

SPECIFICATIONS

1. Spec 15003 – Remove existing section 15003 and insert new section 15003 .
2. Add Spec 15902.
3. Spec 15050 - **Revise part 2.3.3** to "Captive air diaphragm type expansion tank shall be designed, fabricated, tested, and stamped for a working pressure of not less than 860 kilopascals in accordance with ASME-16. Tank size, configuration, and openings shall be as indicated on drawings." **Revise Part 2.3.17** to "Strainers shall be basket type with removable basket. Strainers in sizes DN50 and smaller shall have screwed ends. In sizes DN65 and larger, strainers shall have flanged ends. Body working-pressure rating shall exceed maximum service pressure of system in which installed by at least 50 percent. Body shall have cast-in arrows to indicate direction of flow. All strainers larger than DN65 shall be fitted with manufacturer's standard ball-type blowdown valve. Body material shall be cast bronze conforming to ASTM B 62. Minimum free-hole area of strainer element shall be equal to not less than 3.4 times the internal area of connecting piping. Strainer screens shall have perforations not to exceed 1.14 millimeter. Strainer screens shall have finished ends fitted to machined screen chamber surfaces to preclude bypass flow. Strainer element material shall be AISI Type 304 corrosion-resistant steel.
4. Spec 15083 - Do not use any interior lined duct. Welded on insulation pins are not allowed.
5. Spec 15106 - Eliminate Part 2.2.2. Part 2.2.1 describes the piping and fittings to be used for compressed air.
6. Spec 15110 - Eliminate this specification. This information is covered in Spec 15050.
7. Spec 15120 - Eliminate this specification. This information is covered in Spec 15102.
8. Spec 15135 - Pumps shall have mechanical seals. Spec indicates it can have packed type or mechanical seals.
9. Spec 15225 - Eliminate this specification. There are no chemical waste drainage systems on this project.
10. Spec 15410 - Any information within this specification that has been duplicated in Spec 15102 is to be ignored. If there are any conflicts between this specification and Spec 15102, Spec 15102 takes precedence.
11. Spec 15700 - This specification shall be used only for boilers specification, unit heater and cabinet unit heater specifications.
12. Spec 15815 - "Design Analysis and Calculations shall be submitted for low pressure ductwork systems indicating the manufacturer's recommended air velocities, maximum static pressures, temperature calculations and acoustic levels." contained in this specification is not required.

13. Spec 15840 - VAV boxes shall be lined with foil faced fiberglass insulation.
14. Spec 15971 - Part 1.4 states within it "See Part 1.3.1.1 for information on existing EMCS.", it should read "See Part 1.4.1.1 for information on existing EMCS.". All references to Spec 15971 shall be to Spec 15902.
15. Delete Sections 16050 and 16409.
16. Section 16145 Paragraph 2.1: Revise First paragraph to:

"Conduit shall be 21mm diameter minimum, except where specifically shown smaller on the contract drawings, and except for exposed switch leg runs."
17. Section 16145 Paragraph 2.1.4 (EMT): Add the following text to the last paragraph:

"EMT shall be used in indoor areas where not subject to physical damage (such as areas where tow motors, overhead cranes, and dollies are used on a regular basis). IMC shall be used in such areas where EMT is not permitted. Conduit systems within hazardous classified areas shall meet NFPA 70 requirements for installation in such areas. Contractor shall confirm conduit usage in all construction areas with the NASA COTR prior to installation."
18. Section 16275 Paragraph 2.1 (Equipment Standards): Add the following sentence:

"Transformers shall have copper windings."
19. Section 16536 Paragraph 2.6.2: Faceplate shall be RED (not green).
20. Section 16972 Paragraph 2.1: Enclosure shall be NEMA 12 gasketed enclosure (not NEMA 250).

DRAWINGS:

- CF 192228: Detail "C" is not required.
- CF 192228: Hazardous zones around hydrogen vessels are Class 1 Division 1 Group B 3 feet from connection points, Class 1 Division 2 Group B 15' from the hydrogen vessels in all directions.
- CF 192229: All exterior exit doors shall have emergency lighting on the exterior of the building above the exit door. This shall be accomplished by providing (at each exit door) one (1) Emergi-Lite #JSM18-1 emergency lighting fixture with remote head capability, mounted on the interior wall above the exit door, and one (1) Emergi-Lite #EF11D Surface type twin head weather resistant remote light, mounted on the exterior wall above the exit door. Provide all necessary equipment and wiring to complete the installation per manufacturer's instructions.
- CF 192230: Adjust Note 7 to conform to hazardous zones as described above.
- CF 192232: Note 13 of the FA specifications should begin "Verify proper operation of the fire alarm system including..."
- CF 192234: PXR0101 circuit breaker #1 is 3 pole-225A, not 3 pole-400A.
- CF 192235: PXR0104 panel is main lug only, and does not contain a main circuit breaker.

CF 192238: Remove the "Detail C" symbol from "Typical Duct Trench Detail". This detail is typical for all duct trenches.

CF 192238: Bill of Materials Item #11--Delete "PPSS" designation because this is the ALS3 cable.

CF 192238: Note 3--put a space in the tag label designation "PPSS2 333-334"

CF 192239: On grounding loop detail, the connection should be "to perimeter ground loop" not "bar".

SK181880: Panel F01 has an 800AT/1200AF main circuit breaker as shown on drawing 231.

The following drawings have been revised and are identified as Addendum 1:

CF 192212

CF 192228

CF 192230

CF 192232

CF 192233

CF 192235

CF 192238

CF 192239

CF 192248

CF 192249

SPECIFICATIONS

1. Spec 15003 – Remove existing section 15003 and insert new section 15003 .
2. Add Spec 15902.
3. Spec 15050 - **Revise part 2.3.3** to "Captive air diaphragm type expansion tank shall be designed, fabricated, tested, and stamped for a working pressure of not less than 860 kilopascals in accordance with ASME-16. Tank size, configuration, and openings shall be as indicated on drawings." **Revise Part 2.3.17** to "Strainers shall be basket type with removable basket. Strainers in sizes DN50 and smaller shall have screwed ends. In sizes DN65 and larger, strainers shall have flanged ends. Body working-pressure rating shall exceed maximum service pressure of system in which installed by at least 50 percent. Body shall have cast-in arrows to indicate direction of flow. All strainers larger than DN65 shall be fitted with manufacturer's standard ball-type blowdown valve. Body material shall be cast bronze conforming to ASTM B 62. Minimum free-hole area of strainer element shall be equal to not less than 3.4 times the internal area of connecting piping. Strainer screens shall have perforations not to exceed 1.14 millimeter. Strainer screens shall have finished ends fitted to machined screen chamber surfaces to preclude bypass flow. Strainer element material shall be AISI Type 304 corrosion-resistant steel.
4. Spec 15083 - Do not use any interior lined duct. Welded on insulation pins are not allowed.
5. Spec 15106 - Eliminate Part 2.2.2. Part 2.2.1 describes the piping and fittings to be used for compressed air.
6. Spec 15110 - Eliminate this specification. This information is covered in Spec 15050.
7. Spec 15120 - Eliminate this specification. This information is covered in Spec 15102.
8. Spec 15135 - Pumps shall have mechanical seals. Spec indicates it can have packed type or mechanical seals.
9. Spec 15225 - Eliminate this specification. There are no chemical waste drainage systems on this project.
10. Spec 15410 - Any information within this specification that has been duplicated in Spec 15102 is to be ignored. If there are any conflicts between this specification and Spec 15102, Spec 15102 takes precedence.
11. Spec 15700 - This specification shall be used only for boilers specification, unit heater and cabinet unit heater specifications.
12. Spec 15815 - "Design Analysis and Calculations shall be submitted for low pressure ductwork systems indicating the manufacturer's recommended air velocities, maximum static pressures, temperature calculations and acoustic levels." contained in this specification is not required.

13. Spec 15840 - VAV boxes shall be lined with foil faced fiberglass insulation.
14. Spec 15971 - Part 1.4 states within it "See Part 1.3.1.1 for information on existing EMCS.", it should read "See Part 1.4.1.1 for information on existing EMCS.". All references to Spec 15971 shall be to Spec 15902.
15. Delete Sections 16050 and 16409.
16. Section 16145 Paragraph 2.1: Revise First paragraph to:

"Conduit shall be 21mm diameter minimum, except where specifically shown smaller on the contract drawings, and except for exposed switch leg runs."
17. Section 16145 Paragraph 2.1.4 (EMT): Add the following text to the last paragraph:

"EMT shall be used in indoor areas where not subject to physical damage (such as areas where tow motors, overhead cranes, and dollies are used on a regular basis). IMC shall be used in such areas where EMT is not permitted. Conduit systems within hazardous classified areas shall meet NFPA 70 requirements for installation in such areas. Contractor shall confirm conduit usage in all construction areas with the NASA COTR prior to installation."
18. Section 16275 Paragraph 2.1 (Equipment Standards): Add the following sentence:

"Transformers shall have copper windings."
19. Section 16536 Paragraph 2.6.2: Faceplate shall be RED (not green).
20. Section 16972 Paragraph 2.1: Enclosure shall be NEMA 12 gasketed enclosure (not NEMA 250).

DRAWINGS:

- CF 192228: Detail "C" is not required.
- CF 192228: Hazardous zones around hydrogen vessels are Class 1 Division 1 Group B 3 feet from connection points, Class 1 Division 2 Group B 15' from the hydrogen vessels in all directions.
- CF 192229: All exterior exit doors shall have emergency lighting on the exterior of the building above the exit door. This shall be accomplished by providing (at each exit door) one (1) Emergi-Lite #JSM18-1 emergency lighting fixture with remote head capability, mounted on the interior wall above the exit door, and one (1) Emergi-Lite #EF11D Surface type twin head weather resistant remote light, mounted on the exterior wall above the exit door. Provide all necessary equipment and wiring to complete the installation per manufacturer's instructions.
- CF 192230: Adjust Note 7 to conform to hazardous zones as described above.
- CF 192232: Note 13 of the FA specifications should begin "Verify proper operation of the fire alarm system including..."
- CF 192234: PXR0101 circuit breaker #1 is 3 pole-225A, not 3 pole-400A.
- CF 192235: PXR0104 panel is main lug only, and does not contain a main circuit breaker.

CF 192238: Remove the "Detail C" symbol from "Typical Duct Trench Detail". This detail is typical for all duct trenches.

CF 192238: Bill of Materials Item #11--Delete "PPSS" designation because this is the ALS3 cable.

CF 192238: Note 3--put a space in the tag label designation "PPSS2 333-334"

CF 192239: On grounding loop detail, the connection should be "to perimeter ground loop" not "bar".

SK181880: Panel F01 has an 800AT/1200AF main circuit breaker as shown on drawing 231.

The following drawings have been revised and are identified as Addendum 1:

CF 192212

CF 192228

CF 192230

CF 192232

CF 192233

CF 192235

CF 192238

CF 192239

CF 192248

CF 192249

SECTION 15003

GENERAL MECHANICAL PROVISIONS
03/99

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1 (1981; R 1993) Scheme for the Identification of Piping Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123 (1992; Rev A) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM B 766 (1986; R 1993) Standard Specification for Electrodeposited Coatings of Cadmium

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 82 (1996) Protection of Stratospheric Ozone

MILITARY SPECIFICATIONS (MS)

MS MIL-T-704 (Rev K) Treatment and Painting of Material

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-08 (1991, 1st Ed.) Seismic Restraint Manual Guidelines for Mechanical Systems (Available only from 401 Shatto Place, No. 101, Los Angeles, CA 90020) Sheet Metal Industry Fund (SMIF)

UNDERWRITERS LABORATORIES (UL)

UL 6 (1997; 11th Ed) UL Standard for Safety - Rigid Metal Conduit

UL-02 (1995) Building Materials Directory

1.2 SUBMITTALS (Not Applicable)

1.3 COORDINATION

Contractor shall coordinate the work of the different trades so that interference between piping, equipment, structural, and electrical work will be avoided. All necessary offsets in piping and all fittings, etc., required to install the work properly shall be furnished complete in place at no additional cost to the Government.

1.4 MECHANICAL SYSTEMS IDENTIFICATION

1.4.1 Diagrams

Chart listing of equipment shall be by designation numbers and capacities such as flow rates, pressure and temperature differences, heating and cooling capacities, horsepower, pipe sizes, and voltage and current characteristics. This requirement shall not apply for accessories or minor equipment items, such as vents, but is required for such equipment as pumps, water heaters, air-handling system equipment, refrigeration compressors, heat exchangers, and boilers.

Diagrams shall be neat mechanical drawings provided with extruded aluminum frames and 6 millimeter acrylic plastic protection. Location shall be as directed by the Contracting Officer. The number of charts and diagrams shall be equal to or greater than the number of mechanical equipment rooms.

Where more than one chart per space is required, these shall be mounted in edge pivoted, swinging leaf, extruded aluminum frame holders which open to 170 degrees.

1.4.2 Identification Tags

Identification tags made of brass or aluminum indicating function of a control or similar component shall be installed on such system devices. Tags shall be 50 millimeter in diameter and marking shall be stamped.

Equipment shall be provided with metal identification tags displaying an equipment designation number matching drawing or control diagram designation.

Tags shall be wired to valve or equipment items with No. 12 AWG 2 millimeter diameter corrosion-resistant steel wire.

1.4.3 Service Labeling

All piping, including that concealed in accessible spaces; exposed, bare and painted; and insulated, shall be labeled to designate service. Each label shall include an arrow or arrows to indicate flow direction. Labels and valve tag schedule shall be in accordance with the typical examples below:

<u>SERVIC</u>	<u>LABEL AND TAG DESIGNATION</u>
Cold potable water	COLD POT. WATER
Hot potable water supply	HOT POT. WATER SUPPLY

<u>SERVIC</u>	<u>LABEL AND TAG DESIGNATION</u>
Rain water leader	RAIN WATER
Sanitary sewer	SAN. SEWER
Sanitary drain	SAN. DRAIN
Sanitary vent	SAN. VENT
Storm drain	STORM DRAIN
Storm sewer	STORM SEWER
Natural Gas	NAT. GAS
Air handling unit No. 1	AIR HAND. UNIT NO. 1
Automatic temperature control	AUTO. TEMP. CONTROL
Hot water supply	HHW SUPPLY
Hot water return	HHW RETURN
Makeup water	MAKEUP WATER
Condensate Drain	COND. DRAIN

Similar services with different temperatures or pressures shall be identified. Where pressures may exceed 860 kilopascal, the maximum system pressure shall be included in the label.

Piping shall be labeled and arrowed in accordance with the following:

Each point of entry and exit of pipe passing through walls

Each change in direction, i.e., elbows, tees

In congested or hidden areas and at all access panels at each point required to clarify service or indicated hazard.

In long straight runs, labels shall be located at distances within eyesight of each other but in no case shall the distance between labels exceed 20 meter. All labels shall be visible and legible from the primary service and operating area.

For Bare or Insulated Pipes
for Outside Diameters o

Lettering

13 thru 32 millimeter

13 millimeter

40 thru 90 millimeter

19 millimeter

100 millimeter and larger

30 millimeter

Labels shall be made of self-sticking, plastic film designed for permanent

installation.

1.5 COLOR CODING

Color coding of all piping systems shall be in accordance with ANSI A13.1.

1.6 APPROVAL REQUIREMENTS

Except as otherwise specified, approval of materials and equipment will be based on manufacturer's published data.

Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL-02, and UL 6 will be acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, the Contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Methods of testing used by the specified agencies shall be outlined.

Where materials or equipment are specified to be constructed or tested, or both, in accordance with the standards of the American Society for Testing and Materials (ASTM), the American Society of Mechanical Engineers (ASME), or other standards, a manufacturer's certificate of compliance of each item will be acceptable as proof of compliance.

Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.

1.7 PREVENTION OF CORROSION

Metallic materials shall be protected against corrosion. Equipment enclosures shall be given rust-inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with earth, and where connected to dissimilar metal, shall be protected by approved fittings, barrier material, or treatment. Ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with ASTM A 123 for exterior locations and cadmium-plated in conformance with ASTM B 766 for interior locations.

1.8 OZONE DEPLETING SUBSTANCES USED AS REFRIGERANTS

Releases of Ozone Depleting Substances (ODS) during repair, maintenance, servicing or disposal of appliances containing ODS's will be minimized by complying with all applicable sections of 40 CFR 82 Part 82 Subpart F. Any person conducting repair, maintenance, servicing or disposal of appliances owned by NASA comply with the following:

No Class I or Class II substances used as a refrigerant may be knowingly vented or otherwise released into the environment.

No appliances may be opened without meeting the requirements of 40 CFR 82 Part 82.156 Subpart F, regarding required practices regarding evacuation and collection of refrigerant, and 40 CFR 82 Part 82.158 Subpart F, regarding standards of recycling and recovery equipment.

No work may be conducted on appliances containing refrigerant except by persons who comply with 40 CFR 82 Part 82.161 Subpart F, regarding technician certification.

In addition, copies of all applicable certifications must be provided to the Contracting Officer at least 10 working days prior to initiating maintenance, repair, servicing, dismantling or disposal of appliances, including:

Proof of Technician Certification

Proof of Equipment Certification, if recovery or recycling equipment is to be provided by the Contractor

Proof of availability of certified recovery or recycling equipment, if equipment is to be provided by the Contractor

1.9 USE OF OZONE DEPLETING SUBSTANCES, OTHER THAN REFRIGERANTS

The use of Class I or Class II ODS's listed as nonessential in 40 CFR 82 Part 82.66 Subpart C is prohibited. These prohibited materials and uses include:

Any plastic party spray streamer or noise horn which is propelled by a chlorofluorocarbon

Any cleaning fluid for electronic and photographic equipment which contains a chlorofluorocarbon; including liquid packaging, solvent wipes, solvent sprays, and gas sprays

Any plastic flexible or packaging foam product which is manufactured with or contains a chlorofluorocarbon, including, open cell foam, open cell rigid polyurethane poured foam, closed cell extruded polystyrene sheet foam, closed cell polyethylene foam and closed cell polypropylene foam except for flexible or packaging foam used in coaxial

Any aerosol product or other pressurized dispenser which contains a chlorofluorocarbon, except for those listed in 40 CFR 82 Part 82.66 Subpart C.

A waiver may be requested should a programmatic of facility requirement dictate that a prohibited material is necessary to achieve project goals. A waiver request must be submitted in writing to the Test Operations and Institutional Safety Branch. The waiver will be evaluated and dispositioned by a Hazardous Materials Review subcommittee.

PART 2 PRODUCTS

2.1 IDENTIFICATION PLATES

In addition to standard manufacturer's identification plates, engraved laminated phenolic identification plates shall be provided for each piece of mechanical equipment. Identification plates shall designate the function of the equipment. Designation shall be submitted with the shop drawings.

Identification plates shall be three layers, black-white-black, engraved to show white letters on black background. Letters shall be upper case. Identification plates 40 millimeter high and smaller shall be 1.6 millimeter thick, with engraved lettering 3 millimeter high; identification plates larger than 40 millimeter high shall be 3 millimeter thick, with engraved lettering of suitable height. Identification plates 40 millimeter high and larger shall have beveled edges. Identification plates shall be installed using a compatible adhesive.

2.2 ANCHOR BOLTS

Anchor bolts shall be provided for equipment placed on concrete equipment pads or on concrete slabs. Bolts shall be of the size and number recommended by the equipment manufacturer and shall be located by means of suitable templates. Installation of anchor bolts shall not degrade the surrounding concrete.

2.3 SEISMIC ANCHORAGE

Equipment shall be anchored in accordance with applicable seismic criteria for the area and as defined in SMACNA-08.

2.4 PAINTING

Equipment units shall be painted in accordance with MS MIL-T-704 or in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouching shall be accomplished only if approved; otherwise equipment shall be returned to the factory for refinishing.

PART 3 EXECUTION

3.1 INSTALLATION

Materials and equipment shall be installed in accordance with the requirements of the contract drawings and approved recommendations of the manufacturers. Installation shall be accomplished by workers skilled in this type of work. Installation shall be made so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors. Except as otherwise indicated, emergency switches and alarms shall be installed in conspicuous locations.

3.2 EQUIPMENT PADS

Equipment pads shall be provided and shall be of dimensions shown or, if not shown, they shall conform to the shape of each piece of equipment

served with a minimum 75 millimeter margin around the equipment and supports.

3.3 CUTTING AND PATCHING

Contractor shall install his work in such a manner and at such time as will require a minimum of cutting and patching of the building structure.

Holes in exposed locations, in or through existing floors, shall be drilled and smoothed by sanding. Use of a jackhammer will be permitted only where specifically approved.

Holes through masonry walls to accommodate sleeves shall be made with an iron pipe masonry core saw.

3.4 CLEANING

Exposed surfaces of piping and equipment that have become covered with dirt, plaster, or other material during handling and construction shall be thoroughly cleaned before such surfaces are prepared for final finish painting or are enclosed within the building structure.

Before final acceptance, mechanical equipment, including piping, ducting, and fixtures, shall be clean and free from dirt, grease, and finger marks.

-- End of Section --

SECTION 15902

CONTROL SYSTEMS

09/96

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B40.1 (1991) Gauges - Pressure Indicating Dial
Type - Elastic Element

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 666 (1994; Rev A) Standard Specification for
Austenitic Stainless Steel Sheet, Strip,
Plate and Flat Bar

ASTM B 280 (1995) Standard Specification for Seamless
Copper Tube for Air Conditioning and
Refrigeration Field Service

ASTM B 62 (1993) Standard Specification for
Composition Bronze or Ounce Metal Castings

ASTM D 1693 (1995) Standard Test Method for
Environmental Stress-Cracking of Ethylene
Plastics

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)

ASHRAE 90A (1980; 90A-a 1987) Energy Conservation in
New Building Design

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.22 (1989) Wrought Copper and Copper Alloy
Solder Joint Pressure Fittings

AMERICAN WELDING SOCIETY (AWS)

AWS-02 (1990) Welding Handbook; Eighth Ed; Vol
Two - Welding Process

FEDERAL SPECIFICATIONS (FS)

FS TT-E-489 (Rev H) Enamel, Alkyd, Gloss, Low Voc

Content

FEDERAL STANDARDS (FED-STD)

FED-STD 595 (Rev B) Colors Used in Government Procurement

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA RP60.9 (1981) Piping Guide for Control Centers

ISA RP7.1 (1956) Pneumatic Control Circuit Pressure Test

MILITARY SPECIFICATIONS (MS)

MS DOD-G-24508 (1987a; Am 3) Grease, High Performance, Multipurpose (Metric)

MS MIL-F-18280 (Rev E; Supple 1A) Fittings, Flareless Tube, Fluid Connection

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA DC 3 (1989) Residential Controls - Electrical Wall-Mounted Room Thermostats

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A (1993) Standard for the Installation of Air Conditioning and Ventilating Systems

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP 6 (1991) Surface Preparation Specification No. 6 - Commercial Blast Cleaning

1.2 GENERAL REQUIREMENTS

[Section 15003, "General Mechanical Provisions," applies to work specified in this section.]

[Section 15055, "Welding Mechanical," applies to work specified in this section.]

1.3 SYSTEM DESCRIPTION

Automatic temperature control systems shall be complete in all details and shall include all necessary accessories to maintain conditions indicated or specified.

Automatic temperature control systems may be electric/electronic. As far as practical, control equipment shall be the product of a single automatic control systems manufacturer. Automatic control systems components not the

product of the control system manufacturer shall be approved for use with the control system as indicated.

Automatically controlled valves to control environment shall be furnished by the automatic control systems manufacturer.

Automatically controlled dampers, independent of dampers integral with manufactured air-handling units, shall be furnished by the automatic control systems manufacturer. Damper manufacturer shall be licensed to display the AMCA seal.

Air-mixing valve operators shall be furnished by the automatic control systems manufacturer.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

SD-01 Data

Manufacturer's Catalog Data shall be submitted for the following items:

- Control Components
- Thermometers
- Pressure Gages
- Valves
- Dampers
- Operators
- Spare Parts

SD-04 Drawings

See specification 15971 for drawing submission.

SD-06 Instructions

Operating Instructions shall be submitted for Control and Instrumentation consisting of standard operating procedures including startup, shutdown, and emergency operation.

SD-07 Schedules

Material, Equipment, and Fixture Lists shall be submitted for Control and Instrumentation Systems including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site information.

SD-19 Operation and Maintenance Manuals

Operation and maintenance manuals shall be consistent with manufacturer's standard brochures, schematics, printed

instructions, general operating procedures and safety precautions.

Operation and maintenance manuals shall be provided for the following items:

Electric Operators
Automatically Controlled Valves and Dampers

1.5 STORAGE AND HANDLING

Openings shall be sealed after manufacturing and inspection, until ready for installation.

Instruments and equipment shall be carefully handled, shall not be subjected to shock, and shall be protected from weather, dust, construction materials, and damage.

PART 2 PRODUCTS

2.1 CONTROL COMPONENTS

2.1.1 Line-Voltage Thermostats

Line-voltage thermostats shall have integral "MANUAL ON/OFF/AUTO" selector switch, a maximum differential of degrees, concealed temperature adjustment, and a locking cover. Line-voltage thermostats shall be rated for the load, single or two-pole as required.

Insulating bases for thermostats located on exterior walls shall be provided.

Thermostat guards in unfinished spaces shall be cast-metal type.

Guards and thermostats shall be mounted on separate bases, unless otherwise approved.

Line-voltage thermostats shall be furnished and mounted under this section, and wired in accordance with applicable sections of Division 16, "Electrical," unless otherwise specified.

2.1.2 Electrical Low-Limit Duct Thermostat

Air-handling unit freeze protection shall be provided. Lowest temperature across any of bulb length, single tube, shall be sufficient to trip a snap-acting, single-pole, single-throw switch when the temperature sensed is equal to, or below, set point. Minimum length of bulb shall be. One limit thermostat shall be provided for every square of coil surface or as per manufacturer's recommendations. Thermostats shall have manual reset.

2.2 PRESSURE GAGES

Pressure gages used to indicate supply and outlet air pressures of automatic control instruments shall be the manufacturer's standard, minimum diameter.

2.3 CONTROL SYSTEM VALVES

Valve bodies, iron pipe size (ips) and smaller, shall be bronze with screwed end connections. Valve bodies, ips and larger, shall be cast iron and shall have flanged end connections.

Valves shall be single seated for dead-end service except where otherwise indicated.

Modulating service valves shall have plugs matched to the characteristics of the coil for effective control. Valve-stem packing shall be tetrafluoroethylene, spring-loaded, and self-adjusting.

Valve stem shall be top and bottom guided and shall be AISI 303 corrosion-resistant steel. Cage construction is acceptable.

Valves shall be provided with position indicators and, where indicated or required for proper operation, shall be provided with positioners.

Valve linkage shall have an adjustment for valve lift.

2.3.1 Hydronic

Hydronic system valve bodies and trim shall be rated for service pressures through.

Hydronic system valves shall have replaceable plugs and seats of SAE 72 brass or AISI 303 corrosion-resistant steel, selected for maximum life depending on application conditions.

Maximum pressure drop across any hydronic system valve at maximum flow shall be of water.

2.4 PNEUMATIC SYSTEMS ACCESSORIES

2.5 Control and Instrumentation Tubing

Copper tubing shall be hard drawn or annealed seamless copper, conforming to ASTM B 280.

Fittings shall be solder joint, wrought copper, conforming to ASME B16.22.

Tool made bends in copper tubing are acceptable in lieu of fittings.

Ball-sleeve shall be compression type, rod or forged brass conforming to SAE 72 or 88 UL-approved, conforming to MS MIL-F-18280, with minimum pressure rating of.

Solder shall be 95-5 tin-antimony, alloy Sb5, conforming to AWS-02.

Polyethylene tubing shall be black virgin polyethylene, meeting stress crack test performed in accordance with ASTM D 1693. Multi-tube harness material shall be as specified above, with polyester film barrier and vinyl

jacket not less than thick.

Fittings shall be ball-sleeve compression type, brass or aluminum, with internal sleeves.

2.6 POWER-OPERATED DAMPERS

2.6.1 Frame and Blade Assembly

Frames and blades shall be constructed of galvanized steel or corrosion-resistant steel.

Resilient seals shall be mechanically attached, field replaceable seals. Attachment by adhesive shall not be acceptable. Jamb seals shall be flexible metal compression-type constructed of corrosion-resistant steel.

Frames shall have corner reinforcement and stay rods, where necessary. Frames shall be fabricated by welding or riveting. Damaged galvanized surfaces shall be repaired by coating with an equal weight of zinc.

For static pressures in excess of, master-blade-driven dampers with blades longer than shall have a maximum blade width of. Maximum blade width for other services shall be. Maximum blade length shall be. Dampers more than wide shall be made in two or more sections with intermediate mullions; each section shall be mechanically interlocked with adjoining section or sections.

Minimum shaft size shall be, round or square.

Where linkage is such that operator torque is applied to a master blade and transmitted therefrom, that blade shall be reinforced and the shaft shall be full length. This type construction shall be limited to, static pressure.

Blades shall be attached to round shafts by hardened cup-point setscrews, or by being pinned. A minimum three-thread engagement shall be provided. Where setscrews are used, two setscrews, 90 degrees apart, shall be provided to secure master blade. Shaft end retainers may be secured by pins or spring washers in grooved shaft or by similar construction.

Frames shall be calked with elastomer compounds to prevent bypass leakage.

Blades without resilient seals shall have interlocking edges.

All dampers shall be low leakage type.

2.6.2 Bearings

Shaft bearings shall be oil-impregnated sintered bronze or graphite-impregnated nylon sleeve type, except as otherwise indicated. Thrust washers shall be provided at bearings, when necessary to maintain blade alignment.

Linkage pivot bearings shall be oil-impregnated sintered bronze or

graphite-impregnated nylon.

2.6.3 Installation

Dampers shall be installed in accordance with the manufacturer's instructions.

2.7 CONTROL SYSTEM VALVE AND DAMPER OPERATORS

2.7.1 Operators

Motor operators shall provide smooth proportional control under operating conditions normal to the system.

Spring-return operators shall be provided for two-position control.

Spring returns shall be provided on reversible operators where required for fail-safe operation.

Operators operating in sequence with other operators shall have adjustable operating ranges and set points.

Operators shall have sufficient power on closeoff to provide tight sealing against maximum system pressures.

Operators shall close valves and dampers to fail-safe position indicated.

2.7.2 Dampers

Dampers shall be equipped with operators of sufficient power to control dampers, without flutter or hunting, through the entire operating range at air velocities at least 20 percent greater than maximum design velocity.

2.7.3 Electric Operators

Motor shall have ample capacity to handle applied loads under operating conditions normal to the system. Locations where temperatures fall below minimum operating temperature of operator shall be heated.

2.8 CENTRAL CONTROL CABINET

2.8.1 Panel Instrument Tubing

Instrument tubing within panels shall be copper or black polyethylene tubing. Tubing connections at panels shall be made with through-bulkhead-type fittings.

Tubing shall be neatly installed and properly supported. Instruments and accessories mounted on hinged access panels shall have sufficient flexible tubing to allow the door to open at least 135 degrees. Flexible tubing shall be tied into a single cable.

Fittings and joints shall be pressure-tight, and as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with the manufacturer's instructions and as indicated.

3.2 CONTROL- AND INSTRUMENT-AIR TUBING INSTALLATION

Tubing shall be concealed, except in mechanical rooms or areas where other piping is exposed.

Multiple tube runs shall be neatly nested.

Tubing shall be mechanically attached to supporting surfaces. Supporting adhesives and tie wraps are not acceptable. See additional requirements under Section 15072, "Vibration Isolation for Air Conditioning Systems."

Tubing penetrations in concrete surfaces shall be made through minimum, ips, Schedule 40, rigid, unplasticized, polyvinylchloride (PVC) sleeves. Sleeves shall extend above floors and below bottom surface of slabs. Where water- or vapor-barrier sealing is required, deep elastomer calk shall be applied to surfaces cleaned free of oil and other deleterious substances.

Tubing shall be purged with dry, oil-free compressed air to rid system of impurities generated during joint making and installation and to remove atmospheric moisture before connecting control instruments.

Any exposed to view tubing in finished areas shall be painted to match the surroundings.

All tubing shall be number-coded or color-coded, except local individual room control tubing, for future identification and serving of control system. Tube type indicators shall be used, taped on type indicator are not acceptable.

3.2.1 Copper Tubing

Tubing with mechanical joints shall be cut square and burrs shall be removed. Care shall be exercised not to work-harden copper surfaces. Tube ends shall be cut off or annealed by heating and air cooling in accordance with the manufacturer's instructions.

Copper tubing for solder joints shall be cut square and burrs shall be removed. Inside surfaces of fittings and outside surfaces of tubes in joint area shall be cleaned before assembly of joint. Joint flux, filler material, and heat source shall be applied in accordance with the manufacturer's instructions. Valves in copper piping shall have screwed ends with end adaptors to suit mechanical connections, unless solder jointing is otherwise indicated. Copper joints that fail pressure tests shall be remade with new materials, including pipe or tubing fittings and filler metal.

Hard-drawn copper tubing shall be used in all exposed areas. Hard drawn

shall be used where tubing is concealed.

Fittings for supply system copper tubing shall be wrought-copper solder-joint type except at connection to apparatus where specified brass mechanical and ips thread-adaptor fittings shall be used. Tool-made bends in copper tubing will be acceptable in lieu of fittings.

Copper-tubing runs embedded in concrete shall be annealed and shall be protected by plastic electric conduit.

Copper tubing horizontal supports for less than three tubes shall be rigid metal channel and shall be proprietary metal tube race for three or more tubes.

3.2.2 Plastic Tubing

Plastic tubing, unsheathed, except as otherwise indicated, may be used in lieu of, or in conjunction with, copper tubing upon prior approval, provided:

Tubing is enclosed within conduit or control panel cabinets, or is concealed behind control panels.

Plastic tubing, installed inside or behind control panels, shall be color coded or number coded. Tubing shall be neatly tied and supported. Flexible connections bridging the cabinet and cabinet door shall be neatly fastened along the hinge side and protected against abrasion.

Plastic tubing, in mechanical rooms or in spaces where copper tubing is exposed, shall be run in metallic electric conduit.

Multiple-tube plastic harness or sheathing shall be used in place of single plastic tubes where a number of plastic tubes run to the same point, unless such use is otherwise prohibited.

Fittings for plastic tubing shall be used in accordance with the manufacturer's instructions.

3.3 VIBRATION ISOLATION

To prevent vibration, controllers shall be isolated by location or by mounting devices supplied by the equipment manufacturer.

Tubing and conduit shall be installed to prevent the transmission of equipment vibration. Single tube runs shall be mounted in aircraft-type clamps containing an elastomer insert, and mounting shall prevent contact with ducting or air handling unit housing, casing, or enclosure. Multiple runs shall conform to the same isolation requirements, but mounting details shall be submitted for approval. Refer to Section 15072, "Vibration Isolation for Air Conditioning Equipment," for vibration isolation considerations.

3.4 TESTING, CALIBRATION, AND ACCEPTANCE

After the inspection has been completed, systems shall be checked for continuity.

After completion of control and instrument piping, control equipment shall be tested and adjusted in terms of design, function, systems balance, and performance, and shall otherwise be made ready for air handling systems acceptance tests. Data showing set points and final adjustments of controls shall be provided.

After air handling system acceptance and after the systems have operated in normal service for 2 weeks, the adjustment on instruments and devices shall be checked. Items found to be out of order shall be corrected. When air handling systems are in specified operating condition and when all other pertinent specifications requirements have been met, automatic temperature-control systems will be accepted.

Pneumatic systems shall be tested in accordance with ISA RP7.1. System pressure shall not exceed.

Equipment to check the calibration of instruments shall be provided by the Contractor. Instruments not in calibration shall be recalibrated or replaced.

3.5 OPERATOR TRAINING

Written operating instructions and not less than 8 hours of operator training shall be provided.

Contractor shall provide classroom and field instructions in operation and maintenance of systems equipment where required by the technical provisions. These services shall be directed by the Contractor, using the manufacturer's factory trained personnel or qualified representative. Contracting Officer shall be given seven days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor shall be made available to the Contracting Officer.

3.6 SPECIAL TOOLS

Special tools shall be provided as required for the operation and adjustment of controllers, instruments, or other control system devices.

-- End of Section --