SECTION 15940

OVERHEAD VEHICLE TAILPIPE AND WELDING EXHAUST SYSTEM
06/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 210	(1985) Laboratory Methods of Testing Fans for Rating

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1994) Structural Steel
ASTM A 53	(1993b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 525	(1991) General Requirement for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 569	(1991a) Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
ASTM B 117	(1990) Salt Spray (Fog) Testing

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME-17	(1989; Addenda 1989, 1990, 1991) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

FEDERAL SPECIFICATIONS (FS)

FS QQ-B-654	(Rev A; Am 1; Notice 1) Brazing Alloys, Silver
FS QQ-S-571	(Rev E; Int Am 6) Solder, Electronic (96 to 485 Degrees C)

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA-08	(1977) Round Industrial Duct Construction Standards

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Where an integrated, packaged exhaust system is furnished, all items will be the product of the system manufacturer. System component parts may be by other manufacturers. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.2.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

1.2.3 Equipment Guards and Access

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

1.2.4 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and advise the Contracting Officer of any discrepancy before performing the work.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Exhaust System; FIO.

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than [3] months before the date of beneficial occupancy. Data shall include a complete list of parts and supplies with current unit prices and source of supply.

SD-04 Drawings

Exhaust System; GA.

Detail drawings consisting of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Detail drawings shall also contain complete duct, wiring, and schematic diagrams and any other details to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout

and anchorage of equipment and appurtenances, and equipment in relation to other parts of the work including clearances required for maintenance and operation.

SD-06 Instructions

Exhaust System; FIO

Proposed diagrams, instructions, and other sheets, prior to posting. Framed instructions under glass or in laminated plastic shall be posted where directed, including wiring and control diagrams showing the complete layout of the entire system. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

SD-09 Reports

Tests; FIO.

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-19 Operation and Maintenance Manuals

Exhaust System; FIO.

Six complete copies of operating instructions outlining the step-by-step procedures required for system startup, operation and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include duct and equipment layout and simplified wiring and control diagrams of the system as installed.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the following requirements.

2.1.1 Iron and Steel Sheets

2.1.1.1 Galvanized Iron and Steel

ASTM A 525, Coating Designation G90.

2.1.1.2 Uncoated Steel

ASTM A 569, condition, and type best suited to intended use.

2.1.2 Steel Structural Shapes

ASTM A 36.

2.1.3 Solder Silver

FS QQ-B-654, brazing alloy; grade to suit application.

2.1.4 Solder

FS QQ-S-571, composition to suit application.

2.1.5 Bolts and Nuts

Bolts and nuts, except as required for high temperature exhaust applications, shall be in accordance with ASTM A 307. Bolts and nuts used for exhaust applications where the temperature of the bolt may rise above 200 degrees C (400 degrees F) 400 degrees F or used as flange bolts in corrosion resistant material shall be in accordance with ASTM A 193 Class 2. The bolt head shall be marked to identify the manufacturer and the standard with which the bolt complies in accordance with ASTM A 307 or ASTM A 193 as applicable.

2.2 ELECTRICAL WORK

Electrical motor-driven equipment shall be provided complete with motor starters, high efficiency motors and controls. Electrical equipment, wiring, and motor efficiencies shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Motor starters shall be provided complete with properly sized thermal-overload protection and other appurtenances necessary for the motor control specified. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for control devices but not shown, shall be provided.

2.3 SYSTEM MANUFACTURER

The equipment specified herein shall be for a overhead vehicle tailpipe and welding exhaust system. If a Contractor offers a system different then specified, it shall so be indicated as a substitute and document all exceptions to this specification. The system(s) shall be as shown on the plans and as specified herein.

2.4 AIR MOVING DEVICES

2.4.1 General

Fans shall be tested and rated in accordance with the standards of AMCA 210. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity, and motor sheaves shall be adjustable to provide not less than an overall 20 percent speed variation. Sheaves shall be selected to drive the fan at such speed as to produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable rails or bases.

Fans shall be provided with personnel screens or guards on both suction and supply ends except where ducts or dampers are connected to the fan. Fans and motors shall be provided with vibration isolation supports or mountings. Vibration isolation units shall be standard products with published load ratings, and shall be single rubber-in-shear, neoprene coated fiberglass, double rubber-in-shear springs, or springs under inertia base. Each fan shall be selected to produce the capacity required at the fan total pressure indicated. Standard AMCA arrangements shall be provided unless otherwise indicated and the rotation and discharge shall be as indicated. Fans shall have non-overloading characteristics. Fan housing shall be constructed cast aluminum housing. Fan impellers shall be constructed of a aluminum alloy and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or other approved material suitable to resist the corrosive gases and temperatures produced. Fans shall be free of objectionable vibration or noise. Certified performance curves indicating that the fan supplied will operate in its most efficient operating range will be provided. In addition, "sound power" ratings shall be furnished with each fan.

2.4.2 Centrifugal Fans

Centrifugal fans shall be fully enclosed, single-width, single-inlet or double-width, double-inlet, as required or indicated. Impeller wheels shall have backward-inclined or backward-curved blades of the non-overloading type. Fan wheels 914 mm (36 inches)36 inches or less in diameter may have one or more extra-long bearings between the fan wheel and the drive. The bearings shall be self-aligned ball-bearing type with provisions for lubrication. Fan shafts shall be steel, accurately finished, and shall be provided with key and key seats for impeller hubs and fan pulleys. The fans shall be furnished with factory-finish coating. Motor shall have open enclosure, unless otherwise indicated. Motor starters shall be magnetic across-the-line with general-purpose enclosures.

2.5 DUCTWORK

2.5.1 General

Duct shall be constructed of galvanized sheets of the minimum gauge thickness for ducts as required in SMACNA-08. Ducts shall be constructed and sealed in accordance with SMACNA-08.The welding exhaust removal duct shall be rated at 9.0-inch negative water gage static pressure and the overhead vehicle exhaust tailpipe duct shall be rated at a negative 2-inch water gage static pressure.Ducts, unless otherwise approved, shall be round with longitudinal lock seam and conform to the dimensions indicated. Ducts shall be straight and smooth on the inside with airtight joints. Where ducts with crimped ends are used to make up joints, the joints shall have crimp and bead. The bead shall provide a rigid stop for the mating open end to seat against. Steel spiral wound duct is not acceptable.

2.5.2 Fittings

Reducing fittings shall have a minimum of 1 mm (1-inch) (1-inch) increase in diameter per 8 mm (8 inches)] (8 inches) in length. Elbows shall have a centerline radius of not less than 1-1/2 times the diameter. Branches shall stub into mains at main expansion points at an angle of not more than 30 degrees with the centerline of the main duct in the direction of air flow, unless otherwise indicated or approved. Where riser ducts with single or multiple inlets are indicated, the riser duct shall connect into

the bottom of the main duct at an angle as specified for branches.

2.5.3 Cleanout

Cleanout shall be provided on the end of the main ductwork opposite the end of the fan suction connection. The cleanout opening shall be sized to the approximate inside area of the duct. Removable airtight caps or flange type covers of minimum gauge thickness as the main duct shall be provided. Other cleanout openings shall be provided where indicated.

2.5.4 Apparatus Connections

Where sheet metal connections are made to fan suction and discharge, or where ducts of dissimilar metals are connected, an approved noncombustible flexible connection approximately 150 mm (6 inches) wide shall be installed and securely fastened by zinc-coated steel clinch-type draw bands for round ducts.

2.5.5 Duct Test Holes

Test holes with covers shall be provided where indicated, directed, or where necessary in ducts and plenums for using Pitot tubes for taking air measurements to balance the air systems.

2.5.6 Duct Sleeves and Framed Openings

Duct sleeves shall be provided for all round ducts 375 mm (15-inch) diameter or less passing through floors, walls, ceilings, or roofs. Sleeves in nonload bearing walls shall be fabricated of 1.0 mm (20-gauge) (20-gauge) steel sheets conforming to ASTM A 525. Sleeves in load-bearing walls shall be fabricated of standard-weight galvanized steel pipe conforming to ASTM A 53. Round ducts larger than 375 mm (15-inch) diameter and all square and rectangular ducts passing through floors, walls, ceilings, or roofs shall be installed through framed openings. Structural steel members for framed openings shall conform to ASTM A 36. Framed openings shall provide 25 mm (1 inch) (1-inch) clearance between the duct and the opening. Closure collar of galvanized steel not less than 100 mm (4-inches) wide shall be provided on each side of walls or floors where sleeves or framed openings are provided. Collars for round ducts 375 mm (15-inch) diameter or less shall be fabricated from 1.0 mm (20-gauge), (20-gauge,) galvanized steel. Collars for round, square or rectangular ducts with minimum dimension over 375 mm (15 inches) shall be fabricated from 1.2 mm (18-gauge), (18-gauge,) galvanized steel.

2.6 WELDING EXHAUST REMOVAL SYSTEM EQUIPMENT AND COMPONENT

The welding fume removal system shall capture welding fume/smoke through a self-supported adjustable fume arm with hood, attached to an extraction suction rail by means of an extraction trolley. The suction rail shall be a special duct with rubber profiles that has the ability to extract welding fume/smoke along its complete length by allowing the extraction trolley to slide freely from side-to-side. The welding Fume Removal System Components are listed following and accompanied by a detailed description.

2.6.1 SUCTION RAIL ASSEMBLY

The Suction Rail shall be a polished aluminum extrusion that is formed in a configuration such that the extrusion serves not only as a suction duct, but also as the guide rail that the extracion trolley travels in. The wall

thickness of the aluminum extrusion shall be no less than .09375". The weight of the aluminum extrusion is 5.5 lbs. per lineal foot. The area of the aluminum extrusion, in a cross-section view, shall have the minimum equivalent area of .l2035 sq. ft. with an overall length as specified and indicated on the drawings. A pair of EPDM rubber seals are installed at the bottom of the extrusion opening. The rubber seals have a teflon strip on the inside surface which enables the trolley to travel smoothly and unhindered. The rubber seals close tightly during fan operation for an airtight seal, but open evenly around the trolley during trolley travel. The suction rail shall be supplied with internal rubber bumpers installed at both ends which serve as secondary stops to the trolley. The suction rail shall be supplied with suspension attachments which are specifically designed for fastening to the configuration of the suction rail. Spacing of the suspension attachments shall not exceed 7 feet center-to-center.

2.6.2 EXTRACTION TROLLEY ASSEMBLY

The Extraction Trolley Assembly serves as the compontent in the Rail System that travels in the suction rail, carries and supports the fume extractor arm with hood. The extraction Trolley body shall be made of thick cast aluminum.

2.6.3 VERTICAL FUME EXTRACTOR ARM

The 14' Vertical Fume Extractor Arm shall have a 360 degree swivel elbow, support flange, internal support, pre-set joints with wear discs that can be adjusted if required, fiberglass reinforced PVC hose (6 1/4"), oval polycarbonate hood (10"x12"), quiet damper with positive seal, light package for hood, counter flange for 6" ventilation duct. The 14' Vertical Fume Extractor Arm shall have a 360 degree swivel elbow , a 180 degree vertical friction joint; a 230 degree vertical friction joint; and a four-way friction joint, 180 degree + 220 degree, at the hood.The 14' Fume Extractor Arm shall have a total reach (from the center point of the Extractor Arm outlet to the center point of the Extractor Hood) of 13' 1 1/2". The material structure of the 14' Vertical Fume Extractor Arm shall consist of the following: Hood shall be made of Polycarbonate UL E41613 (M) Card B; the Suspension Ring shall be made of die-casted ASTM B26 (B179);the Damper shall be made of polyamide (nylon); the Internal Tubes shall be made of aluminum extruded, Aluminum Association; the Tube bend and Flange shall be made of Aluminum die-casted; ASTM B26(B179); the Friction Discs shall be made of brake lining material (asbestos free); the Hose shall be made of a woven glass fabric with external and internal PVC lamination, the hose shall be supported by spirally wound steel wire helix; the Decor Ring shall be made of EPDM rubber (Ethylenepropylene diene mononer); the Elbow Swivel Gasket shall be made of PVC (polyvinyl chloride); the friction Discs in the Hood shall be made of phenolic plastic.

2.7 OVERHEAD VEHICLE TAILPIPE

2.7.1 Tailpipe Adapters

Tailpipe adapters shall be fabricated of not less than 20 gage corrosion-resisting steel. Adapters shall be of the tapered cone types with spring clips or other suitable divices for exhaust pipe attachment.

2.7.2 Flexible Exhaust Tubing

Flexible exhaust tubing shall be 0.012 inch minimum strip thickness of galvanized steel. Flexible tubing inside diameter and length shall be as

shown.

2.7.3. Dampers

Dampers shall be installed where shown. Dampers shall be of the blast gate type. Blast gate dampers shall be two piece construction with adjustable sliding gate and setscrew. Gate shall not be less than 16-gage steel.

2.8 FACTORY COATING

Equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturers standard finish except that items located outside of building shall have weather-resistant finishes that will withstand 500 hours exposure to the salt spray test specified in ASTM B 117, using a 5 percent sodium chloride solution as specified in ASTM B 117. Immediately after completion of the test, the specimen shall show no sign of blistering, wrinkling, cracking, or loss of adhesion, and no sign of rust creepage beyond 3 mm (1/8 inch) on either side of the scratch mark.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Exhaust System

The exhaust systems shall be installed as indicated and recommended by the manufacturer. Welding and brazing shall conform to ASME-17. Horizontal sections of the main duct shall be installed with the longitudinal lock seam on the top. Slip joints shall be sealed in accordance with SMACNA-08. Riser duct shall be supported and anchored to the structure. Main duct shall be attached to the structural members of the building as recommended by SMACNA-08.

3.1.2 Suction Rail for the welding exhaust system

The Suction Rail for the welding exhaust system shall include corosin-resistant brackets for ease of mounting to structural channel, trusses, or angle iron. Brackets shall be a minimum of .125" thickness. Mounting bolts to be no less than .5" diameter (and structural grade 8" for connection to steel frame.

3.1.3 Building Surface Penetrations

Penetrations shall be sealed. The space between the sleeve or framed opening and the duct shall be packed with mineral wool or other approved material. Closure collars shall be installed around the duct on both sides of the penetrated surface. Collars shall fit tight against the building surfaces and snugly around the duct.

3.2 Test

3.2.1 Vehicle exhaust system

Vehicle exhaust system see spec 15990 Testing, Adjusting and Balancing of HVAC System.

3.2.2 Welding exhaust system

Each exhaust system and inlet shall be balanced to produce the indicated

air quantities within 10 percent at the conditions shown. Control devices shall be set to control at the points indicated or directed. Bearings shall be lubricated, and the speed, direction or rotation of each fan shall be checked. The running current of each motor shall be checked. Upon completion, and prior to acceptance of the installation, the exhaust system shall be tested at operating conditions to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than 2 hours for each system, and all tests shall be conducted in the presence of the Contracting Officer. If tests do not demonstrate satisfactory operation of the exhaust system, deficiencies shall be corrected and retested. All instruments, facilities, and labor required to properly conduct the tests shall be provided by the Contractor. The electricity required for testing will be furnished by the Government.

3.3 TRAINING

The Contractor shall conduct a training course for the operating staff as designed by the Contracting Officer. The training period shall consist of a total 3 hours. It shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the Operation and Maintenance Manuals, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to date of proposed conduction of the training course.

-- End of Section --