



# **Gujarat University**

## **TECHNICAL SPECIFICATIONS**

### **FIRE FIGHTING WORK**

Tender No: GU/ESTATE/CULT/2018-19/01

#### **Tender Document**

**For Construction of Computer Science, Central  
Research, Upasana performing arts, Library science &  
Transit House Building  
at Gujarat University**

**CONTENTS**

<b>SECTION A:</b>	<b>TECHNICAL SPECIFICATION</b>
<b>SECTION B:</b>	<b>LIST OF CODES FOR FIRE FIGHTING SERVICES</b>

## **SECTION A – TECHNICAL SPECIFICATION**

### **1. SCOPE OF WORK**

Work under this scope shall consist of design, supply, installation, testing & commissioning of all labour, materials, equipment and appliances necessary for fire protection & fighting systems described in this specification, schedule of quantities, drawings etc.

Without restricting to the generality of the foregoing works, the scope of work shall include the following -

- Design, Supply, Installation, Testing and Commissioning of underground and over ground Ring main of Hydrant & Sprinkler pipelines originating from existing underground fire pump house till connecting point of existing wet riser mains in the SDF and CFB at ground floor level.
- The Hydrant and Sprinkler pipe ring main will be installed over ground. Underground ring main will be done only wherever necessary.
- External firefighting lines related works, including supply and fixing of hydrant around the buildings and isolation valves, fire service inlets, alarm control valves, hose cabinets, hoses and branch pipes
- Supply, Installation, Testing and Commissioning of Swinging Types Hose Reels internal to buildings in the SDF and CFB including air vent valves in the terminating points of wet riser mains
- Augmentation, repairing and Commissioning of existing fire pumps including instrumentation
- Analogue addressable type Fire detection & alarm system along with all other relevant accessories.
- Portable First Aid Fire Extinguishers

### **2. SPECIFICATIONS**

- 2.1 Work under this scope shall be carried out strictly in accordance with specifications attached and all relevant latest Indian standards, National building code (NBC) – 2005, Part - IV, local fire approval authority and any other statutory bodies.
- 2.2 Items not covered under these specifications shall be carried out as per specifications of the latest local fire officer's regulations with latest amendments as applicable in the contract.
- 2.3 Works not covered under Para 2.1 and 2.2 shall be carried out as per latest relevant Indian standards. In the event of the works not covered by Indian standards, British / American Standards shall be followed.

### **3. EXECUTION OF WORK**

The work shall be carried out in conformity with the firefighting system drawings.

#### **4. REFERENCE POINTS**

Reference points shall be in relation to the levels and locations given in the firefighting drawings.

#### **5. TESTING**

- 5.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.
- 5.2 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.

#### **6. PIPES AND FITTINGS**

- 6.1 Pipe for firefighting shall be M.S. pipe conforming to IS: 1239: 2004 (Heavy Grade) including all fittings like bends, elbows, tees, anchor fasteners, couplings etc., and shall be of reputed make.
- 6.2 Pipe for Internal Work
  - 6.2.1 All pipes within the building in exposed locations, shafts, under ceiling and service tunnels including connections buried under floor shall be M.S. tubes of class and thickness specified. Pipes 150 mm diameter and below shall conform to IS: 1239: 2004. Pipes 200 mm diameter and above shall be rolled and welded conforming to IS: 3589: 2001 with 6 mm wall thickness or as specified in the schedule of quantities. The pipe/tube supplied shall be as per the vendor list provided.
  - 6.2.2 For Pipes 50 mm diameter and below, Socket welded fittings shall be used for jointing. For Pipes 65 mm diameter and above Butt welded fittings shall be used for jointing.
- 6.3 For External Work
  - 6.3.1 All pipes outside the building shall be M.S. heavy grade pipes conforming to specification.
  - 6.3.2 Fittings for M.S. heavy grade pipes shall be similar to those used for internal work.
- 6.4 Pipe Joining
  - 6.4.1 M.S. Pipes 50 mm diameter and below shall be provided with socket welded joints.
  - 6.4.2 Pipes 65 mm diameter and above shall be joined by electrical resistance welding. Joints shall be butt welded between pipes and pipes & fittings.
  - 6.4.3 Flanges shall have appropriate number of holes as per the relevant IS Standard fastened with nuts, bolts and 3 mm thick compressed asbestos gasket.

#### **7. PIPE PROTECTIONS**

- 7.1 All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two coats of synthetic enamel paint of fire red colour.
- 7.2 All pipes under floors or below ground shall be protected against soil corrosion by wrapping and coating material as per 10221: 1982.
- 7.3 Supply and providing pipe coating and wrapping as follows:-

- 7.3.1 The pipes (buried) should be initially brushed to remove all foreign materials.
  - 7.3.2 Apply a coat of fibre, coal tar and solvent-based primer. The primer shall be allowed to dry until the surface becomes tacky. The primer shall be applied by brushing so as to produce effective bond between metal and subsequent coating.
  - 7.3.3 The tape 4mm thick and 150 / 250 mm wide, comprised of tar based polymeric mix supported on a fabric of high tensile strength fibre glass shall be wound spirally using thermos fusion process to completely adhere with the primer-coated surface and overlaps of 12mm as per IS 10221 : 1982 should be maintained.
- 7.4 Each end of the pipe left uncoated for welding purpose shall be hand coated and wrapped after field welding is completed and surface cleaned.

## **8. HOLIDAY TEST**

On completion of the wrapping & coating, it shall be tested using efficient high voltage holiday detectors, operating at a voltage high enough to jump an air gap the length of which is equal to the thickness of the coating. All holidays found shall be repaired and the repairs shall be retested with holiday detector to ensure that adequate repairs have been made. Holiday testing shall be carried out by flexible and detachable ring probe, which shall enable the entire 360 degree of the surface of the pipe to be scanned.

## **9. PIPE SUPPORTS**

- 9.1 All pipes shall be adequately supported from ceiling or walls by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats or by using anchor fasteners type as per details given in drawings/as per site conditions. All M.S. structural shall be painted with one coat of red oxide and two coats of Red Synthetic enamel paint.

## **10. FIRE HYDRANTS**

- 10.1 The general design of landing valves shall confirm to IS: 5290: 1993 and shall be suitable for indoor / outdoor operations as stated in NBC 2005 Part IV. The landing valves shall be installed at one metre above ground level as per fire brigade regulations. The yard hydrant valves shall be provided with stand post. The yard hydrant is of single outlet, instantaneous & oblique type. Hydrant valve shall be protected from vehicle hitting by means of a barricade post such as bollard pipes with necessary arrangements wherever installed near roadside. All jointing material such as bolts, nuts and gaskets are required for fixing. The isolation valves shall be provided in hydrant ring mains for maintenance.
- 10.2 Hydrant valve body, Stop valve, Check nut, instantaneous female outlet and blank cap shall be made either of leaded-tin-bronze conforming to grade LTB-2 of IS 318: 1981.
- 10.3 The Valve spindle shall be made up of Brass rod confirming to IS 320: 1980 or IS 319: 2007 for use with body of leaded tin bronze.
- 10.4 The Hand wheel shall be made of mild steel conforming to IS 226: 1975 or cast iron

confirming to IS 210: 1978.

10.5 The valve top except the face of the flange and the instantaneous outlet shall be painted fire red of shade No 536 of IS 5: 2007. The outside of instantaneous outlet shall be highly polished. The hand wheel shall be painted black. Paints shall confirm to IS 2932: 1974.

10.6 External fire hydrant of with hose cabinet shall be provided, complete in all respects outside the building. Each fire hose box shall adhere to the following;

10.6.1 Hose cabinets shall be M.S type with single or double glass front door and locking arrangements with breakable glass key access arrangement duly painted red with stove enamelled paint (overall size 750 x 600 x 250 mm deep) and fixed to wall or self- supported on floor as per site conditions.

a) External hose boxes for yard hydrants shall contain 2 Nos. of 15m long hoses with gunmetal male and female instantaneous type couplings machine wound with G.I. wired along with gunmetal branch pipe with nozzle.

b) Reinforced Rubber Lined Hose shall be as per IS 636: 1988 Type - A and couplings, gunmetal branch pipe with nozzle shall be as per IS 903: 1993.

10.7 Internal fire hydrant with hose reel drum shall be provided at all FEA shafts (inside the building).

10.7.1 Hose reel drum with 19mm rubber hose of 36m length and 32mm diameter globe valve shall be conforming to IS:884 - 1985 & as per the requirement of local fire service department.

10.7.2 All internal hydrant system shall be confirming to IS 3844 : 1989, shall contain 2 Nos. of 15m long hoses with gunmetal male and female instantaneous type couplings machine wound with G.I. wired along with gunmetal branch pipe with nozzle. Spindles will be provided to hold fire hoses.

## **11. VALVE CHAMBER**

Valve chamber shall be suitable brick masonry chamber in cement mortar 1:5 (1 Cement: 5 coarse sand) on cement concrete foundations 150 mm thick in 1: 5: 10 mix (1 Cement: 5 fine sand: 10 graded stone aggregated 40 mm nominal size) 15 mm thick plaster inside and outside finish with a floating coat of neat cement inside with R.C.C cover slab, including excavation, back filling complete.

## **12. VIBRATION ELIMINATORS FOR FIRE PUMPS**

Double flanged reinforced neoprene flexible pipe connectors shall be provided on all delivery lines. Connectors shall be suitable for a working pressure of each pump. Length of the connector shall be as per manufacturer's details.

## **13. AIR VESSELS FOR FIRE PUMPS**

Air vessel fabricated from 6 mm M.S. sheet with dished ends and suitable supporting legs shall be provided with a 25 mm diameter connection from fire pumps common delivery

header, one 25 mm diameter drain with isolating valve, one gunmetal water level gauge and 25 mm sockets for pressure gauge. The vessel shall be 300 mm diameter x 1500 mm height and tested to 1.5 times pumps head.

#### **14. SPECIFICATION OF WELDING ELECTRODES & QUALITY CONTROL FOR WELDING**

##### **14.1 Quality Control for Welding**

14.1.1 Welding machines mobilised shall be in good working condition and shall have proper control for regulating current. Adequate spares shall be kept in stock at site during the execution of the work for routine maintenance. Location of welding machines and the distribution boards to be connected with them shall be decided in consultation with site electrical supervisor to avoid overloading of the distribution boards, cables and electrical power sources.

14.1.2 For executing site fabrication/ welding the electric cables, distribution boards and connections for machines shall be carefully checked once a week and maintained in good working condition. Welding cables used shall have proper insulation throughout the length. The cables shall be carefully examined and repaired as necessary every day.

14.1.3 All welding shall be performed strictly in accordance with the welding requirements detailed in approved WPSs and ASME Boiler and Pressure vessel code Section IX. Suitable WPSs to be adopted for welding are required to be qualified.

##### **14.2 Welding Electrodes:**

Generally all welding shall be performed using Shielded metal arc welding (SMAW) process using cellulosid-coated electrode (E 6013 type) for root run and subsequent passes

###### **14.2.1 Storing of Welding Electrodes:**

Welding electrodes shall be stored indoors free from moisture. The package of the welding electrodes shall not be opened until immediately before use.

###### **14.2.2 Handling of Welding Electrodes:**

During welding work, welding electrodes shall be stored in heated quivers. The lid of the quiver shall be kept closed to ensure that the electrodes are not exposed to moisture in the atmosphere.

###### **14.2.3 Brands of Welding Electrodes:**

The following approved makes of welding electrodes shall be used during fabrication and erection work:

1. Ador Welding
2. ESAB

Use of any other brand of electrodes is subject to approval by client.

14.2.4 No welding shall be done if there is impingement of any rain, or high winds on the weld area except when suitable protection or shield against the rain or wind

is provided.

14.2.5 Tack welds may be done either with full penetration or as bridge tacks. If full penetration tacks are made, the ends shall be ground to featheredge and inspected for presence of any defect. If tacks are cracked, these shall be completely removed by grinding and the area shall be inspected by Dye Penetration examination to ensure freedom from defects.

14.2.6 Before welding, the ends shall be cleaned by wire brushing, filing or grinding. Each weld-run shall be thoroughly cleaned to remove the slag, irregularities and any defects, before the next run is deposited.

14.2.7 Welding of any joint shall be completed and uninterrupted. If this cannot be followed for some reason, at least first two passes shall be welded prior to interruption.

#### 14.2.8 Control of Welders

##### i. Qualification of welders

Qualified and certified welders only shall do welding. All welders assigned to the work shall be qualified by test as per the WPSs in accordance with ASME code Sec. IX and approved by QA/QC Engineer. Welders deployed for welding piping joints shall have qualification in SMAW process in 6G positions in accordance with ASME code Sec. IX. Qualified welders whose qualification is still valid, may be deployed subject to the engineer-in-charge approval. Welding qualification records shall be maintained at site for reference of client at any time.

##### ii. Instruction to Welders

Welding procedure and other related requirements should be fully explained to each welder and fitter prior to welding work. Welding shall not be started if bevel preparation and fit up of the base materials to be welded is not correct.

##### iii. Identification of Weld

An identification number shall be given to each welder. Each weld shall be identified by marking the welder's identification number given. This shall be marked on the welded seam or at an adjacent location with metal marker.

## 15. ENAMEL PAINTING

### 15.1 Application:

Paints shall be thoroughly stirred before pouring in small containers and while applying, to ensure uniform consistency. The operation for each coat shall consist of a stroke of the brush given from the top downwards, another from the bottom upward over the first stroke and similarly sideways before it dries. No brush marks, hair marks or clogging of paint puddles shall be left. Each coat shall be allowed to dry before the next coat is applied. After the work is complete, the brushes shall be cleaned of paint and linseed oil by rinsing with turpentine.

### 15.2 Requirements:

Characteristic	Requirement
Water content percent by mass	0.5



Drying Time	
a) Surface dry	< 6 hrs
b) Tack free	<12 hrs
c) Tack free	<24 hrs
Mass in Kg/10 L under coat	12
Mass in Kg/10 L finishing coat	8.5

## 16. PORTABLE FIRST AID FIRE EXTINGUISHERS

### 16.1 Fire Extinguishers:

- 16.1.1 Portable extinguishers are used to fight fires at incipient stages. The various types of Extinguishers that shall be distributed according to the nature of hazard in this building are Water expelling type, Carbon dioxide type, Foam type and ABC type extinguishers.
- 16.1.2 Hand fire extinguishers shall be enamel alloy steel cylinder, provided with a trigger or seat type valve locking pin or a seal and discharge horn.
- 16.1.3 The contents of the extinguisher may be carbon dioxide or powder depending on fire class and storage location. The contents shall be such that no poisonous fumes or dangerous acids shall be produced in any case.
- 16.1.4 Size and type of hand fire extinguishers shall be subject to approval by the local fire service department. Shall conform to IS 2190:2007 and IS 15683:2006.
- 16.1.5 Fire Extinguishers shall be fire red finished and provided with labels indicating dates of filling and renewal & IS codes No. etc. All Fire extinguishers shall have ISI Mark certification.

## 17. FIRE BRIGADE INLET

- 17.1 A two – way / four – way collecting head with built-in non-return valves fitted to the Wet-riser riser main, so that in case of need, the fire brigade can directly pressurize the system with their pump.
- 17.2 Fire brigade inlet consists of 2 1/2" (63 mm) male instantaneous coupling for feeding water into Wet Riser pipe having outlet of 6" (150 mm) NB as per ANSI-B-16.5B 150#.
- 17.3 Fire brigade inlet is made up of Bronze / C.I material as per IS: 1865:2005. And the entire body should be painted red.
- 17.4 Drain valve should be provided along with Fire brigade inlet neck for maintenance purpose.

## 18. STRAINER

Strainer will be of pot-strainer type with flanged ends and construction shall be as per relevant IS. The pot strainer shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of screen without disconnection of the main pipe.

## 19. PRESSURE GAUGE & PRESSURE SWITCH

The range of pressure gauge, pressure switch and differential pressure switch will be from 0 to 21 Kg/Sq.cm and shall have all required fittings, accessories and valves.

## **20. GENERAL**

- 20.1 Cost of painting of all equipment, piping, etc. shall be included in each item as given in the specifications.
- 20.2 The contractor shall provide all anchor fasteners and their installations for successful completion of work.

## **SECTION B – LIST OF CODES FOR FIRE FIGHTING SERVICES**

### **LIST OF CODES FOR FIRE FIGHTING SERVICES**

1. Part IV – 2005 National building code of India – Fire and Life Safety
2. IS: 1239 -2004 Specifications for mild steel tubes, Part I & II) tubular and other wrought steel fittings.
3. IS: 3589 -2001 Specifications of steel pipes for water and sewage (168.3 to 2540 mm outside Diameter)
4. IS: 778 -1984 Specifications for copper alloy gate, globe and check valves for water works purposes.
5. IS: 14846 -2000 Specifications for sluice valves for water works purposes (50 to 1200 mm size).
6. IS: 5312 – 2004 Specifications for swing check type reflux (Non- return) Valves for water works purposes
7. IS: 5290 – 1993 Specifications for landing valves.
8. IS: 884 – 1985 Specifications for first-aid hose reel for fire fighting
9. IS: 903 – 1993 Specifications for fire hose delivery couplings, branch pipe, nozzles and nozzles spanner.
10. IS: 2190 – 2010 Code of practice for selection, installation and maintenance of portable first- aid fire extinguishers.
11. IS: 2878 – 2004 Specifications for fire extinguisher Carbon dioxide type.
12. IS: 3844 – 1989 Code of practice for installation and maintenance of internal fire hydrants and hose reels on premises.
13. IS: 2189 – 2008 Code of practice for selection and maintenance of automatic fire detection and alarm system.
14. IS: 15105 – 2002 Design and Installation of fixed Automatic sprinkler fire extinguishing systems
15. IS: 1538 – 1993 Specifications for cast iron fittings for pressure pipes for water, gas and sewage