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ARAB ENGINEERING BUREAU

7 PLUMBING FOR GASES

7.1 GENERAL

7.1.1 Scope

- 1 The work covered in this Part consists of providing all plant, labour and materials and performing all operations in connection with gas and compressed air supply in buildings.

7.1.2 References

- 1 The following standards are referred to in this Part:

ASME B 31.9.....Building Services Piping
NFPA 99.....Health Care Facilities Code

7.1.3 Compliance

- 1 Installation and testing of gas system shall be in accordance with NFPA 99.
- 2 Gas pressure vessels and relief valves shall be in accordance with the relevant ASME codes.
- 3 Fabrication and installation of gas systems shall be in accordance ASME B 31.9.
- 4 Electrical components for compressed air systems shall be listed and labelled by Underwritten Laboratories.

7.1.4 Quality Assurance

- 1 Manufacturers of gas and compressed air system products shall have been regularly engaged in the manufacture of such products, of the type and size specified in the Project Documentation, that have been in satisfactory use in similar service conditions for not less than five years.
- 2 Installation of gas and compressed air system shall be carried out by specialists with at least three years of successful installation experience of gas and compressed air systems similar to the type specified in the Project Documentation.
- 3 Upon completion and prior to acceptance of the installation, the contractor shall carry out operating and pressure tests at not less than 1.5 times the operating pressure, checked at half hour intervals to demonstrate satisfactory functional and operational efficiency. Such operating tests shall take place over a continuous period of not less than 8 hours for each system and shall include the following information in a report with a conclusion as to the adequacy of the system:
 - (a) a description of the test method including references to standard testing procedures if appropriate
 - (b) time, date and duration of the test
 - (c) compressed air pressure readings of the compressor at each outlet.

7.2 MATERIALS

7.2.1 Gas System Accessories

- 1 Gas cocks shall be bronze with a square head and shall have distinctly marked ON-OFF indications. They shall be pressure rated for 900 kPa (9.0 bar). The units shall conform with SSA 119 and shall be provided with an identification label. Labels shall be visible after installation. Where quick-type couplers are furnished, they shall be of the non-interchangeable type. The connector shall lock firmly into position and shall have a finger-type quick release.

- 2 A wrench shall be provided and attached to each cock.
- 3 Pressure regulators shall be in accordance with SSA 121 and shall have an adjustable diaphragm actuated by a spring-loaded pressure reducing valve, designed for liquid petroleum gas (LPG) systems. Pressure regulators shall be provided with a relief valve, and the diaphragm chamber shall be piped to the outside of the building. Pressure regulators shall be approved and marked by authorised officials recognised by a Qatari authority.
- 4 Shut-off valves shall be wafer type ball valves with bronze body, ball and stem, non-stick seats, seals, O-ring packing and lever handle. Shut-off valves shall have socket ends or threaded socket adapters.
- 5 Check valves shall be of the threaded bronze spring type with composition disc and bronze spring or of the silent double-centre guided conical spring type.
- 6 Safety relief valves shall have a spring-loaded shuttle with a pressure adjustment corresponding to the highest permissible working pressure of the cylinder.
- 7 Pipe failure valves shall have a spring-loaded shuttle suitable to shut off the flow of the gas if the rate of flow is too high.
- 8 Pressure gauges shall be a black enamel cast iron or cast aluminium case, chromium plated brass ring with a heavy glass, phosphor bronze bushed rotary precision movement, and a dial with a suitable pressure range.

7.2.2 Compressed Air System Accessories

- 1 Air compressors shall be of the reciprocating air cooled type.
- 2 Compressors shall consist of replaceable finned cast iron cylinders, flanged cast iron or cast aluminium heads, cast iron or cast aluminium pistons with rings made of carbon or non-stick and forged steel, bronze or aluminium connecting rods. Crank cases shall be made of cast iron. Each compressor shall have an automatic unloader system for no-load start up, a positive pressure lubricating system and stainless steel strip valves
- 3 Compressors and motors shall be direct-connected or operated by means of a V-belt drive, and provided with guard for flywheel and belts.
- 4 Motors shall be of the single-phase type or the three-phase type. Motors shall be standard open frame, drip proof, ball bearing 40°C rise NEMA standard design "B" induction type. Single-phase motors shall have grease lubricated ball bearings and built-in overload. Three-phase motors shall have rigid base mounting with slide rails for belt adjustment. Motor voltage shall be as given in the Project Specification.
- 5 Air receivers shall be suitable for the specified system working pressure, designed and constructed in accordance with the relevant ISO Standards.
- 6 Air receivers shall be provided with condensate drain trap, relief valve, pressure gauge, and welded steel supporting feet.
- 7 The outside of air receivers shall either be galvanised or supplied with a commercial enamel finish.
- 8 Air dryer units shall be of the package assembled type with a cabinet enclosing refrigeration unit, hot bye-pass valve, heat exchanger, moisture separator, chiller section with replaceable type cartridge filter, temperature and pressure gauges, controls and condensate drain trap.
- 9 Refrigeration units shall be of the hermetically sealed compressor type with air cooled condenser.

- 10 The cabinets shall be made of steel and finished with commercial enamel, and provided with top-hinged access door and front panel for easy access.
- 11 Control valves shall be of the top entry or wafer type ball valve with bronze body, ball and stem, non-stick seats, and lever handles with socket ends or threaded socket adapters.
- 12 Check valves shall be of the threaded bronze spring type with composition disc and bronze spring or of the silent double-centre guided conical spring type.
- 13 Pressure regulating valves shall be of the adjustable, direct-acting, single-seat, spring-actuated diaphragm type, or of the double-seated valve plug type, the body shall be made of cast iron, die cast zinc or bronze.
- 14 The regulator shall be provided with an adjustment device for adjusting pressure differential, and shall be of the same size as the pipe.
- 15 The filter regulator units shall consist of a bronze or die cast zinc body, actuated by an adjustable direct-acting single-seat spring diaphragm type regulator.
- 16 The filter regulator units shall be provided with filter units, suitable to filter the supply air of particles down to fine micron size, and pressure gauges.
- 17 Pressure gauges shall have a black enamel cast iron or cast aluminium case, a chromium plated brass ring with a heavy duty glass cover, a phosphor bronze bushed rotary precision movement, and a dial with a suitable pressure range.
- 18 Drains shall be the brass pre-cock type in low points of the compressed air system, or the automatic drain type.

7.3 EXECUTION

7.3.1 Hangers and Supports

- 1 Hangers in contact with copper tubing shall be electrolytically coated and shall be sized to suit the outside diameter of the pipe.

7.3.2 Execution Requirements

- 1 For gas systems only copper tubing shall be used. Joints shall be made either by soldering or welding. Jointing material shall be suitable for soldering and welding gas pipes.
- 2 No gas piping shall be installed under any building or structure and all exposed gas piping shall be kept at least 150 mm above the ground.
- 3 When stand-by gas is connected to the gas piping system, an approved three-way, two-part valve or other adequate safeguard shall be installed to prevent backflow into either supply system.
- 4 An accessible shut-off valve shall be installed in the gas piping system near each appliance and the head of the union connection thereto, and in addition to any valve on the appliance. Shut-off valves shall be within 1.0 m of the appliance. Shut-off valves may be located immediately adjacent to and inside or under an appliance when placed in an accessible and protected location and when such appliance may be removed without removal of the valve.
- 5 Appliance connections shall, at no time, have a diameter less than that of the inlet connection to the appliance as provided by the manufacturer.
- 6 Compressed air piping shall be copper steel, installed free of traps and graded to low points with condensate drain pet-cocks, or automatic condensate drain traps, as required in the Project Specification or shown on the Project Drawings.

- 7 Compressors shall start unloaded and shall start and stop automatically by means of an enclosed diaphragm-type pressure switch mounted on the unit.
- 8 Guards shall be provided for all exposed moving parts.
- 9 After cooler and moisture separator shall be installed between the compressor and the air receiver to remove moisture and oil condensate before the air enters the receiver, except where air dryers are installed.
- 10 Vacuum cleaning piping shall be made of plastic or steel and shall slope to the separator free of traps. Changes in the direction of piping shall be made by using 45 degree bends or long turn tees or bends, and shall be slip jointed.
- 11 Drop lines shall be connected from side or top of horizontal lines only.
- 12 Cleanout plugs shall be provided at all changes in direction and/or as indicated in the Project Specification or shown on the Project Drawings.
- 13 Floor mounted vacuum inlet valves shall be flush with floor finish.
- 14 The vacuum producer unit shall be provided with rubber inlet sleeve and stainless steel clamps for connecting unit to piping.

END OF PART