9.1 GENERAL

This section provides a guide for specifying fiberglass reinforced plastic (FRP) duct and duct fittings for air–handling and fume–control systems. This guide specification is not intended as a reference document, but rather is a guide for the development of specifications for a particular project. This guide specification must be edited to fit the conditions of use and work assignments. Particular attention should be given to the deletion of inapplicable provisions and addition of necessary provisions related to a specific project. Appropriate requirements should be included where blank spaces have been provided.

9.2 DRAWINGS

The duct system should be described by drawings developed in association with the system specification. The drawings should present, as a minimum, a system layout plus the supplementary information required by this guide specification. The drawings should include elevations of duct, slope, service equipment, and location of terminations or connections to other equipment where applicable. Drawings should indicate where ducts are to be concealed or exposed and any other details pertinent to the contractor and not included in the job specifications.

9.3 SEISMIC RESTRAINT PROVISIONS

This manual does not include the special support provisions that may be required for seismic restraint. The system designer should prescribe them as necessary.

9.4 GUIDE SPECIFICATIONS

Starting on page 9.2, a guide specification is presented for use in developing specifications for a particular project.

GUIDE SPECIFICATIONS FOR FIBERGLASS REINFORCED PLASTIC AIR–HANDLING SYSTEMS

1.00 GENERAL PROVISIONS

The General and Supplementary Conditions of the Specification are hereby made a part of this branch of work. The Air Handling Contractor shall be governed by all of the requirements thereof, insofar as they apply to the Contractor's work.

NOTES TO SPECIFIERS

This section corresponds with CSI Division 15, Section 15010 and it relates to CSI Division 1, General Requirements.

1.01 Work Included

This division includes all labor, materials, equipment, and accessories necessary to complete the air–handling system(s) specified herein.

Specifier should select only those items actually required on the particular project. This list may be used as a checklist to ascertain that all component parts of the system are actually covered.

Access doors (ductwork and housings)
Air Handling Units
Air Washers or Scrubbers
Balancing and Adjusting
Belt Guards
Casing, Housings, and Plenums
Dampers, Volume (manual and motorized)
Duct Drainage Fittings
Ductwork
Eliminators
Equipment Foundation Drawings
Fans
Flexible Connections & Expansion Joints
Flexible Ducts
Hoods*
Louvers and Screens (intake and exhaust)
Pans (condensate, etc.)
Spray Booths

** Should be coordinated with CSI Division 11, Laboratory Equipment and Industrial Equipment.*

1.02 Work Excluded

Concrete Foundations
Cutting and Patching
Electrical Work
Metal Access Panels in Building – Construction
Openings in Floors, Walls, and Roofs
Painting (except as specified)
Pipe Insulation
Plumbing and Pipe Work
Temporary Heat
Transfer Grilles in Doors
Waterproofing of Floor Under Equipment
Utilities
Drain Piping from Duct Drainage Fittings

Specifier should verify that allied construction work is covered under appropriate divisions and/or sections of the specification.

If the contract for a FRP duct system is in the nature of a prime contract, these items may be incorporated as applicable.

1.03 Coordination of Work

a. Coordination with Other Contractors: The Air Handling Contractor shall work with other trades to avoid interferences in the installation of work covered by the contract. The routing of ductwork shall have precedence over electrical, plumbing, piping and sprinkler work. Should differences of opinion develop, the Architect's or Engineer's decision shall be final. Work shall be installed so as not to delay progress of construction and shall be correlated with other trades.

Air flow characteristics are normally more critical than hydraulic flow characteristics and additional changes in direction can seriously affect proper balancing of a system.

b. Electrical Work: All control wiring (unless otherwise specified) power wiring, and setting of loose motors shall be by others. Starters and disconnects shall be furnished and installed by others.

Starters and disconnects would normally be included in the electrical portion of the work. Fan and equipment schedules should be cross–referenced in the electrical section for proper take–off.

c. Equipment Foundations: Concrete foundations for all equipment shall be furnished by others under the supervision of the Air–Handling Contractor. Drawings, anchor bolts, and templates shall be provided by the Air–Handling Contractor.

If equipment foundations consist of a concrete inertia base with vibration isolators , these should be specified together with the equipment to be mounted thereon so that they are matched properly.

d. Piping:

1. Plumbing
2. Sprinkler Work
3. Steam fitting.

Steam, hot and cold water, sprinkler, and drain lines should be specified in the appropriate section(s) of the specifications, to be routed and connected to the air–handling units where shown on the drawings.

e. Cutting and Patching: The General Contractor shall do all cutting and patching in floors, walls, and roofs for the installation of equipment and air ducts. The Air–Handling Contractor shall cooperate in the location of openings in new construction. The Air–Handling Contractor shall be responsible for the cutting of all duct openings through non load–bearing walls in existing structures.

Specifier shall verify that this section is referenced in the proper division of the specification to cover the cutting and patching required.

f. Openings in Floors, Walls and Roofs: The General Contractor shall be responsible for providing openings of specified dimensions in floors, walls and roofs complete with curbs and bucks as required for all equipment and air ducts.

g. Scaffolding: The Air–Handling Contractor shall provide all scaffolding for the installation of this branch of the work in areas where the General Contractor has no requirements

The economy of multiple usage of scaffolding may not always be possible. When using this specification, verify that it is also covered under the General Contractor's portion of the work.

for this equipment. Where scaffolding is provided by the General Contractor for the erection of his work, this equipment shall be left in place for the use of the Air–Handling Contractor at no charge. The Air–Handling Contractor shall have free use of hoist and elevators for the transportation of his workers, materials and equipment. All scaffolding shall meet the requirements of local and state codes.

h. Permits and Licenses: The Air–Handling Contractor shall secure all permits and licenses required for the installation of this branch of the work and shall pay all fees incident thereto.

This paragraph should be in agreement with the General Conditions for the entire project and could make reference to them as well as indicate any deviations or additions.

i. Taxes: The Air–Handling Contractor shall pay all federal, state, and local taxes applicable to this branch of the work.

j. Utilities: All temporary sanitary and storm drainage facilities and all utilities including water and electrical services shall be provided by others. Electrical services by others shall include adequate temporary lighting.

Verify coverage of these facilities' services and their usage under other portions of the specification.

k. Access: The General Contractor shall provide and maintain vehicular and pedestrian access routes to all work areas for the purposes of material delivery and workmen entrance and exit.

1.04 Submittals

a. Shop Drawings: The Air–Handling Contractor shall submit for approval _____ copies of outline drawings and pertinent details for major equipment and ductwork as specified for this branch of the work. Including _____ resin information.

Sufficient copies should be included to enable drawings to be supplied to other contractors that are providing openings or curbs for ducts and equipment to be supplied under this section of the specification.

b. Operating and Maintenance Instructions: The Air Handling Contractor shall furnish _____ copies of written operating and maintenance instructions for all equipment furnished by him under this section.

1.05 Equipment Identification

The Air Handling Contractor shall place appropriate permanent identification labels or stencils on all fans and air–handling units.

The contractor providing starters and control stations which are not integrated with the controlled equipment should also provide appropriate permanent identification of these items.

1.06 Referenced Documents

The following documents of the particular edition listed form part of this specification to the extent specified herein.

Refer to CSI Manual of Practice MP–3C "The Use of Reference Standards." While changes in the standards listed herein are normally only of a minor nature, care should be exercised to indicate the exact edition of the reference manual used in the design of the particular systems being specified. The editions listed in this column are the current editions at the time of preparation for this document.

a. *THERMOSET FRP DUCT CONSTRUCTION MANUAL.* (Mandatory provisions in Chapters Three through Eight) as published by the Sheet Metal and Air Conditioning Contractors' National Association, 4201 Lafayette Drive, Chantilly, VA 20153.

b. *HVAC SYSTEMS TESTING, ADJUSTING & BALANCING.* ibid.

c. AMCA Publication 99 in this specification shall mean the *Standards for Air Moving Devices* as published by the Air Movement and Control Association, 30 W. University Drive, Arlington Heights, IL 60004–1893.

d. AMCA Standard 210 in this specification shall mean the *Laboratory Methods of Testing Fans for Rating.* ibid.

e. *INDUSTRIAL VENTILATION MANUAL* in this specification shall mean the ___ edition of *Industrial Ventilation: A Manual of Recommended Practice* as published by the American Conference of Governmental Industrial Hygienists, Kemper Woods Center, 1330 Kemper Meadows Dr., Cincinnati, OH 45240–1634.

This guide specification is based on the use of, and reference to, the mandatory provisions of this manual, which are contained in Chapters Three through Eight. The Manual includes reference to pertinent standards as listed in Appendix E, Referenced Documents. Reference to these documents need not be duplicated in the project specification. Where special requirements demand reference to other documents they should be added to this paragraph.

2.00 AIR DISTRIBUTION FRP DUCTWORK

Reference CSI Broadscope heading 15800.

All ductwork, fittings, and accessories shall be constructed and installed in accordance with SMACNA's *Thermoset FRP Duct Construction Manual.* Hereinafter referred to as SMACNA's *FRP Manual.*

Depending on the particular project, the specifier may find that the use of an alternate Broadscope heading such as "Fume Exhaust System" is more suitable.

Material thickness and reinforcements shall be as specified in SMACNA's *FRP Manual* for the static pressure classification (s) indicated on the project drawings.

SMACNA's FRP Manual specifies construction requirements for maximum operating static pressures. When referencing the construction requirements of this standard, the static pressure classification(s) must be specified.

To provide for more economical construction, the system may be separated into portions having different ratings. Where only a single rating is used, it should be the maximum conditions anticipated in the duct.

2.01 Materials

All materials shall be as specified in SMACNA's *FRP Manual* except as otherwise stated in this specification.

2.02 Size

Duct sizes shall be in accordance with the project drawings which form a part of this specification. Unless otherwise specified on the project drawings, the configuration of offsets, transitions, turns, etc., shall be as specified in SMACNA's *FRP Manual.*

When nonstandard offsets or fittings are desired, they should be so specified on the drawings.

Refer to SMACNA's FRP Manual for standard duct and fitting configurations, and specify sizes in appropriate locations on the drawings.

2.03 Location of Access Doors

Access doors shall be located where indicated in the project drawings. Access doors shall be constructed in accordance with SMACNA's *FRP Manual.*

The location and size of all access openings should be indicated on the project drawings. Access openings are usually provided at all locations requiring routine maintenance and replacement of parts or inspection of items concealed in the ductwork (dampers, drains, etc.). Openings should also be provided as necessary for performance of periodic cleaning.

2.04 Location of Regulating Dampers

Volume dampers shall be furnished and installed where indicated on the projects drawings. The dampers shall be constructed in accordance with SMACNA's *FRP Manual* or equivalent.

The location of all regulating dampers should be indicated on the project drawings. Regulating dampers should normally be provided at all fume hoods, T–connections and any other location as necessary for balancing and adjustment of the system.

2.05 Fire Dampers

Fire dampers shall be furnished and installed where indicated on the project drawings.

Where fire dampers are required, their location and type must be indicated on the project drawings. The design party must assume the responsibility of conformance to local codes and requirements.

2.06 Location of Flexible Connections

Flexible connections shall be located where indicated on the project drawings.

The location of all flexible connections should be indicated on the project drawings. As a minimum, they should be indicated between ductwork and the inlet and outlet of fans and other moving equipment, for the purpose of vibration isolation.

2.07 Location of Expansion Joints

Expansion joints shall be located where shown on the project drawings.

Duct sizes shall be in accordance with the project drawings which form a part of this specification.

Since the expansion rate of FRP duct is several times that of steel, proper consideration must be given to any installation to accommodate the overall linear expansion.

For both Flexible Connections and Expansion Joints, the specifier shall designate suitable materials and construction details.

2.08 Delivery, Storage, and Handling

Duct and fittings shall be protected from damage during shipment and handling. Properly support during shipping and storage to avoid flex strains.

2.09 Hangers

Hangers shall be designed, fabricated, and installed in accordance with the requirements of SMACNA'S *FRP Manual* or equivalent.

2.10 Quality Assurance

All ductwork shall be fabricated and installed by experienced and qualified mechanics who have a minimum of five years experience with the type of material and products specified herein.

2.11 Locations of Drains

Drains shall be furnished and installed at the locations specified on the drawings.

3.00 EQUIPMENT AND ACCESSORIES

CSI Reference 15800

3.01 Fans

Furnish and install, where shown on the drawings, fans of the model(s), size(s), type(s), and capacity or equivalent indicated by the "Fan Schedule" which forms a part of this specification.

The "Fans" schedule included in the specification can be used to indicate the desired equipment.

Field fabricated curbs for power roof ventilators should be detailed and specified under "Roofing" section of specifications. Prefabricated metal curbs may be obtained from the fan manufacturer or manufactured by a sheet metal contractor. Verify type and specification section.

Performance of all units shall be based on tests conducted in accordance with AMCA 210____, *"Laboratory Methods of Testing Fans for Rating."* Fan rotors shall be statically and dynamically balanced by the fan manufacturer.

Give specific AMCA test code number.

The motor and fan assembly shall be isolated from the base with _____ vibration insulators.

(rubber) (other)

3.02 Scrubbers

Furnish and install, where shown on the drawings, air scrubber(s) manufactured by _____, Model No. _____, or approved equal, rated at _____ SCFM, at _____ in. wg (Pa) static pressure, complete with all appurtenances and accessories as required to complete the installation in accordance with the manufacturer's recommendations.

Fill in selected manufacturer's name and pertinent data. Equipment should be constructed of FRP or other material suitable for the environment.

3.03 Hoods, Fume

Furnish and install fume hoods as shown and detailed on the drawings.

See Sections 4 and 5 in the Industrial Ventilation Manual for design criteria. Also coordinate work with CSI Division 11.

3.04 Louvers and Ventilator Heads

Furnish and install FRP air–handling system louvers and ventilator heads where shown on the drawings. The louvers shall be fabricated of FRP and in accordance with SMACNA's *FRP Manual.*

3.05 Motors and Bases

Furnish all motors and bases of the size and characteristics shown on the appropriate schedules for operation of all air–handling equipment called for by this specification.

Provide type, enclosure, frame, etc., as well as rating in appropriate schedules.

3.06 Balancing and Adjusting

Air performance in all air handling and air distribution systems shall be tested, balanced, and adjusted. This work shall be performed with calibrated instruments in accordance with the SMACNA *HVAC Systems Testing, Adjusting & Balancing Manual,* ____ Edition. All instruments used for measurement shall be accurate and calibration histories for each instrument shall be available for examination. Accuracy of measurement shall be in accordance with the SMACNA Standards. _____ copies of final test reports shall be submitted on appropriate SMACNA reporting forms.

Fill in total number of copies required for owner, engineer, etc.

3.07 Guarantee

The Air–Handling Contractor, within 12 months from substantial completion and acceptance of the project or from the date that any air handling system in whole or in part, or any separate piece of equipment or component thereof is placed in operation with the authorization of the owner or his agent, whichever is earlier, shall repair or replace any equipment found to be defective or of inferior workmanship, without cost to the owner.