
**CONSTRUCTION/EXTENSION OF GURU RAMDAS LANGAR HALL
AT
SRI HARMINDER SAHIB, AMRITSAR**

**TENDER DOCUMENT
FOR
FIRE PROTECTION WORKS**

Owner : **SHIROMANI GURDWARA PARBANDHAK
COMMITTEE
SRI AMRITSAR.**

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**PROJECT: CONSTRUCTION OF GURU RAMDAS LANGAR HALL,
AT SRI HARMINDER SAHIB, AMRITSAR**

PLUMBING/SANITARY & FIRE PROTECTION WORKS

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I) 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 these conditions, General Conditions of Contract, Specifications, Bills of Quantities and Drawings, the most stringent of the above shall apply for execution of the work as per decision of Project Manager (Client's representative) at site.

The materials, design and workmanship shall satisfy the specifications contained herein and Codes referred to. Where the technical specifications stipulate the requirement in addition to those contained in the Standard Codes and specifications those additional requirements shall also be satisfied. In the absence of any Standard/ Specifications covering any part of the work covered in this tender document, the instruction/ directions of Project Manager will be binding on the contractor.

The scope of this section is to describe materials and systems for complete Plumbing/Sanitary and Fire protection installations of building which form together with the project documents, a complete volume of work and quality description.

All electrical installation shall be of high quality, safe, complete and fully operational including all necessary items and accessories whether or not specified in detail. All electrical work shall be completed in accordance with the regulations and standards to the satisfaction of the Project Manager/Consultants. The general provisions, special provisions and general requirements apply to the entire installation.

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

2.0 **OWNER, ARCHITECT, SERVICES CONSULTANTS:**

The Owner, Architects & Services Consultants for the subject work are:

OWNER
SHIROMANI GURDWARA PARBANDHAK COMMITTEE,
AMRITSAR,PUNJAB

SITE
GURU RAMDAS LANGAR HALL.
SRI HARMINDER SAB,
AMRITSAR
PUNJAB.

SERVICES CONSULTANTS
M/s. Narinder Singh Consulting Engineers
G-128, Nariana Vihar,
New Delhi – 110028
E-mail: hvacconsult@hotmail.com

3.0 SCOPE OF WORK

Contractor shall furnish all labour, materials, factory supplied new equipment, transportation and incidentals necessary for supply, installation, testing & commissioning of complete Sprinkler & Drainage Works as described in these documents & drawings.

The works to be executed under the contract comprise as detailed here under for:

3.1 FIRE PROTECTION & SPRINKLER SYSTEM

Supply, Installing, Testing and Commissioning of following:

- a) Fire Hydrant System (Internal)
- b) Automatic Sprinkler System
- c) Fire Extinguisher

4.0 Before commencing the works the Contractor shall supply to the Owner for their approval

- a) Drawings showing the general arrangement of temporary facilities.
- b) Provisions for dealing with any water encountered on the works.
- c) Arrangements and methods of execution including all devices whatsoever for the whole of the works.
- d) Order in which the Contractor proposes to execute the work. This will be indicated by diagrams and description. This will be subject to adjustment and approval by the Owner.
- e) Any other item of specific relevance to the Contract if requested by the Project Manager.

Unless specifically mentioned otherwise all the relevant codes & standards published by the Bureau of India Standards before the acceptance of the contract shall apply and govern in respect of design, workmanship, quality and properties of materials, testing and measurements.

5.0 The contractor shall organise his operations in a workman like manner and take all necessary precautions to provide safety and prevent accidents on the site to both person and property, more so if they will be working in proximity to working machinery of existing plants in operation. The Owner shall have the power in requiring the contractor to adopt from time to time such measures as they may consider necessary to ensure the above requirements. The Owner shall not be responsible for any consequence resulting from violation of safety requirements. In particular the Contractor shall ensure compliance with the following safety codes:-

- IS : 3696 (Pt. I) - Safety code for scaffolds and ladders - pt. I, scaffolds.
- IS : 3696 (Pt. II) - DO - pt. II - Ladders.
- IS : 4130 (Pt. III) - Safety code for demolition work.
- IS : 4014 (Pt. II) - Code of practices for steel Tubular Scaffolding - pt. II - Safety Regulations for Scaffolding.

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- 6.0** No escalation of any account shall be allowed, till the final completion of work. All duties taxes octroi, turnover tax etc. shall be borne by the contractor.
- 7.0** Latest relevant BIS specifications shall govern this contract and work shall be carried out strictly in accordance of these.
- 8.0** Time is the essence of this contract. The contractor is expected to work in more than one shift. Nothing extra shall be paid for the same.
- 9.0** The Contractor must submit a Time Schedule with the Tender. The same shall be reviewed during the time of execution. Suitable amendments shall be made in the work programme if in the opinion of the Project Manager the progress of the work is not satisfactory. Nothing extra shall be paid for the same.
- 10.0** In case the contractor fails to match the progress of the work to the programme approved by the Project Manager/Owner, the Owner reserves the right to get the complete or a portion of the work executed by any other agency at the risk of the contractor.
- 11.0** The Contractor shall remove all unserviceable material and such other materials as directed by the Owner from time to time from the site, at his own cost and maintain the site clean to the satisfaction of the Owner. Nothing extra shall be paid for the same.
- 12.0** Rates for extra items shall be derived in order, as under :
- i) From the nearest item of the Tender,
 - ii) Actual cost plus 15% towards overheads and profit.
- 13.0** In case of delay a penalty shall be imposed on the contractors as Liquidated Damages. The decision of Project Manager/Owner in this matter shall be final, conclusive and binding on the contractor. Refer Annexure-IV.
- 14.0** The Owner shall not provide any equipment/machine required for any of the operation as described in the drawings, schedule of quantity, specifications etc.
- 15.0** The contractor must get acquainted with the proposed site of the work and the specifications and conditions carefully before tendering. The work shall be executed as per programme approved by the Project Manager/Owner. If part of site is not available for any reason or there is some unavoidable delay in supply of materials stipulated by the Owner, the programme of execution shall be modified accordingly and the contractor shall have no claim for any extras or compensation on this account of delays or work in odd hours since it is the running property. At no point of time the existing services will be disconnected without prior approval of SGPC or Consultants.
- 16.0** Immediately after the award of work, the contractor shall produce samples of all materials to be used and incorporated in the works for approval of the Project Manager. Only materials conforming to the approved samples shall be used in the works.
- 17.0** The architectural and other drawings shall, at all times, be properly correlated for executing any work. Samples shall be prepared for approval before starting any items of work specified by the Project Manager including verifying & getting the layout-approved etc.
- 18.0** Rates quoted for the items in all individual sections shall be valid for carrying out the items of work at any place, any level and at any height.

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- 19.0** Collection and stacking of materials shall include all leads. The rates quoted by the contractor shall hold good irrespective of the source from which the materials are brought so long as they conform to the specifications and as approved by the Project Manager.
- 20.0** The contractor shall be responsible for watch and ward and handling, storing of all materials handed over to him by the Owner or brought by him to the site. Nothing shall be paid to him for this.
- 21.0** The drawings referred to in the tender documents are available for inspection to the intending tenderers in the office of the Project Manager. Tenderers shall inspect the same and acquaint themselves with the work to be executed. The contractor shall have no claim or reference to these drawings in respect of any of the rates after acceptance of the tender.
- 22.0** When required by the Project Manager, the contractor shall supply for the purpose of testing, samples of any materials to be used in the works as per specifications. The contractor shall provide all such samples at his own cost including suitable packages to contain them, to the Owner. All the expenditure required suitable packages to contain them, to the samples, packing them, conveyance, handling & delivery upto the testing charges and fees to be paid in this respect shall be borne by the contractor including cost of all materials and samples.
- 23.0** The period and time limit for virtual completion of the works shall be 12 Calendar Months from the date of issue of work order to commence works or landing over of site in respect of the award of contract. This time period shall be inclusive of the mobilisation period and monsoon period.
- 24.0** Time Schedule shall be submitted by the contractor and it shall be reviewed periodically in consultation with the Consultants and Client. The time schedule of the activities shall be so done by the contractor so as to finish the work within the stipulated, stagewise and total completion time.

The work have to be executed in shifts and all necessary arrangements are to be made by the contractor & nothing extra shall be claimed for the by the Contractor.

- 25.0** Contractor shall obtain comprehensive all risk (CAR) insurance policy to cover damages to and loss of property and person as under :
- a) Civil Work under construction including all adjacent boundary walls, power,lines, water supply lines, sewer lines, road telephone cable etc.
 - b) Material at site including plants, machinery and other perishable items.
 - c) Injury to persons belonging to the Employer & their Employees, Project Managers, Consultants, Suppliers & Visitors to site or adjacent premises.
 - d) Compensation payable under N C A on account of injury to all workers belonging to the contractors or to the sub contractors.
- 26.0** Contractors shall submit once every fortnight, a detailed report of the following :
- a) Materials procured, consumed & balance at site for previous week as well as expected deliveries during next fortnight.
 - b) List of equipment and machinery at site, stand by as well as those under repair & equipment scheduled to arrive during next fortnight.
 - c) Skilled unskilled, labour & supervisors working at site during past week & expected increased in next fortnight.
 - d) Steps proposed for speeding up the progress of work in the next week.

Contractor must appoint full time responsible site Engineer conversant with the nature of works and attend all site meetings etc.

- 27.0** It should be carefully noted that numerous agencies will be working in the project simultaneously and the contractor shall have to work at every stage in close coordination with each of these agencies. He shall have to programme his work accordingly in consultation with other agencies as per sequential requirements as may be decided by the Consultants and Client or simultaneous execution of other components of the work by other agencies may necessitate reorganizing, which shall not be accepted as grounds for any delay or excuse of any nature what so ever.
- 28.0** The contractor should make his own arrangements for water for drinking purpose at his own cost. However he shall be allowed to use the existing supply lines, free of cost, but he shall have to make all necessary distribution system as his own cost.
- 29.0** The contractor shall make his own arrangements for electricity and its distribution. However Electricity Connection, if any available, shall be given at one point at the site, but the Employers do not guarantee uninterrupted supply. For smooth running of work Contractor shall make his own arrangement of DG Set of adequate capacity. Energy thus provided shall be metered and the contractor shall reimburse the cost of energy to the Employer as per prevailing rates.
- 30.0** In arriving at the quantity of materials consumed for reconciliation purpose only the following maximum ceiling limits of wastage (%) shall be allowed over theoretical consumption computed from the quantities certified in the final bill :

Wastage shall not be removed without Client permission.

- 31.0** The Contractor shall submit shop Drawings in 4 set all the works within 7 days of receipt of relevant drawings from the Consultants, for the approval.
- 32.0** Water shall be supplied at one point at site and contractor shall be responsible for providing flow meter and draw water from this point. The cost of flow meter, water line shall be borne by contractor. Also the cost of water consumed will be charged from the contractor at the same rate as actual.

33.0 SAFETY BARRIERS AND CONSTRUCTION SAFETY

The Contractor shall at his own cost provide for the protection and safety of the persons working in the area, safety barriers around all openings in every location and at the periphery and edges of all slabs, staircases and stairwells, lift shafts, ducts etc., all to the approval and satisfaction of the Project Manager. However contractor shall take appropriate safety precautions suitable for specific locations/ situations and as instructed by the Project Managers.

The Contractor shall, in general, be fully responsible for all matters with regard to every form of safety during construction and in connection with the execution of the Works, and the Contractor shall take all necessary precautions and provide at his cost everything necessary to ensure such safety at all times. Should any accidents occur due to the Contractor's failure to comply with such safety requirements and to take all other safety measures necessary, the Contractor shall be fully responsible for all such accidents and he shall bear and pay for all costs and damages in connection therewith and as a consequence thereof. The Contractor shall indemnify the Owner from and against all claims in this regard.

34.0 DISPOSAL OF RUBBISH FROM THE WORKS AND THE SITE AND PROVISION OF SAFETY NETTING/SCREENS BY CONTRACTOR

The Contractor shall at all times keep the Works and the site in clean, neat and tidy condition. All rubbish from the Works and the site shall be collected and deposited in large bins provided on the site for such purpose by the Contractor at his own cost. The rubbish from such bins shall be regularly carted away by the Contractor to rubbish tips and dump yards beyond the site.

35.0 MALPRACTICES

The Contractor shall not try to influence in any manner the employees, staff or anyone else of the Owner and his Consultants and Project Manager by offering undue favours, monetary gains, or any such illegal gratifications for any reason whatsoever. If it is established that the Contractor has indulged in such activity, the Owner reserves the right to terminate the Contract forthwith.

36.0 LIST OF APPROVED MAKES:

The Contractor shall quote for the first make of materials from the list of approved makes. In case of deviations from the same alternate makes with subsequent price reduction to the client shall be quoted by the contractor. The contractor shall clearly indicate the list of materials proposed to be used by him & enclose the same with the tender.

37.0 MATERIALS SUPPLIED BY THE OWNER

The Contractor shall conduct all checks and carry out all tests and obtain test certificates necessary to ascertain and ensure that the Owner supplied materials are in conformity with the requirements stipulated in the Contract Documents. Should any of the Owner supplied materials obtained from any supplier not be in conformity with the requirements stipulated in the Contract Documents then the Contractor shall not take acceptance of such materials and he shall not incorporate them in the Works unless so specifically authorised by the Project Manager/ Consultants and it shall be the Contractor's responsibility to bring this matter to the immediate attention of the Project Manager/Consultants and seek his instructions in respect of the disposal of such materials. Should the Contractor fail to comply with this procedure then all costs and/or delays which are a result and consequence thereof shall be to the account of the Contractor.

With respect to reconciliation of Owner supplied materials, the quantities of such materials allowed towards consumption for the Works by the Contractor shall be the theoretical requirement plus permissible wastage. The theoretical requirement shall be determined by measurements made in accordance with the dimensions shown on the Drawings to which the Works shall be executed. Owner supplied materials used due to any reason whatsoever for replacement and/or rectification work shall not be deemed to be theoretical requirement, and the costs in respect of these materials used for such work shall be borne by the Contractor.

38.0 TOOLS, TACKLES, EQUIPMENTS & SCAFFOLDING

All tools, tackles & equipments necessary for the installation and testing shall be provided by the contractor. The quoted rates shall take into account for providing any such equipment, which may not form part of the installation, but are necessary for the execution of the job. Contractor shall be responsible to make his own arrangement to provide scaffolding/supports etc., necessary for his work. However the contractor may use the civil contractors scaffoldings if available with prior understanding with the civil contractors.

39.0 COMPLETION CERTIFICATE

On completion of the installation a certificate shall be furnished by the contractor countersigned by the Qualified Engineer/Supervisor, under whose direct supervision the installation was carried out.

40.0 GUARANTEE

At the close of the work and before issuance of final certificate of virtual completion by the Project Manager/ Consultants, the contractor shall furnish written guarantee indemnifying the 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 :

41.0 STAFF

The contractor shall employ competent qualified, full time Mechanical/Plumbing engineers to direct the work of all installation in accordance with the drawings and specifications. The engineers shall be available at all times at site to receive instructions from the Project Manager., 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 requirement of Local authority.

42.0 SANITARY ARRANGEMENTS AT SITE

Contractor shall provide and install adequate latrines and urinals for use by the workmen away from the site. He shall ensure that the workmen shall avail of this facility and not commit any nuisance within the area under construction. This provision shall be strictly enforced by the contractor.

ANNEXURE - I

**TO SPECIAL CONDITIONS SUBMITTAL TO BE MADE BY THE CONTRACTOR
DURING THE EXECUTION OF THE WORK**

1. Weekly progress report including number of men employed under each trade, Equipments at site etc.
2. Fortnightly progress report-showing progress against programme.
3. Programme of work for the forth-coming week.
4. Labour and Equipment Deployed at site - programmed requirement VS actual deployed -- weekly.
5. Updated approved monthly PERT Chart along with monthly progress chart -- weekly.
6. Construction Materials by Contractor: status and mobilisation programme - Fortnightly.
7. Owner supplied Materials for the coming (next) month - monthly.
8. Reconciliation of owner supplied materials -- Monthly.
9. Value of work anticipated to be done in the forth coming month including value of any materials / equipment of large value -- Monthly.

ANNEXURE III

SAFETY REQUIREMENT/GENERAL PRECAUTIONS

1. All workmen to be dressed in approved uniform.
2. All workers to be in good neat appearance.
3. No smoking and tobacco chewing permitted within the premises.
4. All workers to have photo ID card with the following prominently displayed:
 - i) Name of client
 - ii) Name, address and contact number of contractor
 - iii) Name of worker
 - iv) Designation
 - v) Address of worker
 - vi) Worker code number

All the ID cards to be submitted to security department. Subsequently on approval, all cards to be laminated and chained by the contractor.
5. All workers to keep I-Card in visible portion. Card to hung prominently on all working time inside the hotel premises.
6. All workers are subject to security check
7. All contractors to make schedule of entry and exit of all workman. Proper record book to be maintained at site. The record book to be accessible to the Consultant and SGPC Authorities.
8. All tools and plants and refundable material to be noted and verified by the hotel security.
9. All tools and plants to be labeled by the contractor for identification.
10. Insurances/Safeties:
 - i) The contractor shall at this own cost provide for the protection and safety of the persons working in the area. The contractor shall be fully responsible for all matters with regard to every form of safety during construction. Should any accidents occur due to the contractors failure to comply with safety requirements, the contractor shall be fully responsible for all such accidents and he shall bear and pay for all the costs and damages. Rs. 1,00,000/- in each accident at each job site & & to a limit of Rs. 5,00,000/- for all accidents at all job site.
 - ii) Workman compensation.
 - iii) Contractor all risks policy.

Annexure – IV

SCHEDULE OF FISCAL ASPECTS

| S. No. | Description | Fiscal Aspect |
|---------------|--|--|
| 1. | Period of Completion | Completion Period/Construction Period will be for 12 Months from the date of issue of Notice of Award/Letter of Intent. |
| 2. | Schedule of Rates to Cover Taxes and Duties | The Schedule of Rates (and therefore the Contract Sum) shall be deemed to include and cover for all Excise Duties, Sales Tax on works contract, Sales Tax on material, Transport Charges, Entry Tax, Service Tax, VAT, Octrol, labour cess, Education cess, E.S.I & PF for labours, Toll Tax, Stamp Duties, Central and State Government or local body or Municipal Taxes or Duties and / or taxes or duties from any other body whatsoever which shall be applicable from time to time. The final short listed contractors will be asked to submit detailed schedule of rates showing tax component separately before issue of LOI. |
| 3. | Space & Labour hutment | Will not be allowed at site, contractor shall be responsible for the making its own arrangements. |
| 4. | Contractor Store, site offices and other facilities | Owner will give the space for temporary offices and temporary storage for the tools & tackles. Contractor will be responsible for safety and security of its materials. |
| 5. | Nominate Sub-Contractor | The Contractor can consider to nominate sub- contractors with the prior to approval of Project Manager. |
| 6. | Over time Work. | Nothing extra shall be paid on this account. |
| 7. | No financial or other compensation for delays | Nothing extra shall be paid on this account. No escalation is payable on any account. |
| 8. | Liquidated Damages | The Contractor should submit the bar chart based on period of completion mentioned in the tender before issue of the Notice of Award/L.O.I. The approval of submitted bar chart is necessary from the Project Manager. If Project Manager is not satisfied with the submitted bar chart from the contractor, then in this case contractor has to follow the Project Manager bar chart based on the period of completion mentioned in the tender. The Milestones will be derived from the approved bar chart from the Project Manager at the time of issue of Notice of Award/LOI. If any Milestone is not achieved by the contractor, the contractor shall pay the Owner 1.00% (one percent) of the Contract Sum per week of delay, limited to ten percent (10%) maximum of the Contract Sum (inclusive of amounts, increases or decreases, in respect of change orders). The LIQUIDATED DAMAGES shall be applicable on the entire contract amount. |
| 9. | Variation in tender quantity | Overall Variation Limit to be $\pm 25\%$ of the Contract Sum. |
| 10. | Interface with other vendor/ Coordination with the others vendor | Contractor shall be responsible for the coordination with other contractors working at the site for smooth work progress of the project. |
| 11. | Termination by Owner | The Owner, may without, prejudice to any other right or remedy and after giving the contractor seven days notice in writing, terminate the employment of the contractor and take charge of all materials, |

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| S. No. | Description | Fiscal Aspect |
|--------|---------------------------|---|
| | | equipment, tools, and plant and machinery thereon and use these as the Owner's property for the completion of the Project, subject to conditions listed in the tender document. |
| 12. | Termination by Contractor | In case the Work remains suspended (Totally Stopped) for a continuous period of more than Six (6) Months by or at the instance of the Owner or on account of any court orders not arising out of any misconduct of the Contract, or because of any Force- majeure causes, the contractor shall be entitled to Terminate this contract by serving one month's notice in writing and thereupon to have the accounts settled with the Owner, subject to conditions mentioned in the detailed tender document. |
| 13. | Water & Electricity | Water & Electricity required for the installation/ construction purposes shall be provided at one location or chargeable basis. The Contractor shall provide at its own cost distribution as per its requirements and therefore the costs of cable, switches, fuses etc shall be borne by the Contractor. However the Owner shall not be responsible to pay any compensation for any interruption in the supply of electricity & contractor has to arrange his own backup at his own cost. No compensation shall be entertained on this account & there will no relaxation on liquidated damage clause. |
| 14. | Site Cleaning | The Contractor shall maintain the site and all work thereon in clean condition at all times. The contractor shall remove all scrap, debris and other unwanted material from the site and as directed by the Project Manager. In case of default the owner shall have the right to clean the site from the other agency and the cost for it shall be debited to the contractor account. |
| 15. | With Holding Payment | The Project – Manager may withhold payment on account of subsequently discovered evidence and nullify the whole or a part of any payment certificate to such extent as may be necessary to protect the Owner from loss on account of including but not limited to the following. (i). Defective work not remedied by the Contractor. (ii) Failure of the Contractor to make payments properly and regularly to his own workers, to his sub- contractors, to his suppliers. (iii) Damage by the contractor to the work of other contractors, sub-Contractors or vendors etc. |
| 16. | Insurance | Before commencing the execution of the work, the contractor, without hunting his obligations and responsibilities under this contract shall insure in the joint names of the contractor and owner, latter being the beneficiary, against his liability for nay maerial or physical damages, loss or injury which may occur to any property, including that of the owner/Project Manager/Architect, Sub-Contractors, Vendors or a member of the general public by or arising out of the execution of the work or in carrying out the contract. It shall be obligatory for the Contractor to obtain and retain for all relevant times the insurance cover (in the joint nemes of the contractor and owner/Project Manager, latter being the beneficiary) under the policies mentioned in the tender document. The sum to be insured shall also cover the value of entire contract sum including the cost of owner supplied material. The validity of the insurance policy will be valid upto 120 days after the contract period or extended as mutually agreed from time to time. |

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| S. No. | Description | Fiscal Aspect |
|--------|--|---|
| 17. | Running/Interim Bills | One bill in a month. There shall be no minimum value of bill, however Contractor shall submit the cash flow statement within the 15 days of issue of notice of Award/LOI. |
| 18. | Running Bills cerification and payment | Within 30 days of submission of R. A. Bill/Invoice. |
| 19. | Final bill Payment | Within 120 days working days after receipt of contractors final bill complete in all respects. |
| 20. | Retention Money | Deduction towards retentation money shall be 10% of the value of work done of each RA bill, subject to a maximum of 5% of the contract sum. 50% Retention money will be released after issue of virtual completion/Certificate from the Project Manager. Balance 50% will be released after satisfactory completion of defect liability period. |
| 21. | Secured advance against materials | Not applicable. All payment made as per the payment terms. |
| 22. | Defects Liability Period | 12 Months from the date of final commissioning as certified by the Project Manager. Where extended Guarantee periods are stipulated in the Contract Documents for particular parts of the Works, the Contractor shall furnish appropriate guarantees in approved formats for same before issuance of the Final Completion Certificate from the Owner or its representative. |
| 23. | Performance Bank Guarantee | To be submitted with in 10 days from the date of issue of Notice of Award/LOI for the 10% of the Contract sum in the form of bank gurantee as per the approved format valid up to 3 (Three) months after the end of the Defect Liability Period . |
| 24. | Mobilisation Advance | Refer Para-1 above |
| 25. | Others | The Contractor shall also submit within fifteen days of the award of |

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| S. No. | Description | Fiscal Aspect |
|--------|-------------|--|
| | | works, a detailed schedule along with dates for material delivery for the project, a list of machinery and equipment to be used on the site along with site utilization plan showing the placement of equipment, machinery, material stacking areas, temporary stores/ sheds, workshops and site offices etc., a list of tests to be conducted at and off site, a cash flow statement for the project. Any deviations from the list of approved makes and vendors must be brought to the notice of the Project Manager and a substitute got approved well in advance of the actual execution. All subcontractors and specialized agencies must be got approved from the Project Manager. |
| 26. | Extra Item | Basic Cost of Material +labour Cost + 15% of basic cost of material and labour cost towards CP, overhead, tools and plant machinery, transportation, loading/unloading etc. of the works contract tax and service tax shall be paid extra on actuals. |

TECHNICAL SPECIFICATIONS FOR FIRE PROTECTION WORKS:

1.0 SCOPE OF WORK:

- 1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated and diesel driven fire pumps wet riser fire hydrant system/sprinkler system/fire extinguishing hand appliances as required by the drawings and specified hereinafter or given in the Bill of Quantities.
- 1.2 Without restricting to the generality of the foregoing, the work shall include but not limited to the following :

1.2.1 Fire Pumps, Motor, Engine and Accessories:

- a) Electrically operated and diesel driven pumps with motors, base plate and accessories.
- b) Pressure gauge with isolation valves.
- c) M.S. Pipes, fittings, valves, suction strainers, suction & delivery headers & accessories.
- d) Foundations, vibration eliminator pads and foundation bolts.
- e) Pressure vessel, pressure switches etc.
- f) Supply, installation, testing and commissioning of Fire Fighting Pumps.

1.2.2 Fire Hydrant System :

- a) Piping for wet riser hydrant systems.
- b) Landing valves, RRL hose pipes, hose reels, hose cabinets, connections to fire mains.
- c) Isolation & non-return valves, pipe supports/welding/Fire Brigade inlet and accessories.

1.2.3 Fire Sprinkler system

- a) Piping for sprinkler systems.
- b) Installation control valves
- c) Sprinkler heads, Spare Sprinkler.
- d) Inspection & Testing assemblies.

1.2.4 Hand Appliances /Fire Extinguishers :

Supply and installation of fully charged and tested fire extinguishers hand appliances water CO₂, foam, dry chemical powder type, ABC stored pressure type, CO₂ gas cartridge type as required by these specification and drawings.

2.0 HYDRANT SYSTEM DESCRIPTION:

- 2.1 The Hydrants System shall consist of a main electric pump of 2850 LPM at 88 m head with suitable Motor, standby diesel engine driven pump of 2850 LPM at 88 m head and jockey pumps (1W + 1S) of 180 LPM at 88 m head with suitable Motor. An underground tank for Hydrants/Sprinkler System of 200,000 liters capacity shall be provided. The system shall be complete with all required accessories including valves, strainers, special fittings, instrumentation, control panels and any other components required to complete the system in all respects.
- 2.2 The Hydrant system shall be kept pressurized all the times.
- 2.3 In the event of fire when any of the hydrant valves in the network is opened, the resultant fall in the pressure shall start the jockey pump first through pressure switch automatically. In case jockey pump fails to maintain the pressure hydrant pump shall start at the preset pressure. In case of further drop in pressure the diesel standby pump shall start.
- 2.4 The hydrant risers shall be terminated with air release valve at the highest points to release the trapped air in the pipe work.
- 2.5 To provide for an air cushion for counteracting pressure surges/ water hammer, an air vessel shall be furnished in the pump room near the fire pumps. The air vessel shall normally be kept partly full of water.
- 2.6 One No. four way Fire Brigade Inlet Connections shall be provided for filling of Underground Fire tank in case of emergency and in addition one no. four way Fire Brigade connection shall be made to each of internal Fire riser in case fire pumps fail to start.
- 2.7 External fire hydrant will be provided on the ring main. Hydrant shall be located at least 2M away from the building.
- 2.8 Hydrant stations and cabinet shall be provided at all designated location inside and alongwith external hydrants. The hydrant stations shall be located in M.S steel fire cabinet as per drawing and will contain all items described in BOQ.

2.0 SPRINKLER SYSTEM DESCRIPTION:

- 2.1 The automatic sprinkler system will be installed to protect the entire Hotel building with permitted exception e.g. electrical switch room, power transformer and DG room as identified. There is a separate sprinkler pump of 2850 LPM at 88 m head in the pump house to be provided and other than that, Hydrant Pump and Diesel Engine shall also support the sprinkler system.
- 2.2 The Sprinkler System shall be fed both from an underground tank and also from the overhead tank by gravity.
- 2.3 Installation control valve shall be provided for alarming incase of fire. Installation control valve comprising of main stop valve, alarm valve with accessories, strainer and water motor gong.
- 2.4 For the sprinkler system the building shall have a riser of 150 mm dia, tapped on each floor to feed the sprinkler system. On each floor, at the tapping from the sprinkler riser, there shall be butterfly valve of suitable diameter and flow switch. The flow switch shall be connected to the Annunciation Panel through electrical cables.

3.0 FIRE PUMPS, MOTORS, ENGINE AND ACCESSORIES:

3.1 General:

- 3.1.1 The pumps shall be single stage/multistage designed for continuous operation and shall have a continuously rising head characteristic without any zone of instability.
- 3.1.2 Pumps (excluding the jockey pump) shall be able to operate sequentially. The head vs. capacity, input power vs. capacity characteristics, etc. shall match to ensure load sharing and trouble free operation throughout the range.
- 3.1.3 In case of accidental reverse flow through the pump the driver shall be capable of bringing the pump to its rated speed in the normal direction from the point of maximum possible reverse speed.
- 3.1.4 The Pump with motor, base plate, coupling device and coupling guard shall be coupled at the works of the manufacturer.
- 3.1.5 The motor shall have a 15% margin of power rating over the rated pump input power.
- 3.1.6 The pumps shall be capable of delivering a minimum of 150 percent of rated capacity at a total head of not less than 65% of the total rated head. The total shut-off head shall not exceed 120 percent of total rated head on the pump.
- 3.1.7 Contractor shall provide necessary test certificates, type test certificates, performance curves and NPSH curves of the pumps from the manufacturer while submitting data sheet for approval.
- 3.1.8 Pumps coupled with motor or engine on a common platform shall perform smoothly without any excessive noise or vibration.
- 3.1.9 Each pump shall be provided with a plate giving, in the case of centrifugal pumps, the delivery head, capacity and the number of revolutions per minute, and in the case of reciprocating pumps, the diameter of the steam cylinders and water plungers and the length of the stroke, as also the ratios of the effective aggregate areas of the suction and the delivery valves to the area of the water plungers.

3.2 Pump:

- 3.2.1 The pump shall be end suction type, as described in the Schedule of Quantities.
- 3.2.2 The impeller shall be secured to the shaft and shall be retained against circumferential movement by keying, piping or lock rings.
- 3.2.3 All screwed fasteners shall tighten in the direction of normal rotation.
- 3.2.4 Pump shall be provided with approved type of mechanical seals.

3.3 Pumps Casing:

- 3.3.1 The casing of end suction pumps shall be hydrostatically tested to 1.5 times the maximum working pressure but in no case less than 250 PSI.
- 3.3.2 Pressure classification of flange connections shall correspond to casing working pressures.

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3.3.3 Casing material shall be close grained, accurately machined, cast-iron, and precision manufactured for best performance and long-term duty and fitted with gunmetal wearing ring.

3.3.4 Water discharge diffusers shall be included to reduce radial torque to impellers.

3.4 Wearing Ring :

3.4.1 Wearing rings shall be suitable for an individual application. Rings shall be replaceable, and positively keyed to prevent rotation.

3.5 Bearing :

3.5.1 Bearings shall be heavy-duty ball bearings with a minimum average life of 100,000 hours. The bearings shall be self-sealed, and housed in malleable-iron housing aligned to bearing bracket by means of large precision registers. Bearings shall be removable without dismantling any rotating element or pumps.

3.6 Impeller:

3.6.1 Impeller shall be one-piece, phosphor bronze, and the bush of gun metal. The impeller shall be hydraulically and dynamically balanced.

3.6.2 Impellers of pumps shall be fully enclosed and hydraulically balanced.

3.6.3 Impellers shall be accurately keyed to the shaft and fixed in an axial position by shaft sleeves and separate snap rings.

3.6.4 Impellers shall be fully protected against damage from reverse rotation.

3.7 Shaft:

3.7.1 Shaft size shall be selected on the basis of maximum combined shear stress.

3.7.2 The shaft shall be of stainless steel ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads, vibrations and torques coming in during operation.

3.7.3 Length of the shaft sleeves must extend beyond the outer faces of the mechanical seal and plate so as to distinguish between the leakage between shaft and shaft sleeve.

3.7.4 Shaft sleeves shall be securely fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly shall ensure concentric rotation. The sleeve shall be of stainless steel.

3.8 Pump Shaft-Motor Shaft Coupling:

All shafts shall be connected with adequately sized flexible couplings of suitable approved design. Necessary guards shall be provided for the couplings.

3.9 Base Plate:

3.9.1 A common base plate mounting both for the pump and drive shall be provided. The base plate shall be rigid construction, suitably ribbed and reinforced.

3.9.2 Base plate and pump supports shall be so constructed and the pumping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, hydraulic piping thrust etc.

3.10 Vibration & balancing:

The rotating elements shall be so designed to ensure least vibration during start and throughout the operation of the equipment. All rotating components shall be statically and dynamically balanced at workshop.

3.11 Installation :

Installation of the Fire Fighting Pump set shall be carried out exactly as per manufacturer recommendation.

3.12 Foundation :

The foundation of Fire Fighting Pumps & Electrical motor shall be constructed as per the requirement of manufacturer.

3.13 Anti-vortex Plates :

Anti-vortex plates shall be installed at the end of the Fire Pump suction inside tanks.

3.14 Instruction Manual & Tools/Spares:

A comprehensive instruction manual shall be provided by the contractor indicating detailed requirements for operation, dismantling and periodic operation and maintenance procedures.

4.0 ELECTRIC MOTORS:

- 4.1 Electrically driven pumps shall be provided with totally enclosed fan cooled induction motor. The motor shall be full load duty & shall be capable of handling the required starting torque of the pumps. Speed of motor shall be compatible with the speed of the pump.
- 4.2 Motors shall have a dust tight construction with suitable means of breathing.
- 4.3 The motor shall be designed not to draw starting current more than 3 times normal running current. Motor for fire pump shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty.
- 4.4 All Components shall be of adequate mechanical strength and robustness and shall be constructed of metal unless otherwise approved.
- 4.5 The rating and design shall conform to (IS : 325) specification.
- 4.6 The motors shall be wound for Class-F insulation and the winding shall be vacuum impregnated with head and moisture resisting varnish and glass wool insulated to withstand tropical conditions.
- 4.7 Two independent earthing points shall be provided on opposite sides of the motor for bolted connections.
- 4.8 415 Volt power terminals shall be suitable for receiving 1.1 kV grade armoured power cables.
- 4.9 The cable boxes and terminations shall be designed to enable easy disconnection and replacement of cables.

5.0 DIESEL ENGINE:

5.1 General:

- 5.1.1 The engine rating shall be decided considering the de-rating factors which are based on Site conditions as per BS : 5514.
- 5.1.2 The diesel engine shall be of multi cylinder type four/six stroke cycle with mechanical (airless) injection, cold starting type.
- 5.1.3 The Engine shall be direct injection type, capable of being started without use of wicks, cartridge, heater plugs at an engine room temperature of 7°C and shall accept full load within 15 second from the receipt of the signal to start.
- 5.1.4 The Engine shall be turbo-charged and water cooled.
- 5.1.5 The Engine shall be capable of operating continuously on full load at the site elevation for a period of 8 hours and no major overloads before 300 hours of operation.
- 5.1.6 The Engine shall be provided with an adjustable governor to control the Engine speed within 10% of its rated speed under any condition of load upto the full load rating. The governor shall be set to maintain rated pump speed at maximum pump load.
- 5.1.7 The Engine shall be provided with an in-built tachometer to indicate R.P.M. of the Engine.
- 5.1.8 Engine, after correction for altitude and ambient temperature, shall have bare engine horse power rating equivalent to the higher of the following two values :-
- a) 20% in excess of the maximum brake horse-power required to drive the pump at its duty point.
 - b) The brake horse power required to drive the pump at 150% of its rated discharge.
- 5.1.9 The coupling between the Engine and pump shall allow each unit to be removed without disturbing the other.
- 5.1.10 The engine shall be designed with regard to ease of maintenance, repair, cleaning and inspection.
- 5.1.11 All parts susceptible to temperature changes shall have tolerance for expansion and contraction without resulting in leakage, misalignment of parts or injury to parts.

5.2 Starting:

- 5.2.1 The engine shall be capable of both automatic and manual start. Generally the engine shall start automatically, but in case of the auto-start system failure the engine shall be capable of manual start.
- 5.2.2 Provision shall be made for two separate methods of Engine starting viz.
- a) Automatic starting by means of a battery powered high torque D.C. electric starter motor incorporating the axial displacement type of pinion, having automatic repeat start facilities initiated by a fall in pressure in the water supply pipe to the hydrant installation.

b) Manual starting by

i) Electric Starter motor.

Note : The starter motor used for automatic starting may also be used for manual starting provided there are separate batteries for manual starting.

5.2.3 Engine shall be able to start without any preliminary heating of combustion chamber, manual cranking mechanism shall also be provided. All controls/mechanisms, which have to be operated in the starting process, shall be within easy reach of the operator.

5.2.4 The high torque D.C motor charged by battery shall initiate automatic start of diesel engine. The battery shall hold adequate retainable charge to provide the starting of the diesel engine. Starting power will be supplied from storage batteries. The battery capacity shall be adequate for ten consecutive starts without recharging with a cold engine under full compression. Battery shall be lead acid type of 12 V, 180 Ah capacity.

5.2.5 The battery banks shall be used for no other purpose other than starting of the engine and shall be fully charged at all times with provision for trickle & boost chargers. After start of the engine the charger shall be disconnected. The battery being fed from the engine alternator.

5.3 Governing System:

5.3.1 The engine shall have a speed control device, which will control the speed under all conditions of load. The governor shall be suitable for operation without external power supply.

5.3.2 The Governor shall offer following features:

5.3.2.1 An adjustable governor to regulate engine speed within a range of 10% between shut-off and maximum load conditions of the pumps. The governor shall be set to maintain rated pump speed at maximum pump load.

5.3.2.2 An over speed shutdown device to shutdown the engine at speed approximately 20% above rated engine speed with manual reset, so that the automatic engine controller will indicate an over speed signal until the device is manually reset to normal operating position.

5.4 Fuel System:

5.4.1 The Engine fuel oil shall be of quality and grade specified by the Engine manufacturer.

5.4.2 The diesel engine shall be suitable to run on High Speed Diesel (HSD), the tank provided being enough to hold the volume required for 8 hours (minimum) continuous operation. The tank shall be of MS sheet of 3.0 mm thickness.

5.4.3 The fuel tank shall be of welded steel construction to relevant Indian Standard. The tank shall be mounted above the Engine fuel pump to give gravity feed otherwise recommended by the manufacturer. The tank shall be fitted with an indicator showing the level of the fuel in the tank.

5.5 Cooling System:

5.5.1 The engine shall be water cooled with cooling water drawn from the discharge side of the pump and with pressure reducing valve, strainer and all necessary accessories.

5.5.2 A heat exchanger, the raw water being supplied from the fire pump discharge (taken off prior to the pump discharge valve) via a pressure reducing device, if necessary, to limit the applied pressure to a safe value as specified by the engine manufacturer. The raw water outlet connection shall be so designed that the discharged water can be readily observed. The water in the closed circuit shall be circulated by means of an auxiliary pump driven from the engine and the capacity of the closed circuit shall not be less than that recommended by the engine manufacturer. If the auxiliary pump is belt driven there shall be multiple belts so that should half of the belts break, the remaining belts shall be capable of driving the pump.

5.6 Tachometer :

A tachometer shall be provided to indicate revolutions per minute of the engine.

5.7 Oil Pressure Gauge :

The engine shall be provided with oil pressure gauges indicating lubricating oil pressure.

5.8 Temperature Gauge :

The engine shall be provided with a temperature gauge to indicate cooling water temperature.

5.9 Automatic Control Wiring :

All connecting wires for automatic controllers shall be harnessed or flexibly enclosed, mounted on the engine and connected in an engine junction box to terminals numbered to correspond with numbered terminals in the controller, for ready wiring in the field between the two/sets of terminals.

5.10 Signal for Engine Running and Crank Termination :

The engine shall be provided with a speed sensitive switch to signal engine running and crank termination. Power for these signals shall be taken from a source other than the engine generator.

5.11 Engine Exhaust Pipes :

The exhaust pipe shall be galvanized steel pipe and sized in accordance with the manufacturer's recommendations. The exhaust pipe shall be insulated with 50 mm of fibreglass with aluminium jacket for its entire length.

A stainless steel flexible connection shall be provided between the engine exhaust outlet and the exhaust pipe. An exhaust silencer shall be provided as required to satisfy the acoustic requirements.

5.12 Battery Charging :

The means of charging the batteries shall be by a 2-rate trickle charger with manual selection of boost charge and the batteries shall be charged in position. Where separate batteries are provided for automatic and manual starting, the charging equipment shall be capable of trickling charging both the batteries simultaneously. Equipment shall be provided to enable the state of charge of the batteries to be determined.

5.13 Installation :

Installation of the Diesel Engine shall be carried out exactly as per manufacturer recommendation.

5.14 Foundation and Anti Vibration Mounting :

5.14.1 Foundation :

The foundation shall be constructed as per the requirement of Diesel Engine Manufacturer.

5.14.2 Anti Vibration Mounting :

Suitable vibration mounting duly approved by the authorised representative shall be employed for mounting the unit so as to minimise transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

5.15 Accessories:

5.15.1 The engine shall be mounted on a base plate of fabricated steel construction. Adequate access shall be provided to the big end and main bearing, camshaft and governor drives, water jackets etc.

5.15.2 The engine shall be provided with inlet filter and silencer, outlet muffler, expansion joints, dampers etc. as necessary for efficient operation. Intake air shall be taken from inside the building in which the engine is located, but the exhaust shall be discharged into the air at location as desired by the employer.

5.15.3 The contractor shall provide all accessories, fittings and fixtures necessary and required for a complete operating engine set.

5.16 Instrumentation:

5.16.1 The diesel engine shall be provided with instrumentation as under:-

5.16.1.1 Engine Starting System:

It shall be with lead acid batteries heavy duty of minimum 180 AH capacity, higher if so required by the engine manufacturer, 2 Nos. and self-starter switch.

5.16.1.2 Engine Instruments and Standard Control Panel:

It shall be complete with required connections and comprising of following items:

- a) Inlet and outlet water temperature gauge (dial type) with key.
- b) Lubrication oil pressure gauge.
- c) Lubrication oil temperature gauge.
- d) Automatic start stop device (push button type).
- e) Auto /Manual Selector switch shall also be provided.
- f) Manual: the Engine can be manually operated by means of Push Buttons.

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- g) Start Stop and failure control device.
- h) Start key for manual starting.
- i) Stop Push Button for manual stopping of engine.
- j) Starting failure indication by lamp and horn unit.
- k) Engine temperature control with failure indication by red lamp indication.
- l) Engine temperature 'very high' indication by audio alarm and automatic stopping of engine.
- m) Engine set is 'running' and 'in operation' indication by green lamp.
- n) Mains supply available indicated by yellow lamp.
- o) Push Button for Audio Alarm reset.
- p) Push Button Failure indication by lamps.
- q) The Panel shall also have an auto/manual/test/off selector switch.

6.0 CODES AND STANDARDS FOR PUMPS, MOTORS AND DIESEL ENGINE:

6.1 PUMPS:

6.1.1 The pumps shall conform to the standards and codes as given below:

- a) IS: 1520 Horizontal centrifugal pumps for clear, cold and fresh water.
- b) BS: 599 methods of testing pumps.
- c) PTC: 8 ASME Power test Codes – Centrifugal Pumps.

6.2 MOTOR:

6.2.1 The following codes shall applicable for the motor :-

- a) IS: 325 Induction motor, three – phase.
- b) IS: 900 code of practice for induction motors, installation and maintenance.
- c) IS: 7816 guide for testing insulation resistance of rotating machines.
- d) IS: 4029 guide for testing three phase induction motor.
- e) IS: 3043 code of practice for earthing.
- f) Further to those stated above, the design, manufacture, installation and performance of motors shall conform to the latest Indian Electricity Act and Indian Electricity Rules.

7.0 SETTING OF PRESSURE SWITCHES/OPERATING CONDITIONS FOR FIRE PUMPS:

7.1 The fire pumps shall operate on drop of pressure in the mains as given under clause below. The pump operating sequence shall be arranged in such a manner to start the pump automatically but should be capable of being stopped manually by stop push buttons only.

7.2 Operating Conditions for the Hydrant Pumps :

The Pressure Switches mounted on the pressure vessel would be set as under (all figures in kg/cm²).

| | Cut in | Cut out |
|----------------------------|--------|---------|
| Working Pressure | ← | → |
| | 8.3 | 8.8 |
| Jockey Pump | 8.3 | 8.8 |
| Main Fire Pump (Sprinkler) | 7.8 | Manual |
| Main Fire Pump (Hydrants) | 6.8 | Manual |
| Diesel Driven Pump | 5.8 | Manual |

7.2.1 It is thus to be noted that;

- i) Jockey Pumps shall start and stop automatically through pressure switches.
- ii) Jockey Pump shall stop when main pumps start.
- iii) Main/Diesel Engine driven fire pumps shall start automatically when pressure falls below the above specified limits, but stopping shall be manual.

8.0 INTERLOCKING :

8.1 The following inter-locking between the two main fire pumps (i.e. wet riser pump & sprinkler pump), the jockey pump and the diesel engine driven pumps will be followed.

8.1.1 Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (wet riser, the wet riser can come up at a time) and/or diesel driven pump.

| S.No. | Jockey Pump | Sprinkler Pump | Wet Riser Pump | Diesel Driven Pump |
|-------|-------------|----------------|----------------|--------------------|
| i) | ON | OFF | OFF | OFF |
| ii) | OFF | ON | OFF | OFF |
| iii) | OFF | ON | ON | OFF |
| iv) | OFF | ON | ON | ON |
| v) | OFF | ON | ON | OFF |
| vi) | OFF | ON | OFF | OFF |
| vii) | OFF | OFF | OFF | OFF |

9.0 PIPE, FITTINGS, VALVES, SUPPORTS AND OTHER ACCESSORIES :

9.1 Pipes, Fittings & Supports :

9.1.1 General :

- a) All materials shall be new of the best quality conforming to the specifications and subject to the approval of the Project Manager.
- b) Pipes and fittings shall be fixed truly vertical, horizontal as required in a neat workmanlike manner.
- c) 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.
- d) Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.
- e) Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

9.1.2 Pipes and fittings of following types (depending upon the description of item) and ISI marked only shall be used:

| Type of Pipe / (dia) | Size | Grade | Ends/Fitting | Code |
|----------------------|---------------------------------------|--|------------------------------|---------------------|
| M.S Pipes | Upto 50 mm dia | Heavy | Screwed | IS: 1239 (Part I) |
| MS Fittings | - do- | Heavy | -do- | IS: 1239 (Part II) |
| M S Pipes | 65 mm & above dia and upto 150 mm dia | Heavy | Bevel, Butt Welded, 3 layers | IS: 1239 (Part I) |
| MS Fittings | -do- | Heavy, machine formed from IS marked heavy grade pipes | -do- | IS: 1239 (Part III) |
| M S Pipes | Above 150 mm dia | 6.0 mm wall thickness | Bevel, Butt welded, 3 layers | IS: 3589 |
| MS Fittings | -do- | Schedule 40 | -do- | IS: 3589 |

9.1.3 For MS pipes upto and including 50 mm dia screwed jointing shall be adopted, while for pipes 65 mm and above welded connections shall be used. Only Electro galvanised nuts /bolts shall be used.

9.1.4 The piping system and components shall be capable of with standing 150 % of the working pressure including water hammer effects and test pressure upto 16 kg/cm².

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- 9.1.5 Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points to facilitate erection and subsequent maintenance work.
- 9.1.6 Flange thickness shall be as per table below IS : 6392 – 1971. Table – 17/18.
- | | | |
|------------|---|---------|
| 250 mm dia | : | 26 mm ; |
| 200 mm dia | : | 24 mm ; |
| 150 mm dia | : | 22 mm ; |
| 125 mm dia | : | 22 mm ; |
| 100 mm dia | : | 20 mm ; |
| 80 mm dia | : | 20 mm ; |
| 65 mm dia | : | 18 mm . |
- 9.1.7 Fittings for pipes above 65 mm or and upto 150 mm dia shall be fabricated from seamless pipe pieces of minimum 5 mm wall thickness. For tees and other fittings where seamless sections are not available, the fittings shall be fabricated from Electric resistant welded pipes as given in the approved makes. The fittings shall have a minimum 5 mm wall thickness. The fittings shall with stand pressure of upto 21 kg/cm².
- 9.1.8 Fittings below 50 mm or shall be either malleable iron. The fittings shall be threaded at both ends. The fittings shall withstand pressure of upto 21kg/cm².
- 9.1.9 For tapplings of 50 mm/40mm/32mm/25mm from headers, half socket connections with one side threading shall be employed. The half socket shall be welded at the centre of the header, either on the side or on the top.
- 9.1.10 Wherever two horizontal headers are to run side by side, the two headers shall be located at different levels, if possible, so as to avoid unnecessary bends at tapping off from the headers. Accordingly, the supports shall also be staggered to support pipes at two levels.

9.2 Pipe Support :

- 9.2.1 All pipe clamps and support shall be galvanised steel. When fabricated from M.S. steel sections, the supports shall be factory galvanised before use at Site. Welding of galvanised clamps and supports will not to be permitted.
- 9.2.2 Pipe shall be hung by means of expandable anchor fastener of approved make and design (Dash Fasteners or equivalent). The hangers and clamps shall be fastened by means of galvanised nut and bolts. The size/diameter of the anchor fastener and the clamp shall be suitable to carry the weight of water filled pipe and dead load normally encountered.
- 9.2.3 Hangers and supports shall be capable of carrying the sum total of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipelines movements as necessary. All guides, anchore, braces, damapeners, expansion joints and structural steel to be attached to the building/structure, trenches etc shall be provided by the contractor. Hangers and components for all piping shall be approved by the consultant. Anchoring fasteners shall be rated to take minimum 2 tons load and shall be of approved make.
- 9.2.4 While all piping shall have clevis type hanger supports from the ceiling with fasteners, for pipe headers of 100 mm dia and above, additional wall/column mounted supports shall be taken. Clevis type hanger supports shall be at 3.0 m intervals and at every turn, at both ends. MS angle

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supports at wall and columns shall be at 18 m intervals. The angles shall be cut by gas cutter and evened out by grinder. All welding to angles shall also be cleaned by grinder. Angles shall not be less than 40 x 40 x 6 mm size.

- 9.2.5 For fixing clevis hanger and angle support, only dash fasteners shall be used. Exposing of steel reinforcement and welding to them shall not be permitted except in exceptional circumstances.
- 9.2.6 Pipes in vertical shafts shall have MS angle brackets at alternate floor level. The bracket shall be mounted behind the pipe. A baseplate of 50 wide x 6 mm thick shall be welded to the bracket. The baseplate shall be fixed to the wall by means of fasteners GI U clamps shall be used to fix the pipe to the bracket.
- 9.2.7 Each riser shall also be anchored to the floor slab with MS angles mounted on the slab. The angles shall be 40 x 40 x 5 size, one mounted before the pipes and the other after the pipes. Extra cleat pipe pieces shall be welded to the pipes at this point which shall be welded to the angle iron support.
- 9.2.8 Wherever angle type supports are being used, profiled packing materials or wood or materials as approved by the Engineer shall be used. The packing materials shall be at least 25 mm thick, and tight fitted with the pipe.

9.3 Excavation :

- 9.3.1 Excavation for pipelines shall be in open trenches to levels and grades shown on the drawings or as required at Site. Pipelines shall be buried to a minimum depth of 1.2 meter or as shown on drawings.
- 9.3.2 Wherever required contractor shall support all trenches or adjoining structures with adequate timber supports.
- 9.3.3 On completion of testing and pipe protection, trenches shall be refilled with excavated earth in 15 cms layers and consolidated.
- 9.3.4 Contractor shall dispose off all surplus earth within a lead of 200m or as directed by the Authorised Representative.

9.4 Anchor Thrust Blocks :

- a) Contractor shall provide suitably designed anchor blocks in cement concrete to encounter excess thrust due to water hammer & high pressure.
- b) Thrust blocks shall be provided at all bends & tees & such other location as determined by the Authorised Representative.
- c) Exact location, design, size and mix of the concrete block shall be approved by the Authorised Representative prior to execution of work.

9.5 Pipe Protection :

- 9.5.1 All pipes above ground and in exposed locations shall be painted with two coats of Red Oxide primer and two coats of synthetic enamel paint of approved shade.
- 9.5.2 Pipes buried below ground level shall be protected against corrosion to give a uniform with multi layer anticorrosive treatment as per IS : 10221 by using non woven polyester mat of 4 mm

thickness. The application of pipe coat primer and multi layer tape shall be as specified by the manufacturer.

9.6 Welding:

- 9.6.1 Before welding, the ends shall be cleaned by wire brushing, filing or grinding. Each weld-run shall be cleaned of slag before the next run is deposited.
- 9.6.2 Welding shall be done by certified welders only.
- 9.6.3 Welding at any joint shall be completed uninterrupted. If this can not be followed for some reasons, the weld shall be insulated for slow and uniform cooling.
- 9.6.4 Welding shall be done by manual oxy-acetylene or manual shielded metal arc process. Automatic or semi-automatic welding processes may be done only with the specific approval of purchaser.
- 9.6.5 Socket weld joint shall be done with low hydrogen type covered electrodes with manual shielded metal arc process.
- 9.6.6 Joints between M.S. Pipes and fittings shall be made with the pipes and fittings having "V" groove and welded with electrical resistance welding in an approved manner.
- 9.6.7 Weld Electrodes shall be of one of the approved makes, of grade and type as suitable for the job and meeting the approval of the engineer.
- 9.6.8 As far as possible welding shall be carried out in flat position. If not possible, welding shall be done in a position as close to flat position as possible.
- 9.6.9 Joints shall be given a first weld in full width without burrs on the full dia of the pipe. Welding shall be carried out vertically from the surface to be welded. Weld fluxes shall not be so plastic such as to fall or drip down.
- 9.6.10 The root of butt joints shall be such as to achieve full penetration with the complete fusion of root edges. The weld projection shall not exceed 3 mm inside the pipe.
- 9.6.11 After application of first coat the weld shall be ground and then another layer of welding shall take place. The weld shall also be cleaned by grinding.
- 9.6.12 For pipes with wall thickness less than 3 mm, oxy-acetylene welding is recommended.
- 9.6.13 All pipe cutting shall be by oxy acetylene gas cutting only. The cut surface shall be cleaned and ground by a electric grinder before further welding.
- 9.6.14 Pipe cutting or welding in inaccessible areas shall be avoided. Pipes shall not be welded in trenches unless the bottom edge of the pipe does not have clear space for working with electrode.
- 9.6.15 Fillet welds shall be made by shielded metal arc process regardless of thickness and class of piping. Electrode size shall not exceed 10 SWG (3.25 mm). At least two runs shall be made on socket weld joints.
- 9.6.16 For supports, angle pieces shall be cut by oxy acetylene gas and cleaned by electric grinder. All cutting for bolt inserts shall be by electric drill.
- 9.6.17 Tappings (nipple pieces, etc.) for Hydrant from the risers shall be fabricated separately and then welded to the riser. A tool piece of 80 mm dia or as required shall be first prepared, one end shall

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be cut as per profile of riser pipe on which it shall be finally welded. The other end shall have the flange welded to it. The flange holes shall be set so as to receive the hydrant head correctly. Inside of the flange shall also receive a single layer of welding. The welding shall then be cleaned with a grinder. The tool piece shall then be welded to the riser. This procedure shall also be applied for all flanges.

9.6.18 As a rule no backing ring shall be used for circumferential butt welds.

9.6.19 Welding carried out in ambient temperature of 5 Deg C or below shall be heat treated.

9.7 Hose Reel:

9.7.1 The swinging type hose reel shall conform to IS : 884-1969.

9.7.2 The rubber tubing shall be 20 mm dia high pressure rubber hose 30.0 m long with gunmetal nozzle and control valve, shut off valve of approved make. The wall mounted bracket shall be fixed by means of fasteners. The hose reel shall have a gun metal nozzle.

9.7.3 The hose reel shall be connected directly to the riser by means of 25 mm dia MS pipe with threaded bends, union & one no. ball valve.

9.8 Hose Cabinets:

9.8.1 Hose cabinet shall be fabricated from 16 gauge MS powder coated sheet of fully welded construction with hinged single/double door partially glazed door with suitable locking arrangement, stove enameled fire red paint with 'Fire Hose' written on it prominently. Glass panes shall be 4 mm thick.

9.8.2 The hydrant cabinet shall hold single headed hydrant, 2 nos. Hoses and 1 no. branch pipe.

9.8.3 The cabinet shall have two pipe studs of 200 mm dia in MS with base which shall be fixed to the back of the cabinet and shall be used to hold the RRL hose.

9.9 RRL Hoses :

9.9.1 The hoses for the internal and external hydrant system should be rubber impregnated woven jacketed type conforming to IS:636 Type-A. Each fire hose shall be provided with quick coupling, branch pipes, nozzles, spanners etc.

9.9.2 Hose pipes of all types shall be capable of withstanding an internal water pressure of not less than 35 Kg/Sq.cm without bursting. It must also withstand a pressure of 21 Kg/Sq.cm without undue leakage or sweating.

9.9.3 Each hose shall be fitted with instantaneous spring lock type couplings at both ends. Hose shall be fixed to the coupling ends by copper rivets and the joint shall be reinforced by 1.5 mm galvanised mild steel wires and leather bands.

9.10 Branch Pipes and Nozzle :

Gun Metal Standard Branch Pipe shall be used conforming to IS : 903 with gun metal nozzle of 16mm dia to fit standard instantaneous type 63mm dia hose coupling. Suitable spanners of approved design shall be provided in adequate numbers for easy assembly and dismantling of various components like branch pipes, nozzles, quick coupling ends.

9.11 Hydrant:

- 9.11.1 Gun Metal Hydrant valve shall be of oblique pattern provided as per IS: 5290 complete with hand wheel, quick coupling connection, spring and gun metal blank cap and chain.
- 9.11.2 The hydrant shall have flanged inlet of 80 mm dia and 63 mm female instantaneous type outlet. The hydrant shall have a rubber plug with chain fixed to the main body of the Hydrant.

9.12 Pressure Switch:

- 9.12.1 The pressure switches shall be employed for starting and shutting down operation of pumps automatically, dictated by lines pressure. The Pressure switch shall be diaphragm type, it shall be suitable for line pressures upto 15 kg/cm².
- 9.12.2 The switch shall be suitable for consistent and repeated operations without change in values.
- 9.12.3 The enclosure shall be of aluminium and pressure element and wetted parts shall be of stainless steel. The switch shall be snap acting type with 1 no. N O/NC contact.

9.13 Air Vessel:

- 9.13.1 The air vessels shall be provided to compensate for slight loss of pressure in the system and to provide an air cushion for counter acting pressure surges whenever the pumping set comes into operation. It shall be normally partly full of water, the remaining being filled with air, which will be under compression when the system is in normal operation.
- 9.13.2 Air vessel shall be fabricated from MS plate conforming to IS : 2002 grade 2A having 8mm thickness shell with 10 mm thick dished ends and suitable supporting legs. It shall be provided with a 80 mm dia/100 mm dia flanged connections from pump, one 25 mm drain with ball valve and 15 mm sockets for pressure gauge and pressure switches. The air vessel shall be hydraulically tested to 20 kg/cm² pressure for 30 minutes.
- 9.13.3 The pressure vessel shall be provided for hydrant and sprinkler system. The pressure switches shall be mounted on the drain end of each air vessel. The air vessel shall also be provided with safety valve mounted at the top.

9.14 Fire Brigade Inlet:

- 9.14.1 The fire brigade connection shall be fitted with two numbers of 63mm dia instantaneous inlets to feed the fire system in case of emergency. The inlet shall have a wafer type non return valve and a butterfly valve. The fire brigade inlet shall be complete with necessary components like special fittings of medium quality MS bends, flanged tees etc.
- 9.14.2 Fire Brigade Inlet for tank filling by fire brigade shall be four way with gun metal instantaneous male inlet coupling connection for connection with fire brigade vehicles.
- 9.14.3 The inlets shall be provided with ABS quality plastic blank caps with chain.

9.15 Valves :

9.15.1 Sluice Valves :

9.15.1.1 Sluice valve shall be flanged valve with cast iron body. The spindle, wall seat and wedge nuts shall be of bronze. They shall generally have non-rising spindle and shall be of the particular duty and design called for. All sluice valves will be provided with supervisory switch.

9.15.1.2 The valves shall be supplied with suitable flanges, non-corrosive bolts and asbestos fibre gasket. Sluice valves shall conform to Indian Standard IS : 780-1969 and IS : 2906. Sluice valves for water works purposes suitable for seat test pressure of 16 Kg/Sq.cm.

9.15.2 Butterfly Valve :

9.15.2.1 The butterfly valve shall be suitable for water works and tested to minimum of 15 Kg/Sq.cm pressure.

9.15.2.2 The body shall be of cast iron to IS : 210 in circular shape and of high strength to take the water pressure of 10 Kg/Sq.cm. The disc shall be heavy duty cast iron with anti corrosive epoxy or nickel coating.

9.15.2.3 The valve seat shall be of high grade elastomer or nitrile rubber. The valve in its closed position shall have complete contact between the seat and disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be EN 8 grade carbon steel.

9.15.2.4 Butterfly valve shall be of best quality conforming to IS : 13095 of class specified.

9.15.2.5 The valves shall be supplied with manual gear operated opening/closing by lever.

9.15.2.6 The valves shall be supplied with supervisory switch.

9.15.3 Gun Metal Valves :

9.15.3.1 Gun metal valves shall be used for smaller dia pipes, and for threaded connection. The valves shall bear certification as per IS : 778-1971 and shall be rated to 15 Kg/Sq.cm pressure.

9.15.3.2 The body and bonnet shall be of gun metal to IS : 318. The steam gland and gland nut shall be forged brass to IS : 319. The hand wheel shall be of cast iron to IS : 210.

9.15.3.3 The hand wheel shall be of high quality finish to avoid hand abrasions. Movement shall also be easy. The spindle shall non rising type.

9.15.3.4 All valves shall be approved by the Authority Representative before they are allowed to be used on the work.

9.15.4 Non-Return Valve :

9.15.4.1 Non-return valves shall be cast iron spring action swing check type. An arrow mark in the direction of flow shall be marked on the body of the valve. The valve shall bear IS : 531 certification.

9.15.4.2 The valve shall be of cast iron body and cover. The internal flap in the direction of water shall be of cast iron and hinged by a hinge pin of high tensile brass or stainless steel. Cast iron part shall be as per IS : 210.

9.15.4.3 The gasket shall be of high quality rubber and flap seat ring of leaded gunmetal. At high pressure of water flow the flapper shall sit tightly to the seat. The valve shall be capable of handling pressure up to 15 Kg/Sq.cm.

9.15.5 Air Valves :

9.15.5.1 Provide 25 mm dia screwed inlet cast iron single acting air valves, on all high points in the system as shown on the drawing.

9.15.6 Drain Valve :

9.15.6.1 Provide 50 mm dia cast steel pipe to IS : 1239 (heavy class) with 50 mm gunmetal full way valve for draining any water in the system in low pockets.

9.15.6.2 Drain valves shall be provided at low points of all water riser and mains to ensure that all sections of pipe works and plant can be drained.

9.15.7 Foot Valve :

9.15.7.1 Foot valves of water supply system shall be heavy duty construction with integrated flanges connection and have cast iron body, all bronze trims with stainless steel spring and stainless steel strainer.

9.15.7.2 The flow area on strainer shall be at least three times of Pipe size.

9.16 Gate Valve Chamber :

A masonry chamber of internal dimension 1.20m x 1.20m x 1.5m depth shall be built to accommodate sluice valves placed in external ring main, 230mm thick walls shall be of 75 class designation brick work in cement mortar 1:5 (1 cement : 5 fine sand) with CI medium duty manhole cover. The top slab RCC shall be of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded same aggregate 20 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick finished with a floating coat of neat cement all complete.

9.17 Pressure Gauge:

Pressure gauge shall be provided near all connections to hydrant system and isolation valves of sprinkler system and where required. Pressure gauge shall be stainless steel 100 mm dia gunmetal Bourden type with a scale range from 0 to 15 Kg/cm² and shall be constructed as per IS 3624. Each pressure gauge shall have a siphon tube connection with ball valve, tapping and connecting pipe and nipple. The gauge shall be installed at appropriate level and height for easy readability

9.18 Painting:

All hydrant pipes shall be finished with post office red colour paint. All M.S. pipes shall first be cleaned thoroughly before application of primer coat. After application of 2 coats of Red oxide primer, two coats of enamel paint shall be applied. Wherever required all pipe headers shall be worded indicating the direction of the pipe and its purpose such as " TO RISER NO 1" etc.

9.19 Testing :

- 9.19.1 All piping in the system shall be tested to hydrostatic pressure of 13.5 Kg/Sq.cm without drop in pressure for atleast 2 hours.
- 9.19.2 Rectify all leakages, make adjustments and retest as required and directed.

9.20 Branch Pipe:

Gun Metal Standard Branch Pipe shall be used conforming to IS : 903 with gun metal nozzle of 16mm dia to fit standard instantaneous type 63mm dia hose coupling.

9.21 Butterfly Valve:

Cast iron butterfly valves shall be conforming to IS : 13095 for isolation and /or flow regulation as directed by the Engineer-in-charge. The valves shall be tight shut off/regulatory type with resilient seat suitable for flow in either direction.

9.22 Non Return Valve/Water Type:

- 9.22.1 Non-return valves shall be cast iron dual plate type. An arrow mark in the direction of flow shall be marked on the body of the valve. The valve shall bear IS:5312 certification.
- 9.22.2 The valve shall be of cast iron body and cover. The internal flap in the direction of water shall be of cast iron and hinged by a hinge pin of high tensile brass or stainless steel.
- 9.22.3 The gasket shall be of high quality rubber and flap seat ring of leaded gun metal. The valve shall be capable of handling pressure upto 15 kg/cm².

9.23 Gun Metal Valves/Ball Valves:

- 3.18.1 Gun metal vales shall be used for smaller dia pipes, and for threaded connections. The valves shall be conforming to IS : 778.
- 3.18.2 The hand wheel shall be of high quality finish to avoid hand abrasions. Movement shall also be easy. The spindle shall be non rising type.

9.24 Pendent /Upright Type Sprinkler Head:

- 9.24.1 Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly, yoke and the deflector. The sprinkler shall be of approved make and type with 15 mm nominal dia outlets.
- 9.24.2 The bulb shall be made of corrosion free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches at 68⁰ C.
- 9.24.3 The nominal bore shall be 15 mm dia and colour of liquid shall be Red.
- 9.24.4 The Sprinkler head shall bear approval of FOC/UL/FM.

9.25 Installation Control Valve for Sprinkler:

- 9.25.1 The installation control valve shall be double seated clapper type check valve. The body and cover shall be made from cast iron to IS: 210 grade FG- 200. The seat and seat clamp shall be

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made from bronze to IS: 318, LTB II grade. The sealing to the seat shall be neoprene gasket. The hinges pin and ball shall be from stainless steel.

- 9.25.2 It shall be vertically mounted and the direction of water travel shall be indicated on the surface. It shall be rated to 12 kg/cm² and tested to 25 kg/cm² pressure.
- 9.25.3 A by-pass check valve shall be fitted to adjust minor and slow variations in water pressure for balancing so as to avoid any false alarm.
- 9.25.4 The valve shall also be provided with a test control box. The box shall house a lever to test and operate the ICV. A brass strainer shall also be provided at the point of water supply to the alarm gong. A retarding chamber shall also be provided. The chamber shall be able to balance the water pressure in case of water line surges.
- 9.25.5 Each installation control valve shall have two sets of pressure gauges with brass ball valve type shut off.
- 9.25.6 A water motor Alarm shall also be provided. This shall be mechanically operated by discharge of water through an impeller. The drive bearing shall be weather resistant. A strainer shall be provided on line before the nozzle.
- 9.25.7 A brass automatic ball drop valve with the retard chamber shall also be provided.

9.26 Flow Switch:

Flow switch shall have a paddle made of flexible material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/pipe through a connecting socket. The switch shall be potential free in either N O or N C operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation panel. The seat shall be of stainless steel. The flow switch shall have IP : 55 Protection. It should operate even with the flow of one Sprinkler bursting

9.27 FIRE MAN'S AXE :

Fire man's axe for fire fighting purpose shall be used conforming to IS:926- 1985

10.0 IS CODES FOR DESIGN, MANUFACTURE, ERECTION, TESTING AND TRAIL OPERATION OF PIPING VALVES ETC. :

- 10.1 The following codes and standards and their subsequent modifications shall apply for the design, manufacture, shop testing, erection, fabrication at site, resting and trial operation of piping, valves and specialties requirements:
- 10.1.1 IS: 554 : Dimensions for pipe threads where pressure tight joints are required on the threads.
 - 10.1.2 IS : 638 : Sheet rubber jointing and rubber insertion jointing.
 - 10.1.3 IS : 778 : Copper alloy gate, globe and check valve for water work purposes.
 - 10.1.4 IS : 780 : Sluice valves for water –works purposes (50 mm to 300 mm).
 - 10.1.5 IS : 901 : Couplings, double male and double female, instantaneous pattern for fire fighting.
 - 10.1.6 IS : 1239 : Mild steel tubes, tubulars and other wrought (Part I & II) steel fittings.
 - 10.1.7 IS : 884 : Swinging type wall mounted hose reel with drum.
 - 10.1.8 IS : 388 : Hose tubing.
 - 10.1.9 IS : 4038 : Foot valves for water-works purposes.
 - 10.1.10 IS : 5290 : landing Valves.
 - 10.1.11 IS : 10221 : Anti corrosion treatment for underground MS pipes.
 - 10.1.12 IS : 5312 : Swing check type reflux (non-return) valves.

11.0 FIRE EXTINGUISHERS:

11.1 Scope of Work :

Without restricting to the generality of the foregoing the work shall inter-alia consist of the following:

- a) Installation of fully charged and tested fire extinguishing hand appliances CO₂ and dry chemical powder type as required by these specifications and drawings.

11.2 General Requirements :

Fire extinguishers shall conform to the following codes and standards as revised and amended upto date and shall be with BIS approved stamp.

- a) CO₂ type : IS:2878
- c) Co₂ type Water Expelling
(9 liters capacity) : IS:940
- d) Mechanical form
(9 liters capacity) : IS:10204
- e) ABC Type Stored Pressure : IS:13849

11.2.1 Fire extinguishers shall be installed as per NFPA10

11.2.2 Hand appliances shall be installed in readily accessible locations with the appliance brackets fixed to wall by suitable anchor fasteners or by means of floor mounted supports.

11.2.3 Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.

11.2.4 All appliances shall be fixed in a true workman like manner truly vertical and at correct locations. Identical type of extinguishers shall be of same make and shall have similar method of operation.

11.3 Measurement and rates:

Fire extinguishers shall be measured by numbers and shall include full charge of extinguishing agent, installation and all items necessary and required and given in the specifications.

12.0 ELECTRICAL INSTALLATION:

12.1 GENERAL:

Work shall be carried out in accordance with the specifications, Indian Electricity Act 1910 as amended upto date, and rules and regulations of local electricity authority and Indian Standard Code of practice No. IS: 732-1963 (revised).

12.2 MV SWITCHGEARS/PANELS/SUB-PANELS/DISTRIBUTION BOARDS:

12.2.1 System Rating:

All the Main MV switchgears/Panels/Motor control centres shall be suitable for operation on three phase/ single phase, 415/230 volts, 50 Hz neutral solidly grounded at transformer and short circuit level not less than 50 kA /35 kA at 415 Volts.

The Distribution boards shall be designed to withstand heaviest condition at site, with maximum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

12.2.2 Standards And Codes:

The Distribution boards shall comply with the latest edition of relevant Indian Standards and Indian Electricity Rules and Regulations. The following Indian Standards shall be complied with :

| | |
|-----------------------------|--|
| IS 1394 - | L.V. switchgear and control gear Part-I Part I -1993 General rules. |
| IS 5578-85 | Guide for marking of insulated conductors. |
| IS 11353-85 | Guide for uniform system of marking and identification of conductors and apparatus terminals. |
| IS 2147-62 | Degree of protection provided by enclosures for low voltage switch gear and control gears. |
| IS: 2675-83 | Enclosed distribution fuse boards and cutouts for Voltages not exceeding 1000 V. |
| IS 2551-82 | Danger notice plates. |
| IS 13947-1993 | Circuit breakers.(Part-II) |
| IS 13947-1993 | Switches, Disconnectors, switch disconnector (Part-III) and fuse combination units. |
| IS 1818-72 | Alternating current isolators (disconnectors) and earthing switches. |
| IS 8623-77 | Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC & 1200 V DC. |
| IS 8828 | Miniature air break circuit breakers for voltages not exceeding 1000 V. |
| IS 9926 | Fuse wires used in rewirable type Electric fuses upto 650 Volts. |
| IS 2208 | HRC fuse links |
| IS 2705 (Part- I, II & III) | Current Transformers |

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| | |
|---|--|
| IS 3156 (Part- I, II & III) | Voltage Transformers |
| IS 1248 | Indicating Instruments |
| IS 13947-93(Part - 5) Section-1 | Control devices and switching elements. |
| IS 13947-93 (Part - 4) Section-1 | Contactors and motor starter section 1 Electromechanical. |
| IS 3231 | Relays |
| IS 375 Indian Electricity Act and Rules. | Marking and arrangement of bus-bars |

12.2.3 Shop Drawings:

Prior to fabrication of the Switchgears, Distribution boards, the contractor shall submit for Construction manager/Consultants approval the shop/ vendor drawing, and design calculations, indicating type, size, short circuit rating of all the electrical components used, details & schedule of components & model Nos. type, rating etc., busbar size, internal wiring size, Distribution board dimension, colour, mounting detail etc., The contractor shall submit manufacturer's catalogues of the electrical components installed in the distribution.

12.2.4 Inspection:

At all reasonable times during production and prior to transport of the distribution boards to site, the contractor shall arrange and provide all the facilities at their plant for inspection by Construction manager/Consultant or authorized representative.

12.2.5 Test Certificates:

Testing of Distribution boards shall be carried out at factory and or at site as specified in Indian Standards in the presence of Construction manager/Consultants the test results shall be recorded on prescribed forms. The test certificates for the test carried out at factory or at site shall be submitted in six copies to the Construction manager/Consultants for approval.

12.3 CONSTRUCTION FEATURES:

The power supply and control panel shall be metal enclosed sheet steel cubical indoor type, dead front, floor mounting/wall mounting type. The panel shall be totally enclosed, completely dust and vermin proof, Gaskets between all adjacent units and beneath and all covers shall be provided to render the joints dust proof. These Panels shall be arranged in multitier formations. All doors and covers shall be lockable.

All mild steel sheets used in the construction of panels shall be 2mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all slag grounded off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with check nuts. Self threading screws shall not be used in the construction of control panels. Base channel shall of 75mm x 75mm x 5mm thick shall be provided at the bottom. Minimum clear space of 200mm between the floor of panel and bottom most units shall be provided.

The panels shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switchgear. Knockout holes of appropriate size and number shall be provided in the control panels in conformity with the location of incoming and outgoing conduits/cables, all equipment such as meters and indicating lamps, etc shall be located adjacent to the unit with which it is associated and care shall be taken to achieve a neat and symmetrical arrangement. Facility shall be provided for termination of cables from both above and below the control panel. Where cables enter below, cables boxes shall be fitted at the rear and arranged in tiers to facilitate making connections to the upper and lower units. Clamps shall be provided to support the weight of the cables. All incoming and outgoing feeders shall be brought out to a terminal block of adequate size at suitable location inside the control panel. All wiring inside the control panel shall be colour coded and labelled with approved plastic beads for identification. Circuit diagrams showing the arrangement of circuits shall be pasted on the inside of the panel door and covered with transparent plastic sheet and all labeling shall be provided on the front face of the panel board.

12.3.1 Circuit Compartments:

Each circuit breaker, contactor and relay shall be housed in a separate compartment and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the breaker in the 'ON' position. Safety interlocks shall be provided to prevent the breaker or Contactor from being drawn out when the breaker is in ON position. Instruments and indicating lamps shall not be mounted on the panel compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section.

12.3.2 Instrument Compartment:

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accident contact with live parts of the circuit breaker and bus bar.

12.3.3 Bus Bars and Bus Bar Connection:

The bus bar and interconnections shall be of aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bars and shall be extensible on either side. The bars and interconnections shall be insulated with PVC sleeve tapes and colour coded. All bus bars shall be supported on unbreakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising in case of short circuit in the system. Bus bars shall be provided in separate chamber main control panels shall be done by clamping, no holes shall be drilled in bus bars. If holes have to be drilled for making connections, extra cross section of busbars shall be provided.

All bus bar connections in smaller control panels shall be done by drilling hole and connecting by brass bolts and nuts. Additional cross section of bus bars shall be provided in small control panels to cover up the holes drilled in the bus bars.

All connections between the bus bar and breaker and between breaker and contactor, shall be through aluminium strips of proper size to carry full rated current and shall be insulated with PVC sleeves.

12.3.4 Terminals:

The outgoing terminals and neutral links shall be brought out to a terminal block suitably located in the control panels. The current transformer for instruments, metering and for protection shall be mounted on the bus bars. Separate cable compartment shall be provided for incoming and outgoing cables.

12.3.5 Wire Ways:

A horizontal wire way screwed covers shall be provided at the top to take in the connecting control wiring different vertical sections.

12.3.6 Cable Compartments:

Cable compartments of adequate size shall be provided in the control panels for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate and proper supports shall be provided in cable compartments to support cables. All incoming and outgoing terminals shall be brought out to terminal blocks in the cable compartment.

12.3.7 Materials:

All materials shall be of the best quality complying with the appropriate Indian Standard specifications, Materials used shall be subject to the approval of the Architect/ Consultant and sample of the same shall be furnished where required.

12.3.8 Moulded case circuit Breaker (MCCB):-

MCCBs shall satisfy the requirements of IS-2516 and shall be of current limiting type. MCCB shall provide type 'C' protection to the contactors as per IEC 158-1B. MCCBs shall be quick make, quick break, independent manual type with trip free feature with mechanical ON, OFF, and TRIP indications. A trip button shall be provided for tripping the breaker.

12.3.9 Rotary Switches:

Switches upto 60 amps shall be rotary type with compact and robust construction, built up from one or more stacks with contacts and a positioning mechanism, with stop as required. The terminals shall be shrouded with insulation to prevent accidental contact with live parts. Rotary switches shall be backed up with moulded type HRC fuse fittings of appropriate rating.

12.3.10 Selector Switch:

When called for, selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode.

12.3.11 Switches:

Switches beyond 60 amps shall be panel mounted double break type and suitable for load break duty, quick make and break action, manufactured in accordance with IS: 4047 - 1967. Switch contacts shall be silver plated and shall be backed up with HRC fuses of appropriate rating. The switch handles shall be located at the front.

12.3.12 HRC Fuses:

Fuses shall be high rupturing capacity and shall be in accordance with IS: 3208 - 1962 and having rupturing capacity of not less than 20 MVA at 415 volts. The back up fuse rating of each motor/heater/equipment shall be so chosen that the fuse does not operate on starting of motor/heater/equipment. Fuses shall be of the same make as the switches.

12.3.13 Starters:

Each motor shall be provided with a starter of suitable rating. Starter shall be in accordance with IS: 1822 - 1967. Direct on line starters shall be provided for motors.

All starters shall have auxiliary contacts for inter locking, control & indication. Starters (contactors) shall have 3 main and 4 auxiliary contacts and shall be air break type suitable for making and breaking contact a minimum power factor of 0.35. For design consideration of contactors, the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of star delta/reduces Voltage starters. In case of soft starters the current shall be limited to 1.8 times.

Main and auxiliary contacts shall be silver or silver alloy. The insulation for contactor coils shall be of class "E". Operating coils of contactors shall be suitable for $230 \pm 10\%$ volts AC, 50 cycles supply system. The contactor shall drop out when voltage drops to 90% of the rated voltage. The housing of the contactors shall be heat resistant and having high impact strength. Each starter shall have thermal overload protection on all three phases.

12.3.14 Over Load Relays:

Contactors shall be provided with a three element, positive acting ambient temperature compensated time lagged hand-reset/self reset type thermal over load relay with adjustable setting. Hand reset button shall be flush with the front door for resetting with starter compartment door closed, Relays shall be directly connected for motors below

35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacity. Heater circuit contactors may not be provided with overload relays.

12.3.15 Current Transformers:

Current Transformer shall be of minimum accuracy class 1.5 and suitable VA burden for operation for the connected meters and relays.

12.3.16 Single Phase Preventers:

Single phase preventers shall be provided as per schedule of quantities and shall be in conformity with relevant ISI standards. Single phase preventers shall act when the supply voltage drops down to 90% of the rated voltage or on failure of one or more phases.

12.3.17 Time Delay Relays:

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one no. auxiliary contacts for indicating lamp connection.

12.3.18 Indicating Lamp and Metering:

All meters and indicating lamps shall be in accordance with the relevant ISS. The meters shall be flush mounted and draw out type. The indicating lamp shall be neon type and of low burden. Each main panel shall be provided with operated ammeter of suitable range with three Nos. CTs of suitable ratio with three way and off selector switch, phase indicating lamps, and other indicating lamps as called for. Each phase indicating lamp shall be backed up with 5 amps fuse and toggle switch. Other indicating lamps shall be backed up with fuses as called for.

12.3.19 Toggle Switch:

Toggle switches, where called for, shall be in conformity with IS: 3854-1969 and shall be of 5 Amps rating.

12.3.20 Push Button Stations:

Push button station shall be for manual starting and stopping of motors/equipment as called for. Red and Green colour push buttons shall be provided for starting and stopping operations. Start or stop indicating flaps shall be provided for push buttons. Push buttons shall be suitable for panel mounting/projection mounting and accessible from front without opening door, lock lever shall be provided for stop push button. One set of normally open and one set of normally closed contacts shall be provided in push button stations. The push buttons contacts shall be suitable for 15 Amps current capacity.

12.4 CABLING/WIRING SYSTEM :

All power cabling shall be carried out with 650/1100 volt grade PVC insulated PVC sheathed, armoured, aluminium conductor cables laid on the cable tray/racks/pipes. Cables shall be sized for starting current and by applying proper derating factor. All control wiring shall be carried out by using 650/1100 volts PVC insulated copper conductor wires in wire ways or in conduit. Minimum size of control wiring shall be 1.5 sq.mm. Wherever control wiring in the Scope of AC contractor has to be done in conduits (exposed or concealed) no additional cost for conduiting shall be paid.

12.5 CABLE LAYING:

Cable shall be laid generally in accordance with Indian Standard Code of practice. Cable shall be laid on 2 mm thick perforated M.S. sheet cable trays as approved by the Consultant. Easy access to all cables shall be provided to allow cable withdrawal/replacement in the future. Where more than one cable is running, proper spacing shall be provided to minimise the loss in current carrying capacity.

Cable shall be suitably supported with wooden cleats when run on wall/floor ducts. When buried, they shall be covered with a layer of fine sand and protected with cement concrete tiles bricks. Special care shall be taken to ensure that the cable are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of the cable.

12.6 CABLE/WIRE/STARTER SIZES:

For all single phase/3 phase wiring, 650/1100 volts grade PVC insulated copper conductor wires shall be used. The equipment inside plant room shall be connected to the control panel by means of insulated aluminium conductor wires of adequate size in exposed conduits. Final connections to the equipment shall be through wiring enclosed in M.S. flexible conduits rigidly clamped at both ends.

An isolator shall be provided near each motor/equipment wherever the motor/equipment is separated from the supply panel through a partition barrier or through ceiling construction. PVC insulated single strand aluminium conductor wires shall be used inside the control panel for connecting different components and all the wires inside the control panel shall be neatly dressed and plastic beads shall be provided at both ends for easy identification.

- a) The minimum size of control wiring shall be 1.5 sq.mm. PVC insulated stranded soft drawn copper conductor wires drawn through conduit to be provided for connecting equipment and control panels.

- b) All the switches, conductors, push buttons stations, indicating lamps shall be distinctly marked with a small description of the service installed. Circuit wiring diagram of control panel shall be fixed to the cover of control panel for verification.

12.7 EARTHING:

Shall be carried out with galvanised Iron Strips/wires, or copper strips /wires as specified below:

- a) G.I. Earthing:

The main panel shall be connected to the main earthing system of the building by means of 32mm x 6mm GI strips. All single phase metal clad switches and control panels shall be earthed with minimum 3mm diameter GI conductor wire. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

- | | | |
|------|---|---------------------------|
| i. | Motors upto and including including 10 HP rating. | 2 Nos. 4mm dia GI wires |
| ii. | Motors 12.5 HP to 40 HP capacity. | 2 Nos. 6mm dia GI wires |
| iii. | Motors 50 to 75 HP capacity. | 2 Nos. 25 x 3mm GI strips |
| iv. | Motor above 75 HP | 2 Nos. 25 x 6mm GI strips |

All the switches shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

- | | | |
|------|---|--------------------------------|
| i. | 3 phase switches and control panels upto 60 Amps rating. | 2 Nos. 4mm dia GI wires |
| ii. | 3-phase switches and control panel 63 Amps to 100 Amps rating. | Nos. 8mm dia GI wires |
| iii. | 3 phase switches and control panels 125 Amps to 200 Amps rating. | 2 Nos. 25 x 3mm GI tapes. |
| iv. | 3 phase switches and Control panels, ducts above 200 Amps rating. | 2 Nos. 25mm x 6mm GIbus tapes. |

12.8 DRAWINGS:

Shop drawings for control panels and wiring of equipment showing the route of conduit/cable shall be submitted by the electrical contractor for approval of Architect/Consultant before starting the fabrication of panel and starting the work. The Fire Fighting contractor shall co-ordinate, interact and furnish necessary engineering information of the motor thermal curves, starting time, requirement of protection & interlocking & other miscellaneous requirement so that same can be incorporated before manufacture is taken up. On completion, four sets of completion "As-installed" drawings incorporating all details like, conduit routes, number of wires in conduit, location of panels, switches, junction/pull and cable route etc. shall be furnished by the Contractor.

12.9 TESTING:

Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with Code of practice IS: 732-1963 (Revised) & Indian Electricity Rule and test report furnished by a qualified and authorised person. The entire electrical installation shall be got approved by Electrical Inspector and a certificate from Electrical Inspector shall be submitted. All tests shall be carried out in the presence of Owner/his authorised representative. At the completion of the works, the entire installation shall be subject to following tests:-

- a) Wiring continuity checks with respect to approved wiring diagram.
- b) Insulation resistance test with 500V megger between phase to phase and phase to earth.
- c) Earth continuity test.
- d) Electrical current readings in Amps of full & average load running and starting together with name plate current of each electrical motor.
- e) Operating tests on all protective relays to prove their correct operation before energizing the main equipment including secondary injection test at site.
- f) Operating tests on all starters, circuit breakers etc.

All tested and calibrated equipments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

12.10 PAINTING:

All sheet steel work shall under go a process of degreasing, through cleaning, and painting with a high corrosion resistant primer. All panels shall then be backed in an over the finishing treatment shall be by application of synthetic enamel paint of approved shade. The panels in the erection scope of Fire Fighting contractor shall be given 2 coats of suitable paint of approved colour when all work has been completed. Various feeder & panel name shall be painted with approved colour as per the single line diagram details.

13.0 PRECOMMISSIONING :

On completion of the installation of all pumps, piping, valves, pipe connections, and water level controlling devices the contractor shall proceed as follows :-

13.1 Electrical works:

The following tests shall be carried out on the MCC:

- a) Insulation resistance test with 500 V megger, before and after high voltage test, on all power and control wiring.
- b) High voltage test at 2000 V AC for one minute on all power and control wiring.
- c) Low Voltage continuity test (6 V) on power wiring of each feeder, between bus bars and the outgoing terminals with switches and contactors in closed position.
- d) Low voltage continuity test (6 V) on all control wiring.
- e) Operation test for all feeders with only control supply made "ON" to ensure correctness of control wiring, operation of the various equipment used such as push buttons, protective devices, indicating lamps and relays etc. All contactors shall be checked for the presence of humming and chattering.
- f) Earth continuity test with voltage not exceeding 6 V between various non-current carrying metallic parts of equipment, steel work etc. and the earth bus provided in the MCC.
- g) Operation of all instruments and meters provided on the MCC.

13.2 Pipe Works :

13.2.1 Check all clamps, supports and hangers provided for the pipes.

13.2.2 Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

13.3 Fire Protection System :

13.3.1 Check all hydrant valves by opening and closing any valve found to be open shall be closed.

13.3.2 Check all the piping under hydro test.

13.3.3 Check that all suction and delivery connections are properly made for all pump sets.

13.3.4 Check rotation of each motor after decoupling and correct the same if required.

13.3.5 Test run each pump set.

13.3.6 All pump sets shall be run continuously for 8 hours (if required with temporary piping back to the tank).

14.0 COMMISSIONING & TESTING :

14.1 Hydrant System

- 14.1.1 Pressurise the fire hydrant system by running the main fire pump and after attaining the required pressure shut off the pump.
- 14.1.2 Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts out at the pre-set pressures. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- 14.1.3 Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the pre-set pressure and should not cutout automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However the jockey pump should cut-out as soon as the main pump starts.
- 14.1.4 Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- 14.1.5 When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant valves simultaneously and allow the hose pipes to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.
- 14.1.6 Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly shall be replaced by the contractor. Landing valves shall also be checked by opening and closing under pressure.

14.2 Sprinkler System :

- 14.2.1 Start the sprinkler pump and develop the required pressure in the sprinkler pipes.
- 14.2.2 Open the test valve to test the automatic starting of the pump. If necessary, make necessary adjustments in the setting of pressure switch. The sprinkler installation valve and associated water gong alarm shall also operate when the test valve is open. This operation is to be done for each and every section of the sprinkler system and the alarm for each section (via flow switch) shall be checked for operation.
- 14.2.3 After satisfactory operation of the pump the Contractor shall set up mock fire and test the system.
- 14.2.4 Check all annunciations by simulating the alarm conditions at site.

15.0 HANDING OVER :

- 15.1 All commissioning and testing shall be done by the contractor to the complete satisfaction of the Project Manager, and the job handed over to the Project Manager, or his authorised representative.
- 15.2 Contractor shall also handover, to the Project Manager, all maintenance & operation manuals and all other items as per the terms of the contract.

16.0 GUARANTEE :

- 16.1 The contractor shall submit a warranty for all equipment, materials and accessories supplied by him against manufacturing defects, malfunctioning or under capacity functioning.
- 16.2 The form of warranty shall be as approved by the Project Manager.
- 16.3 The warranty shall be valid for a period of one year from the date of commissioning and handing over.
- 16.4 The warranty shall expressly include replacement of all defective or under capacity equipment. Project Manager may allow repair of certain equipment if the same is found to meet the requirement for efficient functioning of the system.
- 16.5 The warranty shall include replacement of any equipment found to have capacity lesser than the rated capacity as accepted in the contract. The replacement equipment shall be approved by the Project Manager.

17.0 TECHNICAL DATA (TO BE FILLED BY BIDDERS) :

17.1 Diesel Engine Driven Fire Pump:

| | | | |
|---------------------------------|-------|--|-------|
| Quantity | _____ | | _____ |
| Make | _____ | | _____ |
| Model | _____ | | _____ |
| Fluid Handled | _____ | | _____ |
| Type | _____ | | _____ |
| Suction | _____ | | _____ |
| Delivery | _____ | | _____ |
| Impeller Type | _____ | | _____ |
| Coupling | _____ | | _____ |
| Base Plate with Foundation Bolt | _____ | | _____ |
| No. of Stage | _____ | | _____ |
| Flow Rate (m ³ /hr) | _____ | | _____ |
| Total Head (m) | _____ | | _____ |
| Speed of Pump (rpm) | _____ | | _____ |
| Efficiency at rated duty point | _____ | | _____ |
| Material of construction (MOC) | _____ | | _____ |
| Casing material | _____ | | _____ |
| Impeller material | _____ | | _____ |
| Shaft material | _____ | | _____ |
| Shaft sleeve | _____ | | _____ |
| Casing Ring | _____ | | _____ |
| Impeller Ring | _____ | | _____ |

17.2 Engine for Diesel Pump:

| | | |
|---|-------|-------|
| Quantity | _____ | _____ |
| Make | _____ | _____ |
| Model | _____ | _____ |
| Horse Power | _____ | _____ |
| Engine | _____ | _____ |
| RPM | _____ | _____ |
| Engine overspeed setting | _____ | _____ |
| Operating Cycle | _____ | _____ |
| Number of Cylinder | _____ | _____ |
| Accessories | _____ | _____ |
| Dynamically balanced fly wheel | _____ | _____ |
| Flexible coupling and coupling guard | _____ | _____ |
| Electrical standing equipment and starting system | _____ | _____ |
| Governer | _____ | _____ |
| Fuel pump and water pump | _____ | _____ |
| Lubricating oil pump | _____ | _____ |
| Fuel, Air and Lubrication Oil Filter | _____ | _____ |
| Instrument and Protection Device complete as per Engine Model | _____ | _____ |
| Lubricating oil pressure | _____ | _____ |
| High Cooling Water Temperature | _____ | _____ |
| High Lubricating Temperature | _____ | _____ |
| Engine Cooling and Oil System | _____ | _____ |
| Capacity of Diesel Tank | _____ | _____ |
| Detail of Batteries | _____ | _____ |
| Battery Charger | _____ | _____ |
| Other necessary accessories as per Model No in order to make the Diesel Engine Functional | _____ | _____ |

17.3 Electrical Motor Driven Fire Pumps:

| Description | Hydrant/Sprinkler | Jockey Pump |
|---------------------------------|-------------------|-------------|
| Quantity | | |
| Make | | |
| Model | | |
| Fluid Handled | | |
| Type | | |
| Suction | | |
| Delivery | | |
| Impeller Type | | |
| Coupling | | |
| Base Plate with Foundation Bolt | | |
| No. of Stage | | |
| Flow Rate (m ³ /hr) | | |
| Total Head (m) | | |
| Speed of Pump (rpm) | | |
| Efficiency at rated duty point | | |
| Material of construction (MOC) | | |
| Casing material | | |
| Impeller material | | |
| Shaft material | | |
| Shaft sleeve | | |
| Casing Ring | | |
| Impeller Ring | | |

17.4 Electric Motor For Main Fire Pumps :

| Description | Hydrant/ Sprinkler | Jockey Pump |
|--|--------------------|-------------|
| Make | | |
| Model | | |
| Type of Motor | | |
| Horse Power | | |
| Vattage (V) | | |
| Full Load Amps – A | | |
| Speed of Motor | | |
| Enclosure | | |
| Mounting | | |
| Class of Insulation | | |
| Ambient Temperature/Temp in Degree | | |
| Starting Temperature as % of full temp | | |
| Efficiency at 100% load efficiency at 75% load | | |
| Type of rotating movement | | |
| Coupling | | |
| Type of lubrication | | |
| Frequency | | |
| Make and type of starter | | |

ANNEXURE- A

APPLICABLE CODES, STANDARDS AND PUBLICATIONS

1.0 All equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practices. All equipment and material being supplied by the Contractor shall meet the requirements of IS., Tariff advisory committee's regulation (fire insurance), electrical inspectorate and Indian Electricity rules and other Codes/Publications as given below.

A) General :

| | |
|---------------------|---|
| SP : 6 (1) | Structural steel sections |
| IS : 27 | Pig lead |
| IS : 325 | Three phase induction motors |
| IS : 554 | Dimensions for pipe threads where pressure tight joints are required on the threads. |
| IS : 694 | PVC insulated cables for working voltages up to and including 1100 V. |
| IS : 779 | Specification for water meters (domestic type) |
| IS : 782 | Specification for caulking lead |
| IS : 800 | Code of Practice for general construction in steel |
| IS : 1068 | Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium |
| IS : 1172 | Code of basic requirements for water supply drainage and sanitation |
| IS : 1367 (Part- 1) | Technical supply conditions for threaded steel fasteners : Part 1 introduction and general information. |
| IS : 1367 (Part- 2) | Technical supply conditions for threaded steel fasteners : Part 2 product grades and tolerances. |
| IS : 1554 (Part- 1) | PVC insulated (heavy duty) electric cables : Part 1 for working voltages up to and including 1100V. |
| IS : 1554 (Part- 2) | PVC insulated (heavy duty) electric cables : Part 2 for working voltages from 3.3 kV up to and including 11 kV. |
| IS : 1726 | Specification for cast iron manhole covers and frames |
| IS : 1742 | Code of practice for building drainage. |
| IS : 2064 | Selection, installation and maintenance of sanitary appliances – Code of practice. |
| IS : 2065 | Code of practice for water supply in buildings. |
| IS : 2104 | Specification for water meter boxes (domestic type) |

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| | |
|---------------------|---|
| IS : 2373 | Specification for water meters (bulk type) |
| IS : 2379 | Colour code for identification of pipe lines |
| IS : 2527 | Code of practice for fixing rainwater gutters and down pipes for roof drainage. |
| IS : 2629 | Recommended practice for hot dip galvanizing on iron and steel |
| IS : 3114 | Code of practice for laying of cast iron pipes |
| IS : 4111 (Part 1) | Code of practice for ancillary structures in sewerage system : Part 1 manholes |
| IS : 4127 | Code of practice for laying glazed stoneware pipes. |
| IS : 4853 | Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes |
| IS : 5329 | Code of practice for sanitary pipe work above ground for buildings. |
| IS : 5455 | Cast iron steps for manholes. |
| IS : 6159 | Recommended practice for design and fabrication of material prior to galvanizing |
| IS : 7558 | Code of practice for domestic hot water installations |
| IS : 8321 | Glossary of terms applicable to plumbing work |
| IS : 9668 | Code of practice for provision and maintenance of water supplies and fire fighting. |
| IS : 9842 | Preformed fibrous pipe insulation |
| IS : 9912 | Coal tar based coating materials and suitable primers for protecting iron and steel pipe lines. |
| IS : 10221 | Code of practice for coating and wrapping of underground mild steel pipelines |
| IS : 10234 | Recommendations for general pipeline welding. |
| IS : 10446 | Glossary of terms relating to water supply and sanitation. |
| IS : 11149 | Rubber Gaskets |
| IS : 11790 | Code of practice for preparation of butt-welding ends for pipes, valves, flanges and fittings. |
| IS : 12183 (Part 1) | Code of practice for plumbing in multistoreyed buildings : Part 1 Water supply |
| IS : 12251 | Code of practice for drainage of building basements |
| IS : 5572 | Code of practice for sanitary pipe work |

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| | |
|------------|--|
| IS : 6700 | Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their cartilage. |
| IS : 8301 | Code of practice for building drainage |
| BSEN : 274 | Sanitary tapware, waste fittings for basins, bidets and baths. General technical specifications. |

B) PIPES AND FITTINGS :

| | |
|--------------------|---|
| IS : 458 | Specification for precast concrete pipes (with and without reinforcement) |
| IS : 651 | Salt glazed stone-ware pipes and fittings |
| IS : 1239 (Part 1) | Mild steel tubes, tubulars and other wrought steel fittings Part 1 Mild Steel tubes |
| IS : 1239 (Part 2) | Mild steel tubes, tubulars and other wrought steel fittings : Part 2 Mild steel tubulars and other wrought steel pipe fittings. |
| IS : 1536 | Centrifugally cast (spun) iron pressure pipes for water, gas and sewage |
| IS : 1537 | Vertically cast iron pressure pipes for water, gas and sewage. |
| IS : 1538 | Cast iron fittings for pressure pipes for water, gas and sewage |
| IS : 1729 | Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories. |
| IS : 1879 | Malleable cast iron pipe fittings |
| IS : 1978 | Line pipe |
| IS : 1979 | High test line pipe |
| IS : 2501 | Copper tubes for general engineering purposes |
| IS : 2643 (Part 1) | Dimensions for pipe threads for fastening purposes : Part 1 Basic profile and dimensions. |
| IS : 2643 (Part 2) | Dimensions for pipe threads for fastening purposes : Part 2 Tolerances |
| IS : 2643 (Part 3) | Dimensions for pipe threads for fastening purposes : Part 3 Limits of sizes. |
| IS : 3468 | Pipe nuts |
| IS : 3589 | Seamless or electrically welded steel pipes for water, gas and sewage (168.3 mm to 2032 mm outside diameter) |
| IS : 3989 | Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories. |
| IS : 4346 | Specifications for washers for use with fittings for water services. |
| IS : 4711 | Methods for sampling steel pipes, tubes and fittings |
| IS : 6392 | Steel pipe flanges |

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- IS : 6418 Cast iron and malleable cast iron flanges for general engineering purposes.
IS : 7181 Specification for horizontally cast iron double flanged pipe for water, gas and sewage.

C) VALVES :

- IS : 778 Specification for copper alloy gate, globe and check valves for water works purposes
IS : 780 Specification for sluice valves for water works purposes (50 mm to 300 mm size)
IS : 1703 Specification copper alloy float valves (horizontal plunger type) for water supply fittings
IS : 2906 Specification for sluice valves for water works purposes (350 mm to 1200 mm size)
IS : 3950 Specification for surface boxes for sluice valves
IS : 5312 (Part 1) Specification for swing check type reflux (non return) valves : Part 1 Single door pattern
IS : 5312 (Part 2) Specification for swing check type reflux (non return) valves : Part 2 Multi door pattern
IS : 12992 (Part 1) Safety relief valves, spring loaded : Part 1 – Design
IS : 13095 Butterfly valves for general purposes.

D) FIRE FIGHTING EQUIPMENT:

- IS : TAC Tariff advisory committee fire protection manual Part I
IS : TAC Rules of Tariff Advisory Committee for Automatic Sprinkler system
IS : NFPA : Standards on Carbon Dioxide Extinguishing System
12, 1993
IS : 636 Non- percolating flexible fire fighting delivery hose
IS : 884 Specification for First Aid Hose Reel for fire fighting
IS : 901 Specification for first aid hose reel for fire fighting
IS : 902 Specification for couplings, double male and double female, instantaneous pattern for fire fighting
IS : 903 Suction hose coupling for fir fighting purposes
IS : 904 Specification for fire hose delivery couplings, branch pipe, nozzles and nozzle spanner
IS : 905 Specification for 2-way and 3-way suction collecting heads for fire fighting purposes

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| | |
|-----------------------------|---|
| IS : 907 | Specification for delivery breechings, dividing and collecting instantaneous pattern for fire fighting purposes |
| IS : 908 | Specification for suction strainers, cylindrical type for fire fighting purposes. |
| IS : 909 | Specification for underground fire hydrant, sluice valve type |
| IS : 910 | Specification for combined key for hydrant, hydrant cover and lower valve. |
| IS : 933 | Specification for portable chemical foam fire extinguisher |
| IS : 1648 | Code of practice for fire safety of building (general) : Fire fighting equipment and its maintenance. |
| IS : 2171 | Specification for portable fire extinguishers dry powder (cartridge type) |
| IS : 2190 | Selection installation and maintenance of first-aid fire extinguishers- Code of practice |
| IS : 2871 | Specification for branch pipe, universal for fire fighting purposes. |
| IS : 2878 | Specification for fire extinguishers, carbon dioxide type (portable and trolley mounted) |
| IS : 3844 | Code of practice for installation and maintenance of internal fire hydrants and hose reel on premises |
| IS : 5290 | Specification for landing valves |
| IS : 5714 | Specification for hydrant, stand pipe for fire fighting |
| IS : 8090 | Specification for coupling, branch pipe, nozzle, used in hose reel tubing for fire fighting |
| IS : 8423 | Specification for controlled percolation type hose for fire fighting |
| IS : 10658 | Specification for higher capacity dry powder fire extinguisher (trolley mounted) |
| IS : 11460 | Code of practice for fire safety of libraries and archived buildings |
| IS : 13039 | External hydrant system – provision and maintenance – Code of practice. |
| IS : 5514 (Parts 1 to 7) | Reciprocating internal combustion engines : performance. |

E) WATER QUALITY TOLERANCE :

| | |
|-----------------------------|---|
| IS : 3025 (Part 1 to 44) | Method of sampling and test (physical and chemical) for water and waste water |
| IS : 4764 | Tolerance limits for sewage effluents discharged into inland surface waters |
| IS : 10500 | Drinking water |

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F) PUMPS AND VESSELS :

| | |
|--------------------|--|
| IS : 1520 | Specification for horizontal centrifugal pumps for clear cold fresh water |
| IS : 2002 | Steel plates for pressure vessels for intermediate and high temperature service including boilers |
| IS : 2825 | Code for unfired pressure vessels |
| IS : 4682 (Part 1) | Code of practice for lining of vessels and equipment for chemical processes Part 1 : Rubber lining |
| IS : 5600 | Specification for sewage and drainage pumps |
| IS : 8034 | Specification for submersible pump sets for clear, cold, fresh water |
| IS : 8418 | Specification for horizontal centrifugal self priming pumps |

G) QUALITY ASSURANCE AND QUALITY CONTROL

- 1.0 The work shall conform to high standards of design and workmanship, shall be structurally sound and aesthetically pleasing quality standards prescribed shall form the backbone for the quality assurance and quality control system.
- 2.0 At the site level the Contractor shall arrange the materials, their stacking/storage in appropriate manner to ensure the quality. Contractor shall provide equipment and manpower to test continuously the quality of materials, assemblies etc. as directed by the Engineer-in-Charge. The test shall be conducted continuously and the result of tests maintained. In addition the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of surface.
- 3.0 The Engineer- in-Charge shall be free to carry out tests as may be considered necessary by him at his sole discretion, from time to time, in addition to those specified in this document. The Contractor shall provide the samples and labour for collecting the samples nothing extra shall be payable to the Contractor for samples or for the collection of the samples.
- 4.0 The test shall be conducted at the site laboratory that may be established by Engineer-in-Charge or at any other standard Laboratory selected by Engineer- in-Charge.
- 5.0 The contractor shall transport the samples to the laboratory for which nothing extra shall be payable. In the event of Contractor failing to arrange transportation of the samples in proper time Engineer-in-Charge shall have them transported and recover two times the actual cost from the Contractor's bills.
- 6.0 Testing charges shall be borne by the Engineer-in-Charge.
- 7.0 Testing may be witnessed by the Contractor or his authorized representative. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.

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ANNEXURE- B

Pipe Colour Code

| S.No. | Pipe lines | Ground Colour | 1 st Colour Band | 2 nd Colour Band |
|-------|--|---------------|-----------------------------|-----------------------------|
| 1. | Filtered water (all cold water lines after filter) | Sea green | French blue | Signal red |
| 2. | Drinking water (normal temperature) | Sea green | Light orange | |
| 3. | Drinking water (chilled temperature) | Sea green | Light orange | Signal red |
| 4. | Domestic hot water | Sea green | Light grey | |
| 5. | Drainage | Black | | |
| 6. | Fire Lines | Red | | |

This colour code is as per I.S. 2379-1983.

IV) LIST OF APPROVED MAKES FOR PLUMBING/SANITARY & FIRE PROTECTION WORKS:

| S.No. | MATERIAL DESCRIPTION | APPROVED MAKES |
|-------|---|--|
| 1. | Fire Pumps | : Kirloskar/Armstrong/Patterson/HBD |
| 2. | Jockey Pumps | : Grundfoss/Kirloskar |
| 3. | Motor | : Kirloskar / Siemens / Crompton / ABB |
| 4. | Diesel Engine | : Clarke/Catterpillar/Kirloskar /Cummins |
| 5. | Forged Steel Fittings | True Forge/VS Forge |
| 6. | Gun Metal Gate Valves | Zoloto/ LE |
| 7. | Gun Metal/C.I. Air release valve | Leader/Oven Trop/Zoloto |
| 8. | GM Landing Valve (Single Outlet/Double Outlet) | Minimax / Newage /Superex |
| 9. | Gun Metal Branch Pipe with Nozzel | Minimax/Newage/Superex |
| 10. | Male/Female Coupling | Minimax/Newage/Superex |
| 11. | Hose Reel Drum | Minimax/Newage/Superex |
| 12. | Shut off Nozzel | Minimax/Newage/Superex |
| 13. | Fire Man Axe | Minimax/Newage/Superex |
| 14. | GM Two Way/Three Way/Four Way Collecting Head | Minimax/Newage/Superex |
| 15. | GM Drawout Connection (Suction Hose Coupling) | Minimax/Newage/Superex |
| 16. | 20 mm dia rubber pipe for hose reel | Dunlop/Good year/Jyoto/ Mitras |
| 17. | Pressure switch | Danfoss/Switzer |
| 18. | Pressure Gauges | Fiebig / H Guru./Waree |
| 19. | Suction Strainers | Dashmesh/Emerald |
| 20. | Fire Extinguishers (ISI Branded only) | Minimax / Cease Fire/ Superex |

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| S.NO | MATERIAL DESCRIPTION | APPROVED MAKES |
|------|---|---|
| 21. | Anti corrosive pipe treatment (As per IS:10221 – 1982) | Raytek |
| 22. | RRL Hose/C.P.Hose | Newage / CRC/ Superex |
| 23. | Mechanical Seal | Sealol/Burgman/Hindustan |
| 24. | Foot Valve | Kirloskar/Kalpana/Venus |
| 25. | Antivibration mounting | Resistoflex/ Kanwal |
| 26. | Dash Fasteners | Hilti / Fisher |
| 27. | Paint Primer | Asian / Jenson Nicholson/ICI/ Berger |
| 28. | Enamel Painting of pipes etc. | Asian / Goodlac Nerolac |
| 29. | Welding Electrodes | Advani / Esab/D & H Secheron |
| 30. | Installation control valve | Mather & Platt / HD/Viking |
| 31. | Deluge Valve | HD/ Viking/Equivalent |
| 32. | Pendant / Upright / Powder coated Pendant Sprinkler Heads / Spray Nozzle | Tyco/Grinnel/Central/Spray Safe/ Viking. |
| 33. | Powder coated sprinkler rosette | Tyco/Grinnel/Central/Viking |
| 34. | Concealed Sprinkler | Tyco/Grinnel/Central/Viking |
| 35. | Flow Switch | System Sensor / Potter |
| 36. | Exit Sign | Prolite |
| 37. | Electrical Panel | Adlec/Tricolite/Sudhir/Jackson/Spaceage /Neptune |
| 38. | Power Cables & Control Cables | Ecko/RPG/Universal/Nicco |
| 39. | PVC insulated copper wires | Finolex/Rajnigandha /Skyline |
| 40. | Single phase preventor | L & T/ Siemens |
| 41. | Relays | L & T/Alstom/ Siemens |
| 42. | Indicating Lamps | L & T/ GE/ BCH/Siemens |
| 43. | Lugs | Dowell/Lotus |

NARINDER SINGH CONSULTING ENGINEERS

| S.NO | MATERIAL DESCRIPTION | APPROVED MAKES |
|------|---|--|
| 44. | Push buttons | L & T/ Siemens |
| 45. | Fuses & fuse bases | L & T / GE |
| 46. | Current Transformer/Voltage Transformers | Kappa/ Automatic Electric |
| 47. | Timers | L & T / BCH / Siemens / G.E. Power Contracts |
| 48. | Time delay relay/limit switch | Cutler Hammer / L&T |
| 49. | Controls | Honeywell/ Staefa / Penn / Danfoss |
| 50. | Starters/Switches/Contractors | L & T/ Siemens/GE |
| 51. | Changer over switches | HPL Socomec / H.H. Elcon |
| 52. | Annunciator | Minilec |
| 53. | ACB/MCCB | L&T/Siemens/Merlin Gerin/ABB |
| 54. | Miniature Circuit Breakers | L&T(Hager)/ GE/ MDS/ Siemens/ABB |
| 55. | Terminals | Elmex |
| 56. | Conduits | BEC /Precision |
| 57. | Earth Leakage Relay | PIC Make |
| 58. | Battery Charger | AE/Chhabi Electric/Waves Electronics |
| 59. | Battery | Exide/Standard |
| 60. | Selector switch | Kaycee/L&T |
| 61. | Indicating instruments | AE/Rishabh/Meco |
| 62. | Cable glands (Single/Double Compression) | Stripwell/Comex |
| 63. | Bimetallic Crimping type lugs | Dowells |
| 64. | Water flow meter | Actaris |

V) (I) NOTES ON BILL OF QUANTITIES

- 1) All items of work shall be executed strictly in accordance with the description of the item in the bill of quantities, equipment schedule, drawings and standard specifications read in conjunction with the appropriate Indian Standard specifications and conditions of contract.
- 2) The rate for each item of work included in the bill of quantities shall unless expressly stated otherwise, include cost of:
 - a) All materials, equipment's fixing materials, accessories operations, tools plant, equipment, transport, labour and incidentals required in preparation for in the full and entire execution and completion of the work called for in the item and as per specifications and drawings completely.
 - b) Wastage on materials and labour.
 - c) Loading, transportation, unloading, handling/double handling, hoisting to all levels, setting, fitting and fixing in position protecting, disposal of debris and all other labourers necessary in and for the full and entire execution and to fully complete and job in accordance with contract documents, good practice and recognized principles.
 - d) Liabilities, obligations and risks arising out of conditions of contract.
 - e) All requirements of specifications whether such requirements are mentioned in the item or not. The specification and drawings are to be read as complimentary to and part of the schedule of quantities and any work called for in one shall be taken as required for all.
 - f) In the event of conflict between the bill of quantities and other documents, the most stringent shall apply and interpretation of the Construction manager/Consultants shall be final and binding.
- 3) The contractor shall be paid for the actual quantity of work executed by him in accordance with the drawings at the contract rates.
- 4) The bill of quantities shall be fully priced and the extensions and totals duly checked. The rates for all items shall be filled in ink. The entries under the amount column shall be rounded off to the nearest rupee.
- 5) Unless otherwise stated all measurements shall be carried out in accordance with IS 1200 (Latest Edition).
- 6) The terms "Equivalent or Equal" shall mean the equivalents as approved in writing by the Construction manager/Consultants. The question of "Equivalent" material/equipment shall be considered only if, the specified make is not available in the market or discontinued by the manufacturer. The consultant will reserve the right to choose any of the particular make given in the approved manufacturers list.

7) **Supply of Materials:**

Supply of materials shall mean supply of materials at site. The rate for supply shall include all taxes, octroi, insurance, packing and forwarding charges, transportation, unloading at site and overheads & profit.

- 8) The quantities indicated in the bill of quantities are provisional and the contractor is required to measure the actual quantity at site and as per construction drawing and procure the same only after getting the approval of consultant.
- 9) The rates quoted shall include all taxes/duties.
- 10) The owner reserves the right to supply any materials/ Equipment's indicated as supply items in the Bill of Quantities. The contractor shall not have any extra claim or objection to such items supplied by the owner.
- 11) Before any material or equipment is supplied at site contractor shall submit samples/technical details etc, for consultant's/owners approval.
- 12) Shop drawings shall be prepared to get approval before start of any work.
- 13) For the items in the opinion of the consultant requires inspection at the place of manufacturer, contractor shall arrange for such inspection.

| S.No. | Description | Drawing No. |
|-------|--|-------------|
| | FIRE FIGHTING DRAWINGS : | |
| 1 | BASEMENT FLOOR PLAN FIRE FIGHTING LAYOUT | FF - 1 |
| 2 | GROUND FLOOR PLAN FIRE FIGHTING LAYOUT | FF - 2 |
| 3 | FIRST FLOOR PLAN FIRE FIGHTING LAYOUT | FF - 3 |
| 4 | SECOND FLOOR PLAN FIRE FIGHTING LAYOUT | FF - 4 |
| 5 | TERRACE PLAN FIRE FIGHTING LAYOUT | FF - 5 |
| 6 | FIRE FIGHTING SCHEMATIC DIAGRAM | FF - 6 |

**PROJECT: CONSTRUCTION/EXTENSION OF GURU RAMDAS LANGAR HALL
AT SRI HARMANDER SAHIB, AMRITSAR**

SUMMARY OF COST FOR FIRE FIGHTING WORKS

| S. NO. | DESCRIPTION | Amount |
|-------------------------------------|---|--------|
| A) | FIRE PUMPS, EQUIPMENT, PIPING, VALVES & ACCESSORIES | |
| B) | FIRE HYDRANT SYSTEM : | |
| C) | SPRINKLER SYSTEM: | |
| TOTAL FIRE PROTECTION AMOUNT | | |

**PROJECT: CONSTRUCTION/EXTENSION OF GURU RAMDAS LANGAR HALL,
SRI HARMANDER SAHIB, AMRITSAR**

BILL OF QUANTITIES FOR FIRE FIGHTING WORKS

| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
|---|--|------|-----|--------------|
| BILL OF QUANTITIES FOR FIRE PROTECTION WORKS | | | | |
| A) | PUMPS WITH ACCESSORIES: | | | |
| 1.0 | Electric Motor Driven Hydrant & Sprinkler Pump : | | | |
| | Supplying, installing, testing and commissioning of Fire authority approved Electrical driven fire pump suitable for automatic/ manual operation consisting of the following: | | | |
| i) | Horizontal centrifugal end suction type fire pump capable of delivering 2280 LPM (38 LPS) against a total head of 70 M while running at 2900 r.p.m. complete with 150mm dia burdon type pressure gauge with Gun metal cocks/ valves etc. on the delivery side, including bypass arrangement (50 mm dia GM Stop valve including 5 m pipe of 50mm dia with fittings). Gland arrangement shall be included. | | | |
| ii) | Squirrel cage, TEFC induction motor suitable for 415 ± 10%V, 3-phase, 50 Hz A.C. supply and suitable H.P. rating for the above pump running at 2900 r.p.m. | | | |
| iii) | Common bed plate for mounting Pump and Motor of requisite strength manufactured out of M.S.channels as per manufacturer's recommendation. | | | |
| iv) | Suitable R.C.C pump foundations as per manufacturer's design and 6 Nos. antivibration (Cushy foot) heavy duty mounting pads. | | | |
| v) | Coupling and coupling guard for direct coupling of pump and motor. | | | |
| vi) | Drain pipe with valve (50 mm dia) | | | |
| | Hydrant & Sprinkler Pump: | | | |
| | Discharge : 2280 LPM (38 LPS) | | | |
| | App. Head : 70 M | | | |
| | App. Motor H.P : 62 (47 KW) or As per manufacturer recommendation. | | | |
| | Location : Plant Room | Set | 2 | |
| 2.0 | Diesel Engine Driven Fire Pump [Stand by Pump] | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|---|--|-------------|------------|---------------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| | Supplying, installing, testing & commissioning of fire authority approved Diesel Engine driven fire pump suitable for automatic/manual operations consisting of the following: | | | |
| | | | | |
| i) | Horizontal centrifugal end suction type fire pump capable of delivering 2280 LPM (38 LPS) against a total head of 70 M while running at 1500 r.p.m. complete with 150mm dia burdon type pressure gauge with Gun metal isolation cocks/ valves etc. on the delivery side, including bypass arrangement (50 mm dia GM Stop valve & 5 m 50mm dia pipe with fittings pipe). Gland arrangement shall be included. | | | |
| | | | | |
| ii) | Diesel engine of 50.00 BHP at 1500 RPM for the above pump complete with standard accessories & suitable water cooling system mechanism batteries, automatic battery charger unit, flexible coupling with the pump. Fuel tank, silencer, exhaust pipe & all standard accessories as required including mandatory spares and tool kit. | | | |
| | | | | |
| iii) | Common base plate for mounting pump & motor of requisite strength manufactured out of M.S. channels as per manufacture's recommendation. | | | |
| | | | | |
| iv) | Suitable R.C.C pump foundations as per manufacturer's design and 6 Nos. antivibration (Cushy foot) heavy duty mounting pads. | | | |
| | | | | |
| v) | Coupling & coupling guard for direct coupling of engine & pump. | | | |
| | | | | |
| vi) | 1 No. 6 hours capacity day oil storage tank fabricated from 16 SWG thick M.S. plates. Tank shall be provided with inlet, outlet, overflow, vent, drain connections, manhole cover (300 mm I.D.) & level indicator. Tank shall be mounted on a suitable steel structural supports (Painted with 2 coats of red oxide paint). Tank shall be provided with epoxy coat from inside & two or more coats of synthetic enamel paint over two coats of red oxide primer. | | | |
| | | | | |
| vii) | Drain pipe with valve (50 mm dia) | | | |
| | | | | |
| viii) | 24 volts 180 AH lead acid battery (12 volts - 2 Nos) with boost/Trickle charger for starting the engine automatically complete as required. | | | |
| | | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| | Diesel Engine driven pump of: | | | |
| | Discharge: 2280 LPM (38 LPS) | | | |
| | App. Head: 70 M | | | |
| | Location : Plant Room | Set | 1 | |
| | | | | |
| 3.0 | Electrical Motor Driven Jockey Pump : | | | |
| | | | | |
| | Supplying, installing, testing & commissioning of fire authority approved electrically driven Jockey pump suitable for automatic/manual operation consisting of the following: | | | |
| | | | | |
| i) | Horizontal centrifugal end suction type fire pump capable of delivering 180 LPM (3 LPS) against a total head of 70 M while running at 2900 r.p.m. complete with 150mm dia burdon type pressure gauge with Gun metal cocks/ valves etc. on the delivery side, including bypass arrangement (25 mm dia GM Stop valve & 5m pipe). Gland arrangement shall be included. | | | |
| | | | | |
| ii) | Squirrel cage, TEFC induction motor suitable for 415 ± 10%V, 3 phase, 50 Hz A.C. supply of suitable H.P. for the above pump running at 2900 r.p.m. | | | |
| | | | | |
| iii) | Common bed plate for mounting pump & motor of requisite strength manufactured out of M.S. channel as per manufacturer's recommendation. | | | |
| | | | | |
| iv) | Suitable R.C.C pump foundations as per manufacturer's design and 6 Nos. antivibration (Cushy foot) heavy duty mounting pads. | | | |
| | | | | |
| v) | Coupling and coupling guard for direct coupling of motor and pump. | | | |
| | | | | |
| vi) | Drain pipe with valve (25 dia) Jockey pump of: | | | |
| | Discharge: 180 LPM (3 LPS) | | | |
| | App. head: 70 Metre | | | |
| | Min Motor HP : 15 HP (12 KW) | | | |
| | Location : Plant Room | Set | 1 | |
| | | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 5.0 | Providing, fixing, testing and commissioning of Diaphragm type air vessel (size 450 mm dia & 2000 mm height) fabricated shell from 8 mm thick & dished end 10 mm thick M.S. Plate for pressurization of hydrant/ sprinkler system complete with adequate pressure switches (as per design / requirement) with valve to operate as per operating sequences including 25 mm dia drain valve, air release valve with ball cock on top, 65mm/80 mm dia flanged inlet with isolating valve duly painted from inside and out side complete as required. | Each | 1 | |
| 6.0 | Providing, fixing, testing and commissioning of heavy duty MS pipe class 'C', IS : 1239 marked with all necessary fittings like tees, elbows, flanges, reducers, gaskets, nuts and bolts etc. welded or screwed joints as required including fixing the pipe with necessary structural supports including painting of two coats of synthetic enamel paint over two coats of red oxide primer including all civil breakage's and making good the same GI Pipe / PVC sleeve of suitable higher size shall be provided wherever the pipes are crossing the walls/ floors and sealing the sleeves with glass wool in between & fire sealant compound at either end all as per project Manger/ Consultants requirement including cutting holes and chases in brick, RCC work. All hangers, clamps brackets etc shall be of galvanized Iron unless specified other wise and then supply of the same shall be included for the rates under this head. Welding of any kind on the galvanized support / hanger shall not be permitted including synthetic enamel paint of approved make over a coat of zinc primer. | | | |
| a) | 50 mm dia | RM | R.O | |
| b) | 65 mm dia | RM | 10 | |
| c) | 80 mm dia | RM | 50 | |
| d) | 100 mm dia | RM | 10 | |
| e) | 150 mm dia | RM | 114 | |
| 7.0 | Providing, fixing, testing & commissioning of heavy duty MS pipe class 'C', IS : 3589 marked with all necessary fittings like tees, elbows, flanges, reducers, gaskets, nuts and bolts etc. welded or screwed joints as required including fixing the pipe with necessary structural supports (for delivery/suction manifold related to the pumps) including painting of two coats of synthetic enamel paint over two coats of red oxide primer including all civil breakages and making good the same [Location : Plant room]. | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| a) | 200 mm dia (6 mm thick) with necessary supports etc. as required. | RM | R.O | |
| b) | 250 mm dia (6 mm thick) with necessary supports etc. | RM | 18 | |
| c) | 300 mm dia (6 mm thick) with necessary supports etc. | RM | 12 | |
| d) | 350 mm dia (6 mm thk) with necessary supports etc. | RM | R.O | |
| 8.0 | Providing, fixing, testing & commissioning of flanged end basket strainer made from MS body with bottom and top removable flanges with nuts, bolts etc having filtration area at least 6 times the cross sectional area of the pipe. | | | |
| a) | 200 mm dia | Each | R.O | |
| b) | 250 mm dia | Each | 2 | |
| c) | 300 mm dia | Each | R.O | |
| 9.0 | Providing, fixing, testing & commissioning of C.I. Butterfly valve conforming to IS : 13095 with flanges, nuts, bolts and washers complete for following sizes :- [PN 16 rating (16 kg/cm ² pressure rating)]. | | | |
| a) | 300 mm dia (Gear operated) | Each | R.O | |
| b) | 250 mm dia (Gear operated) | Each | 2 | |
| c) | 200 mm dia (Gear operated) | Each | 3 | |
| d) | 150 mm dia | Each | 6 | |
| e) | 100 mm dia | Each | 4 | |
| f) | 80 mm dia | Each | 2 | |
| g) | 65 mm dia | Each | 1 | |
| h) | 50 mm dia | Each | 1 | |
| 10.0 | Providing, fixing, testing & commissioning of C.I. dual plate non-return valve [PN 16 Rating (16 kg/cm ² pressure rating)] complete 2 nos. matching flanges, rubber insertion, with nuts, bolts and washers etc of following sizes . | | | |
| a) | 250 mm dia | Each | R.O | |
| b) | 200 mm dia | Each | 1 | |
| c) | 150 mm dia | Each | 3 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|---|---|-------------|------------|---------------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| | | | | |
| d) | 100 mm dia | Each | 2 | |
| | | | | |
| e) | 80 mm dia | Each | 1 | |
| | | | | |
| f) | 65 mm dia | Each | 1 | |
| | | | | |
| g) | 50 mm dia | Each | 1 | |
| | | | | |
| 11.0 | Providing & fixing dial type (100 mm dia) pressure gauge with isolation ball valve suitable for working pressure of 250 PSI cost shall be of inclusive of providing any short pieces, nipples, elbows etc as required. having calibration of 0-15 Kg/cm ² . | Each | 5 | |
| | | | | |
| 12.0 | Providing, fixing, testing & commissioning of resilient rubber lined single arch vibration eliminators suitable for raw water up to 45°C temperature, working pressure 8.8 Kg/cm ² and test pressure 20 Kg/cm ² for :- | | | |
| | | | | |
| a) | 250 mm dia | Each | R.O | |
| | | | | |
| b) | 200 mm dia | Each | 1 | |
| | | | | |
| c) | 150 mm dia | Each | 3 | |
| | | | | |
| c) | 100 mm dia | Each | 2 | |
| | | | | |
| d) | 80 mm dia | Each | 2 | |
| | | | | |
| e) | 65 mm dia | Each | 2 | |
| | | | | |
| 13.0 | Providing, fixing water flow meter complete with all accessories for flow indication , monitoring & testing of fire pumps. | Each | 1 | |
| | | | | |
| 14.0 | Providing, fixing, testing & commissioning of M.S. class 'C' diesel pump exhaust pipe including all fittings like bends, tee, clamps/structural steel support of suitable dia for the engine . The insulation of the exhaust pipe shall be carried out with rock wool with specific gravity of 100kg/cm2 and cladded with 22 gauge aluminium sheet. | RM | 25 | |
| | | | | |
| 15.0 | ELECTRICAL WORKS: | | | |
| | | | | |
| 15.1 | PANELS: | | | |
| | | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| | Supply, installation, testing and commissioning of following fire fighting panel suitable for 415 V, 3 phase, 4 wires, 50 Hz power distribution system. The panel shall be free standing floor mounting sheet metal enclosed dust and vermin proof conforming to IP-52, compartmentalized design, fabricated out of 14 SWG sheet steel, painting, earthing numbering, danger plate as per specifications and drawings , flush front with Aluminium busbars, separate earth bus bars to be provided throughout the length of the panel. The incoming and outgoing feeder breakers, fuses, indicating lamps etc shall be accommodated in a modular multitier arrangement. The painting shall done as per relevant IS codes/as specified in the specifications. Adequate size cable alley shall be provided all round the panel and in the back for each cable bending and termination. The panel shall be fabricated by TAC/Fire authority approved vendor. The outgoing feeders inside the panel shall be connected through solid bus bars. Flexible cable links are not acceptable. | | | |
| | Bus bars shall be provided with heat shrinkable sleeves and shall be colour coded. The panels shall be suitable for cable entry from top. The minimum fault rupturing of all incoming and outgoing switches/breakers shall be 35 KA. The panels shall be fabricated after the approval of fabrication drawings. | | | |
| Note : | All wires and cables used will be FRLS. 2 Nos. earthing terminals shall be provided for 3 phase, 415 V, 50 HZ supply system. M Lifting hooks shall also be provided in case of large panels. Cadmium plated hardware shall be used in fabrication of Panels. | | | |
| 15.1.1 | Main Fire Pump Panel: | | | |
| a) | Incoming : | | | |
| i) | One (1) No. 630A TPN MCCB (35 KA) with Earth leakage protection. | | | |
| | Metering & Indication : | | | |
| iii) | One (1) No. digital volt, current & Frequency (VAF) Meter with in built selector switch, 630A/5A CL-1.0,15VA CTs and control fuses. | | | |
| v) | One (1) set of three (3) nos. phase indicating lamps with fuses. | | | |
| vi) | One set of indication lamp with fuses for ON/OFF/TRIP of breaker. | | | |
| | Busbars: | | | |
| ii) | Electrolytic high conductivity Aluminium three pole and neutral busbars rated at 630 amps having a maximum current density of 1.0 amp per sq mm insulated with heat shrinkable PVC sleeves. | | | |
| b) | Outgoing: | | | |
| i) | Three (3) Nos. 200 A TP MCCB 35 KA with Ammeter (0-200A) with selector switch and CTs of ratio 200/5A , 5VA, Class 1.0. | | | |
| ii) | Two (2) Nos. 63 A TPN MCCB 35 KA with Ammeter (0-60A) and selector switch. | | | |
| iii) | One (1) No. 40A, TP MCCB 35kA with Ammeter (0-40A) and selector switch. | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| iv) | Two (2) Nos. Soft Starters complete with over load relay with single phasing protection feature. ON/OFF & TRIP, indication lamp, contactors and sufficient nos. of potential free spare contacts, etc. suitable for 60 HP (45kW) motor. | | | |
| | - Two (2) Nos. pressure switch | | | |
| | - Wiring from pressure switch to starter - Lot. | | | |
| v) | Two (2) Nos. DOL Starter with over load relay with single phase protection feature. ON/OFF & TRIP, indication lamp, contactors and sufficient nos. of potential free spare contacts, etc. suitable for 15.0 HP (11.5kW) motor. | | | |
| | - Set of control system to make the system automatic as per functional requirements which is activated with pressure switches as per specifications and complete with all accessories as required. | | | |
| | - One (1) No. pressure switch. | | | |
| | - Wiring from pressure switch to starter – Lot | | | |
| vi) | The diesel engine driven fire pump shall start automatically in the event of pressure drop beyond preset limit on mains failure or failure of electrical driven pumps to start. AMF logic for starting the diesel engine fire pump with trickle / boost battery charger, DC ammeter Voltmeter, Hooter indication etc to meet the system requirement. | | | |
| | - One (1) no. pressure switch. | | | |
| | - Wiring from pressure switch to Diesel engine control panel. | Set | 1 | |
| | Notes : | | | |
| i) | Separate neutral link to be provided wherever TP MCCB are used. | | | |
| ii) | Following provisions to be made in the fire panel: | | | |
| a) | Audio visual alarm & indications having disconnect/reset facility with a range of 1/2 km. Annunciator to be provided in the Fire panel with hooter and acknowledge, test and reset PBs. The indication shall come on when electrical driven pump set fails to start on pressure drop or when there is power failure during pressure drop. | | | |
| b) | Facility for mode selection ie auto/manual/test & ON/OFF operation from local/remote . | | | |
| c) | Protection features & control cabling. | | | |
| d) | Panel shall be interlocked in such a way when fire pump starts on pressure drop in the header, supply to working chiller and A/c panel is disconnected. | | | |
| e) | Remote indication of ON/OFF/ TRIP shall be provided through potential free contact. | | | |
| f) | Provision of remote starting/ stopping (manual) of the engine shall be made. | | | |
| g) | Sufficient No. of potential free contacts and terminals shall be provided for connecting it to BMS | | | |
| | | | | |
| 15.1.2 | Supply, installation, testing & commissioning of following sizes of 1100 V grade XLPE insulated extruded PVC inner & outer sheathed, Aluminium, armoured cables, as per site conditions. | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| a) | 3.5C x 300 Sq.mm | RM | R.O | |
| b) | 3C x 150 Sqmm | RM | 80 | |
| c) | 3C x 16 Sqmm | RM | 60 | |
| d) | 3C x 10 Sqmm | RM | R.O | |
| e) | 4C x 10 Sqmm | RM | 40 | |
| 15.1.3 | <u>Copper Conductor Armoured Control Cables :</u> | | | |
| a) | 3C x 2.5 Sq.mm | RM | 250 | |
| b) | 5C x 2.5 Sq.mm | RM | R.O | |
| 15.1.4 | <u>Cable Termination:</u> | | | |
| | Supply & making end termination with brass double compression glands for the following XLPE insulated, PVC sheathed & armoured 1100 V grade Aluminium cable including cost of crimping lugs/ferrules, compression glands, solder, cable sockets, insulation tape etc complete as required. | | | |
| a) | 3C x 300 Sqmm | Nos. | R.O | |
| b) | 3C x 150 Sqmm | Nos. | 4 | |
| c) | 3C x 16 Sqmm | Nos. | 4 | |
| d) | 3C x 10 Sqmm | Nos. | R.O | |
| e) | 4C x 10 Sqmm | Nos. | 2 | |
| 15.1.5 | <u>Cable Termination :</u> | | | |
| | <u>Suitable for Copper Conductor Armoured Control Cables :</u> | | | |
| a) | 3C x 2.5 Sq.mm | Nos. | 20 | |
| b) | 5C x 2.5 Sq.mm | Nos. | R.O | |
| 15.1.6 | 4 Way TPN MCB DB (for Fire Pump Room) | | | |
| | <u>Incomer</u> : One (1) no. 40A TPN MCB (10 KA) | | | |
| | <u>Outgoing</u> : Twelve (12) nos. 10/16/20A SP MCB (10 KA) | No. | 1 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 15.1.7 | Supply and installation of GI ladder type/perforated type cable trays of the following sizes fabricated out of perforated hot dip galvanized MS sheets of minimum 2mm thick with 75mm flange to be installed horizontally or vertically. | | | |
| 15.1.7.1 | <u>Ladder Type Cable Tray</u> | | | |
| a) | 300mm wide | RM | R.O | |
| b) | 150mm wide | RM | R.O | |
| c) | 100mm wide | RM | R.O | |
| 15.1.7.2 | <u>Perforated Type Cable Tray</u> | | | |
| a) | 300mm wide x 50mm x 2mm | RM | 60 | |
| b) | 150mm wide x 40mm x 2mm | RM | 80 | |
| c) | 100mm wide x 40mm x 2mm | RM | R.O | |
| 15.1.8 | <u>Earthing:</u> | | | |
| | Supply, Installation, Testing & Commissioning of the following size of GI strip/wire clamped to wall, cable trays complete as required including interconnection between lengths at joints, all fixing accessories saddles, calmps etc. and other fixing hardware. | | | |
| a) | 40 x 6 mm strip | RM | 100 | |
| b) | 25 x 6 mm strip | RM | 100 | |
| c) | 25 x 3 mm strip | RM | R.O | |
| d) | 6 mm dia GI wire | RM | 200 | |
| Note : | Contractor shall include in his rate for providing level controller, pressure switches, wiring, cabling from level controller/pressure switch to panel etc. complete as required to operate the system automatic/manual. Pump shall be protected against running dry. | | | |
| 16.0 | Electrical Driven Terrace Pump : | | | |
| | Supplying, installing, testing & commissioning of fire authority approved electrically driven Terrace pump suitable for automatic/manual operation consisting of the following: | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| i) | Horizontal centrifugal end suction type fire pump capable of delivering 900 LPM (15 LPS) against a total head of 20 M while running at 2900 r.p.m. complete with burdon type pressure gauge with Gun metal cocks/ valves etc. on the delivery side, including bypass arrangement (25 mm dia GM Stop valve & 5m pipe). Gland arrangement shall be included. | | | |
| ii) | Squirrel cage, TEFC induction motor suitable for 415 ± 10%V, 3 phase, 50 Hz A.C. supply of suitable H.P. for the above pump running at 2900 r.p.m. conforming to IP 55 pralecting and class 'F' insulation. The motor shall be conform to IS:325 1978 (upto date) | | | |
| iii) | Common bed plate for mounting pump & motor of requisite strength manufactured out of M.S. channel as per manufacturer's recommendation. | | | |
| iv) | 4 Nos. antivibration (Cushy foot) heavy duty mounting pads. | | | |
| v) | Coupling and coupling guard for direct coupling of motor and pump. | | | |
| vi) | Drain pipe with valve (25 dia) Terrace pump of: | | | |
| | Discharge: 900 LPM (15 LPS) | | | |
| | App. head: 20 Metre | | | |
| | Min. Motor HP : 15 HP (approx.) | | | |
| | Location : Terrace | No. | 1 | |
| | TOTAL OF FIRE PUMPS, EQUIPMENT, PIPING, VALVES & ACCESSORIES [PART-II A] CARRIED OVER TO SUMMARY | | | |
| B) | FIRE HYDRANT SYSTEM : | | | |
| 1.0 | Black Mild Steel Class `C' (Heavy Duty) pipes conforming to IS : 1239 Part-I including cutting, threading, welding & all fittings like flanges, tees, elbows, bends junctions, reducers etc. welded or screwed joints, clamps & structural steel supports (as per TAC norms) or as required/ directed at site including cutting & making good the walls, floors, RCC work etc cutting chases & filling the same with cement concrete 1:3:6 (1 cement :3 coarse sand :6 graded stone aggregate 20 mm nominal size) including painting the pipes with 2 coats of desired shade of synthetic enamel paint over 2 coats of Red oxide primer. (For Internal work). | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| a) | 25 mm dia | RM | 50 | |
| b) | 50 mm dia | RM | R.O | |
| c) | 65 mm dia | RM | R.O | |
| d) | 80 mm dia | RM | 90 | |
| e) | 100 mm dia | RM | 25 | |
| f) | 150 mm dia | RM | 475 | |
| g) | 200 mm dia (As per IS:3589 and thickness 6.00 mm) | RM | R.O | |
| | Notes : | | | |
| 1 | Pipes upto and 50 mm dia shall be threaded joints, above 50 mm shall be welded joints. | | | |
| 2 | For pipe upto 50mm dia standard threaded forged steel fittings and pipe 50mm dia standard MS fitting with welded joint shall be used. | | | |
| 3 | Steel structural supports are included in this items. | | | |
| 4 | G.I Pipe sleeve of suitable higher size shall be provide of wherever in the pipe are crossing the walls/ floors and sealing the sleeves with glass wool in between and sealant compound at either end as per project manager's | | | |
| 2.0 | Black Steel Class `C' (Heavy Duty) pipes conforming to IS : 1239 Part-I including cutting, threading, welding & all fittings like flanges, tees, elbows, bends, junctions, reducers, supports, clamps, welded joints as required etc. necessary excavation & back filling the same. (For External work) | | | |
| a) | 50 mm dia | RM | R.O | |
| b) | 65 mm dia | RM | R.O | |
| c) | 80 mm dia | RM | 20 | |
| d) | 100 mm dia | RM | 25 | |
| e) | 150 mm dia | RM | 400 | |
| 3.0 | Providing and applying one coat of 4 mm thick anti rust pipe protection including approved primer as per manufactures specifications and lap of 25 mm to make an impermeable layer on M.S. Pipes in trenches or structural /masonry members complete including surface prepration. | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| a) | 50 mm dia | RM | R.O | |
| b) | 65 mm dia | RM | R.O | |
| c) | 80 mm dia | RM | 20 | |
| d) | 100 mm dia | RM | 25 | |
| e) | 150 mm dia | RM | 400 | |
| 4.0 | Gun metal double headed hydrant valves with 100 mm dia flanged inlet brass spindle control & 63 mm dia female instantaneous outlet type gun metal coupling complete with rubber blank cap and chain as per IS : 5290 [ISI marked should be embossed]. | Each | R.O | |
| 5.0 | Gun metal single headed ISI marked oblique pattern hydrant landing valves with 80mm dia flanged inlet & 63 mm dia female outlet complete with gun metal cap and GI chain twist release type plugh and all accessories as per IS : 5290 including fixing with anchor fasteners and flanged tapping from wet riser and providing pressure gauge with gun metal ball valve complete as required. (For Internal + External | Each | 30 | |
| 6.0 (a) | 63 mm dia 15 m long non-percolating flexible hose (RRL-type A) as per IS : 636. Type "A" with Gunmetal male & female instantaneous type coupling (IS 903) bound and riveted to hose pipe with copper rivets and 1.5 mm copper wire (For extranal hydrant system). | Each | 60 | |
| b) | 63 mm dia 15 m long controlled Percolating (C.P.) type hose pipe, as per IS : 8423. Type A with Gunmetal male & female instantaneous type coupling bound and riveted to hose pipe with copper rivets and 1.5 mm copper wire with wire to pipe. | Each | R.O | |
| 7.0 | Standard Gun metal branch pipe with nozzle of 20 mm nominal bore outlet as per IS:903 suitable to fit with standard instantaneous type 63mm dia coupling ISI marked (IS:903) complete. | Each | 24 | |
| 8.0 | Standard Fireman's Axe with heavy insulated handle. | Each | 24 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 9.0 | Wall mounting swinging type first aid fire hose reel with drum, hanging bracket, 36.5 Mtr. length x 20 mm dia high pressure hose reel tubing as per IS: 444 with gun metal (GM) shut off nozzle having 6.5 mm dia orifice. The hose reel shall be conforming to IS : 884-1985. Rate shall include 25 mm dia M.S. pipe (heavy class) connection from Riser to hose reel, sockets, nipples, elbows and ball valve (25 mm dia). Drum shall be fixed on adjoining wall by means of 120 mm x 100 mm long fasteners, bolts and nuts including painting. <u>(For internal hydrant system).</u> | Set | 24 | |
| 10.0 | Weather proof standard fire hose cabinet (750 mm x 600 mm x 300 mm deep) for yard hydrants and terrace hydrant made of 16 SWG powder coated M.S. sheet having single or double opening glazed (4.0 mm thick glass) shutter including necessary locking arrangement by allan key, stove enamelled Fire red finish (as per IS : 5, shade no. 536) with " Fire Hose" marked on front, suitable for housing 2 nos. Hose pipe, 1 No. branch pipe & nozzle spanner. Cost shall inclusive of break glass box containing key for the cabinet along with axe hammer <u>(For external hydrant system+Terrace Hydrant).</u> | Each | 11 | |
| 11.0 | Providing & fixing fire authority approved M.S. hose box (size 900 (L) x 2000 (H) x 600 mm deep) made out of 16 SWG powder coated M.S. sheet Angle frame capable of accommodating fire hose reel, fire hydrant, hose pipe, fittings & accessories. The box shall have a single or double glazed front glass door (with 4 mm thick glass) with lock & key arrangement & shall be painted with Fire red as per IS:5, shade no. 536. <u>(For Internal Hydrant)</u> | Each | R.O | |
| 12.0 | Providing & fixing fire authority approved weather proof M.S. fire hose door (size 900 (L) x 2000 (H)) made out of 16 gauge M.S. sheet Angle frame capable of accommodating fire hose reel, fire hydrant, hose pipe, fittings & accessories. The box shall have a single or double glazed front glass door (with 4 mm thick glass) with lock & key arrangement & shall be painted with Fire red as per IS:5, shade no. 536. <u>(For Internal Hydrant).</u> Drain arrangement shall be provided by Contractor. | Each | 19 | |
| 13.0 i) | C.I. Butterfly valve conforming to IS : 13095 with nut, bolts and washers complete. [PN -16 rating(16 kg/cm ² pressure rating)] | | | |
| a) | 150 mm dia | Each | 8 | |
| b) | 100 mm dia | Each | 7 | |
| c) | 80 mm dia | Each | 8 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|---|---|-------------|------------|---------------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 13.0 ii) | Cast Steel Butterfly Valve conforming to BIS including all fitting and accessories [PN 16 rating (16 Kg/Sq.cm pressure rating)]. | | | |
| a) | 150 mm dia | Each | 10 | |
| b) | 100 mm dia | Each | R.O | |
| c) | 80 mm dia | Each | R.O | |
| | [Location : External ring main]. | | | |
| 14.0 | Gun Metal three way fire brigade inlet to hydrant ring/hydrant riser with 63 mm dia instantaneous type inlet and 150 mm dia flanges outlet conforming to IS:904 with blank cap and chain including 150 mm dia butterfly valve (PN 16 rating) and wafter type non-return valve complete with nuts, bolts, flanges and complete in all respect. Cost shall include a wall mounted box of M.S. construction (16 SWG) with glass door (4.0 mm thick) to house the above mentioned component. | Each | 1 | |
| 15.0 | Gun Metal four way fire brigade connection having 63 mm dia instantaneous type inlet and 150 mm dia flange outlet conforming to IS:904 with blank cap and chain with 150 mm dia butterfly valve and non return valve necessary 150 mm dia MS (heavy duty) pipe and flanges, nuts, bolts etc. Cost shall include a wall mounted box of M.S. construction (16 SWG) with glass door (4.0 mm thick) to house the above mentioned component complete in all respect. (Approx. 0.6 mts x 0.6 mts x 0.45 mts) (Location: For internal Hydrant system and fire tank filling). | Each | 2 | |
| 16.0 | 100 mm dia gun metal fire brigade suction hose coupling of (gunmetal draw off connection) with 100 mm dia M.S. 'C' Class suction pipe with 100 mm dia C.I. foot valve. (Pipe max. 10 m long). Cost shall include a wall mounted box of M.S. construction (16 SWG) with glass door (4.0 mm thick) to house the above mentioned component to be connected to static water tank. | Set | 1 | |
| 17.0 | Providing & fixing cast iron air release valve of 25 mm dia including 25 mm dia Ball valve with fittings etc. as per the requirement. | Each | 4 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 18.0 | Providing and laying light duty non pressure NP-3 Class RCC pipe S/S jointed with stiff mixture in the proportion 1:2, 300 mm dia R.C.C. Hume pipe for underground hydrant pipe at road crossings including collar pieces and filling inside of pipe with sand complete as required including necessary excavations and back filling and bed concrete. (For road crossing) | RM | 50 | |
| 19.0 | Bourden type Stainless Steel dial type pressure gauge with brass isolation valve and pipe. (For each internal Fire hose cabinet) | | | |
| | Dial Diameter : 100 mm | | | |
| | Caliberation : 0-15 Kg/cm ² | Each | 15 | |
| 20.0 | Constructing brick masonry chamber with 75 class designation brick work in cement mortar 1:5 (1 cement :5 fine sand) for Sluic valve, with C.I. medium duty manhole cover fixed in concrete slab 1:2:4 mix (1 cement :2 coarse sand :4 graded stone aggregate 20 mm nominal size), necessary excavation, foundation concrete 1:5:10 (1 cement :5 fine sand :10 graded stone aggregate 40 mm nominal size) and 12 mm thick inside plastering with cement mortar 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement complete as per standard design. | | | |
| a) | 900 x 900 x 1400 mm internal dimensions | Each | 3 | |
| 21.0 | Providing and making drainage provision for the wet riser with 40 mm dia MS (heavy duty) pipe, ball valve, fittings etc. as required maximum length of pipe 6 mtr. | Set | 11 | |
| 22.0 | Providing and fixing C.I. gratings grating of approved make and quality grade 18/8 - 304 on top of floor trap. The rate includes the cost of all ancillary works and material as required to complete the works. | | | |
| a) | 100 mm dia | Each | 20 | |
| 23.0 | Providing and fixing 100mm dia GI pipe approximately 300 mm long with one reducer elbow 100x50 mm and dipped in hot bitumen complete. | Each | R.O | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|---|--|-------------|------------|---------------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| 24.0 | Approval of Fire Hydrant/Sprinkler System from Local Fire Authority and any other relevant statutory authority at initial and various other stages of work, including preparation of report/drawings as per fire authority. Contractor shall include cost of all liason work which are not explicitly mentioned above but are mandatory to have fire authority approval (any statutory charges will be paid extra). | Job | 1 | |
| 25.0 | Providing and fixing brass mosquito proof grating in elbow with necessary G.I. Vent pipe with fitting. | Each | R.O | |
| | TOTAL OF FIRE HYDRANT SYSTEM [PART-II B] CARRIED OVER TO SUMMARY | | | |
| C) | SPRINKLER SYSTEM: | | | |
| 1.0 | Supply, installation, testing and commissioning of Black Mild Steel Pipe class 'C' (heavy duty) conforming to IS:1239/IS : 3589 including all accessories such as screwed/welded joints, flanges, tees, reducers structural steel supports and clamps etc. including lift to all heights, welding, jointing, painting and inserted rubber gaskets, nuts, bolts etc. as required. Pipes shall be painted with two coats of primer & two coats of post office red synthetic enamel paint over a coat of primer. Prior to application of primer surface to be cleaned including painting of legends both direction arrow as per approval of Project Manager and shall be fixed in ceiling, walls, columns for all heights with hangers/supports and fasteners all as per drawing including chasing of walls/columns /ceiling etc. and making good the same as required. G.I. pipe/PVC sleeve of suitable higher size shall be provided whenever the pipes are crossing the walls/floors and sealing the sleeves with glass wool in between & fire sealant compound at either end all as per Project Manager/Consultant requirement. | | | |
| a) | 200 mm dia | RM | R.O | |
| b) | 150 mm dia | RM | 400 | |
| c) | 100 mm dia | RM | 100 | |
| d) | 80 mm dia | RM | 142 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|--|------|------|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| e) | 65 mm dia | RM | 230 | |
| f) | 50 mm dia | RM | 245 | |
| g) | 40 mm dia | RM | 270 | |
| h) | 32 mm dia | RM | 400 | |
| i) | 25 mm dia | RM | 4160 | |
| | Notes : | | | |
| i) | Pipe upto 50 mm dia shall be threaded joints, above 50 mm shall be welded joints. | | | |
| ii) | For pipe upto 50mm dia standard threaded forged steel fittings and for pipe above 50mm dia standard of MS fittings with welded joints shall be used. | | | |
| iii) | Supports are included in this items. | | | |
| iv) | G.I Pipe sleeve of suitable higher size shall be provided wherever in the pipe are crossing the wall/ floors and sealing the sleeves with glass wood in between and sealant compound at either end as per project manager's | | | |
| 2.0 | Providing, fixing, testing and commissioning of 150 mm dia Cast Iron installation control valve assembly (test pressure should not be less than 15.0 Kg/Sq.cm) with flanges, nut, bolts & gasket complete with pad locking arrangement, vertical wet alarm valve with hydraulic alarm motor & gong, 2 nos. pressure gauges as per manufacturer recommendation with ball valves, 15 mm dia test valves, 50 mm dia drain valve with all necessary accessories. | Set | 2 | |
| 3.0 | Providing, fixing, testing and commissioning of 100 mm dia Bourden type, Stainless Steel dial type pressure gauges for sprinkler system including ball valve and pipe having calibration of 0-15Kg/cm ² . | Each | 2 | |
| 4.0 | Providing, fixing, testing and commissioning of 15 mm dia quartzoid bulb type GM sprinkler head suitable to operate at 68 deg C (UL/FM/LOC listed /approved) | | | |
| a) | Concealed Sprinkler 68 ⁰ C | Each | R.O | |
| b) | Side Wall Quick Response Type Sprinkler 68 ⁰ C (For Guest Block) | Each | R.O | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|------|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| c) | Side Wall Standard Response Type Sprinkler 68°C (For Ramp Area) | Each | 25 | |
| d) | Pendent type Quick Response type Sprinkler 68°C | Each | R.O | |
| e) | Pendent type Standard Response type Sprinkler 68°C | Each | 1350 | |
| f) | Upright type Standard Response Sprinkler 68°C (Location : Space between slab and false ceiling is more than 800). | Each | 950 | |
| | Notes : | | | |
| a) | All sprinklers shall be chrome finish / powder coated except for concealed. | | | |
| b) | The concealed sprinkler shall be brass finish. The cover plate of concealed sprinkler shall be factory painted at manufacturers work and the shade be conformed prior to application on the cover plate. | | | |
| c) | The sprinkler shall be either pendent or upright type/side wall and shall not be universal style. | | | |
| d) | Contractor shall ensure provision of sprinkler guard at no additional cost | | | |
| e) | All pendent sprinkler will be provided with rosette plate. | | | |
| 5.0 | Providing, fixing, testing and commissioning of C.I. Butterfly valve with cast iron body, cast iron disc and seat of EPDM rubber banded on bakelite with hard back to PN (16 kg /cm ² pressure rating) conforming to IS : 13095 with flanges, nut, bolts and washers complete :- | | | |
| a) | 150 mm dia | Each | 6 | |
| b) | 100 mm dia | Each | 6 | |
| c) | 80 mm dia | Each | 1 | |
| d) | 65 mm dia | Each | 1 | |
| 6.0 | Providing & fixing cast iron single acting air valve with screwed inlet 25 mm dia including Ball valve and all fitting & accessories. | Each | 4 | |
| 7.0 | Providing, fixing, testing and commissioning of dual plated Non Return Valve PN 16 rating (16 kg/cm ² pressure rating) conforming to IS :5312 complete with nuts, bolts & washers. | | | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|--|---|------|-----|--------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| a) | 100 mm dia | Each | 1 | |
| b) | 150 mm dia | Each | 1 | |
| 8.0 | Providing and fixing of UL listed electrically operated flow indicating switch (vane type) of following diameter with threaded connection with flexible full bore paddle & NO/NC contact terminals as specified complete with all accessories and necessary wiring. | | | |
| a) | On 150 mm dia line | Each | 7 | |
| b) | On 100 mm dia line | Each | 7 | |
| c) | On 80 mm dia line | Each | 3 | |
| d) | On 65 mm dia line | Each | 1 | |
| 9.0 | Providing and fixing 25 mm dia inspection & testing assembly with gun metal ball valve, gun metal sight glass, by pass valve & connection to drain. | Each | 15 | |
| 10.0 | Providing and fixing Orifice plates, S.S. 304, 12 mm thick, bore and construction as per TAC's Sprinklers manual, for all horizontal tapping from the sprinkler riser. | Each | R.O | |
| 11.0 | Providing and fixing MS cabinet (size 600 x 450 x 150 mm) fabricated from 16 gauge MS sheet with full front glass door & locking arrangement with suitable shelves for keeping 50 Nos. spare sprinklers & one no. spanner properly fixed in shelves. Cabinet shall be painted with enamel paint of approved shade. (Cost shall include 50 Nos. (Pendent 25 Nos, Upright 20 Nos, Side wall 5 Nos) spare sprinklers & one | Set | 4 | |
| 12.0 | Providing and fixing brass/bronze lever operated ball valves of full flow with stainless steel ball (AISI 304 and spindle AISI 401) with settling and gland of superior quality and having minimum working pressure of 15 Kg/cm ² .(For Sprinkler Drain) | | | |
| a) | 25 mm dia | Each | 1 | |
| b) | 32 mm dia | Each | 1 | |
| c) | 40 mm dia | Each | 1 | |
| d) | 50 mm dia | Each | 5 | |

| BILL OF QUANTITIES FOR FIRE FIGHTING WORKS | | | | |
|---|---|-------------|------------|---------------------|
| Sr. NO | DESCRIPTION | UNIT | Qty | Final amount |
| | TOTAL OF SPRINKLER SYSTEM [PART-II C)] CARRIED OVER TO SUMMARY | | | |