

SECTION 1589X DUCT FOR CORROSIVE FUME EXHAUST

PART 1

GENERAL

REV: 02/01/24 CAT060BE

1.1 Related Documents

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.
- B. Division 15 Basic Mechanical Materials and Methods Sections apply to work of this Section.

1.2 Related Work

- A. Extent of coated duct is indicated on drawings and in schedules, and by requirements of this section.
- B. Refer to other Division XX sections for exterior insulation of coated duct; not work of this section.
- C. Refer to other Division XX sections for fans and air handling units; not work of this section.

1.3 Quality Assurance

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of coated stainless steel duct products of types, materials, and sizes required. Manufacturer shall perform their own sheet metal fabrication and coating processes. The owner and/or his representatives shall have the right to tour the manufacturer's plant any time that fabrication is being performed on duct intended for this project. Manufacturer shall possess an assembly training video easily accessible to installation contractors.

1. Codes and Standards:

- a. Ducts shall have been tested to ASTM E-84 and have flame spread of "0" and smoke generation rate of less than "20".
- b. Ducts shall be listed for use without the necessity for internal fire protection sprinklers or any device relied on to cut off air flow in the event of fire by Factory Mutual Research Standard 4922 with a minimum coating thickness FM approval not less than 14 mils.
 - i. Duct shall be Factory Mutual approved for use without sprinklers for an unlimited vertical height.
 - ii. Duct shall be Factory Mutual approved for sizes 4 (101.6mm) inch through 60 (1524.0mm) inch in diameter.
 - iii. Clamped type (EZ Clamp) connections shall be Factory Mutual approved for duct sizes 4 (101.6mm) inch through 14 (1524.0mm) inch.
 - iv. Angle ring type connections made from stainless steel or powder coated (non-shedding) black iron shall be Factory Mutual approved for duct sizes 4 (101.6mm) inch through 60 (1524mm) inch.

- c. SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal duct and SMACNA's "Round Industrial Duct Construction Standards" intended for use by designers of industrial ventilation systems.
- B. Installer Qualifications: Installation contractors shall have at least 3 years of successful experience on duct projects, specifically industrial exhaust systems.
- 1. Codes and Standards:
 - a. ASHRAE Standards: Comply with ASHRAE handbook, Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of metal duct.
 - b. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems", NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems" and NFPA 91 "Standard for the Installation of Blower and Exhaust Systems."
 - c. Field Reference Manual: Have available for reference at project field office, copy of SMACNA "Round Industrial Duct Construction Standards."

1.4 Submittals

- A. Submit manufacturer's technical product data and installation instructions for coated stainless steel duct.
- B. Shop Drawings: Installing contractor responsible for submitting scaled layout drawings of coated duct and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, walls and floor penetrations, and connections. Show interface and spatial relationships between coated duct and adjacent equipment. Show modifications of indicated requirements and how those modifications ensure that free area, materials, and rigidity are not reduced.

1.5 Delivery, Storage, and Handling

- A. Protect coated duct from damage due to normal handling during shipment and storage. Protection shall be applied to ends of duct to prevent dirt and moisture from entering ducts and fittings.
- B. Consignee must inspect shipment upon delivery and note any and all damages and discrepancies on bill of lading and notify manufacturer within 24 hours.
- C. Coated duct should not be stored in an area where it will have a chance to be damaged from traffic or debris. All coated duct should be stored on cardboard, styrofoam or similar materials. Where possible, store inside and protect from dirt and debris. Where necessary to store outside, store above grade and enclose with waterproof wrapping to protect from dirt and debris.
 - 1. If coating is scratched during shipping or handling it must be inspected using the methods described in Section 2 "Products", Subsection 2 "Duct Construction Materials", Subsection A3. Contact the manufacturer for approved repair procedures.

2.1 Acceptable Manufacturers

Coated Stainless Steel Exhaust Duct and Fittings:

PSP® & PSP-EZ™ (PermaShield Pipe) as manufactured by:
 Fab-Tech, Inc.
 480 Hercules Drive
 Colchester, VT 05446

Coating

PermaShield Fluoropolymer Barrier Coating:
 Fab-Tech, Inc.
 480 Hercules Drive
 Colchester, VT 05446

Duct Joint Sealant, Joint Tape and Die-cut Sheet Gasket:

PermaShield Fully Expanded 100% PTFE as distributed by:
 Fab-Tech, Inc.
 Colchester, VT 05446

Part No.	Description
GAS03	1/4" (6.35mm) x 3/16" (4.76mm) Joint Sealant
GAS09	.010" (2.54mm) Gasket Tape

2.2 Duct Construction Materials

A. Coated stainless steel duct shall be constructed in full accordance with the specifications below:

1. Base metal shall be AISI 304 or 316 series stainless steel, constructed to a duct gauge and reinforcing system in accordance with "SMACNA Round Industrial Duct Construction Standards" with a Class 1, -6" WG (-1493 kPa) thru -18" WG (-4479.1 kPa) schedule. Potential for higher pressure class systems through engineering approval. Longitudinal seams shall be fusion welded. Transverse seams shall be butt welded, no dissimilar filler materials allowed.
2. The coating shall be PermaShield fluoropolymer barrier thermoplastic resin. The average coating thickness per project shall not exceed 12 mils (.012 inch 0.30mm). For straight duct and fittings, the average coating thickness shall fall between 10 mils +/- 4 mils (.010" +/- .004" 0.254mm +/- 0.102mm). For control devices, the average thickness shall fall between 11 mils +/- 5 mils (.011" +/- .005" 0.279mm +/- 0.127mm). Complete and uniform coating coverage is required.
3. The manufacturer shall perform dielectric testing of the coating on all pieces of duct. All coated surfaces will be subjected to 2500 volts DC with no failures (sparks or audible alarms) indicated.

2.3 Miscellaneous Duct Construction Materials

A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with duct system requirements including proper connection of duct and equipment. Support materials in contact with the duct shall be fabricated of compatible materials unless otherwise specified.

1. Duct Fittings:

- a. Factory fabricated duct fittings to match adjoining ducts, and to comply with the contracted duct requirements. Unless otherwise specified, fabricate elbows with centerline radius equal to one and one half (1-1/2) times the duct diameter. Unless otherwise specified, use 45 degree laterals and 45 degree elbows for branch take-off connections. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.
- b. Predetermine location of duct drains prior to manufacturer's fabrication. Drains are to be located at the lowest vertical point of all main and branch ducts which are P-trapped and/or as shown on the drawings to allow removal of condensate.
- c. Factory fabricate duct and fittings with predetermined location of test ports for monitors. Post assembly, accessories must be available through the manufacturer's product line.

2. Duct Joints:

- a. General: Duct joints may be either cast stainless steel (Companion Bolted Cast Rings), Van Stone mild steel or stainless steel (Companion Bolted Angle Rings), or PSP-EZ™ (V-ring Insert Band Clamps).
- b. Construction shall be generally cast metal or roll formed. Materials shall be either Mild Steel Alloy with PermaProtect baked on non-shedding coating or AISI 304 Series Stainless Steel. All bolt holes shall be elongated.
- c. Cast Stainless Steel (200 Series SS) 4" (101.6mm) to 14" (355.6mm) diameter or Van Stone Flange 16" (406.4mm) to 120" (3048.0mm) diameter.

- I. Hardware shall be SAE Grade 5 Plated steel alloy or 304/316 stainless steel. Hardware to be tightened to the torque values located in the factory installation guide. Stainless steel hardware requires application of anti-seize lubricant prior to assembly. Locktite LB771 or equal.

Hardware Bolt Diameter

3/8" (9.5mm)

1/2" (12.7mm)

Stainless Steel Bolt Diameter

3/8" (9.5mm)

1/2" (12.7mm)

- II. Gasket shall be PermaShield Joint Sealant:

4" (101.6mm) diameter to 30" (762.0mm) diameter =

GAS09 .010" (0.25mm) x .75" (19.01mm) Tape Gasket

32" (812.8mm) diameter & up =

GAS03 1/4" (6.35mm) x 3/16" (4.76mm) Rope Gasket

d. PSP-EZ™ Joints

- I. Construction shall be generally roll and press formed stainless steel sheet goods.
- II. Duct flanges will be backed with a half round shaped loose metallic ring shaped to work with the formed profile of the clamp band. One circumferential bolt with one locknut is used to tighten the clamp to the duct.

- III. Gasket shall be a self adhesive PermaShield Tape .010" (0.25mm) x .75" (19.1mm) on each end of duct [4" (101.6mm) to 14" (355.6mm) diameter] or a singular die cut PermaShield gasket [2" (50.8mm) to 3" (76.2mm) diameter] as specified by the manufacturer.

Clamp bolt shall be tightened to the values located in the installation assembly guide:

Clamp Bolt Diameter

1/4" (6.35mm) [Ø2" (50.8mm) - 8" (203.2mm)]
5/16" (7.94mm) [Ø10" (254.0mm) - 14" (355.6mm)]

3. Accessories

- a. Dampers: Equipment isolation dampers, balancing dampers and header separation shall be manufactured of the same materials as the duct unless otherwise noted. All dampers shall be manufactured in such a way that all surfaces exposed to the air stream shall be either coated or shall have the chemical resistance of the PermaShield fluoropolymer barrier coating being used. This shall include, where appropriate, o-ring seals on damper shafts.
- i. Round Dampers shall be single blade type with locking axle shafts and bearings external to the airstream. Seals shall be FKM/Viton for Standard, Heavy Duty Industrial and Ultra series. Damper series are pressure class dependent.
- I. Option for Industrial Single Blade Isolation Dampers in sizes 6" (152.4mm) to 48" (1219.2mm) diameter shall be certified to bear the AMCA Seal. Damper ratings shall be based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program.
- i. Test method per AMCA Standard 500.
- ii. Air leakage based on operation between 50°F & 104°F (10°C to 40°C) and data corrected to represent standard air density 0.075 lbs/ft³ (1.201 kg/m³).
- ii. Rectangular dampers shall be parallel, opposed or back-draft type as indicated on the drawings. All blade shafts shall pass through FKM/Viton seals, and thermoplastic bearings and shall be connected by stainless steel bearing supports with blade linkage systems made entirely of stainless steel, installed external to damper air flow.
- I. Opposed Blade - Linkage shall be located outside of airstream. Blades must have blade stops.
- II. Parallel Blade - Linkage shall be located outside of airstream. Blades must have blade stops.
- III. Backdraft damper shall be an adjustable counterbalance type with parallel action blades. Counterbalance arm shall be 300 series stainless steel. Linkage shall be located outside of air stream. Blades must have blade stops.

- IV. Blastgate shall be non-binding when blade is inserted and extracted. Actuated blastgate construction shall provide adequate support of blade when in the open position with blastgate mounted in vertical or horizontal duct. Manual blastgate blades shall be segmented to limit weight of blade sections to 40 lbs (18.2 kg) maximum. Blastgates are not recommended to be used for balancing purposes. Blades should be fully open or fully closed.
- i. Horizontal Isolation Blastgate: Fabricate as above with blade(s) and flanges perpendicular to air stream with 8 inch (203.2mm) minimum flange to flange width.
 - ii. Inclined Isolation Blastgate: Fabricate as above with flanges perpendicular to air stream and with blade(s) and track at the maximum incline based on the blastgate width in Table below.

Duct Diameter	Damper Width (inches)
4" (101.6mm) to 8" (203.2mm)	8" (203.2mm)
10" (254.0mm) to 16" (406.4mm)	12" (304.8mm)
18" (457.2mm) to 48" (1219.2mm)	16" (406.4mm)

PART 3

EXECUTION

3.1 Installation

- A. Examine areas and conditions under which coated duct are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- B. Assemble and install coated stainless steel duct while using extreme care not to scratch surface of coating (if scratched, immediately contact manufacturer for repair instructions) and in accordance with recognized industry practices which will achieve air-tight, under 1% leakage. Install each run with a minimum number of joints. Align duct accurately at connections, with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type, which will hold in accordance with SMACNA "Industrial Duct Construction Standards."
 - 1. Coating must not be penetrated during installation. No fastening devices such as Tek-style screws, rivets, etc. are to be used on any part of a coated duct application. Test holes and slots for monitoring must be predetermined before fabrication and coating unless using approved Fab-Tech Field Modification Kits. Install coated stainless steel duct as shown on drawings and described herein, following applicable state and city codes, and per SMACNA HVAC Duct Construction Standards.
 - 2. Welding: Under no circumstances shall welding or a heat source greater than 300°F (150°C) be allowed on the stainless steel surface of the duct.
 - 3. Routing: Locate coated stainless steel duct runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run duct in the shortest route that does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Wherever possible in finished and occupied spaces, conceal duct from view, by locating in mechanical shafts, hollow wall

construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finish work.

4. Electric Equipment Spaces: do not route duct through transformer vaults and their electrical equipment spaces and enclosures.
5. Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal space between construction openings and duct with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2" (38.1mm).