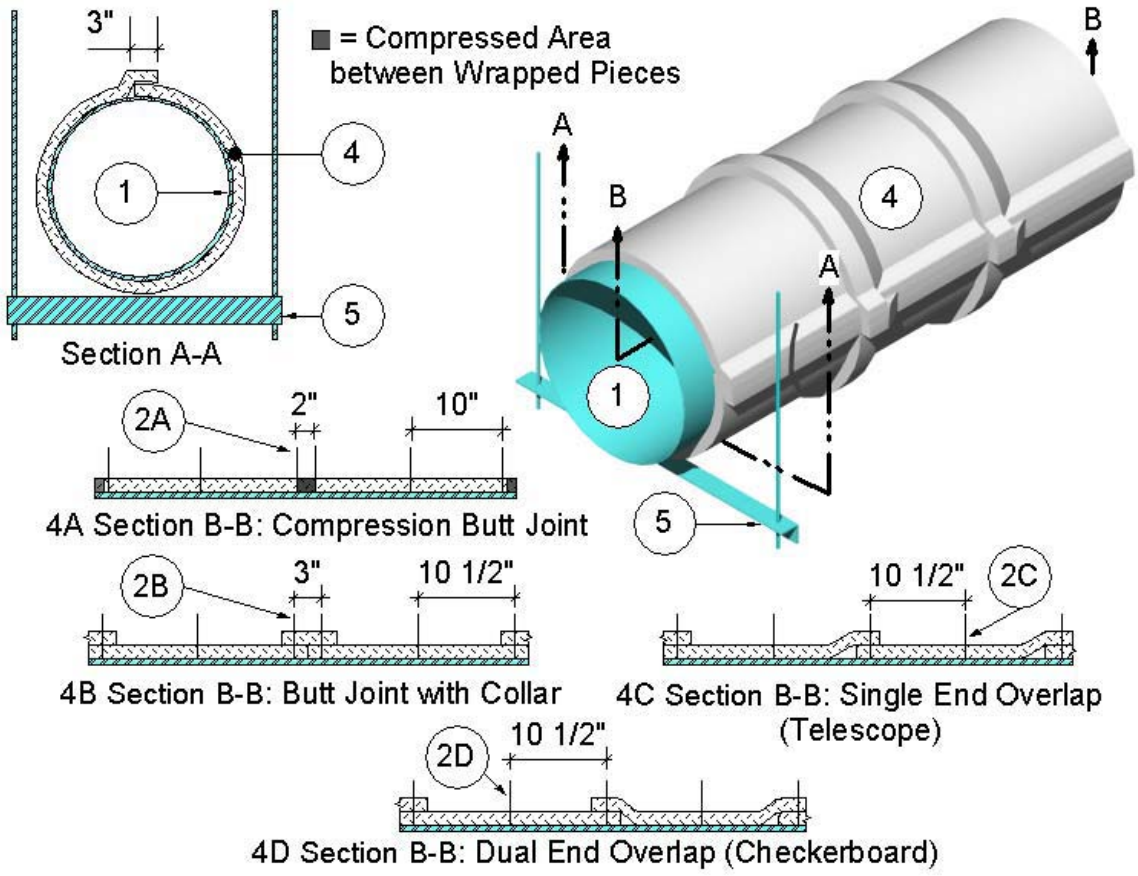
Design No. 3MU/FRD 120-11
OPL Design Number: CFD 501 F
CHEMICAL FUME EXHAUST DUCT PROTECTION
3M Company
3M Fire Barrier™ Duct Wrap 15A or 3M Fire Barrier™ Duct Wrap 615+
UL 1978 (June 25, 2002) Section 12 Temperature Test – Pass
Section 13 Abnormal Temperature Test – Pass
ICC-ES Acceptance Criteria for Grease Duct Enclosure Systems (AC101)
Section 4.5 Fire-Engulfment Test (ASTM E 119 Exposure) – 2 hr



1. CHEMICAL FUME EXHAUST DUCT: Continuously welded, liquid-tight L-shaped round duct system with horizontal and vertical shafts constructed of 16 GA sheet steel or 18 GA stainless steel with a maximum 1320 in^2 area and a maximum 41 in. diameter. When required, equip the duct with a prefabricated access door (Item 6) or field fabricated access door (Item 7).

   A. Construct the duct using sections affixed to each other with welded seams.

   B. Reinforce the duct to IMC or NFPA 96 requirements designed to carry the weight of the chemical fume exhaust duct assembly covered with insulation under a fire load equivalent to UL 1978 exposure and the ASTM E 119 time-temperature curve.

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C. Rigidly support the duct in accordance with IMC or NFPA 96 requirements or as specified in Item 5.

D. Protect the annular space around the duct passing through a fire-rated wall assembly with an Intertek-certified, compatible, 3M penetration firestop system having the same fire rating as the wall or floor assembly.

2. FASTENERS: Weld minimum 12 GA, 4-1/2 in. long, copper-coated steel insulation pins or 12 GA insulated cup head pins to the chemical fume exhaust duct (Item 1). Match fastener method with corresponding insulation (Item 4) method.

A. Compression Butt Joint: Locate pins at all blanket overlaps, on all sides of the chemical fume exhaust duct (Item 1), and meet the following requirements.

I. Space pins maximum 12 in. apart in rows across the width of the chemical fume exhaust duct (Item 1). Locate pins maximum 6-3/4 in. from the edges of the chemical fume exhaust duct (Item 1). Refer to Section view A-A.

II. Space the rows of pins maximum 10 in. apart along the length of the chemical fume exhaust duct (Item 1). Where pieces of insulation (Item 4A) are butted together, space edge pins of the insulation (Item 4A) a maximum 2 inches apart. Refer to Section view B-B.

III. After insulation (Item 4A) is installed, place minimum 2.5 in. x 2.5 in. square, galvanized steel, self-locking washer clips onto all insulation pins.

IV. After clips are installed, cut off or bend flush with insulation (Item 3) pins that are too long.

B. Butt Joint with Collar: Locate pins at all blanket overlaps, on all sides of the chemical fume exhaust duct (Item 1), and meet the following requirements.

I. Space pins maximum 12 in. apart in rows across the width of the chemical fume exhaust duct (Item 1). Locate pins maximum 6-3/4 in. from the edges of the chemical fume exhaust duct (Item1). Refer to Section view A-A.

II. Space the rows of pins maximum 10-1/2 in. apart along the length of the chemical fume exhaust duct (Item 1). Where pieces of insulation (Item 4B) are overlapped, space pins a maximum 1-1/2 in. from the edge of the insulation. Refer to Section view B-B.

III. After insulation (Item 4B) is installed, place minimum 2.5 in. x 2.5 in. square, galvanized steel, self-locking washer clips onto all insulation pins.

IV. After clips are installed, cut off or bend flush with insulation (Item 4B) pins that are too long.

C. Single End Overlap (Telescope): Locate pins at all blanket overlaps, on all sides of the chemical fume exhaust duct (Item 1), and meet the following requirements.

I. Space pins maximum 12 in. apart in rows across the width of the chemical fume exhaust duct (Item 1). Locate pins maximum 6-3/4 in. from the edges of the chemical fume exhaust duct (Item 1). Refer to Section view A-A.

II. Space the rows of pins maximum 10-1/2 in. apart along the length of the chemical fume exhaust duct (Item 1). Where pieces of insulation (Item 4C) are butted together, space pins a maximum 1-1/2 in. from the edge of the insulation. Refer to Section view B-B.

III. After insulation (Item 4C) is installed, place minimum 2.5 in. x 2.5 in. square, galvanized steel, self-locking washer clips onto all insulation pins.

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IV. After clips are installed, cut off or bend flush with insulation (Item 4C) pins that are too long.

D. Dual End Overlap (Checkerboard): Locate pins at all blanket overlaps, on all sides of the chemical fume exhaust duct (Item 1), and meet the following requirements.

I. Space pins maximum 12 in. apart in rows across the width of the chemical fume exhaust duct (Item 1). Locate pins maximum 6-3/4 in. from the edges of the chemical fume exhaust duct (Item 1). Refer to Section view A-A.

II. Space the rows of pins maximum 10-1/2 in. apart along the length of the chemical fume exhaust duct (Item 1). Where pieces of insulation (Item 4D) are butted together, space pins a maximum 1-1/2 in. from the edge of the insulation. Refer to Section view B-B.

III. After insulation (Item 4D) is installed, place minimum 2.5 in. x 2.5 in. square, galvanized steel, self-locking washer clips onto all insulation pins.

IV. After clips are installed, cut off or bend flush with insulation (Item 4D) pins that are too long.

3. BANDING: (Not Shown) Not applicable to Item 2A. Option to fasteners Items 2B, 2C and 2D. After insulation (Item 4) is installed, apply minimum 1/2 in. wide, 0.015 in. thick stainless steel bands and secured with minimum 1 in. long stainless steel crimp clamps. When needed to ease installation, use filament tape as a temporary hold for the insulation (Item 4) prior to banding. Place banding a maximum 1-1/2 in. from all insulation (Item 4) edges and a maximum of 10-1/2 in. on center (oc). Tension the banding to hold the insulation (Item 4) in place without cutting or damaging the insulation (Item 4) or chemical fume exhaust duct (Item 1).

4. CERTIFIED COMPANY: 3M Company

CERTIFIED PRODUCT: Duct Insulation

MODEL: 3M Fire Barrier™ Duct Wrap 15A- Nominal 1-1/2 in. thick, 8 pcf blanket, made of mineral fibers and encapsulated with aluminum foil scrim.

Or

CERTIFIED COMPANY: 3M Company

CERTIFIED PRODUCT: Duct Insulation

MODEL: 3M Fire Barrier™ Duct Wrap 615+- Nominal 1-1/2 in. thick, 6 pcf density blanket, made of calcium-, silica-, and magnesium-oxide (CSM) fibers, encapsulated with polypropylene-foil or aluminized polyester scrim.

INSULATION: Apply one layer of duct insulation over the entire surface of the chemical fume exhaust duct (Item 1). Use blanket, available in various widths, that is fully-encapsulated or single-faced scrim. Expose the foil-faced side of insulation to view. Wrap one layer of insulation around the chemical fume exhaust duct (Item 1) circumference so that each terminating end of insulation overlaps onto the starting end of insulation a minimum of 3 in. at all transverse joints. Alternate the transverse overlap location so that no two consecutive adjacent overlaps align. Refer to Section view A-A for transverse overlap section view. Cover all visually exposed ends and edges of insulation with nominal 4 in. wide pressure-sensitive aluminum foil tape.

A. Compression Butt Joint: Refer to 4A section view B-B. Wrap the chemical fume exhaust duct (Item 1) with one layer of insulation installed with compression butt joints at all longitudinal joints. Compress each end of each piece of insulation together and butt to preceding edge of insulation. Each piece of installed insulation width is 2 in. less than insulation nominal width. (Example: each piece of nominal 24 in. wide insulation when installed is 22 in. wide.) Install insulation with zero clearance at the surface and mating

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edges, or in the field between overlaps. Verify all insulation butt joints are a minimum 1-1/2 in. in overall thickness at compression butt joints.

B. Butt Joint with Collar: Refer to 4B section view B-B. Wrap the chemical fume exhaust duct (Item 1) with one layer of insulation installed with butt joints at all longitudinal joints. Butt each end of each piece of insulation together with preceding edge of insulation. Each piece of installed insulation width is its nominal width. (Example: each piece of nominal 24 in. wide insulation when installed is 24 in. wide.) Install insulation with zero clearance at the overlaps, or in the field between overlaps. Place and center 6 in. wide collar of insulation over the butt joint. Overlap 6 in. wide collar onto each adjacent insulation 3 in. Verify all insulation butt joints with collars are a minimum 3 in. in overall thickness.

C. Single End Overlap (Telescope): Refer to 4C section view B-B. Wrap the chemical fume exhaust duct (Item 1) with one layer of insulation installed with 3 in. minimum overlaps at all longitudinal joints. Overlap each adjacent insulation edge with the edge of the next piece of insulation. Install insulation with zero clearance at the overlaps, or in the field between overlaps. Verify all insulation overlaps are nominally 3 in. in overall thickness.

I. Starting at one end of the chemical fume exhaust duct (Item 1), apply the first piece of insulation around the chemical fume exhaust duct (Item 1) to overlap fasteners (Item 2C). Refer section view A-A.

II. Position and overlap the leading edge of the second piece of insulation nominally 3 in. over the flush edge of the first piece of insulation. Place the opposite edge of the second piece of insulation flush against the surface of the chemical fume exhaust duct (Item 1). An “S shaped” cross section of the insulation is created. Refer to 4C section view B-B.

III. Apply all additional pieces of insulation as “S-shaped” cross section of the insulation in compliance with Item 4CII.

D. Dual End Overlap (Checkerboard): Refer to 4D section view B-B. Wrap the chemical fume exhaust duct (Item 1) with one layer of insulation installed with 3 in. minimum overlaps at all longitudinal joints. Overlap each full-width insulation edge with the edge of the “gull wing” (-v -) shaped piece of insulation. Install insulation with zero clearance at the overlaps, or in the field between overlaps. Verify all insulation overlaps are a minimum 3 in. in overall thickness. Do not align two consecutive insulation end overlaps.

I. Wrap the first piece of insulation around the chemical fume exhaust duct (Item 1) so that the insulation is flush against the surface of the chemical fume exhaust duct (Item 1). Position the starting end of the insulation to overlap pins (Item 2A) a minimum of 1-1/2 in. while the edges of the insulation overlap the rows of pins (Item 2B) a minimum of 1-1/2 in.

II. Position the second piece of insulation nominally 18 in. from the edge of the first piece of insulation. Install the second piece in the same manner as the first.

III. Cover the chemical fume exhaust duct (Item 1) that is exposed between the edges of the first two pieces of insulation with another piece of insulation. Position the starting end of the insulation to overlap pins (Item 2A) a minimum of 1-1/2 in. while the edges of the insulation overlap the adjacent edges of the two pieces installed insulation a minimum of 1-1/2 in.

5. SUPPORTS: Support the chemical fume exhaust duct (Item 1) with insulation (Item 4) using a “trapeze” system composed of a minimum 2 x 2 x 1/4 in. steel angle as the

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trapeze cross-member and minimum 3/8 in. diameter rods. Connect all-thread steel rods (insulation (Item 4) not required) to the trapeze cross-member using nuts and washers. Connect the all-thread steel rods to the bottom of the floor assembly using an attachment method designed to carry the weight of the chemical fume exhaust duct (Item 1) with insulation (Item 4) under a fire load equivalent to ASTM E 119 time-temperature curve. Place one all-thread steel rod 2 in. from each end of trapeze cross-member. Center chemical fume exhaust duct (Item 1) with insulation (Item 4) on trapeze cross-member. Space all-thread steel rods a maximum 6 in. from surface of the insulated chemical fume exhaust duct. Extend trapeze cross-member at least 2 in. past each all-thread steel rod. Space trapeze supports a maximum 60 in. oc.

6. CERTIFIED MANUFACTURER: 3M Company

   CERTIFIED PRODUCT: 3M Fire Barrier™ Grease Duct Access Door

   MODELS: 000-51115-16584-9 (20 x 20), 000-51115-16583-2 (12 x 8), and 00051115-16582-5 (10 x 6)

   ACCESS DOOR ASSEMBLY: (Not shown) When required, apply an access door and insulated cover plate as described:

   A. OPTIONAL PRE-FABRICATED ACCESS DOOR: Mark a clean-out access opening location on the chemical fume exhaust duct (Item 1) with insulation (Item 4) at its mid-height along the horizontal section. Cut an opening (maximum 22 x 22 in.) in the insulation (Item 4) 2 in. larger than the outside dimension of the pre-fabricated access door (maximum 20 x 20 in.). Remove and discard the cut insulation (Item 4). Cut an opening (maximum 20 x 20 in.) into the side of the chemical fume exhaust duct (Item 1) according to the manufacturer's instructions for the size of the pre-fabricated access door to be installed. Install and tightly secure the pre-fabricated access door in accordance with the manufacturer's instructions to the chemical fume exhaust duct (Item 1). Pre-fabricated access door fitted with four 3/8 in. diameter corner thumb bolts through the exterior face.

   B. CERTIFIED COMPANY: 3M Company

      CERTIFIED PRODUCT: Duct Insulation

      MODEL: 3M Fire Barrier™ Duct Wrap 15A

      CERTIFIED COMPANY: 3M Company

      CERTIFIED PRODUCT: Duct Insulation

      MODEL: 3M Fire Barrier™ Duct Wrap 615+

      ACCESS INSULATION: (Not Shown) Remove the four corner 3/8 in. diameter thumb bolts and replace them with four 3/8 in. diameter all-thread steel rods extending from prefabricated access door (Item 6A). Apply 2 layers of access insulation over the pre-fabricated access door (Item 6A) as follows. Cut the first piece of access insulation a minimum 1/4 in. larger than the clean-out access opening. Position, square and impale the first piece of the access insulation over the four 3/8 in. diameter all-thread steel rods extending from pre-fabricated access door (Item 6A). Press the first piece of access insulation flush over the prefabricated access door (Item 6A). Compress and abut the cut edges of the first piece of the access insulation against the cut edges of opening in the insulation (Item 4). Cut a second piece of access insulation a minimum of 2 in. larger than first piece of access insulation on all sides. Seal cut edges of the second piece of access insulation with nominal 4 in. wide aluminum foil tape. Position, square and impale the second piece of the access insulation over the four 3/8 in. diameter all-thread steel rods extending from pre-fabricated access door (Item 6A). Press the second piece of access insulation flush over first piece of access insulation.

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C. COVER PLATE: Cut a cover plate to the same dimensions as the second piece of access insulation (Item 6B) using a minimum 16 GA steel sheet. Drill holes in the cover plate that match the location of the four 3/8 in. diameter all-thread steel rods and locate the holes so that the cover plate is squared to the second piece of access insulation (Item 6B). After both layers of access insulation (Item 6B) are impaled over the four 3/8 in. diameter all-thread steel rods install the cover plate. Pass the four 3/8 in. diameter all-thread steel rods through the cover plate. Place washers and wing nuts onto each of the four 3/8 in. diameter all-thread steel rods. Secure the cover plate by tightening wing nuts.

7. OPTIONAL FIELD FABRICATED ACCESS DOORS: (Not shown) Mark a clean-out access opening location on the chemical fume exhaust duct (Item 1) with insulation (Item 4) at its mid-height along the horizontal section. Use either option A or B.

   A. (OPTION A) Cut a 13 x 13 in. opening in the insulation (Item 4). Remove and discard the cut insulation (Item 4). Cut a 10 x 10 in. opening into the side of the chemical fume exhaust duct (Item 1) maintaining a 1 in. clearance around the perimeter of the opening and the cut insulation (Item 4). Remove and discard the cut steel. Weld four 4 x ¼ in. all-thread rods to the chemical fume exhaust duct (Item 1). Locate one at each corner of the chemical fume exhaust duct (Item 1) so that they are 11 in. oc and squared within the insulation (Item 4) opening.

      I. ACCESS DOOR: Cut a 13 x 13 in. 16 GA steel plate to be used as an access door. Drill clearance holes in the access door to match the all-thread steel rod pattern. Place the access door over the all-thread steel rods. Seal the opening in the chemical fume exhaust duct (Item 1) by overlapping the access door over the opening cut in the insulation (Item 4) by 1-1/2 in. on all sides. Weld four 6-1/2 in. long, 12 GA copper-coated steel insulation pins to the access door corners so that the pins are 9 in. oc.

      II. CERTIFIED COMPANY: 3M Company

      CERTIFIED PRODUCT: Duct Insulation

      MODEL: 3M Fire Barrier™ Duct Wrap 15A

      CERTIFIED COMPANY: 3M Company

      CERTIFIED PRODUCT: Duct Insulation

      MODEL: 3M Fire Barrier™ Duct Wrap 615+

      ACCESS INSULATION: Apply two layers of access insulation over the access door. Cut the first piece of access insulation into a 13 x 13 in. square and install it over the insulation pins and covering the access door (Item 7AI). Cut the second piece of access insulation into a 15 x 15 in. square. Square it to and install it over the insulation pins. Cover the first piece of access insulation so that a 1 in. overlap exists. Secure blanket to pins with 1-1/2 in. square or round, galvanized or stainless steel speed clips. Turn down or cut off insulation pins that extend beyond the second piece of access insulation. Place steel tubing over each all-thread steel rods. Apply washers and wing nuts over the all-thread steel rods. Secure the access door by tightening the wing nuts.

   B. (OPTION B) Cut a maximum 16 x 16 in. opening into the insulation (Item 4) and the chemical fume exhaust duct (Item 1). Remove and discard the cut insulation (Item 4) and steel. Weld together 4 pieces of 1-1/2 x 1-1/4 x 1/8 in. steel angle to form a flanged frame.

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The narrow frame edge is welded to the visual surface of the chemical fume exhaust duct (Item 1) at the perimeter of the opening that positions the 1-1/2 in. flange 1-1/4 in. off the chemical fume exhaust duct (Item 1). The flange extends away from the opening. Weld four minimum 4 in. long ¼ in. diameter all-thread steel rods to the flange. Locate one each in the center of each corner.

I. ACCESS DOOR: Cut an 18-1/2 x 18-1/2 in. 16 GA steel plate to be used as an access door. Drill clearance holes in the access door to match the all-thread steel rod pattern on the flange. Place the access door over the all-thread steel rods.

II. COVER PLATE: Cut a 20-1/2 x 20-1/2 in. external cover plate out of 16 GA steel and drill clearance holes matching the locations of the all-thread steel rods on the flange. Weld minimum four 12 GA copper-coated steel impaling pins onto the internal surface of the cover plate, spaced minimum 14 in. oc. Install access insulation (Item 7BIII). Position the cover plate with access insulation over the all-thread steel rods flush to access door. Apply washers and wing nuts over the all-thread steel rods. Secure the access door by tightening the wing nuts.

III. CERTIFIED COMPANY: 3M Company

CERTIFIED PRODUCT: Duct Insulation

MODEL: 3M Fire Barrier™ Duct Wrap 15A

CERTIFIED COMPANY: 3M Company

CERTIFIED PRODUCT: Duct Insulation

MODEL: 3M Fire Barrier™ Duct Wrap 615+

ACCESS INSULATION: Apply two layers of access insulation over the interior of the cover plate. Cut the first piece of access insulation into a 20-1/2 x 20-1/2 in. square and install it over the insulation pins on the internal surface of the cover plate. Cut the second piece of access insulation into a 24 x 24 in. square. Square it to and install it over the insulation pins. Cover the first piece of access insulation so that a 3-½ in. overlap exists. Secure blanket to pins with 1-1/2 in. square or round, galvanized or stainless steel speed clips. Turn down or cut off insulation pins that extend beyond the second piece of access insulation.

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