**SPECIAL SPECIFICATION**

**SECTION 15890-S**

**COATED STAINLESS STEEL DUCTWORK**

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. This section includes coated stainless steel ductwork and appurtenances for corrosive fume exhaust systems for the MicroFab, Acid and Ammonia process exhaust systems, and the Fume Hood exhaust system on the top floor of the MicroLab .

B. Related Sections

1. Section 13085S – Seismic Protection.

2. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

3. Division 15, Basic Mechanical Materials and Methods.

4. Division 15 Section “Mechanical Identification” for labeling and identifying.

1.02 SUBMITTALS

A. Product Data:

1. Manufacturer’s technical product data and installation instructions for coated stainless steel duct and dampers.

2. Manufacturer’s technical product data and installation instructions for flexible duct connectors.

3. Manufacturer’s technical product data and installation instructions for gaskets.

B. Shop Drawings:

1. Fully dimensioned and to-scale 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.
2. Show the location of every flanged duct connection and structural support member with dimensions relating to:

    a. Coordinated flanged connections in horizontal runs to be clear of horizontal structural supports.

    b. Coordinated flanged connections in vertical runs to align with vertical structural supports and details of fastening flanges to the supports.

    c. Showing interface and spatial relationships between coated duct and adjacent equipment.

    d. Showing 2-hole alignment of duct flanges for welded ring flanges, and that all flange bolt holes will straddle normal N-S, E-W and vertical centerlines.

    e. Showing all drain, test and instrumentation tap locations and sizes.

    f. Details of any and all special structural attachment points required to be welded prior to coating duct.

    g. Showing modifications of indicated requirements and how those modifications ensure that free area, materials, and rigidity are not reduced.

## 1.03 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer's Qualifications

    a. Manufacturer shall perform his own sheet metal fabrication and coating processes.

    b. The owner and/or his representatives shall have the right to tour the manufacturer's plant anytime that fabrication is being performed on duct intended for his project.

2. Codes and Standards

    a. Ducts shall be listed for use without the necessity for internal fire protection sprinklers or any devices relied on to cut off air flow in the event of fire by Factory Mutual Research Standard 4922.

b. Duct shall have a flame spread of less than 25 and a smoke generation rate of less than 50.

c. Duct shall be Factory Mutual approved for use without sprinklers for an unlimited vertical height.

3. 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.

4. Installer Qualifications

a. Installation contractors shall have at least 3 years of successful experience on duct projects, specifically industrial exhaust systems.

b. Codes and Standards

(1) ASHRAE Standards: Comply with ASHRAE handbook, Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of metal duct.

(2) NFPA Compliance: Comply with NFPA 90A "Standards 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."

(3) Field Reference Manual: Have available for reference at project field office, copy of SMACNA "Round Industrial Duct Construction Standards."

1.04 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 shall not be stored in an area where it will have a chance to be damaged from traffic or debris. All coated duct shall be stored on cardboard, styrofoam or similar materials. Where possible, store inside and protect from dirt and debris. When

necessary to store outside, store above grade and enclose with waterproof wrapping to protect from dirt and debris.

D. If coating is scratched during shipping or handling it must be inspected using the methods described in Section 2 “Products”, Subsection 2 “Materials”, Subsection A3. Contact the manufacturer for approved repair procedures.

E. All adhesive advertisement or company logos should be removed from duct before shipping.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

Coated Stainless Steel Exhaust Duct and Fittings:

PSP & PSP-EZ (PermaShield Pipe), manufactured by:
Fab-Tech, Incorporated
21 Hercules Drive
Colchester, VT 05446

Powder and Primer
Teflon (ETFE Fluoropolymer) as manufactured by:
E.I. Dupont De Nemours and Company
Wilmington, DE
532-6005 Primer
5321-6012 Top Coat

Duct Joint Sealant, Joint Tape and Die-cut Sheet Gasket
Gore-Tex (Fully Expanded 100% PTFE) as manufactured by:
W.L. Gore and Associates, Inc.
Elkton, MD

| Part no. | Description |
|---|---|
| 0000C-FAB | 3/16 ” x 1/8” Joint Sealant |
| 0000D-FAB | 1/4 ”x1/8 ” Joint Sealant |
| KK-FAB | 1/4 ”x 3/16” Joint Sealant |
| 0100100.75 | .010 Gasket tape |

2.02 MATERIALS

A. Stainless Steel Coated Duct shall be in full accordance with the specifications below:

1. Base metal shall be AISI 300 series stainless steel, constructed to a duct gauge and reinforcing system in accordance with "SMACNA Round Industrial Duct Construction Standards" with Class 1, +10 in WG (after fans) and -10 in WG (before fans) schedule for all MicroFab acid and ammonia services, and –4 in WG schedule for all fume hood exhaust on the top floor of the MicroLab. Longitudinal seams shall be fusion welded. Transverse seams shall be butt welded, no dissimilar filler materials allowed.

2. The coating shall be Teflon ETFE. The average coating thickness shall be 10 mils (.010 inch). 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.

4. Duct Joints

a. Companion (Van Stone) Flange is the preferred method for connecting coated duct 20" or larger in diameter.

b. PSP-EZ clamp ( V-ring Insert Band Clamps) is the preferred method for connecting duct smaller than 20" diameter.

c. Gasket shall be form-in-place, fully expanded 100% PTFE.

2.03 COMPONENTS

A. Provide miscellaneous materials and products of types and sizes indicated provide type and size required to comply with duct system requirements including proper connection of duct and equipment unless specified otherwise. Support materials in contact with the duct shall be fabricated of compatible materials unless otherwise specified.

B. Duct Fittings

1. Factory fabricated duct fittings are 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 45 degree elbows shall be a minimum of 3 gores and 90 degree elbows shall be a minimum of 5 gores. 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.

2. Provide flexible duct connectors at inlet and outlet of each fan and scrubber.

3. Predetermine location of duct drains prior to manufacturer's fabrication. Drains are to be located in the bottom of all main and branch ducts which are P-trapped and/or as shown on the drawings to allow removal of condensation.

4. Factory fabricated duct and fittings with predetermined location of test holes for monitors should be utilized.

C. Duct Joints

1. Duct Joints may be either Van Stone (Companion Angle Ring Bolted Flanges) or PSP-EZ (V-ring Insert Band Clamps).

   a. Van Stone Flange 4" diameter to 120" diameter.

      (1) Construction shall be generally roll formed or pressed sheet stock. Materials shall be either AISI 300 Series Stainless Steel or owner approved equal.

      (2) Bolt holes shall be elongated.

      (3) Hardware shall be SAE Grade 5 plated steel alloy. Grade 5 hardware shall be tightened to the following values:

| Bolt Diameter | Torque (foot-lbs) |
|---|---|
| 5/16" | 22 |
| 3/8" | 36 |

2. Gasket shall be Gore-Tex Joint Sealant

| Diameter | Seal Size |
|---|---|
| 4" to 11" | 3/16" x 1/8" |
| 12" to 24" | 1/4" x 1/8" |
| 25" up | 3/16" x 1/8" |

   a. PSP-EZ Joints

(1) Construction shall be generally roll and press formed stainless steel sheet goods.

(2) Duct flanges will be backed with a trapezoidal-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.

(3) Gasket shall be a self-adhesive Gore-Tex Tape .010 x .75" on each end of duct (4" diameter to 18"diameter) or a singular die cut Gore-Tex gasket (2" diameter to 3" diameter) as specified by the manufacturer.

(4) Clamp bolt shall be tightened to the following values:

| Clamp Bolt Diameter | Torque(foot-lbs) |
|---|---|
| ¼" | 75 |
| 5/16" | 120 |

2.04 ACCESSORIES

A. Flexible duct connectors shall be "PROCO" series 500, style 520, U-type, Viton elastomer with A.36 retaining back-up bars, and 9" face to face dimension.

B. Dampers: Equipment isolation dampers, balancing dampers and header separation manifold dampers 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 with Teflon or shall be made of Teflon. This shall include, where appropriate, Teflon v-ring seals on damper shafts and Teflon injection molded bearings.

1. Round Dampers shall be single blade type with locking quadrants and non-metallic external shaft bearings. Bearings and seals shall be ETFE or PFA Teflon injection molded for standard industrial sizes or shall be Teflon v-ring assembly with thermoplastic sleeve for heavy-duty industrial sizes.

2. Rectangular dampers shall be parallel, opposed or back-draft type as indicated on the drawings. All blade shafts shall pass through ETFE Teflon bearings and shall be connected by stainless steel and installed external to damper air flow.

a. Opposed Blade – Linkage shall be located outside of air stream. Blades must have blade stops.

b. Parallel Blade – Linkage shall be located outside of air stream. Blades must have blade stops.

c. Back draft damper shall be an adjustable counterbalance type with parallel action blades. Counterbalance arm shall be 316 stainless steel. Linkage shall be located outside of the air stream. Blades must have blade stops.

d. Blast gate shall be non-binding when blade is inserted and extracted. Construction shall provide adequate support of blade when in the open position with blast gate mounted in vertical or horizontal duct. Damper blade shall be segmented to limit weight of blade sections to 40 pounds maximum.

3. Horizontal Isolation Blast Gate: Fabricate as above with blade(s) and flanges perpendicular to air stream with 8" maximum flange to flange width.

4. Inclined Isolation Blast Gate: Fabricate as above with flanges perpendicular to air stream and with blade(s) and track at the maximum incline based on the blast gate width in Table below.

5. Butterfly damper shall be low leakage and non-binding. Blades must have blade stops. Adjustment shall be infinite through an externally mounted wheel handle with a worm gear drive and marked with a position indicator.

| Duct Diameter | Damper Width |
|---|---|
| 4" to 8" | 8" |
| 10" to 16" | 12" |
| 18" to 48" | 16" |

## PART 3 - EXECUTION

### 3.01 ERECTION & 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 a manner acceptable to installer and owner.

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. Assemble and install in accordance with recognized industry practices that will achieve air-tight seal, under 1% leakage. Install each run with a minimum number of joints and orient the longitudinal seams to be on top of the duct. 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 SMACNA HVAC Duct Construction Standards.
2. Routing: Unless otherwise specified, locate coated stainless steel duct runs vertically and horizontally to 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.

3. Electrical Equipment Spaces: Do not route duct through transformer vaults and their electrical equipment spaces and enclosures.

4. Penetrations: Wherever ducts passing through interior partitions and exterior walls are exposed to view, conceal space between construction openings and duct with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2".

END OF SECTION