

SECTION 15311**FIRE PROTECTION VALVES****PART 1 GENERAL****1.01 SCOPE OF SECTION**

- A. This technical specification establishes the type and quality of materials, and the standard of workmanship to be used in the supply and installation of fire protection valves.

1.02 WORK INCLUDED

- A. The work includes the provision of all labour, materials and the performance of all operations in connection with the supply and installation of valves as specified herein and where referred to on the Drawings.
- B. Coordination: The contractor shall be responsible for the full coordination of the work of all trades.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of valves whose products have been in satisfactory use in similar applications for not less than 10 years.
- B. Installer: Firms regularly engaged and qualified in the installation of valves with at least 5 years successful installation experience on projects of a similar nature.

1.04 APPLICABLE CODES AND STANDARDS

- A. The valves and all associated materials shall comply with NFPA Standards and be UL listed.

1.05 SUBMITTALS

- A. Drawings - refer to Section 15010
- B. Products - submit full manufacturers data for every item.

1.06 OPERATION AND MAINTENANCE DATA

- A. Comply with Section 15010.

1.07 WARRANTY

- A. Provide 12 month warranty in accordance with contract conditions.

PART 2 PRODUCTS

2.01 GENERAL

- A. Bodies of valves and cocks on mild steel pipework up to and including 50mm size shall be of cast gunmetal or bronze. Approved valves having hot-pressed bodies may be offered as an alternative. Bodies of valves 65mm size and larger shall be of cast iron. Castings and pressings shall be of good quality, clean and smooth and free from scale or flaws.
- B. Holes in covers or in gates for screwed portions of spindles shall have full threads of a length not less than the diameter of the spindle over the thread. Glands shall be machined to provide a running fit between the spindle and the stuffing box. Stuffing boxes shall be properly packed or fitted with "O" rings which may be located in plastic bushes.
- C. Valves and cocks on mild steel pipework up to and including 50mm size shall have taper screwed ends, and of 65mm size and above shall have flanged ends.
- D. All screwed valves shall have heavy hexagonal reinforcements at openings, threads of ample length to ensure a sound joint and heavy shoulders to prevent over entry of pipes, fittings or adapters.

Flanged valves shall have flat-faced flanges.

- E. All valves and valve components (e.g. seatings, packings, etc.) shall be suitable for the working pressures, operating temperatures and conditions of the fluid handled in the systems in which they will be installed. All valves shall be hydraulically tested to at least twice the working pressure of the systems in which they will be installed. Where necessary valves shall have extended spindles to facilitate insulation. The declared pressure rating of the valve shall be equal to or greater than the maximum test pressure of the system.
- F. The working pressure for valves is to be based on the static pressure in the pipework in addition to the operating pressure exerted by the pumps on the system.
- G. Each valve shall have the manufacturer's name or trade mark, the UL and FM listed, the nominal diameters, the nominal pressure rating and body material all identified in the form of stamped or cast body markings.

2.02 ISOLATING VALVES

- A. Isolating valves up to and including 50mm nominal bore shall be bronze or gunmetal gate valves with solid wedge discs, non-rising stems, screwed in bonnets, metal hand wheels and screwed ends.
- B. Isolating valves for 65mm nominal bore and above shall be cast iron gate valves with solid wedge discs with bronze trim and seatings, bolted on cast iron

bonnets, high grade graphited asbestos packings, rising stems with outside screws and yokes, cast iron handwheels and flanged ends.

- C. Where shown on the drawings or specified herein, lock shield valves shall have easy-clean shields or enclosures to match the inlet valves. As a minimum requirement, one loose key shall be provided for every 25 No valves of the same spindle size.

2.03 NON-RETURN VALVES

- A. Non-return valves up to and including 50mm nominal bore shall be of the bronze swing pattern with screwed ends.
- B. Non-return valves 65mm nominal bore and above shall be of the cast iron swing pattern with bolted access covers, solid discs with bronze trim and seatings ends. An air cock shall be fitted to the bolted cover for air release purposes.

2.04 DRAIN VALVES

- A. Drain valves shall be of the bronze straight type glanded pattern complete with brass hose union and malleable iron lever.

2.05 AIR COCKS

- A. Air cocks shall be nickel or chrome plated, of the spoutless pattern and with screwed tape thread. Two loose keys shall be provided for each installation having up to 10 air cocks and one loose key shall be provided for every additional ten air cocks.

2.06 AUTOMATIC AIR VENTS

- A. Automatic air vents shall be of bronze or gunmetal construction. Vents shall be designed to eliminate air from the system automatically without passage of water. The unit shall be of the float operated type screwed connection on the outlet to enable the unit to be piped to a remote drain position.

2.07 TEST & DRAIN VALVES

- A. All bronze, angle valve with screwed ends complete with metering orifice, discharge tundish etc.

2.08 ALARM TEST VALVE

- A. All bronze multiport plug valve with screwed ends, operating lever and engraved position lever attached to body.

2.09 STRAINERS

- A. All bronze 'Y' type strainer with screwed ends, screwed cover and 30 mesh stainless steel screen for alarm supply line.

2.10 WATER MOTOR ALARM

- A. All bronze construction of through the wall type with threaded inlet and outlet connections, wall sleeve, drive shaft and bell.

PART 3 EXECUTION

3.01 STORAGE

- A. All valves shall be stored within a well lit container on purpose made compartmented racks or shelves, constructed in a similar manner to support the entire weight of materials without noticeable deformation.
- B. The valves shall be separated by means of their type and size and laid out in an orderly manner for ease of identification.
- C. Valves shall be supplied and stored with purpose made or manufactured plugs to prevent ingress of dirt.

3.02 GENERAL INSTALLATION

- A. Valves with screwed ends shall have a union installed adjacent to the valve for ease of dismantling.
- B. Where possible, valves shall be installed with the stem in the vertically upright position. However, all valves shall be installed in a manner such that they are readily accessible for ease of operation.
- C. Sufficient clearance shall be allowed for the application of thermal insulation, valve boxes, etc. and to ensure that full travel of the valve stem can be achieved.

3.03 ISOLATING VALVES

- A. Separate isolating valves shall be provided on all pipework services to each item of plant or equipment and on each main and submain, except where flow measuring or regulating valves are required and these valves can be used for isolating purposes without affecting their measuring or regulating functions.

3.04 MEASUREMENT AND REGULATING VALVES

- A. Flow measurement valves shall generally be installed on the flow pipework with the regulating valve installed on the return pipework.
- B. Where a particular valve manufacturer recommends the use of a double regulating valve, close coupled to a measuring station as a means of flow measurement and regulation at one point, then the commissioning station shall be installed on the return pipework.

- C. All regulating devices shall be of the double regulating type and each shall be installed in the fully open position.
- D. Flow measurement valves and commissioning stations shall be installed a minimum of 6 pipe diameters up-stream and 12 pipe diameters down-stream of any fitting which would create water turbulence.
- E. All flow measurement valves shall be installed with sufficient clearance around the test points to enable commissioning instruments to be connected.

3.05 DRAIN VALVES

- A. Drain valves shall be installed at all system low points on the dead side of isolating valves and on all items of plant to facilitate emptying down and removal.
- B. Line sized drain valves shall be installed at the end of each pipework run and at the base of each pipework riser to enable the system to be adequately flushed.

3.06 AIR VENTING DEVICES

- A. Air venting devices shall be installed at all system high points.
- B. Automatic air eliminators shall be complete with galvanised mild steel relief pipework, taken to within 1.5 m of the floor level with a gunmetal isolating valve and extended to a position where any discharge will not damage building fabrics, decorations or the like.
- C. Air bottles shall be made from 50mm size tube. Each shall be a minimum of 150mm long, fitted with a cap and 8mm size air cock. Where an air bottle is fixed out of reach, a 15mm extension tube shall be run from the cap to within 1.5m of the floor level and terminating with a needle valve and hose union.

3.07 RETARD CHAMBERS

All controlling valves, alarms and indicator switches shall have retard chambers adjustable from 0-90 seconds to avoid false alarms.

- 3.08 All O.S.&Y valves shall be fitted with supervisory switches wired back to central fire indicator panel to signal alarm if valves are tampered with.

END OF SECTION 15311

SECTION 15312**FIRE PROTECTION SUPPORTS, HANGERS AND BRACKETS****PART 1 GENERAL****1.01 SCOPE OF SECTION**

- A. This technical Specification establishes the type and quality of materials and the standard of workmanship to be used in the supply and installation of Supports, Hangers and Brackets.

1.02 WORK INCLUDED

- A. The work includes the provision of all labour, materials and the performance of all operations in connection with the supply and installation of Supports, Hangers and Brackets as specified herein and where referred to on the Drawings.
- B. Coordination: The Contractor shall be responsible for the full coordination of the work of all trades.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of Supports, Hangers and Brackets whose products have been in satisfactory use for a similar application for not less than 10 years.
- B. Installer: Firms regularly engaged and qualified in the installation of pipework systems with at least 5 years successful installation experience on projects of a similar nature.

1.04 APPLICABLE CODES AND STANDARDS

- A. The Supports, Hangers and Brackets and all associated materials and workmanship shall comply with the latest NFPA requirements.

1.05 SUBMITTALS

- A. Drawings - Refer to Section 15010.
- B. Products - Submit full manufacturers data for every item.

1.06 OPERATION AND MAINTENANCE DATA

- A. Comply with Section 15010.

1.07 WARRANTY

- A. Provide 12 month warranty in accordance with contract conditions.

PART 2 PRODUCT

2.01 GENERAL

- A. All supports, hangers and brackets shall be of an approved manufacture and shall conform to the requirements of NFPA 13 and NFPA 14.
- B. All steel products used for support systems if not manufactured from malleable cast iron or stainless steel shall be either galvanised or painted with one coat of red oxide paint.
- C. All drop rods shall be galvanised and sized to suit the bracket type and system weight but in no case shall be less than 6 mm diameter.
- D. All materials used for support systems shall be compatible with the material they are supporting. Generally steel pipework shall be supported by cast iron and steel clips and UPVC pipework by brass or PVC clips. Where galvanised steel pipework is used all pipework clips shall be galvanised.
- E. Where brackets are exposed to view they shall be of a chrome plated finish.
- F. Fixings to concrete and masonry shall be of the expanding bolt or wedge anchor type selected in accordance with the manufacturers recommendations and suitable for the imposed loads. Where fixings are to be made close to the outside edge of concrete or masonry structures resin banded fixings shall be used to reduce the risk of fracture.
- G. Brackets for fixing to woodwork or light weight partitioned walls shall be of the screw on pattern.
- H. Purpose made girder clamps shall be used where any system is supported from steelwork and only with the approval of the Engineer.

PART 3 EXECUTION

3.01 STORAGE

- A. All continuous lengths of channel angle and screwed rod shall be stored on purpose made pipe racks of welded construction and of sufficient strength to support the entire weight of the material without any noticeable deformation. The racks shall be such that all material is clear of the ground.
- B. All raw metal shall be wire brushed and painted with one coat of red oxide paint prior to storage.

- C. All general support materials shall be stored within a well lit container on purpose made compartmented racks or shelving. The materials shall be separated by means of their type and size and laid out in an orderly manner for ease of identification.

3.02 GENERAL

- A. All systems shall be adequately supported in such a manner as to permit free movement due to expansion, contraction, vibration or other changes in the system. Supports shall be arranged as near as possible to joints and changes in direction.
- B. Vertical rising pipes and ducts particularly in shafts shall be adequately supported at the base to withstand the total weight of the riser. Under no circumstances shall branches from vertical rising pipes be the means of support for the vertical pipework.
- C. Hangers for horizontal systems at high level shall be supported from angle or channel irons suitable for securing to the structure.
- D. Pipework shall be independently supported, double stacking of pipes from the same support will not be permitted.
- E. Adjustable mild steel hangers on steel pipework systems shall be used with swivel joints at the pipe rings and spherical washers at the top of the hanger rods. Pipe rings shall be malleable cast iron or fabricated steel made in halves and secured by bolts or screws. Malleable iron hinged pipe rings may also be used but caliper hooks shall not be permitted. Pipework 65 mm diameter and over shall not be supported using malleable iron brackets. All pipe brackets over 50 mm diameter shall be submitted to the Engineer and approved by the Engineer prior to manufacture.
- F. Where rollers and chairs are required, these shall be preformed and where used singularly they shall have restraining "U" straps or bolts formed over the diameter of the pipe and bolted to the base support of the chair. The "U" straps or bolts shall be fitted to allow movement of the pipe without binding. Continuously threaded "U" bolts will not be permitted.
- G. The spacing of supports shall be determined in accordance with the following table. Where one support carries more than one pipe of different diameters the spacing shall be determined by the requirement of the smallest diameter.

Figures are for normal ambient temperatures below 20°C. For temperatures above 20°C the pipe manufacturer should be consulted. Based on average temperature of 80°C.

Maximum spacing of fixings for internal piping shall conform to the requirements of NFPA 13 and NFPA 14.

END OF SECTION 15312

SECTION 15320**FIRE PUMPS****PART I GENERAL****1.01 SCOPE OF SECTION**

- A. This technical Specification establishes the type and quality of materials and the standard of workmanship to be used in the supply and installation of Pumps and Pressurization Units.

1.02 WORK INCLUDED

- A. The work includes the provision of all labour, materials and the performance of all operations in connection with the supply and installation of Pump and Pressurization Units.
- B. Coordination: The Contractor shall be responsible for the full coordination of the work of all trades.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of Pumps and Pressurization Units whose products have been in satisfactory use for a similar application for not less than 10 years.
- B. Installer: Firms regularly engaged and qualified in the installation of Pumps and Pressurization Units with at least 5 years successful installation experience on projects of a similar nature.

1.04 APPLICABLE CODES AND STANDARDS

- A. The Pumps and Pressurization Units and all associated materials and workmanship shall comply fully with NFPA 20.

The following are the most commonly used and relevant British Standards associated with pipework products and associated materials. However, the Contractor shall ensure that all applicable British Standards are complied with whether listed here or not.

NFPA 1 - Fire Prevention Code.

NFPA 20 - Standard for the Installation of Centrifugal Fire Pumps

NFPA 22 - Standard for Water Tanks for Private Fire Protection

- NFPA 24 - Standard for the Installation of Private Fire Services Mains and Their Appurtenances
- NFPA 26 - Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection
- NFPA 31 - Standard for the Installation of Oil Burning Equipment
- NFPA 37 - Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 54 - National Fuel Gas Code
- NFPA 58 - Standard for the Storage and Handling of Liquefied Petroleum Gases
- NFPA 110 - Standard on Emergency Power Supplies
- NFPA 291 - Recommended Practice for Fire Flow Testing and Marking of Hydrants.
- ANSI B73.1 - Specification for Horizontal End Section Centrifugal Pumps
- FMEC - Loss Prevention Data 3-251. Break Tanks
- UL - Underwriters Laboratory

1.05 SUBMITTAL

- A. Drawings - refer to Section 15010
- B. Products - submit full manufacturers data for every item.
- C. Calculations

1.06 OPERATION MAINTENANCE DATA

- A. Comply with Section 15010.

1.07 WARRANTY

- A. Provide 12 month warranty in accordance with contract conditions.

PART 2 PRODUCTS

2.01 GENERAL

- A. Values of the resistance to fluid flow of items of equipment, pipework and/or the total distribution systems indicated in the contract documents are approximate. It shall be the responsibility of the Contractor to verify these values and provide pumps capable of delivering the required fluid volume when operating against the actual total system resistance. Pumps shall be "type tested in accordance with the requirements of NFPA 20 and shall be selected to give the correct fluid flow rate and, unless otherwise indicated test certificates and performance curves shall be submitted in triplicate. Pumps and their drives shall be segregated such that failure of pump seals shall not result in damage to the drive motors.
- B. Where self priming pumps are required these shall be suitable for the total suction head and available NPSH together with the required volumetric displacement. The self priming operation shall be achieved automatically without the need for manually assisted starting.
- C. Pumps shall be complete with a drain plug and, except where the pump is inherently self-venting, and air cock.

Pumps shall have flanged connections appropriate to the maximum test working pressure.

- D. All pumps shall be provided with flexible connections at suction and delivery.
- E. All pumps shall be fully tested in accordance with NFPA 20 prior to works despatch and the performance characteristics guaranteed in accordance with NFPA 20.

2.02 FIRE PUMP STATIONS

- A. There shall be 1 No. fire pump station located in pump house between water tanks.
- B. The fire pump shall be supplied from dedicated fire water storage tanks as detailed on the drawings.
- C. Fire pump station shall comprise at least the following:
 - 1 No. Electric motor driven pump (duty)
 - 1 No. Diesel driven pump (standby)
 - 1 No. Jockey pump to maintain system pressure due to minor losses.
 - 1 No. control monitoring/alarm panel.

Pumps are to be as detailed in the schedule of public health services equipment and on the drawings.

- D. The pumps shall have inertia bases mounted on captive spring isolators.
- E. Each pump shall be complete with isolating gate valves and pressure gauges on the suction and discharge and in addition strainers and non return valves on the suction and discharge respectively.
- E. Each pump and motor shall be mounted on a common cast iron ease frame and the pump shall be connected to the motor via a guarded flexible coupling.

2.03 CONTROLS

A. Mode of Control:

1. When fire main system is at design set pressure point, all pumps are shut down.
2. A small fall in pressure shall start the jockey pump, which has a 3 minute run on timer to prevent start cycling.
3. If pressure continues to fall, the lead electrical pump starts. A 3 minutes run on timer is included.
4. If the pressure continues to fall further due to the lead pump failing to start or, although operating, being unable to maintain system pressure the standby (lag) pump will start. A 3 minute run on timer is included.
5. As the set point pressure is achieved and maintained the system shall shut down in reverse.
6. All set control points and differentials shall be as indicated on the drawings.

B. Control Panels:

1. The main control panel contain all starters, relays, isolators, miniature circuit breakers, transformers, switches, indicators etc. required for fully automatic operation of the system.

PART 3 EXECUTION

3.01 STORAGE

- A. Pumps shall be stored within well fitted storage containers with the open ends sealed with manufactured plugs to prevent the ingress of dirt.

3.02 GENERAL INSTALLATION

- A. Base mounted pumps shall be installed on concrete bases with suitable anti-vibration isolators.

- B. All pumps shall be installed as indicated on the drawings complete with isolating valves, non return valves and flexible connections.
- C. Pumps shall be installed fully in accordance with the manufacturer's recommendations, with particular regard to venting and permanent lubrication of bearings.
- D. Installation shall be carried out in accordance with NFPA 20, the manufacturers instructions and as specified herein.

3.03 FABRICATION

- A. All like parts of same type pumps fabricated by the same manufacturer shall be interchangeable.
- B. Wherever possible, the pump shall be manufactured such that it shall be possible to disassemble the rotor assembly with minimum disassembly of other parts such as suction and discharge nozzles, bearing supports, etc.
- C. All casting shall be clean and without defect. Casting repairs shall be done only after agreements reached between the Engineer and the Contractor.
- D. All foundry machine work shall be in accordance with good practice for the class of work involved.
- E. All parts shall conform to the required dimensions and shall be free from defects that will prevent proper functioning of the pump.
- F. Assembly of parts shall be well fitted and smoothly operating.
- G. Individual pump sets shall be assembled as a unit including base plate, driver, coupling and guards as required.

3.04 TEST AND GUARANTEE:

- A. Pump performance test shall be conducted in accordance with Hydraulic Institute test codes as described in HI E35.01, E37.01 and E39.01. In addition, each pump shall be tested at five different flows, including "shut-off" with no water flowing.
- B. All pumps shall be hydrostatically tested for leaks at 1.5 times the design pressure. There shall be no leakage during the one hour test period.

END OF SECTION 15320

SECTION 15325**FIRE PROTECTION SYSTEMS AND EQUIPMENT****PART 1 GENERAL****1.01 SCOPE OF SECTION**

- A. This technical Specification establishes the quality of materials and workmanship to be used in the supply and installation of the Fire Protection systems and equipment used internally within buildings.

1.02 WORK INCLUDED

- A. Provisions of all labour, materials and the performance of all operations in connection with the installation and testing fire protection and fire fighting systems within buildings as specified herein and shown on the drawings.
- B. Coordination: The Contractor shall be responsible for proper coordination of the work of all trades and shall provide clear drawings where necessary.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of fire fighting and fire protection systems and equipment fittings whose products have been in satisfactory use in similar service for not less than 10 years.
- B. Installer: Qualified with at least 5 years of successful installation experience on projects with fire fighting and fire protection schemes and equipment similar to that required for this project.

1.04 APPLICABLE CODES AND STANDARDS

- A. The Fire Protection systems and equipment shall comply fully with the latest relevant National Fire Protection Association standards in all respects.
- B. The following are the most commonly used NFPA Standards associated with Fire Protection systems. However, the contractor shall ensure that all applicable NFPA Standards are complied with, whether listed here or not.

NFPA 1 - Fire Prevention Code.

NFPA 10 - Standard for Portable Fire Extinguishers.

NFPA 13A - Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems.

NFPA 13E - Recommendations for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems.

- NFPA 14 - Standard for installation of Standpipe and Hose Systems.
- NFPA 17 - Standard for Dry Chemical Extinguishing Systems.
- NFPA 45 - Standard for Fire Protection for Laboratories using Chemicals.
- NFPA 72 - Standard for Installation, Maintenance and Use of Local Protective Signalling System for Guard's Tour, Fire Alarm and Supervisory Service.
- NFPA 78 - Lightning Protection code.
- NFPA 79 - Electrical Standard for Industrial Machinery.
- NFPA 80 - Standard for Doors and Windows.
- NFPA 82 - Standard on Incinerators, Waste and Linen Handling Systems and Equipment.
- NFPA 85A - NFPA 85A-G Standard for Prevent of Furnace Explosions in Fuel Oil and Natural Gas-Fired Single Burner Boiler-Furnaces.
- NFPA 1961 - Standard for Fire Hose.
- NFPA 1962 - Standard for the Care, Use and Maintenance of Fire Hose including Connections and Nozzles.
- NFPA 1963 - Standard for Screw Threads and Gaskets for Fire Hose Connections.
- NFPA 2001 - Clean agent extinguishment systems.

1.05 SUBMITTALS

- A. Drawings - refer to Section 15010
- B. Products - submit full manufacturers data for every item.

1.06 OPERATION AND MAINTENANCE DATA

- A. Comply with Section 15010.

1.07 WARRANTY

- A. Provide 12 month warranty in accordance with contract conditions.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

- A. All materials, equipment and procedures associated with the Fire Protection Systems shall be in accordance with NFPA requirements.
- B. Where operating or warning instructions are provided or specified they shall be clearly denoted in Arabic and English.
- C. The Contractor shall supply original authenticated certificates for each type of material or equipment, confirming the standard they have been manufactured and tested to.

2.02 HOSEREELS

- A. 30 m of 25 mm red rubber hose suitable for a working pressure of 1034 kPa mounted on a revolving drum. Lever operated control nozzle of 6 mm orifice, swing type with jet/spray. The reel to be fitted with an automatic valve to operate when 3 metres of hose is unwound. The drum shall be painted red. The reel shall be supplied complete with cabinet with water connection placed to suit the supply pipe.
- B. Each hosereel shall be complete with locally fixed operating instruction plate.
- C. Each hosereel cabinet shall contain one multi purpose dry powder extinguisher 6 kg capacity.

2.03 PORTABLE FIRE EXTINGUISHERS

- A. Portable Fire Extinguishers shall be of the type indicated on the drawings and specified herein.
- B. The fire extinguishers shall conform to the requirements of NFPA 10 for design standard and performance with the classes of fire as defined in that standard and this Specification.
- C. Classes
 - Class A Fire involving solid materials, usually of an organic nature such as wood, cloth, paper, rubber and many plastics.
 - Class B Fires involving flammable liquids, oils, greases, tars, oil based paints, lacquers and flammable gases.
 - Class C Fires involving energized electrical equipment where the electrical non-conductivity of the extinguishing media is of importance.
- D. Multi-purpose dry powder (chemical)-Class A.B. and C fires. Multi-purpose dry powder extinguishers shall be ammonium phosphate, stored pressure type with

nearest standard deviates considerably from the Specification the Contractor shall obtain the approval of the Engineer before placing his order.

J. Extinguisher Marking

All extinguishers shall carry in English and Arabic clear and concise operating instructions and warnings against use on fires for which the extinguishant is not suitable, or any other warnings of which the operator must take heed. The extinguisher class suitability and warnings may take the form of pictorial labels as depicted in the NFPA Standard 10.

The following information shall also be clearly marked on the body of each unit:

1. The name of the manufacturer.
2. Instructions for regular periodic checking of the units for operational serviceability.

K. Portable Fire Extinguishers - Types and Sizes

1. Multi-purpose dry powder complete with wall bracket.

Capacity	6Kg	10Kg
Range & discharge	5-7m	5-7m
Duration of discharge	13 secs	20secs
Blocked nozzle pressure at 20°C	13 bar	13 bar

2. Carbon Dioxide

Capacity	3 kg	5 kg	6 kg
Minimum range of discharge	3 m	5 m	3 m
Duration of discharge	17 secs.	15 secs.	17 secs.
Working pressure at 20°C	50 bar	50 bar	50 bar

3. Foam

Capacity	6 L	9 L
Minimum range of discharge	4 m	4 m
Duration of discharge	28 secs.	40 secs.
Working pressure at 20 C	12.5 bar	12.5 bar

4. Water

Capacity	10 L
Minimum range of discharge	6 m
Duration of discharge	65 secs.
Working pressure at 20 C	12.5 bar

steel cylinders, braided PVC or black reinforced rubber discharge hose and nozzle and pressure gauge. Suitable carrying handles shall be incorporated in the extinguisher body or the control mechanism moulding. Extinguishers shall be hermetically sealed to prevent moisture contaminating the powder.

- E. Carbon Dioxide (CO₂) - Class B and C fires. Carbon Dioxide extinguishers shall have steel cylinders and be complete with swivel horn or hose and horn applicator.
- F. Water (H₂O) - Class 'A' fires water extinguishers shall be stored pressure type with steel cylinders, braided PVC or black reinforced rubber discharge hose and nozzle and pressure gauge. Suitable carrying handles shall be incorporated in the extinguisher body or the control mechanism moulding.
- G. Foam - Class A and B fires. Foam extinguishers shall be of the stored pressure type with steel cylinders, braided PVC or black reinforced rubber discharge hose and nozzle and pressure gauge. Suitable carrying handles shall be incorporated in the extinguisher body or control mechanism moulding.
- H. Special Features

All portable extinguishers shall be wall bracket mounted as shown on the drawings. Wall mounted units shall be supplied complete with purpose made wall brackets, and the Contractor will secure these to the building structure so that the installed height of each extinguisher conforms to the NFPA Standard 10 Clause 1-6.9 relative to its gross weight. Where floor standing units are provided these shall be fitted with integral steel skirts such that the extinguisher body itself does not rest on the floor. Specific extinguisher requirements are shown on the drawings.

All types of extinguisher shall be fitted with a locking pin arrangement to prevent accidental discharges, the safety pins being secured to the unit by a chain or wire cable to prevent loss.

- I. Design, Deployment and Capacity

The extinguisher designs shall be such as to facilitate inspection, cleaning, repair and replacement, and be simple and reliable when in use under operational (or training) conditions.

The mounting requirement for extinguishers shall be as shown on the Drawings. The Contractor shall not deviate from this requirement or other aspect of the specification without the permission of the Engineer.

The locations, type of extinguishant and capacity of fire extinguishers are shown on the relevant Drawings. The capacity of each unit specified is the minimum quantity of extinguishant required at the location indicated. The Contractor may supply slightly larger sizes to that specified where the Specification does not coincide with a particular supplier's production standard extinguisher. If the

PART 3 EXECUTION**3.01 STORAGE**

- A. All pipework shall be stored on purpose made racks of welded construction and of adequate strength to support the entire weight of materials without noticeable deformation.
- B. All pipework shall be stored clear of the ground and with all open ends sealed with purpose made or manufactured plugs to prevent the ingress of dirt.
- C. All fittings shall be stored within a well lit container on compartmented racks or shelving, separated by their type and size and laid out in an orderly manner for ease of identification.
- D. Hose reels, fire extinguishers and fire blankets shall be covered in protective packaging and stored in a well lit container. Fire extinguishers in particular, shall be secured to prevent damage resulting from falling and in no instance shall they be subject to temperatures in excess of 50°C for to direct sunlight.

3.02 GENERAL INSTALLATION

- A. All items shall be installed in the locations indicated on the drawings and strictly in accordance with the manufacturer's instructions.
- B. The installation shall comply fully with all applicable standards and codes listed in Part 1.04.
- C. Pipework shall be installed in accordance with Section 15060 – Pipes and Pipe Fittings of the Specification.
- D. Hose reels, fire extinguishers and fire blankets shall be securely fixed with approved fixings in a position offering unobstructed access.
- E. All hose racks shall be installed with an isolating valve and a union between the valve and pack to enable any reel to be removed without having to shut down the system.

END OF SECTION 15325