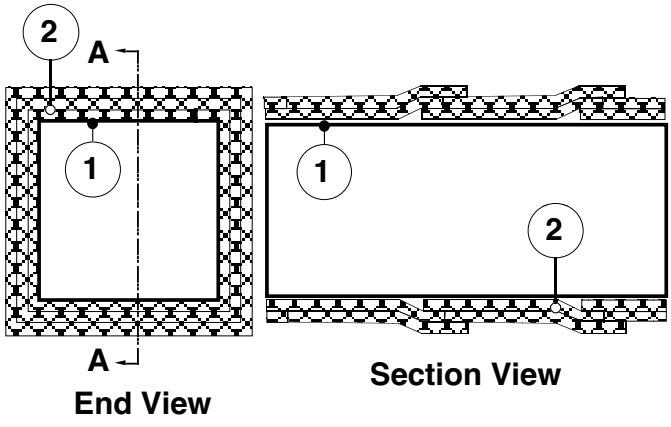
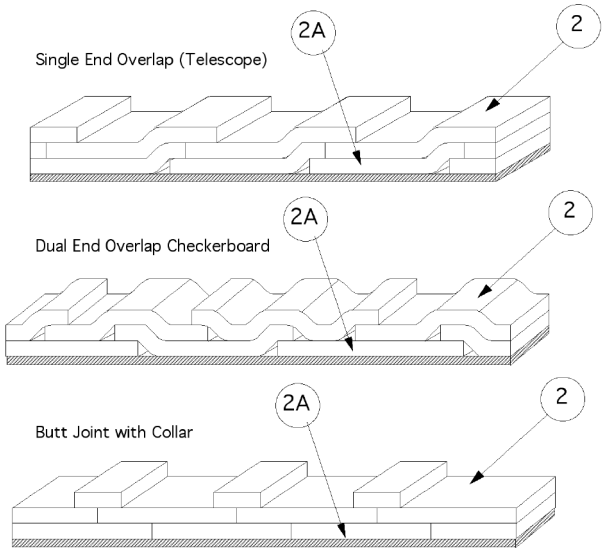
Design No. CFD 504 F

CHEMICAL FUME EXHAUST DUCTS

ICBO ES AC 101 Criteria

Section 5.4 Pass





1. CHEMICAL FUME EXHAUST DUCT**: A continuously welded, liquidtight L-shaped duct system with horizontal and vertical shafts constructed of 16 GA sheet carbon steel or 18 GA. stainless steel with a max. outside dimensions of 24 in. high x 48 in. wide. When required, equip the duct with a field fabricated access door. Construct the duct using sections affixed to each other with seams. Reinforce the duct to IMC or NFPA 96 requirements designed to carry the weight of the duct assembly covered with insulation under a fire load equivalent to AC101 Section 5.4 exposure and the ASTM E 119 time-temperature curve. Duct to be rigidly supported in accordance with IMC or NFPA 96 requirements and as specified in Item 5.

2. INSULATION: Use nom. 2-in. thick, 7-pcf blanket made of alkaline earth silicate wool refractory fiber. Use blanket that is

fully encapsulated with a polypropylene/foil scrim. The blanket is available in various widths. Wrap the steel duct with two layers of duct wrap installed with 3-in. min. overlaps at all joints both transverse and longitudinal. Use min. 2 mil x 3 in. wide aluminumfoil tape to seal cut edges of the blanket. Install insulation with zero clearance at any point. Wrap inner layer around the duct so that each exposed edge of the inner layer is overlapped onto the starting edge. Space the starting edge of the outer layer band a max. 3 in. from the exposed edge of the inner layer (2A). Overlap the exposed edge of the outer layer onto the exposed edge of the inner layer (2A) and a min. 3 in. onto the starting edge of the preceding outer layer. The overlaps are to occur on the top side of horizontal runs, or any side of vertical runs. Overall nom. thickness of 6 in. at overlaps. The longitudinal overlaps of adjacent blankets (2A) can be accomplished by one of the following three methods as depicted in the drawings:

* a 3-inch overlap checkerboard pattern for both layers where both edges of each alternating blanket are covered by each adjacent blanket whose edges are exposed. The outer layer edges are offset 12 in. from the inner layer, as shown in Section A-A, or
* a 3-inch overlap telescoping method where each adjacent blanket has one edge exposed and one edge covered by the next blanket, this technique is duplicated for the outer layer as shown in Section A-A, or
* a butt splice with collar method where the blankets are butted together on both layers and a 6-inch wide collar of blanket is centered over the butt splice of the outer layer overlapping each adjacent blanket 3-inches.

Reference Product Section of this Directory for more details.

Listed Manufacturer:

Thermal Ceramics Inc.--

Applied Fireproofing

Ceramic Blanket

FireMaster® Duct Wrap 2x2+™

3. PINS: Not shown. Required for installation. For duct widths greater than or equal to 24-in., weld min. 10 GA, 5 in. to 7-in. long, mild steel insulation pins. Space pins in columns max. 12-in. apart. Position pins 6 to 12 in. from each edge and min. 10-1/2-in. o.c. along the bottom horizontal and outside vertical duct sides to prevent blanket sag. Pins are required a max. 1 in. from the end of a duct and max. 1 in. from any corner (edge of a 90° bend). End and corner pins spaced max. 6-in. o.c. The blanket is locked into place over the pins with minimum 1.5 in. x 1.5-in. square, or 1.5-in. diameter round, galvanized steel, speed clips or cup head pins. Insulation pins that extend beyond the outer blanket wrap layer shall be turned down to eliminate sharp edges.
4. ACCESS DOOR: (Not shown) Equip all access ports in the duct with a perimeter reinforcement frame. Cut the blanket around the access door with a knife to create 1-in. step joints around the perimeter of the door opening. (Example: Consider an access port with a 9 x 9-in. opening. Cut the first layer attached to the duct to a size of 12 x 12 in. to provide a min. 1-1/2-in overlap of the access port cover plate around the perimeter. Cut the second layer attached to the first layer of blanket to a size of 14 x 14 in. to provide a min. 1-in overlap around the perimeter.) Weld four pieces of min. 1/4-in. diameter, 5 in. to 7-in. long, threaded rods to the corners of the perimeter reinforcement frame of the access port. Cut an access port cover plate from 16 GA. sheet steel so that it overlaps the access port opening a min. of 1-1/2 in. on all sides. (Example: an access port which measures 9 in. x 9 in. is covered with a 12 in. x 12 in. access port cover plate.) Drill holes in the access port cover plate to match the rods attached to the perimeter reinforcement frame. Then place 5 in. to 7-in. long hollow steel tubing over the threaded rods to act as protection "sleeves" for the FireMaster® Duct Wrap 2x2+ installation. Weld four 10 GA, 7 to 8-in. long, mild steel insulation pins to the access port cover plate for blanket installation. Cut a piece of FireMaster® Duct Wrap 2x2+ to overlap the opening cut in the first layer of FireMaster® Duct Wrap 2x2+ by a min. 1

in. Center and impale the cut piece of FireMaster® Duct Wrap 2x2+ over the pins and sleeves. Cut a second piece of FireMaster® Duct Wrap 2x2+ to overlap the opening in the second layer of FireMaster® Duct Wrap 2x2+ a min. 1 in. Center the cut piece of FireMaster® Duct Wrap 2x2+ and impale it onto the pins and sleeves. Cut a third piece of FireMaster® Duct Wrap 2x2+ to overlap a min. 1 in. the opening in the second layer of FireMaster® Duct Wrap 2x2+ attached to the duct. Center the cut piece of FireMaster® Duct Wrap 2x2+ and impale it onto the pins and sleeves. Place a compatible wing nut onto each stud and securely tighten to the torque rating of the threaded stud. Lock the blanket layers in place with a min. 1.5 x 1.5-in. square, or 1.5-in. diameter round, speed clips. Insulation pins that extend beyond the outer FireMaster® Duct Wrap 2x2+ shall be turned down to avoid sharp edges on the door. Apply access door labels to all access clean-out doors.

5. STRAPPING: Not shown. If needed, use of filament tape as a temporary hold prior to banding to ease installation is permitted. Secure the second layer (or exterior wrap) of FireMaster® Duct Wrap 2x2+ in place using 1/2 in. to 3/4-in. wide x .015-in. thick carbon steel banding material. Place the bands a max. 1.5 in. from each blanket edge and midway between edges (10.5-in. o.c.). Tension the banding material to hold the FireMaster® Duct Wrap 2x2+ in place without causing any cutting or damage to the blanket or duct.

6. SUPPORTS: (Not shown) After the insulation of the FireMaster® Duct Wrap 2x2+ system is complete, add a typical trapeze support system with horizontal supports a min. 96-in. o.c., starting at the center of the vertical rise portion. Horizontal supports consist of hanger rods and angle irons. Lift until the duct weight is supported by the tubing. Note: Support hanger systems do not need to be wrapped provided the hanger rods are at least a min. of 3/8-in. diameter and the angle iron is a minimum of 1.5 in. x 1.5 in. x 1/8 in.

**The AC 101 Section 5.4 test, which is an internal fire test, evaluates the capability of the duct enclosure system to prevent the ignition of combustible construction adjacent to the duct enclosure in the event of an internal grease fire. The ASTM E-119 engulfment test, which is an external fire test, evaluates the capability of the duct enclosure system to remain intact, protecting the duct system in the event of a fire outside the duct. These tests do not, nor are they intended to, replicate a real world fire. Rather, the purpose of these tests is to create a severe fire exposure situation, and to subject all similar devices to a standardized test in order to gage their performance. The performance criteria for the AC 101 Section 5.4 test is a maximum allowable temperature rise measured on the exterior surface of the wrap enclosure. The performance criteria for the ASTM E-119 engulfment test is that there shall be no structural collapse, failure, or opening of the duct cavity during the fire exposure or hose stream tests. The performance of the engulfment test is based on an hourly rating.

With this application for a fume exhaust system, there is a potential presence of various types of chemicals. The presence of these various chemicals are not within the scope of the test protocols. Hence, this Design Listing will provide the ratings specified when installed in accordance with the Design Listing and tested in accordance with AC 101 Section 5.4. The various chemicals, to which the chemical fume exhaust system may be subjected to, should be considered by a chemical engineer to determine if the presence of various combinations may be a source of combustion, or if they may be a source for a fire exposure exceeding that of the AC 101 Section 5.4 test, or if they will react with the insulation, deteriorating the insulative characteristic.