Flexible Wrap Fire-Resistive System:
 1. The words " Fire-Resistive Enclosure - Do not Remove" shall be pre-printed on the duct wrap material.
 2. Label all access doors with the following text "Access Door – Do not obstruct".
- D. Install identification Labels for Through Penetration Systems: Pressure sensitive self-adhesive vinyl labels, preprinted with the following information:
 1. The words "Warning - Through Penetration Firestop System - Do not Disturb. Notify Building Management of Any Damage."
 2. Listing agency's system number or designation.

3. System manufacturer's name, address, and phone number.
4. Installer's name, address, and phone number.
5. General contractor's name, address, and phone number (if applicable).
6. Date of installation.

END OF SECTION