

FIRE FIGHTING SYSTEM CONTENT

A. SPECIAL CONDITIONS OF CONTRACT

1.0 GENERAL:

These special conditions are meant to amplify the specifications and General Conditions of Contract. If any discrepancy is noticed between General Conditions of contract, specification, Bill of Quantity and Drawings, the most stringent of the above shall apply.

The work shall be carried out in the accordance with the drawings and design as would be issued to the Contractor by the Design Consultant duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications etc. not bearing Design Consultant signature and stamp. Similarly the Contractor shall not take cognizance of instructions given by any other Authority except the instructions given by the Client's Representative/ Consultant in writing.

The scope of this section is to describe materials and systems for fire fighting installations within the building which form together with the project documents, a complete volume of work and quality description.

All fire fighting installations shall be of high quality, safe, complete and fully operational including all necessary items and accessories whether or not specified in details. All fire fighting works shall be completed in accordance with the regulations and standard to the specification OWNER, the general provisions, special provisions and general requirements apply to all items of this specification.

The work shall be carried out simultaneously with building work, civil work, etc. and shall be continued till it is completed satisfactorily along with the completion of essential portions of the building works.

The work shall be executed and measured as per metric dimensions given in the Bill of Quantities, drawings etc.

The Contractor shall acquaint himself fully with the partial provisions for supports that may be available in the structure and utilize them to the extent possible. In any case the Contractor shall provide all the supports regardless of provisions that they have been already made. Nothing extra shall be payable for situations where insert plates (for supports) are not available or are not useful.

Shop coats of paint that may be damaged during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.

The Contractor shall protect / handle the material carefully and if any damage occur while handling by the Contractor then the sole responsibility shall be of the Contractor. Such damages shall be rectified/recovered by the Contractor at no extra cost whatsoever.

During the progress of work, completed portion of the building may be occupied and be put to use by OWNER but the contractor will remain fully responsible for the maintenance of Fire Protection System installations till the entire work covered by this contract is satisfactorily completed by him and handed over to OWNER.

2.0 ACCOMPANIMENT TO TENDER:

The tendered will attach to the Tender, at the time of submission, a statement containing information on the following points on separate pro forma.

List of all the confirmation of materials to be used as per specification along with manufacturer's name, catalogue and other technical details. Any deviation from the specifications shall be separately pointed out.

3.0 INTENT:

It is the intention of the specification and drawings to call for finished work, tested and ready for operation, whenever the words "Supply" or "Provide" are used. It shall mean delivery of material as specified in an assembled manner, ready for installation. Any apparatus, material or work not shown on drawings but mentioned in the specification or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the contractor without additional expenses to OWNER. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work and in the contract.

4.0 INTERPRETATION OF PROJECT DOCUMENTS:

The Specification, Drawings, and Bill of quantity shall be interpreted in accordance with good installation practice defined in the appropriate regulations and standards whether specifically referred to or not. If there is any discrepancy or shortfall in the application of the regulations to any aspect of this contract or the contractor considers there is anything detrimental to the standards or inconsistent with his obligations and guarantees, OWNER shall be informed prior to signing the contract and shall thereafter inform the contractor in writing the course to be followed. Where the drawings are to a small scale or are expressed in symbolic terms or are in the form of a diagram, then exact location of items shall not be inferred and in all cases, the work shall be fully integrated with the work of other trades and with the fabric of the building. The contractor shall appraise the duties of all plants and equipments taking account of any additions or variations and shall inform the OWNER of any matters which may affect the design. In all cases the equipment installed shall be of appropriate rating for the duty it performs.

The Specifications and Bill of quantity shall be considered as part of this contract and any work or material shown on BOQ and not called for in the specification or vice versa, shall be executed as if specifically called for in both. The Drawings indicate the extent and general arrangement of the Fire Pumps, Fire Hydrants & Sprinkler system layout etc. and are essentially diagrammatic.

The work shall be installed as indicated on the drawings, however, any minor changes found essential to coordinate the installations of this work with other services shall be made without any additional cost to the owner. The drawings are for the guidance of the contractor, exact locations, distances and levels will be governed by the building. The contractor shall examine all structural and Fire Protection system drawings before starting the work, and report to OWNER or its representative, any discrepancies which in his opinion appear on them, and get them clarified.

5.0 SCOPE OF WORK:

The work to be carried out under this contract comprises of the Fire Fighting work for the proposed project called for in the documents. The work covered under this contract comprises of supply (wherever called for), installation, connection, testing and commissioning the Fire Fighting work commencing from point of fire brigade inlet or fire water storage within the project/site as per specifications, relevant to TAC, NFPA, NBC, Indian standards, Local Fire Rules and Code of practice.

The contractor shall carry out and complete the said work under this contract in every respect and in conformity with the current rules and regulations of the local Fire Authority, the Indian Standards and with the directions of and to the satisfaction of the Consultant and Owner. The Contractor shall furnish all labour and install all materials, appliances, equipment (except those items which will be supplied by the Owner to the contractor at site), necessary for complete provision and testing of the whole fire fighting installation as specified herein and shown on the drawings. This also includes any material, appliances, equipment not specifically mentioned herein or noted on the drawing as being furnished or installed but which are necessary and customary to make complete installation and to make the fire fighting system shown in the schedule or described herein, properly connected and in working order.

The work shall include all incidental jobs connected with Fire Fighting installation such as foundation block for pump-motor sets, excavation for pipe trenches and back filling, cutting/drilling holes through walls/floors and grouting, fixing of sprinklers with necessary civil work , supports & hangers for hydrant / pipes, etc.

In general, the work to be performed under this contract shall comprise of supply, installation, testing &

commissioning of the following work but limited to followings:-

| |
|--|
| Wet Riser, Yard Hydrant |
| Hose Reel, Portable Fire Extinguisher, Signages |
| Sprinkler System |
| Isolation valves |
| Fire Pumps,U.G Tank&OHT |
| System Pipes with all fittings,Flanges, Orifice Plates, valves, Hangers, Supports. |

All quantities mentioned in the Bill of quantity are approximate and the contractor shall not be eligible for any claim due to any variation in / or omission of any item.

Any extra item shall be calculated on the rate analysis basis approved by OWNER.

It is the responsibility of the contractor to co-ordinate with Local Fire Authority, Fire Officer and fulfils all the documents, drawings & any other requirement of them at no extra cost.

6.0 MODE OF MEASUREMENTS:

M.S. pipes shall be measured per linear meter of the finished length and shall include all fittings, welding, jointing, clamps for fixing to walls or hangers, anchor fasteners and testing.

Sluice valves, check valves, butterfly valves shall be measured by numbers and shall include all items necessary and required for mixing and as given in the Specifications/Bill of Quantities.

Hydrant valves, hose cabinets, rubberized fabric linen fire hose pipes, First-aid fire Hose reels, S.S. branch pipes, sprinkler shall be measured by numbers and shall include all items necessary and required for fixing as given in the Specifications/Bill of Quantities.

Suction and delivery headers shall be measured per linear meter of finished length and shall include all items as given in the Bill of Quantities. Painting shall be included in the rate of headers. Painting of pipes shall be included in the rate for pipes and no separate payment shall be made.

No additional payment shall be admissible for cutting holes or chases in walls or floors, making connections to pumps, equipment and appliances.

7.0 MODE OF PAYMENT:

Advance against material up to 60% of actual value of materials shall be paid after necessary warranty of the same at site of work is done, in terms of quantity, quality, and purchase price of such material. Such advance amount shall be paid for pipes, all Valves, Hydrant valves, Pump set only.

Vender shall bring the material at site maximum one month in advance before the actual usage of the same for erection. If the material is brought earlier then specified above, the payment of such material shall not be made.

8.0 FEES, PERMITS AND TESTS:

The Contractor shall pay for any and all fees and obtain permits required for the fire fighting work. On completion of the work the contractor shall obtain and deliver to the OWNER, **NOC**, certificates of final inspection and approval by the local fire authority and the Fire inspector.

9.0 UTILITY SUPPLY:

It is the responsibility of the contractor to co-ordinate with various utility agencies, the exact location of such Hook-Up Point and mode of connection. Further the contractor shall co-ordinate with such utility agencies to provide necessary drawings, documents, get their approval, make the necessary arrangement for the payments and arrange the utilities supply at no extra cost.

10.0 ACTUAL ROUTE OF PIPE:

The locations of the Hydrant pipes are only indicative, therefore, the actual route may differ from the plans according to the details of the building construction and the conditions of executions of the installations.

The contractor shall supply and install at his expense all secondary materials and special fittings found necessary to overcome the interference and to supply the modifications on the route of pipe and fittings that are found necessary during the work, to the complete satisfaction of the owner's representative.

11.0 MATERIAL AND EQUIPMENT:

All material and equipment shall conform to the relevant standards and shall be of the approved make and design. The materials and equipment shall conform to relevant Indian Standards. The Contractor shall be responsible for the safe custody of all the materials and shall insure them against theft, damage by fire, earthquake etc. A list of items of materials and equipment, together with sample of each shall be submitted to the OWNER within 10 days of the award of the contract. Any item which is proposed as a substitute, shall be accompanied by all technical detail giving

sizes, particulars of materials and the manufacturer's name and shall be submitted along with the tender or bid offer. At the time of the submission of proposed substitute the Contractor shall state the credit, if any due to the owner. In the event the substitution is approved, all changes and substitutions shall be requested in writing and approvals obtained in writing from OWNER. Owner's decision in the matter shall be final.

All materials of the same kind of service shall be identical and made by the same manufacturers. Any deviation to this rule shall be approved by the Consultant. Top priority shall be given to the products that have a permanent agent providing spare parts and maintenance facilities in the same city where the project is situated.

The make of fire equipments, components, accessories, etc. has been mentioned in the tender. In case if the make is not given for the equipment / component / accessories, the contractor shall get approval for sample of that particular equipment / component / accessories from the Client / Consultants before any procurement.

12.0 MANUFACTURERS:

Where manufacturers have furnished specific instructions relating to the materials used in this job, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases.

Where manufacturer's names and/or catalogue numbers are given, this is an indication of the quality, standards and performance required.

When interfacing occurs, equipment shall be mutually compatible in all respects.

13.0 RATING:

Rating of all items shall be appropriate for the conditions on the particular site on which the items will be used. All the equipment shall be fit for continuous work under the worst conditions of site and shall be rated for the following ambient condition.

- Outdoor temperature 50° C.
- Corrosive and humid

14.0 INSPECTION AND TESTING:

OWNER'S representative reserves the right to request inspection and testing at manufacturer's works at all reasonable times during manufacture of items for this contract. Tests on site of completed works shall demonstrate, among other things:

That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.

That all items operate efficiently and quietly to meet the specified requirements.

That all circuits are correctly fused and protected and that protective devices are properly coordinated.

That all non-current carrying metal work is properly and safely grounded in accordance with the specifications.

The contractor shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the OWNER and

shall provide test certificates signed by a properly authorized person. Such test certificates shall cover all works.

If tests fail to demonstrate the satisfactory nature of the installation or any part thereof then no claims for the extra cost of modifications, replacements or re testing will be considered. Owner's decision as to what constitutes a satisfactory test shall be final.

The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere.

15.0 PRICE DETAILS:

At anytime and at the request of OWNER, the contract shall provide details or breakdown of costs and prices of any part or parts of the works.

16.0 TEST CERTIFICATES:

The contractor shall submit test certificates for all the material/system installed. These shall be issued by a government recognized inspection office certifying that all equipment, materials, construction and functions are in agreement with the requirements of these specifications, ISI and when ISI is not applicable other approved certifying agencies.

17.0 INSTRUCTION MANUAL:

The contractor shall prepare and produce instruction, operation and maintenance manuals in English for the use, operation and maintenance of the supplied equipment and installations, and submit 3 sets to OWNER, at the time of handing over.

18.0 SAMPLES AND CATALOGUES:

Before ordering the material necessary for this work, the contractor shall submit to OWNER for approval, a sample along with the catalogues.

For big items such as Pump, Prime Mover, Valves, Hydrants, Pipe, Sprinkler the submission of catalogues shall be enough. Prior to ordering any fire fighting equipment/material/system, the contractor shall submit to OWNER, the catalogues, along with the samples, at least from three different manufacturers. After the selection of manufacturer by OWNER, the contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the OWNER.

19.0 VENDOR AND SHOP DRAWINGS:

The contractor shall prepare and submit to OWNER, for his approval, two sets of vendor detailed drawings of all distribution boards, switch boards, outlet boxes, special pull boxes, and other likewise material, equipment to be fabricated by the contractor, or other vendor within 15 days of signing of the contract.

Before starting the work, the contractor shall submit to OWNER for his approval in the prescribed manner, the shop/execution drawings for the entire installation, specially the main connections and junctions, the route of conduits and cables, no. and size of wires drawn through the conduits, location of all the outlet points, and switch boards and distribution boards and any other information required by OWNER. OWNER reserves the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance.

20.0 AS BUILT DRAWINGS:

At the completion of work and before issuance of certificate of virtual completion the contractor shall submit to OWNER, three sets of layout drawing drawn at appropriate scale indicating the complete Fire Protection system "as installed". These drawings must provide (in plan, elevation and section)

Location and details of Fire Pumps, Prime Movers and Panels,

Location of Wet Risers, Hose reel details, Fire Extinguisher, Signages & Sprinkler System.

Location of Fire Brigade inlets & Fire Storage Tank.

21.0 GUARANTEE:

At the close of the work and before issuance of final certificate of virtual completion by OWNER, the contractor shall furnish written guarantee indemnifying OWNER against defective materials and workmanship for a period of one year after completion. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to OWNER, the following:

Any defective work or material supplied by the contractor.

Any material or equipment supplied by OWNER which is damaged or destroyed as a result of defective workmanship by the contractor.

Any material or equipment damaged or destroyed as a result of defective workmanship by the contractor

22.0 SAFETY OF MATERIALS:

The contractor shall provide proper and adequate, storage facilities to protect all the materials and equipment including those issued by OWNER against damage from any cause whatsoever.

23.0 COMPLETION CERTIFICATE:

On completion of the Fire Protection System installation (or an extension to an installation) a certificate shall be furnished by the contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local supply authority. The contractor shall be responsible for getting the **approval/NOC** by the local concerned authorities.

24.0 DEFECTS LIABILITY:

Defects liability period shall mean 12 calendar months after OWNER have issued certificate of completion of the whole work. The certificate of completion shall be issued after the necessary tests have been carried out to the satisfaction of OWNER and the required drawings are submitted.

The contractor shall make good at his own cost and to the satisfaction of OWNER, all defects or other faults arising in the opinion of OWNER out of bad workmanship or faulty materials not in accordance with the drawings, NBC or TAC and the Rules and Regulations under which it may appear within twelve months after completion of the work.

25.0 STAFF:

The contractor shall employ a competent fully licensed qualified, full time erection engineer to direct the work of erection in accordance with the drawings and specifications. The engineer shall be available all times at site to receive instructions from OWNER, in the day to day activities throughout the duration of contract. The engineer shall correlate the progress of the work in conjunction with all the relevant requirements of the supply authority.

26.0 REINSTATING AND FINISHING OF CIVIL DAMAGES:

For erection of equipment / cables etc., if any civil structure is required to be broken, the same shall be done, restated and finished as original by the tendered without any extra cost.

B. TECHNICAL SPECIFICATIONS

1.0 SCOPE OF WORK :

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install Wet riser, Sprinkler, First Aid Fire Protection system as required for all floor as per the drawings and specified here in after or given in the Bill of Quantities.

Without restricting to the generality of the foregoing, the fire safety system shall include the following:-

- a) G.I. piping, Wet riser, Yard Hydrant, Hose box& accessories
- b) Hose reels, Fire Extinguishers etc.
- c) Pump House & Accessories
- d) Sprinkler System
- e) Suction, Delivery & header pipe, fittings, flanges & valves.
- f) Signages

2.0 PIPE WORK :

2.1 GENERAL REQUIREMENT:

All the materials shall be of ISI mark / TAC approved, best quality conforming to the specifications and subject to the approval of the Client or his representative. If so directed, materials shall be tested in an approved testing laboratory & the contractor shall produce the test certificate in original to the Engineer-in-charge & the entire charges for original as well as repeated tests shall be borne by the Contractor.

Before welding, the pipe faces shall be cleared & then shall be welded conforming to IS: 9595 – 1980. The electrodes used for welding shall comply with IS: 814. The laying of welded pipe shall also comply to IS 5822 – 1986. The welding joints shall be tested in accordance to IS: 3600, Part 1973.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

Pipes shall be securely fixed to walls and ceilings by **suitable clamps or supported at every 3 mtrs. & at change of direction as required**. Only approved type of anchor fasteners shall be used for RCC ceiling and walls.

Valve and other apparatus shall be so located that they are easily accessible for operations, repairs and maintenance.

2.1.PIPES AND FITTINGS:

All pipes shall be conforming to IS:1239-1990 (M.S./ G.I. Heavy class) with screwed flanged or welded joints as specified by the Client's Representative.

Pipes (exposed) shall be given two primary coat of Zinc chromate with two coat of compatible epoxy paint give an even look (Fire red, shade No. 536 as per IS: 5).

All black steel pipes under floors or below ground shall be provided with protection against corrosion by application of 100/ 150 mm wide and 4mm thick layer of PYPKOTE/ MAKPOLYKOTE (IS:10221) over the pipe, as per manufacturer's specifications. Checking with holiday testing machine. Excavation of soft soil including backfilling, compacting, watering up to 1.3M depth.

Fittings for M.S. / G.I. pipes shall be approved type malleable iron (forged fittings) for tapered screwed joints. Fittings shall be approved type steel fittings conforming to IS:1239-1982 Part - II for screwed joints and welded.

All fittings such as bends, tees, etc. for 50mm below shall be standard forged fittings. Cast iron fittings and fabricated fittings shall not be accepted.

All piping laid shall be as follows:

| Pipe Size | Material | Joints & Fittings | Sealing Material |
|----------------------|---|--|---|
| Up to 50mm | E.R.W., M.S./G.I. Pipe Heavy Class IS:1239/1979 | Screwed Fittings Unions Raised face Slip-on Flanges | Non- Hardening Lubricant 3mm, 3-ply Rubber insertion |
| 75mm to 150mm | E.R.W., M.S./G.I. Pipe Heavy Class IS:1239/1979 | Welded Fittings Raised face Slip-on Flanges ----- | ----- ----- 3mm, 3-ply Rubber insertion |
| 200mm to 300mm | E.R.W. Welded Pipes (Minimum 6.35 mm Thk.) IS:3589/1981 | Welded Raised face Slip-on Flanges ----- | ----- 3mm, 3-ply Rubber insertion ----- |

Pipes shall be provided with electrical resistance welding. Jointing shall be butt welded between pipe and pipe and fittings.

Joints between C.I. and M.S./G.I. pipes shall be made by provided a suitable flanged tail or sockets piece and M.S. flanges on the M.S./G.I pipe shall have appropriate number of holes and

shall be fastened with nuts, bolts and 1.5mm thick compressed asbestos gaskets.

Tee off connections shall be through reducing tees. Drilling and tapping of the main walls of the main pipe shall not be allowed.

All equipment and valve connections shall be through flanges (Welded or screwed for mild steel).

All welded piping is subjected to the approval of the Client's Representative and sufficient number of flanges and unions shall be provided.

Tender drawings indicate schematically the size and location of pipes. The Contractor on the award of the work, shall prepare detailed working drawings, showing the cross-section, longitudinal sections, details of fittings, locations of isolating and control valves, drain valves and all pipe support, structural supports. He must keep in view the specific openings in buildings and other structures through which pipes are designed to pass. Drawings to be got approved from Local Fire Authorities.

Contractor shall submit the Hydraulic calculation for the system in accordance with Fire Authority By Laws.

Piping shall be properly supported on or suspended from stand clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers, and be responsible for their structural sufficiency.

Pipe supports shall be of steel, adjustable for height and primer coated with rust preventive paint and finish coated back. Where pipe and clamps are of dissimilar materials a gasket shall be provided in between. Spacing of pipe supports shall not exceed the following:

| Pipe Size | Spacing between Supports |
|------------------|---------------------------------|
| Up to 65 mm Dia | 3500 mm |
| 65 to 100 mm Dia | 4000mm |
| 100 to 250 mm | 5000 mm |

Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars steel structural supports attached to pipe and with a 15 mm thick rubber pad or any resilient material. Where pipes pass through the roof floor, suitable flashing shall be provided to prevent water leakage. Risers shall have a suitable clean out at the lowest point and air vent at the highest point. The Contractor shall coordinate with structural.

Pipe sleeves, 50 mm larger diameter than pipes, shall be provided wherever pipes pass through walls and slabs, and annular space filled with fire proof materials like putty, fire seal etc.

Piping work shall be carried out in a workmen like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation and coordination with other agencies work so that particular area work shall be carried out in one stretch.

Piping layout shall take due care for expansion and contraction in pipes.

All pipes using screwed fittings shall be accurately cut to the required sizes and thread in accordance with IS:554 and burrs removed before lying. Wherever reducers are to be made, eccentric reducers shall be used.

3.0 HUME PIPE:

NP3 class R.C.C Hume pipe (IS-458) shall be provided at the road crossing. Hume pipes with mortise - tension jointed with cement and with RCC collar to cover and overlap the joints laid to correct below ground level.

4.0 VALVES:

4.1 GATE/SLUICE VALVES:

Sluice valves of sizes 50mm and above shall be cast iron double flanged solid wedge, inside screw, non rising stem, bolted bonnet Construction. The valves shall have renewable screwed body seat. Pressure rating shall be PN 1.6 and valve shall be as per IS: 14846.

4.2 CHECK VALVES (NON RETURN VALVE):

Check valves / Non Return valve shall normally be used in all water services. Check Valve / Non return valves shall be provided as required or as shown in the drawings and conform to the following specifications:

- a) Type: Dual Plate
- b) Body material: Cast iron
- c) Standard : IS:5312 / API 594
- d) Test Pressure: Body 24 Bar, Seat 16 Bar

4.3 BUTTERFLY VALVES:

All the isolation valve 50cm and above on the equipment and water lines, where specified or shown on drawings shall be wafer type butterfly valves. They shall be designed to fit without gaskets, the water tight seal being obtained by Nitrile seat projection at the faces compressed between the flanges. The valves shall be supplied inclusive of M.S. pipe flanges and high tensile steel bolts of dimensions recommended by suppliers of valves. The valves shall comply with following specification. It is provided as per following specifications:

- a) Type: Wafer type
- b) Pressure rating: PN 1.6
- c) Body Material: Cast iron
- d) Disc Material: Stainless steel
- e) Seat material: Nitrile
- f) Operation: hand Lever
- g) Standard : IS:13095
- h) Test Pressure: Body 24 Bar, Seat 18 Bar

4.4 AIR RELEASE VALVE:

Provide 25mm diameter screwed inlet ball type Gun metal air valve on all high points in the system for venting. Valve shall be of the single acting type, vulcanite balls, rubber seating etc.

4.5 INSTALLATION:

- Valve shall be installing in a manner that allows future removal and service of the valve.
- Packing and gasket shall not contain asbestos.
- The valve shall be of the same size as the pipe to which they are installing.
- Valve above 150mm diameter shall be self locking worm gear type water proof and protory lubricated.
- Provide chain operator's w/chain cleats on all valves more than 2.4 meter above floor.

5.0 HYDRANT VALVES:

Contractor shall provide on each landing and other locations as shown on the drawings one single headed Stainless Steel (S.S.) landing valve with 63mm dia, outlets and 80mm inlet (IS:5290) with individual shut off valves and cast iron wheels. Landing valves shall have flanged inlet and instantaneous type outlet as shown on the drawings.

Instantaneous outlets for fire hydrants shall be standard pattern approved and suitable for fire brigade hoses.

Contractor shall provide for each internal fire hydrant station two numbers of 63mm dia, 15 metre long rubberized fabric lined hose pipes with gunmetal male and female instantaneous type coupling machine wound with CI wire (Hose to IS:636 and couplings to IS:903 with IS certification), fire hose reel, S.S. branch pipe with nozzle IS:903 and fireman's axe.

Each hose box shall be conspicuously painted with the letters "FIRE HOSE".

6.0 HOSE PIPE, BRANCH PIPE & NOZZLE:

6.1 HOSE PIPES:

Two numbers Hose Pipes shall be rubber lined woven jacketed and 63mm in dia. 15m long. They shall conform to type A (Reinforced rubber lined) of IS: 636 - 1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose shall be complete with necessary coupling at the ends to match with the landing valve or with another run of hose pipe or with branch pipe. The couplings shall be of instantaneous swinging type. This shall be conforming to IS: 903.

6.2 BRANCH PIPES:

Branch pipe shall be of S.S. as given in BOQ 63 mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

6.3 NOZZLE:

The nozzle shall be of S.S.as specified in BOQ 20 mm in (internal) diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe. The inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

End Couplings, Branch pipe, and Nozzles shall conform to IS: 903 - 1985.

7.0 HOSE REEL:

Contractor shall provide standard fire hose reels with 25mm dia, rubber hose of 30 metres length with S.S nozzle with 8mm bore, and control valve, connected wall mounted on circular hose reel of heavy duty mild steel construction and cast iron brackets. Hose reel shall conform to IS:884-1969. The hose reel shall be connected directly to the pipe riser through an independent connection.

8.0 FIRE HOSE CABINETS:

Provide MS / FRPcabinets for internal / external hydrants with single or double glass front door and locking arrangement with breakable glass key access arrangement, duly painted red with stove enameled paint fixed to wall or self supported on floor as per site conditions. The cabinet

shall also have a separate chamber to keep the key with breakable glass as per approved design. Hose cabinets shall be stove enameled fire red paint with "FIRE HOSE" written on it prominently. Samples of hose cabinet for internal and external works be got approved from Client's Representative/ Consultant before installation at site.

Fire hose cabinet suitable to accommodate 2 Nos. 15 metres long R.R.L. hoses, 1 No. branch pipe and nozzle.

9.0 FIRE BRIGADE INLET CONNECTIONS:

Fire Brigade inlet connection shall be provided for Fire Tender. It should be installed at a point near the entry to the premises where a fireservice vehicle can approach easily & feed water in system line as well as in underground water tank.

C.I. Two way fire brigade inlet with isolation and check valve shall be installed and connected to system line.

C.I. Four way fire brigade inlet with isolation valve shall be installed and connected to underground water tank.

10.0 AUTOMATIC SPRINKLER SYSTEM:

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install the sprinkler system as required by the drawings and specified hereinafter or given in this Bill of Quantities.

Automatic sprinkler system has been installed at basement parking area. Sprinklers shall be 15mm dia, Quartz bulb type G.M. & operate at 57° C/68° C. Sprinkler should be Pendent / Upright / Side wall type with rosette plate.

Sprinkler system should be separate header with M.S. piping, drain pipe & assembly, flow switch, butterfly valve etc. Water supply to the sprinkler system shall be fed from the separate motor driven sprinkler pump.

Contractor shall supply spare Sprinkler Heads of each type as per requirement and one Spanner for each type of sprinkler neatly installed in a steel box with glass shutters at locations approved by the Engineer-in-Charge.

- a) Sprinkler mains, branch and connection from piping complete with valves, hangers, appurtenances and painting.
- b) Sprinkler heads with spare sprinklers.
- c) Connections to risers, pumps and appliances.
- d) Flow switches, installation valve.
- e) Vertical drain pipes.

11.0 ORIFICE FLANGES:

Provide orifice flanges fabricated from 6mm thick stainless steel plate to reduce pressure on individual Hydrants/ sprinkler to restrict the operating pressure to 3.5 Kg/cm². The design of the orifice flanges shall be given by the Contractor as per the location and pressure conditions of each hydrants/hose reel and get approved from Client's Representative before installation.

12.0 FIRE EXTINGUISHERS:

Installation of fully charged and tested Fire Extinguishing Hand Appliances Carbon Dioxide (Co2) type extinguisher of 4.5 kg, 6 kg DCP powder as required by these specifications and drawings.

Fire extinguishers shall conform to the following Indian Standard specifications and shall be with BIS approved stamp as revised and Amended upto date.

- a) CO2 Type : IS:15683
- b) DCP Powder Type : IS:15683

Fire extinguishers shall be installed as per Indian Standard Code of practice for selection, installation and maintenance of portable first aid appliances IS:2190-1979.

Hand appliances shall be installed in readily accessible locations with the Appliance brackets fixed to wall by suitable anchor fasteners.

Each appliances shall be provided with an inspection, testing, change of charge and other relevant data.

All appliances shall be fixed in a true workman like manner truly vertical and at current locations.

The Extinguisher shall be so distributed over the entire floor area that a person has to travel not more than 15 Mtr. to reach the nearest fire extinguishers.

13.0 SIGNAGES:

Fire Exit Signage: Self illuminate Exit Signage have been provided near all Stairwells, as well as along the Corridors and passages.

Equipment & Instruction Signages: Signages have been provided near all the equipment/ shaft(i.e. Hydrant valve, Hose Reel, Fire Extinguishers etc) for easy to use.

14.0 BALL VALVES:

S.S. ball valves shall be provided with each Hose reel & wherever required for drain purpose as mentioned in BOQ/ Drawing.

15.0 FIRE PUMPS:

15.1 SCOPE:

Contractor shall furnish all labour, materials, equipment for supply, installation testing and commissioning of complete fire pumping system. In general, the item of works shall include but not limited to the following:

- a) 1 no. of Main Pump - Electrically operated pump
- b) 1 no. of Spinkler Pump - Electrically operated pump
- c) 1 no. of Standby Pump –Diesel Engine Driven pump
- d) 1 no. of Jockey Pump - Electrically operated pump
- e) 1 no. of Jockey Pump - Electrically operated pump
- f) Complete electrical system, Panels for pumps.

15.2 MAINPUMP (ELECTRIC DRIVEN):

Contractor shall provide and install electrically operated fire pumps of capacity and head indicated in the Drawings/Bill of Quantities.

Pumping sets shall be single/multi stage horizontal End suction / split casing centrifugal type. The delivery pressure at pump outlet shall be not less than 8.0Kg./cm^2 in any case.

Pumps shall be capable of giving a discharge of not less than 150 % of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of rated head.

The pump casing shall be of cast iron of grade FG 200 to IS:210 and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel.

Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed and number of stages.

The pump casing shall be designed to withstand 1.5 times the working pressure.

15.3 MOTORS FOR ELECTRIC DRIVEN PUMPS:

15.3.1 MOTOR:

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz. System. Degree of protection shall be IP 55. The class of insulation shall be F. Temperature rise limit up to class 'B', duty 'S1'. The synchronous speed shall be 3000 RPM as specified. The motor shall be rated for continuous duty and shall have a horse power rating necessary to drive the pump at 150% of its rated discharge with at least 65% rated head. The motor shall conform to I.S. 325 - 1978.

15.3.2 MOTOR STARTER:

The motor starter shall be soft or variable frequency drive type conforming to IS : 1822 - 1967. The unit shall include suitable current transformer and ammeter of suitable range on one line to indicate the current. The starter shall not incorporate under voltage no voltage trip overload or SPP.

The starter assembly shall be suitably integrated in the power and control panel for the wet riser system.

15.4 JOCKEY PUMP (ELECTRIC DRIVEN):

The discharge of the Jockey Pump shall be 10% of rated discharge of the main fire pump. The pump shall be horizontal split casing / End Suction type single stage or multi stage as specified. The pump casing shall be cast iron and parts like impeller, shaft sleeve, wearing ring etc. shall be non-corrosive metal like bronze, brass or gun metal. The shaft shall be of stainless steel. Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust/ water.

The pump casing shall be designed to withstand 1.5 times the working pressure.

15.5 MOTOR FOR ELECTRIC DRIVEN PUMP:

15.5.1 MOTOR:

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz. System. Degree of protection shall be IP 55. The class of insulation shall be F. Temperature

rise limit up to class 'B', duty 'S1' The synchronous speed shall be 3000 RPM as specified. The motor shall be rated for continuous duty and shall have a horse power rating necessary to drive the pump at 150% of its rated discharge with at least 65% rated head. The motor shall conform to I.S. 325 - 1978.

15.5.2 MOTOR STARTER:

The motor starter shall be soft or variable frequency drive typewith overload trip, but without under voltage / no volt trip. An independent single phasing preventer shall be provided for each motor. The unit shall include ammeter of suitable range on the one line to indicate the current with current transformer as necessary. Starter shall conform to IS 1822 - 1967. The starter shall be integrated in the power and control panel for the wet riser system.

15.6 DIESEL ENGINE:

15.6.1 ENVIRONMENTAL CONDITIONS:

The engine shall be required to operate under the conditions of environment as specified the place of installation.

15.6.2 ENGINE RATING:

The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or combustion chamber (for example, by wicks, cartridge, heater plugs etc.). The engine shall be multi cylinder / vertical 4 stroke cycle, water cooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and after correction for altitude, ambient temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum HP required to drive the pump at its duty point. It shall also be capable of driving the pump at 150% of the rated discharge at 65% of rated head. The engine shall be capable of continuous non-stop operation for 8 hours and at least 3000 hours of operation before major overhaul. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run.

The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS 649/IS 1601/IS 10002, all amended up to date.

15.6.3 ENGINE ACCESSORIES:

The engine shall be complete with the following accessories:-

- a) Fly wheel dynamically balanced.
- b) Direct coupling for pump and coupling guard.
- c) Radiator with hoses, fan, water pump, drive arrangement and guard.
- d) Corrosion Resister.
- e) Air cleaner, oil bath type / dry type.
- f) Fuel service tank support, semi-rotary pump and fuel oil filter with necessary pipe work.
- g) Pump for lubricating oil and Lub. oil filter.
- h) Elect. starting battery (2 x 12 v).
- i) Exhaust silencer with necessary pipe work.

- j) Governor.
- k) Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting).
- l) Necessary safety controls.
- m) Winterization arrangement, where specified.

15.6.4 COOLING SYSTEM:

The engine cooling system shall be radiator water cooled system. The radiator assembly shall be mounted on the common bed plate. The radiator fan shall be driven off the engine as its auxiliary with a multiple fan belt. When half the belts are broken, the remaining belts shall be capable of driving the fan. Cooling water shall be circulated by means of an auxiliary pump of suitable capacity driven by the engine in a closed circuit.

15.6.5 FUEL SYSTEM:

The fuel shall be gravity fed from the engine fuel tank to the engine driven fuel pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself or suitably wall mounted on brackets at a height not less than 60 cm above the fuel injection pump. The fuel filter shall be suitably located to permit easy servicing.

All fuel tubing to the engine shall be with copper, with flexible hose connections where required. Plastic tubing shall not be permitted.

The fuel tank shall be of welded steel construction (3mm thick) and of capacity sufficient to allow the engine to run on full load for at least 8 hours. The tank shall be complete with necessary floor mounted supports, level indicator (protected against mechanical injury) inlet, outlet, overflow connections and drain plug and piping to the engine fuel tank. The outlet should be so located as to avoid entry of any sediment into the fuel line to the engine.

A semi rotary hand pump for filling the daily service tank together with hose pipe 5 mtr. long with a foot valve etc. shall also form part of the scope of work or as specified in Bill of Quantities.

15.6.6 LUBRICATING OIL SYSTEM:

Forced feed Lub. oil system shall be employed for positive lubrication. Necessary Lub. oil filters shall be provided, located suitably for convenient servicing.

15.6.7 STARTING SYSTEM:

The starting system shall comprise necessary batteries (2x12v), 24 volts starter motor of adequate capacity and axle type gear to match with the toothed ring on the fly wheel. By metallic relay protection to protect starting motor from excessively long cranking runs suitably integrated with engine protection system shall be included within the scope of the work.

The capacity of the battery shall be suitable for meeting the needs of the starting system.

The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression.

The scope shall cover all cabling, terminals, initial charging etc.

15.6.8 EXHAUST SYSTEM:

The exhaust system shall be complete with silencer suitable for outdoor installation, and silencer piping including bends and accessories needed for a run of 5 meter from the engine manifold. (Adjustment rates for extra lengths shall also be given). The total back pressure shall not exceed the engine manufacturer's recommendation. The exhaust piping shall be suitably lagged.

15.6.9 ENGINE SHUT DOWN MECHANISM:

This shall be manually operated and shall return automatically to the starting position after use.

15.6.10 GOVERNING SYSTEM:

The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.

15.6.11 ENGINE INSTRUMENTATION:

Engine instrumentation shall include the following:-

- a) Lub. Oil pressure gauge.
- b) Lub. Oil temperature gauge.
- c) Water pressure gauge.
- d) Water temperature gauge.
- e) Tachometer.
- f) Hour meter.

The instrumentation panel shall be suitably resident mounted on the engine.

15.6.12 ENGINE PROTECTION DEVICES:

Following engine protection and automatic shut down facilities shall be provided:-

- a) Low lub. oil pressure.
- b) High cooling water temperature.
- c) High lub. oil temperature.
- d) Over speed shut down.

15.6.13 PIPE WORK:

All pipe lines with fittings and accessories required shall be provided for fuel oil, lub. oil and exhaust system, copper piping of adequate sizes shall be used for lub. oil and fuel oil. M.S./G.I. piping will be permitted for exhaust.

15.6.14 ANTI VIBRATION MOUNTING:

Suitable vibration mounting duly approved by engineer-in-charge shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

15.6.15 BATTERY CHARGER:

Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery under trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

15.7 AIR VESSEL FOR FIRE PUMPS:

Provide on air vessel fabricated from 8 mm M.S. sheet with dished ends and suitable supporting legs, one 25mm dia drain with valve and 25mm ball valve with all necessary accessories. The vessel shall be 450mm x 2000mm dia. high and tested to 12.0 Kg/cm² pressure.

The fire pumps shall operate on drop of 1 Kg/cm² pressure in the mains. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

15.8 CONTROL PANEL:

15.8.1 CUBICAL PANEL:

The main switch board cubicle panel shall be of floor mounted type, totally enclosed, dust and vermin proof made from 14 SWG M.S. sheet of suitable size duly painted with one coat of anti-corrosive paint and two coats of synthetic enamel paint of approved make and shade with stove enameled finish. The cubical shall comprise of the followings:

- a) Incoming main M.C.C.B unit of required capacity.
- b) Outgoing M.C.C.Bs one for each motor.
- c) Aluminium busbar of suitable capacity.
- d) Fully Automatic "DOL" starter suitable for the motor H.P. with Push Buttons and ON/OFF indicating light one for each motor for all pumps.
- e) Single phasing preventers one for each motor.
- f) 96 mm² panel type Ampere meters - one for each motor complete with CTs.
- g) 150 mm² voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.
- h) Three neon phase indicating lamps.
- i) Rotary switch for manual/auto operation.
- j) All color coded internal and inter-connecting wiring from incoming main to bus bar, switch board panel and power/control cables from switch board cubicle to motors, engine and batteries etc. complete in all respect.

All switchgears and accessories shall be approved make to relevant IS codes and to the satisfaction of Client's Representative/Consultant and rating of all equipment must match the KW of motors included and as per TAC rules. All electrical work to be carried out as per TAC and NBC rules/specifications.

15.8.2 EARTHING:

There shall be two independent earthing stations at least 3 meters away from the pump room. Each earth electrode shall consist of GI earth plate 600mmx600mmx6mm thick including accessories and masonry enclosure with cover plate having locking arrangement. All electrical apparatus, cable boxes and sheath/armour clamps shall be connected to the main bar by means of branch earth connection of 25mm x 5mm copper strip. All joints in the main bar and between main bar and branch bars shall have the lapping surface properly tinned to prevent oxidation. The joints shall be riveted and sheathed. The main earthing strip shall be 25 x 5mm copper in 40mm dia G.I. pipe from earth electrode as required.

Earth plates shall be buried in a pit 1.2 x 1.2m at minimum depth of 3 meters below ground. The connections between main bar shall be made by means of these 10 mm studs and fixed at 100mm centers. The pit shall be filled with coke breeze, rock salt and loose soil. A G. I pipe of 29mm dia with perforations on the periphery shall be placed vertically over the plates to reach ground level or watering.

A brick masonry man hole 30x30x30cms size shall be provided to surround the pipe for inspection. A bolted removable link connecting main bar outside the pit portion leading to the plates shall be accommodated in this manhole for testing.

Earthing shall be done complete as per NBC / TAC specifications.

15.8.3 CABLING:

All cables from switch board panel to the motors shall be PVC insulated and PVC sheathed armoured aluminum conductor power cables of 650/1100 V grade conforming to IS:1553. The cables of required size shall be suitable for laying on surface of wall or in flooring with suitable clamps. Necessary cable trays shall be deemed to be included in this item as per site requirements.

The termination shall be with brass compression glands suitable for PVC sheathed armoured aluminium conductor cable of 1.1 KV 'A' grade of the required size.

15.9 PRESSURE GAUGE & PRESSURE SWITCH:

Contractor shall provide 150 mm dia Pressure Gauge of range 0 - 15 Kg /cm² conforming to IS - 3624 having bourdon tube of stainless steel 310 in cast aluminium, stove enamelled, black, weather proof case with outer, screwed aluminium bezel and complete with necessary U-type stainless steel siphon tube and cock including providing suitably painted angle iron support to the tube. Pressure gauge shall be provided at each pump suction, delivery line & common delivery header.

Contractor shall provide Pressure Switches for automation of fire pumps. Pressure switches shall be double pole single throw type suitable for 3 phase supply with diaphragm. Aluminum Enclosure with IP 66 protection as required.

15.10 'Y' WITH STRAINER:

Contractor shall provide C.I. 'Y' strainer at pump suction as specified in Bill of Quantity.

16.0 TESTING OF THE SYSTEM:

All piping shall be tested to hydrostatic test pressure of 12 Kg/Cm² for a period of not less than 2 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Client's Representative.

Piping required subsequent to the above pressure test shall be re-tested in the same manner.

System may be tested in sections and such sections shall be securely capped.

The Client's Representative shall be notified well in advance by the Contractor of his intention to test a section of piping and all testing shall be witnessed by the Client's Representative.

The Contractor shall make sure that proper noiseless circulation of fluid is achieved through the system concerned. If proper circulation is not achieved due to air bound connections, the Contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification including the tarring-up and re-finishing of floors, walls etc. as required.

The Contractor shall provide all materials, tools, equipment, instruments, services and labor required to perform the test, and shall ensure that the plant room and other areas are cleaned up and spill over water is removed.

The Contractor shall give the pressure test of head for external yard hydrant at ground level and also for hydrant at terrace level.

All air shall be trapped from the pipeline through hydrants, Hose Reel & air valves. Each section of the pipe shall be slowly filled with the water & allow to stand the water for few hours with the ends closed.

Flushing of underground connections: Underground mains and lead-in connections to system risers shall be flushed before connections made to piping in order to remove foreign materials which may have entered the underground during the course of installation. For hydrant system the flushing operation shall be continued until water is clear.

17.0 COMMISSIONING OF SYSTEM :

Before commissioning, the entire system shall be flushed to ensure that any earth /foreign matters which might have entered during installation are taken out. For this, pump may be operated and valves opened at different locations.

As soon as the work is complete, the system shall be commissioned and made available for use. Requirement of fire fighting installations is equally important during occupation of the building. If the building is to be occupied in part, fire fighting system of building completed shall be commissioned by isolating the system of under construction portion of the building.

The fire fighting system shall be maintained and manned from the very first day of its Commissioning.

Any defects noticed during the warranty period shall be promptly attended by the Contractor and availability of the system at all time is to be ensured.

18.0 ACCEPTANCE TEST:

At the time of taking over, the hydrant system shall fulfil the following acceptance tests:-

Starting up of the pressure suction (Jockey Pump): The pressure switch shall be set at 7.0 kg/cm^2 at the lower limit and 8.0 kg/cm^2 at the upper limit. The system drain shall be opened to cause a drop in the pressure. The Pump shall start as soon as the pressure gauge needle falls down to 7.0 kg/cm^2 . The pump shall also stop automatically when the system has been pressurized again up to required pressure (8 kg/cm^2).

All these tests mentioned above shall be repeated after one hour interval. The result of all the tests shall be identical again. After the system has satisfactorily withstood the above tests, it can be taken over from the contractor.

19.0 START-UP / SYSTEM TESTING:

It will be the responsibility of the tenderer to cause interim/stage inspection by the TAC/CFO during execution of the work as and when so called for by the Employer / Architect and shall carry out any rectification / modification as may be suggested by the Tariff Advisory Committee (TAC) / State Fire Officer (CFO).

Soon after the work is completed, the contractor shall inform the TAC/CFO in writing with a copy to the Architect / Employer for getting the complete system including all sub system and instrumentation, control etc. thoroughly inspected and tested for satisfactory performance. After satisfactory completion of tests of the systems by the TAC / CFO the contractor shall be required to submit in built drawings on tracing cloth to the Architect which have been so approved.

In addition to TAC, the contractor shall also be responsible for getting the system and equipment tested and approved by other Statutory Authorities like the Area Fire Officer or the State Fire Services as may be required.

20.0 HANDING OVER:

All commissioning and testing shall be done by the Contractor to the complete satisfaction of the Engineer-in-Charge / Consultants, and the job handed over to the Client. Contractor shall also hand over to the Client all maintenance and operation manuals and all items as per the terms of the contract.

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| | FIRE FIGHTING SYSTEM | |
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C. CODES & STANDARDS

| SR. NO. | IS NO. | TITLE |
|---------|-----------------------|---|
| 1 | IS: 325 | Motors |
| 2 | IS:458 | Hume Pipe |
| 3 | IS:636 | RRL Hose |
| 4 | IS:778 | Gun Metal valves |
| 5 | IS:14846 | Sluice valve |
| 6 | IS:884 | Fire Hose Reel |
| 7 | IS:903 | Fire Hose, couplings, branch pipe, nozzles |
| 8 | IS:1239 / 3589 | G. I. Pipe / M.S. pipe |
| 9 | IS:5132 | Rubber Hose Pipe |
| 10 | IS:13095 / API 609 | Butterfly valves |
| 11 | IS:5290 | Fire Hydrants |
| 12 | IS:5312 / API 594/598 | Non Return Valves |
| 13 | IS:6595 / 12469 | Pumps |
| 14 | IS:8423 | C. P. Hose |
| 15 | IS:10001 / 10002 | Diesel Engine |
| 16 | IS:10221 | Coating / wrapping of underground M.S. pipe |
| 17 | IS:15683 | Fire Extinguishers |
| 18 | IS:12349 | Signages |