# Planning, Design, Supply, Installation, Testing, Commissioning, Trial Run (3 Months) & obtaining NOC of Firefighting works complete in all respect on turnkey basis at HAFED Mega Food Park, IMT Rohtak, Rohtak, Haryana

**Issued by:**
Haryana State Cooperative Supply and Marketing Federation Limited
HAFED Building, Sector 5, Panchkula, Haryana 134108

| | |
|---|---|
| **Name of work: -** | Planning, Design, Supply, Installation, Testing, Commissioning, Trial Run (3 Months) & obtaining NOC of Firefighting works complete in all respect on turnkey basis at HAFED Mega Food Park, IMT Rohtak, Rohtak, Haryana |
| **Estimated cost:** | Rs.263.98 Lakhs |
| **Time Limit: -** | 4 Months |
| **Earnest Money:** | Rs. 5.27 Lakhs |

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## SECTION-1 (I): PRESS NOTICE

## HAFED
## NOTICE INVITING TENDERS

**E-Tender** is invited from the experienced reputed bidders for the following work for HAFED Mega Food Park at IMT Rohtak, Rohtak, Haryana.

| Name of the Work | Estimated Cost (Rs. in Lakhs) | Bid Security / Earnest Money ( in Rs. Lakhs ) | Cost of Bid Document + E-tendering Fee (Rs.) | Time Limit | Date and time for bid preparation & submission |
|---|---|---|---|---|---|
| Planning, Design, Supply, Installation, Testing, Commissioning, Trial Run (3 Months) & obtaining NOC of Firefighting works complete in all respect on turnkey basis at HAFED Mega Food Park, IMT Rohtak, Rohtak, Haryana | 263.98 | 5.27 | 6000/- (5000+1000) | 4 Months | 21.12.2022 at 17:01 Hrs to 13.01.2023 at 14:00 Hrs |

- The eligibility criteria for the bidders have been defined in the Tender documents.
- The tender document containing details of required work, quantity, specifications, e tendering schedule etc. and other terms & conditions are available on e-tendering portal, i.e.- https://etenders.hry.nic.in
- The interested parties may download the tender document and must remit the funds on or before 00.00.2020 at 16:00 Hrs.
- The date of bid submission is from 21.12.2022 at 17:01 Hrs to 13.01.2023 at 14:00 Hrs through e-Tender portal as mentioned above
- Pre- Bid meeting will be held on 03.01.2023 at 11.00 Hrs. At HAFED Corporate Office, Sector-5, Panchkula, Haryana.
- The technical bids will be opened on 13.01.2023 at 14.30 Hrs at HAFED Corporate Office, Sector-5, Panchkula (Haryana). The schedule of opening of financial bids will be notified on the e-procurement portal separately after opening of the technical bids
- HAFED reserve the right to reject any/all tenders without assigning any reason whatsoever.

Managing Director

**SECTION-1 (II):**
**DETAILED NOTICE INVITING TENDER/BIDS**

**E-Tender** is invited from the experienced reputed bidders for the following work for HAFED Mega Food Park at IMT Rohtak, Rohtak, Haryana.

| **Name of the Work** | **Estimated Cost (Rs. in Lakhs)** | **Bid Security / Earnest Money (In Rs. Lakhs )** | **Cost of Bid Document + E-tendering Fee (Rs.)** | **Time Limit** | **Date and time for bid preparation & submission** |
|---|---|---|---|---|---|
| Planning, Design, Supply, Installation, Testing, Commissioning, Trial Run (3 Months) & obtaining NOC of Firefighting works complete in all respect on turnkey basis at HAFED Mega Food Park, IMT Rohtak, Rohtak, Haryana | 263.98 | 5.27 | 6000/- (5000+1000) | 4 Months | 21.12.2022 at 17:01 Hrs to 13.01.2023 at 14:00 Hrs |

**1.** Under this process, the Technical online bid Application as well as online Price Bid shall be invited at single stage under two covers i.e. Technical & Financial Envelope. Eligibility and qualification of the Applicant will be first examined based on the details submitted online under first cover (Technical) with respect to eligibility and qualification criteria prescribed in this Tender Document. The Price Bid under the second cover shall be opened for only those Applicants whose Technical Applications are responsive to eligibility and qualification requirements as per Tender Document.

**2.** The payment for Tender Document Fee and e-Service Fee shall be made by eligible bidders/contractors online directly through Debit Cards & Internet Banking Accounts the payment can be made online directly through RTGS/NEFT or OTC Please refer to 'Online Payment Guideline' available at the Single e-Procurement portal of GoH (Govt. of Haryana) and also mentioned under the Tender Document. In case of EMD, bidders can submit the in the form of Bank Guarantee from any Nationalized Bank. The EMD in the form of Bank Guarantee should be remain valid for 165 days from date of Technical bid opening. The Bank Guarantee is required to scan & upload in the online portal. Original Bank Guarantee should be submitted to HAFED Office, Panchkula addressing to Managing Director of HAFED & mentioning the DNIT details on the top of the cover within 3 days of Technical Bid Opening.

**3.** Intending bidders will be mandatorily required to online sign-up (create use account) on the website https://etenders.hry.nic.in to be eligible to participate in the e-Tender. **The intended bidders fails to upload EMD during the bid submission shall not be allowed to submit his/her bids for the respective event/Tenders.**

**4.** The interested bidders must remit the funds (Tender Document Fee, e-Service Fee & others as mentioned in the Portal) at least T + 1 working day (Transaction + One Day) in advance i.e. **on or before 00.00.2020 and make payment Vis RTGS/NEFT or OTC to the beneficiary account number specified under the online generated challan. The intended bidder/Agency thereafter will be able to successfully verify their payment online, and submit their bids on or before the expiry date & time of the respective event/Tenders at** https://etenders.hry.nic.in

The interest bidders shall have to pay mandatorily e-Service fee (under document fee – Non refundable) of Rs. 1000/- (Rupee One Thousand only) online by using the service of secure electronic gateway. The secure electronic payments gateway is an online interface between bidders & online payment authorization networks.

The payment for document fee/ e-Service fee can be made by eligible bidders online directly through Debit Card & Internet Banking.

**5.** Tender Documents can be downloaded online from the Portal https://etenders.hry.nic.in by the Contractors registering on the Portal.

**6.** The bids are required to be submitted on single percentage basis above or below given as estimated cost in this tender document in figures as well as in words in the space provided in section– 7 Tender Form for filling rates (form of bid).

**7.** As the Bids are to be submitted online, these are required to be encrypted and digitally signed, the Bidders are advised to obtain the same at the earliest. For obtaining Digital Certificate, the Bidders may contact the representative of Next Tenders, the service Providers of Electronic Tendering System or any other service provider.

**8.** The bidders can submit their tender documents on line as per dates mentioned in the key dated mentioned below:

| **Sr. No.** | **HAFED Stage.** | **Contractor Stage** | **Start Date & Time** | **Expiry Date & Time** |
|---|---|---|---|---|
| 1 | Tender Authorization & Publishing | - | 21.12.2022 17.01 Hrs | 13.01.2023 14.00 Hrs |
| 2 | - | Downloading of Tender Document & Bid Preparation | 21.12.2022 17.01 Hrs | 13.01.2023 14.00 Hrs |
| 3 | Pre Bid Meeting | | 03.01.2023 11.00 Hrs | |
| 4 | Corrigendum Issue (if any) | | 06.01.2023 17.00 Hrs | |
| 5. | - | Proof of Submission of Tender Document Fees, EMD, E-Service Fee and (Technical) Documents. | 21.12.2022 17.01 Hrs | 13.01.2023 14.00 Hrs |
| 6. | Technical Opening & Short listing | - | 13.01.2023 14.30 Hrs | |
| 7. | Open Commercial/ Price Bid | - | Will be informed later on | |

**CONDITIONS:-**

1) Conditional tenders will not be entertained & liable to be rejected.

2) In case of the day of opening of tenders happens to be holiday, the tenders will be opened on the next working day. The time and place of receipt of tenders and other conditions will remain unchanged.

3) HAFED reserves the right to reject any tender or all the tenders without assigning any reason.

4) The tender without earnest money will not be opened.

5) The jurisdiction of court will be at Panchkula.

6) The financial bids of the bidders who does not satisfy the qualification criteria in the bid documents will not be opened and no claim whatsoever on this account will be considered.

7) The bid for the work shall remain open for acceptance during the bid validity period to be reckoned from the date of opening of technical bids. If any bidder / tenderer withdraws his bid / tender before the said period or makes any modifications in the terms and conditions of the bid, the bids security of that bidder may be forfeited.

Managing Director,
HAFED,

## SECTION-2
## INSTRUCTIONS TO BIDDERS (ITB)

Throughout these bidding documents, the terms 'bid' and 'tender' and their derivatives (bidder/tenderer, bidding/tendering, etc.) are synonymous.

**Eligibility Criteria: -** This Invitation for Bids is open to all bidders who fulfil the qualification criteria prescribed as under:

**I. Experience:**

| Sr. No. | Description of works | DNIT cost (Rs. in Lacs) | The bidder must have successfully executed & completed similar works, in last seven years i.e. Fire Fighting (Rs. In Lakh)*** | | | | |
|---|---|---|---|---|---|---|---|
| | | | One work of magnitude of 80% i.e. | Or | Two works of magnitude of 50% each i.e. | Or | Three works of magnitude of 40% each i.e. |
| 1 | Planning, Design, Supply, Installation, Testing, Commissioning, Trial Run (3 Months) & obtaining NOC of Firefighting works complete in all respect on turnkey basis at HAFED Mega Food Park, IMT Rohtak, Rohtak, Haryana | 263.98 | 211.18 | | 131.99 | | 105.58 |

a) For this, a Certificate from the competent authority shall be submitted along with the applicant incorporating clearly the name of the work, Contract value, billing amount, date of commencement as well as completion of works, satisfactory performance of the Contractor and any other relevant information.

b) **Turnover:** The bidder should demonstrate an average annual turnover of Rs. 211.18 lakh during the last three financial years.

c) **Net worth:** Financial net worth of bidder should be positive as on 31 March of the previous financial year and should be certified by Chartered Accountants.

**The net worth shall be worked out as under:**

Net Worth = (Paid Up Equity + Reserves) – (Revaluation Reserves + Misc. expenditure not written off and accrued liabilities)

II. **Bid Capacity or Solvency:**

**Bid Capacity:** The assessed available Bid Capacity of the Bidder shall not be less than Rs. 263.98 Lakh.

To be calculated as per follow:

**Working Bid Capacity**> Total estimated **cost of work(s) at the time of bidding**.
Contractors should calculate the available bid capacity as per given formula.

**WBC = 2AN – B**

| | |
|---|---|
| A= | Average Annual Turnover of the bidder for last three financial years from similar nature of projects |
| B= | Value of the existing commitments and ongoing works of the bidder to be completed during next 4 months (period of completion of works as per bid) |
| N= | No. of years prescribed for completion of works for which bids are invited i.e. 0.4 in this case. |

**OR**

**Solvency Certificate**: Solvency of the amount equal to 50% of the estimated cost of the work i.e . Rs. 131.99 lakh. The date of this Certificate must be within 6 months of the date of opening this tender.

The Bidders are advised to raise all their queries and submit their deviations (if any) in the pre bid meeting on any parameter or technical specifications. No deviations will be allowed during execution.

# SECTION-3
# SUBMISSION OF BIDS

## INSTRUCTIONS TO BIDDER ON ELECTRONIC TENDERING SYSTEM

These conditions will over-rule the conditions stated in the tender documents, wherever relevant and applicable.

**1. Registration of bidders on e-Procurement Portal:**

All the bidders intending to participate in the tenders process online are required to get registered on the centralized e-Procurement Portal i.e. **https://etenders.hry.nic.in** Please visit the website for more details.

**2. Obtaining a Digital Certificate:**

**2.1** The Bids submitted online should be encrypted and signed electronically with a Digital Certificate to establish the identity of the bidder bidding online. These Digital certificates are issued by an Approved Certifying Authority, by the Controller of Certifying Authorities, Government of India.

**2.2** A Digital Certificate is issued upon receipt of mandatory identity (i.e.Applicant‟s PAN Card) and Address proofs and verification form duly attested by the Bank Manager / Post Master / Gazetted Officer. Only upon the receipt of the required documents, a digital certificate can be issued. For more details please visit the website – **https://etenders.hry.nic.in**

**2.3** The bidders may obtain Class-II or III digital signature certificate from any Certifying Authority or Sub-certifying Authority authorized by the Controller of Certifying Authorities or may obtain information and application format and documents required for the issue of digital certificate from.

**2.4** The bidder must ensure that he/she comply by the online available important guidelines at the portal **https://etenders.hry.nic.in** for Digital Signature Certificate (DSC) including the e-Token carrying DSCs.

**2.5** Bid for a particular tender must be submitted online using the digital certificate (Encryption & Signing), which is used to encrypt and sign the data during the stage of bid preparation. In case, during the process of a particular tender, the user loses his digital certificate (due to virus attack, hardware problem, operating system or any other problem) he will not be able to submit the bid online. Hence, the users are advised **to keep a backup of the certificate** and also keep the copies at safe place under proper security (for its use in case of emergencies).

**2.6** In case of online tendering, if the digital certificate issued to the authorized user of a firm is used for signing and submitting a bid, it will be considered equivalent to a no-objection certificate/power of attorney /lawful authorization to that User. The firm has to authorize a specific individual through an authorization certificate signed by all partners to use the digital certificate as per Indian Information Technology Act 2000. Unless the certificates are revoked, it will be assumed to represent adequate authority of the user to bid on behalf of the firm in the department

tenders as per Information Technology Act 2000. The digital signature of this authorized user will be binding on the firm.

**2.7** In case of any change in the authorization, it shall be the responsibility of management/ partners of the firm to inform the certifying authority about the change and to obtain the digital signatures of the new person/ user on behalf of the firm/ company. The procedure for application of a digital certificate however will remain the same for the new user.

**2.8** The same procedure holds true for the authorized users in a private/ Public limited company. In this case, the authorization certificate will have to be signed by the directors of the company.

**3. Pre-requisites for online bidding:**

In order to operate on the electronic tender management system, a user‟s machine is required to be set up. A help file on system setup/Pre-requisite can be obtained from NIC or downloaded from the home page of the website - **https://etenders.hry.nic.in** The link for downloading required java applet & DC setup are also available on the Home page of the e-tendering Portal.

**4. Online Viewing of Detailed Notice Inviting Tenders:**

The bidders can view the detailed N.I.T and the time schedule (Key Dates) for all the tenders floated through the single portal e-Procurement system on the Home Page at https://etenders.hry.nic.in

**5. Download of Tender Documents:**

The tender documents can be downloaded free of cost from the e- Procurement portal https://etenders.hry.nic.in

**6. Key Dates:**

The bidders are strictly advised to follow dates and times as indicated in the online Notice Inviting Tenders. The date and time shall be binding on all bidders. All online activities are time tracked and the system enforces time locks that ensure that no activity or transaction can take place outside the start and end dates and the time of the stage as defined in the online Notice Inviting Tenders.

**7. Online Payment of Tender Document Fee, Processing fee, Bid Preparation & Submission (Technical & Commercial/ Price Bid):**

**7.1** **Online Payment of Tender Document Fee + Processing fee:** The online payment for Tender document fee, Processing Fee & EMD can be done using the secure electronic payment gateway. The Payment for Tender Document Fee and Processing Fee shall be made by bidders/Vendors online directly through Debit Cards & Internet Banking Accounts and the Payment for EMD shall be made online directly through RTGS / NEFT & OTC.

The secure electronic payments gateway is an online interface between contractors and Debit card / online payment authorization networks.

**7.2 PREPARATION & SUBMISSION OF online APPLICATIONS/BIDS:**

(i) Detailed Tender documents may be downloaded from e-Procurement website **https://etenders.hry.nic.in** and tender mandatorily be submitted online following the instruction appearing on the screen.

(ii) Scan copy of Document to be submitted / uploaded for Technical bid under online Technical Envelope. The required documents (refer to DNIT) shall be prepared and scanned in different file formats (in PDF/JPEG/MS WORD format such that file size is not exceed more than 10 MB) and uploaded during the on-line submission of Technical Envelope.

(iii) **FINANCIAL or Price Bid PROPOSAL shall be submitted mandatorily online under Commercial Envelope and original not to be submitted manually)**

## 8. ASSISTANCE TO THE BIDDERS

For queries on Tenders Haryana Portal, Kindly Contact

Note: Bidders are requested to kindly mention the URL of the ortal and Tender ID in the subject shiel emailing any issue along with the contact detail. For any issue/clarification relating to the Tender (s) published kindly contact the repective tender Inviting Authority.

Tel:-0120-4200462,0120-4001002, Mobile:88262-46593

Email:-support.etender@nic.in

For any technical related queries please call at 24x7 Help Desk number

0120-4001002,0120-4200462,0120-4001005,120-6277787

For support related to Haryana Tenders in addition to help desk you may also contact on email ID eproc.nichry@yahoo.com, Tel:0172-2700275

**Timing:** Technical support assistance will be available over telephone Monday to Friday (9:00am to 5:30pm) (Helpdesk Support in team shall not be contracted for online bidding on behalf of the contractors).

**Note:** Contact e-Procurement helpdesk on or before prior to 4 hours of the scheduled closing date and time of respecive e-tendering event. Also, for queries related to e-payment of EMD kinldy contact the helpdesk at least two days prior to closing date and time of the respective event.

Intended bidders mandatorily required to register their queries if there is any pertaining to the online bidding and the single e-Procurement portal at email address:- https://etenders.hry.nic.in

**NOTE:-** ***Bidders participating in online tenders shall check the validity of his/ her Digital Signature Certificate before participating in the online Tenders at the portal*** **https://etenders.hry.nic.in**

**(Online Payment Guidelines)**

***Guideline for Online Payments at e-Procurement Portal of Government of Haryana.***

Post registration, bidder shall proceed for bidding by using both his digital certificates (one each for encryption and signing) & Password. Bidder shall proceed to select the event/Tenders he is interested in. On the respective Department's page in the e-Procurement portal, the Bidder would have following options to make payment for tender document fee + Processing fee & EMD:

A. Debit Card
B. Net Banking
C. RTGS/NEFT or Over the Counter (OTC)

**Operative Procedures for Bidder Payments**

**A) Debit Card**

**The procedure for paying through Debit Card will be as follows:**

(i) Bidder selects Debit Card option in e-Procurement portal.

(ii) The e-Procurement portal displays the amount and the card charges to be paid by bidder. The portal also displays the total amount to be paid by the bidder.
(iii) Bidder clicks on "Continue" button.
(iv) The e-Procurement portal takes the bidder to Debit Card payment gateway screen.
(v) Bidder enters card credentials and confirms payment
(vi) The gateway verifies the credentials and confirms with "successful" or "failure" message, which is confirmed back to e-Procurement portal.
(vii) The page is automatically routed back to e-Procurement portal
(viii) The status of the payment is displayed as "successful" in e-Procurement portal.
(ix) In case of successful payment, a success message along with unique transaction ID is passed on to e-Procurement system. The e-tendering portal shall store the unique transaction number in its database along with the date and timestamp.
(x) The e-Procurement portal allows Bidder to process another payment attempt in case payments are not successful for previous attempt.

**B) Net Banking**

The procedure for paying through Net Banking will be as follows:

(i) Bidder selects Net Banking option in e-Procurement portal.
(ii) The e-Procurement portal displays the amount to be paid by bidder.
(iii) Bidder clicks on "Continue" button
(iv) The e-Procurement portal takes the bidder to Net Banking payment gateway screen displaying list of Banks
(v) Bidder chooses his / her Bank
(vi) The Net Banking gateway redirects Bidder to the Net Banking page of the selected Bank
(vii) Bidder enters his account credentials and confirms payment
(viii) The Bank verifies the credentials and confirms with "successful" or "failure" message to the Net Banking gateway which is confirmed back to e- Procurement portal.
(ix) The page is automatically routed back to e-Procurement portal
(x) The status of the payment is displayed as "successful" in e-Procurement portal.
(xi) In case of successful payment, a success message along with unique transaction ID is passed on to e-Procurement system. The e-Procurement portal shall store the unique transaction number in its database alongwith the date and timestamp.
(xii) The e-Procurement portal allows Bidder to process another payment attempt in case payments are not successful for previous attempt.

**C) RTGS/ NEFT**

This solution shall also allow the bidder to make the EMD payment via RTGS/NEFT this shall add to the convenience of those bidders who are not conversant to use net banking option to make the transaction.

Using this module, bidder would be able to pay from their existing bank account through RTGS/NEFT. This would offer a wide reach for more than thousands bank branches and would enable the bidder to make the payment from almost any bank branch across India.

1. To choose the payment of EMD, the bidder clicks on RTGS/NEFT payment option.

2. Upon doing so, the e-Procurement portal will redirect the bidder to a page where it will generate a Challan.
3. This Challan shall include the beneficiary (virtual) account number and other details like beneficiary IFSC code each.

**RTGS / NEFT Payment Procedure**

The bidder shall be required to take a print of the challan and make the RTGS/ NEFT on the basis of the virtual account number period on the challan. This provision will ensure that number confidential details regarding the bidder or tender are disclosed to the bank while remitting the RTGS/NEFT.

The bidder would remit the fund at least one day in advance to the last day and make the payment via RTGS/NEFT to the beneficiary account number as mention in the challan. SBI Bank shall receive this amount and credit the payment gateway service provider intermediary Department/ PSUs Escrow Security Deposit account post validating the first part of the beneficiary account number, i.e., the client code only, In case of validation of client code is not successful, the bank shall return the fund and not credit the Techprocess intermediary Department/PSUs Escrow Security Deposit A/c.

**D) Over the Counter (OTC)**

This solution shall allow the bidder having account with SBI bank, to make the payment from any CMS enables Branch of SBI Bank in India. Bidders can make the payment via cash (if amount is <=[]49,999), Demand Draft or SBI Bank Cheque.

The procedure for paying through OTC mode is as follows:

(i) Bidder selects over the counter remittance option in e-Procurement portal.

(ii) The e-Procurement portal displays the amount to be paid. The bidder chooses the bank account number for refund of the amount.

(iii) Bidder clicks on “Continue” Button.

(iv) The e-Procurement portal displays the details of payment. The Bidders click on “Print Challan” and print the OTC Challan.

(v) Bidder submits the OTC Challan at the counter of any designated bank of SBI Bank with Cash/Demand Draft/SBI Bank Cheque (Payment in Cash is allowed upto Rs. 49,999/-).

(vi) SBI bank verifies the URL (format to be discussed and decided) and amount with e-Procurement portal prior to accepting the payment.

(vii) On successful verification from e-Procurement portal, SBI bank accepts the payment. In case of failure, SBI bank shall return back the OTC challan and payment to the bidder.

(viii) SBI bank commits the payment transaction (in case of successful verification from e-Procurement portal) and sends the Bank Transaction number (I-Sure Reference Number) online against the URN and Amount.

(ix) SBI bank will generate receipt for the payment transaction and issues the same to the bidder.

(x) The e-Procurement system update the bank transaction number against the URN and Amount based on the details sent by SBI bank online prior to generation of the receipt.

(xi) The status of the payment will be displayed as "verification successful" in e- Procurement Portal, when the bidder clicks on the verification option in the portal.

(xii) Bidder would be required to upload the scan copy of receipt as received from SBI Bank as part of proof in next tender portal before submitting the tender.

## SECTION 4 (I)

## CONDITIONS OF CONTRACT

**Clause 1:-** The time allowed for carrying out of work as entered in the tender shall be strictly observed by the contractor, and shall be reckoned from the date on which the order to Commence work is given to the contractor. The work shall throughout the stipulated period of the contract be proceeded with all due diligence (time being deemed to be the essence of the contract on the part of the contractor). To ensure good progress during the execution of work the contractor shall be bound in all cases in which the time allowed for any work exceeds one months to complete one-fourth of the whole of the work before one fourth of the whole time allowed under the contract has elapsed, one-half of the work before one half of such time has elapsed and three fourth of the work before the three fourth of such time has elapsed. In the event of the contractor failing to comply with this condition he shall be liable to pay compensation as mentioned below:-

a) If the work is not initiated or left before the middle stage i.e. the work paid is less than 60% then compensation will be levied @ 2% per week of delay subject to a maximum of 10% of the original tender cost, as advertised in the newspaper.

b) If 60% work is over and paid and then left incomplete or delayed, then percentage compensation will be levied @ 2% per week subject to a maximum of 5% of the tender cost.

c) If 80% work is already paid and then left in-complete or delayed, then percentage compensation will be levied at the rate of 2% per week of the tender cost subject to a maximum of 2% of the tender cost.

d) Penalty applicable for AMC Period: In case supplier does not address the issue after information received by HAFED or Contractor's Team and make delay in response, **penalty** shall be **imposed @ 10% of the entire AMC value quoted by the bidder per week for** the maximum limit of 2 weeks. In case the supplier fails to address the issues & submit report / solutions to HAFED even after extended period of 2 weeks with penalty, the security (Performance Bank Guarantee) will be forfeited.

e) The MD, HAFED will have the power to reduce or waive the penalty/compensation after receiving the representation from the contractor and if it is felt that penalty is wrong-fully imposed but such representation will be entertained only after the contractor first completes the work and then makes the representation. The decision of MD, HAFED will be final and will not be challengeable before the arbitrator or any other court of law in the country.

f) The date of completion of work will be the one on which the contractor has received the completion certificate from the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

**Clause 2:** In any case, in which under any clause or clauses of this contract the Contractor has rendered himself liable to pay compensation amounting to the whole of his security deposit (whether paid in one sum or deducted by instalments), the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak on behalf of the Federation shall have power to adopt any of following course as he may deem best suited to the interest of Federation.

(a) To rescind the contract of which rescission notice in writing to the Contractor under the hand of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak dispatched by registered post to the address of the Contractor given in the Tender shall be conclusive evidence and in which case the security deposit of the Contractor shall stand forfeited and be absolutely at the disposal of Government.

(b) To employ labour and to supply materials to carry out the work, or any part of the work debiting the Contractor with the cost of the labour and the price of the materials and crediting him with the value of the work done at the same rates as if it had been carried out by the Contractor under the terms of his contract. The certificate of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtakas to the value of the work done, and quantity, rate & amount of the labour and material employed for doing the work shall be final and conclusive against the Contractor.

(c) To measure the work of the Contractor and to take such part there-of as shall be unexecuted out of his hands and to give it to another Contractor to complete. In such case, any expends which may be incurred in excess of the sum which would have been paid to the original Contractor shall be borne and paid by the original Contractor. Certificate in writing of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak in respect of work taken out of the hands of original Contractor, and the excess expenditure incurred shall be final and conclusive. This money may be deducted from any money due to him by Government under the contract or otherwise or from his security deposit.

In the event of any one or more of the above courses being adopted by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any material or entered into any engagement or made any advances on account of or with a view to the execution of the work for the performance of the contract and in case the action is taken under any of the provisions aforesaid, the Contractor shall not be entitled to recover or be paid any sum for any work actually executed under the contract, unless and until the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak will have certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

**Clause 3:** In any case in which any of the powers conferred upon the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak by clause 2 hereof, shall have become exercisable and the same shall not be exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such power shall notwithstanding be exercisable in the event of any future case of default by the Contractor and the liability of the Contractor for past and future compensation shall remain unaffected. In the event of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak exercising either of the power (a) or (c) vested in him under the preceding clause he may, if he so desires, take possession of all or any tools, plants materials and stores in or upon the works, or the site there of belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or allowing for the same in account at the contract rates or in case of these not being applicable at current market rates to be certified by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak whose certificate thereof shall be final. Otherwise the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may by notice in writing to the Contractor or his clerk of the works, foreman or other authorized agent require him to remove such tools and plant material or stores from the premises within a time to be specified in such notice. In the event of the Contractor failing to comply with any such requisition, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and at his risk in all respects and the certificate of the GM HAFED, CFP,

Rohtak/Executive Engineer, HAFED, Rohtak to the expense of any such removal and the amount of the proceeds and expenses of any such sale be final and conclusive against the Contractor.

**Clause 4:** If the Contractor shall desire an extension of time for the completion of the work on the grounds of his having unavoidable hindrance in its execution or on any other ground, he shall apply in writing to GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak within 30 days of the date of the hindrance, on account of which he desires such extension as aforesaid. The Federation shall, if in its opinion (which shall be final) reasonable grounds be shown there-for, authorize such extension of time, if any, as may, in its opinion be necessary or proper.

**Clause 5 :** Contractor shall deliver in the office of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak the work execution progress on fortnight basis. No extra items will be considered during execution from the contractor side as this contract is turn-key.

**Clause 6** : Without prejudice to the rights of Federation under any clause hereinafter contained on completion of the work, the contractor shall be furnished with a certificate by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak of such completion, but no such certificate shall be given, not shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all Surplus materials, and rubbish and cleaned of the dirt from all wood works, doors, windows, walls, floors or other parts of this work. In upon or about which the work is to be executed, or of which he may have had possession for the purpose of the execution thereof and the measurements in the said certificate shall be binding and conclusive against the contractor, If the contractor shall fail to comply with the requirements of this clause as to removal of surplus materials and rubbish, and cleaning off dirt on or before the date fixed for the completion of the work, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may at the expenses of the contractor, remove such surplus materials and rubbish and dispose off the same as he thinks fit and clean off such dirt aforesaid and the contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such surplus materials as aforesaid except for any sum actually realized by the sale thereof less any expense incurred by GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak in connection therewith

**Clause 7** : No payment shall be made for work estimated to cost less than rupees one thousand, till after the whole of the works shall have been completed and a certificate of completion given. But in case of works estimate to cost more than rupees one thousand, the contractor shall be submitting the bill thereof, be entitled to receive a monthly payment proportionate to the part thereof then approved & passed by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the contractor. But all such intermediate payments shall be regarded as payments by ways of advances against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsounded and imperfect or unskilful work to be removed and taken away and reconstructed or re-erected, or be considered as an admission of the due of performance of the contract, or any part thereof in any respect or according of any claim, nor shall it conclude, determine or affecting any way the powers of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak under these conditions, or any of them as to the final settlement and adjustment of the accounts or otherwise, or in any other way , vary or affect the contract. The final bill shall be submitted by the contractor within one month of the date fixed for completion of the work otherwise the GM's HAFED, CFP, Rohtak/Executive Engineer's, HAFED, Rohtak certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on all parties.

**Clause 7 (a)**: If Retention in running bills or such part thereof as may be due to the contractor under this contract shall be payable to the contractor after a period of three months has lapsed after payment of final bill.

**Clause 8:** A bill shall be submitted by the Contractor each month on or before the date fixed by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak for the work executed in the previous month. The Contractor shall submit all bills on the printed forms available with the department. The charges in the bills shall always be entered at the rates specified in the tender. In case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the tender, at the rates hereinafter provided for such work. Final bill in respect of the Contract shall be submitted by the Contractor within 30 days of the date fixed for completion of the Work or the date of the certificate of completion furnished by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak. GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim, as far as admissible, if possible, before the expiry of 10 days from the presentation of the bill. If the Contractor does not submit the bill within the time fixed as aforesaid, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may depute a subordinate to measure up the said work in the presence of the Contractor, whose countersignature to the measurement list will be sufficient warrant. GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may prepare a bill from such list which shall be binding on the Contractor in all respects.

**Clause 9 :**The contractor shall submit all bills on the printed forms to be had on application at the office of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, and the charges in the bill shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the tender at the rates hereinafter provided for such work.

**Clause 10** : If the specification of estimate of the work provides for the use of any special description of materials to be supplied from the GM's HAFED, CFP, Rohtak/Executive Engineer's, HAFED, Rohtak store or if it is required that the contractor shall use certain stores to be provided by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak( such materials and stores and the prices to be charged thereof as hereinafter mentioned being so far as practicable for the convenience of the contractor, but not so as in any way to control the meaning or effect of this contract, specified in the schedule of memorandum, have to be annexed), the contractor shall be supplied with such materials and stores as required from time to time to be used by him for the purposes of the contract only and the value of the full quantity of materials and stores so supplied at the rates specified in the said schedule or memorandum may be set off or deducted from any sums then due on thereafter to become due to the contractor under the contract or otherwise, against or from the security deposit, or the proceeds of sale thereof if the same is held in Government securities, the same or a sufficient portion thereof being in this case sold for the purpose. All materials supplied to the contractor, shall remain the property of the contractor, but shall not on any account be removed from the site of the work without the written permission of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak and shall at all the 'times be open to inspection by him. Any such materials unused and in perfectly good condition at the time of completion or termination of the contract shall be returned to the GM's HAFED, CFP, Rohtak/Executive Engineer's, HAFED, Rohtak store if by a notice in writing under his hand he shall so require, but the contractor shall not be entitled to return any such material unless with such consent and shall have no claims for compensation on account of any such materials so supplied to him as aforesaid being unused by him or for any wastage in or damage to any such materials.

**Clause 11** : The Contractor shall execute the whole and every part of the work in most substantial and workman like manner and both as regards materials and otherwise in every respect in accordance with the specifications. The Contractor shall also conform exactly fully and faithfully to the designs, drawings and

instructions in writing relating to the work signed by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtakand lodged in the office and to which the Contractor shall be entitled to have access at such office, or at the site of the work for the purpose of the inspection during office hours. The Contractor shall, if he so requires, be entitled at his own expense to make or cause to be made copies of the specifications, and of all such designs, drawing and instructions as aforesaid.

**Clause 11 (a)**: The GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall have full powers, at all times to object of the employment of any workman, foreman, or other employee on the works by the contractor and if the contractor shall receive notice in writing from the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak requesting the removal of any such man or men from the work the contractor shall comply with the request forthwith.

No such workman, foreman or other employee after his removal from the works by request of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall be re-employed or reinstated on works by the contractor at any time, except with the previous approval in writing of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

The contractor shall not be entitled to demand the reason from the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak for requiring the removal of any such workman, foreman or other employees.

**Clause 12**:The GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall have power to make any alteration in, omissions from, addition to or substitutions for the original specifications, drawing designs and instructions that may appear to him to be necessary or advisable during the progress of the work. The Contractor shall be bound to carry out the work in accordance with such instructions given to him in writing signed by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak. Such alterations, omissions, additions or substitutions shall not invalidate the contract. Such altered, additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on same conditions in all respects on which he agreed to do the main work. The time for the completion of the work shall be extended in the proportion the altered, additional or substituted work bears to the original contract work and the certificate of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall be conclusive as to such proportion. If the rates for the altered, additional or substituted work cannot be determined in the manner specified above then the Contractor shall, within 7 days of the date of receipt of order to carry out the work, inform the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak of the rate which he intends to charge for such class of work. If the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak does not agree with this rate, he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable provided always that if the Contractor shall commence work or incur any expenditure in regard thereto before the rates shall have been determined lastly herein before mentioned, then and in such case he shall be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of determination of the rates as aforesaid according to such rate or rates as shall be fixed by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak. In the event of a dispute the decision of the Federation shall be final.

**Clause 13** : If at any time after the commencement of the work, the Federation shall for any reason whatsoever not require the whole work, or part thereof, as specified in the contract to be carried out, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall give notice in writing of the fact to the Contractor who shall have no claim to have any payment or compensation whatsoever on account of any profit or advantage, which he might have derived from the execution of the work in full, that which he did not derive in consequence of the full amount of the work not having been carried out. The Contractor shall

also not have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

**Clause 14** : If it shall appear to the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or his subordinate-in-charge of the work, that any work has been executed with unsound, imperfect or unskilful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution of the Work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract, the Contractor shall, on demand in writing which shall be made by GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak specifying the work, materials or articles complained of, notwithstanding that the same may have been passed, certified and paid for, forthwith rectify or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost. In the event of his failing to do so within a period to be specified by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak in his demand aforesaid, the Contractor shall be liable to pay compensation at the rate of 1% of the estimated cost of the Work (as shown in the tender) for every day not exceeding ten days, while his failure to do so shall continue. In the case of any such failure, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of, as the case may, be at the risk and expense in all respects of the Contractor.

**Clause 15** : All work under or in course of execution or executed in pursuance of the contract shall at all times be open to the inspection and supervision of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak and his subordinates and the Contractor shall at all times, during the usual working hours, and at all other times at which reasonable notice of the intention of GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or his subordinate to visit the Work shall have been given to the Contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the Contractor himself.

**Clause 16** : The Contractor shall give not less than 7 days' notice in writing to the \ GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or his subordinate-in-charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is so covered up, placed beyond the reach of measurement, and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or his subordinate - in - charge of the work. If any work shall be covered up or placed beyond the reach of the measurement without such notice having been given or consent obtained the same shall be uncovered at the Contractor's expenses or in default there of no payment of allowances shall he made for such work or the materials with which the same was executed.

**Clause 17** : If the Contractor or his workers shall break, deface, injure or destroy any part of building in which they may be working, or any building, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone posts or wires, trees, grass or cultivated ground contiguous to the premises on which the Work or any part of it is being executed, or if any damage shall happen to the work while in progress from any cause whatever or if any defect, shrinkage or other faults of imperfections appear in the Work within 9 months after a certificate final or otherwise of its completion shall have been given by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak as aforesaid, the Contractor shall, upon a receipt of a notice in writing in that behalf, make the same good at his own expense. In default, the GM HAFED, CFP,

Rohtak/Executive Engineer, HAFED, Rohtak may cause the same to be made good by other workmen and deduct the expense from any sums that may be then, or at anytime thereafter may become due to the Contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof.

**Clause 18** : The Contractor shall supply at his own cost all materials plant, tools, cranes, appliances, implements, ladders, cordage, tackle, scaffolding and temporary works requisite for proper execution of the work, whether original, altered or substituted and whether included in the Specifications or other documents forming part of the Contract referred to in these conditions or not or which may be necessary for the purpose of satisfying or complying with requirements of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak as to any matter as to which under these conditions he is entitled to be satisfied or which he is entitled to require together with carriage there-for to and from the work. The Contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out work and counting, weighing and assisting in the measurement or examination at any time and from time to time of the Work or materials. Failing his so doing the same may be provided by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak at the expense of the Contractor and the expenses may be deducted from any money due to the Contractor or from his security deposit or the proceeds of sales thereof or of sufficient contract portion thereof.

The Contractor shall also provide all necessary fencing and lights required to protect the public from accident. He shall be bound to bear the expenses of defence of every suit, action or other proceedings, at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such persons or which may with the consent of the Contractor be paid to compromising any claim by any such person.

**Clause 18(a)**: The final bill of the contractor shall not be paid unless or until he furnishes to the satisfaction of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak a proof of the clarity of submission of all taxes. The contractor shall also be liable to indemnity the Government against all claims made proceedings and action taken by any person in respect of the price of the earth removed by the contractor from his land for the work against all losses, damages cost and expenses which the Government may suffer or incurred as a result of a such claims.

**Clause 19 (a):** No labour below the age of 16 years shall be employed on the work.

**Clause 19 (b)**: The contractor shall not pay his labourers less than the wages paid for similar work in neighbourhood.

**Clause 20**: No work shall be done on Sunday without the sanction in writing of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

**Clause 20 (a)**: In every case in which by virtue of the provisions of section 12, sub- section (1) of the workman's Compensation Act., 1923, Federation is obliged to pay compensation to workman employed by the contractor, in execution of the works, Federation will recover from the contractor the amount of the compensation so paid and without the prejudice to the rights of Federation. Under section 12, sub- section (2) of the Act Federation shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Federation to the contractor whether under this contract or otherwise.

Federation shall not be bound to contest any claim made against it under section 12, sub- section (1) of the said Act-except on the written request of the contractor and upon his giving to Federation

full security for all costs for which Federation might become liable in consequence of contesting such claim.

**Clause 21:** The contract shall not be assigned or sublet without the written approval of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak. And if the Contractor shall assign or sublet his contract or attempt to do so or become insolvent or commence any in-solvency proceedings or make any composition with his creditors or attempt to do so or give any bribe, gratuity, gift, loan, requisite reward of advantage, pecuniary or otherwise shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employ of Federation in any way relating to his office or employment or if any such officer or person shall become in any way directly or indirectly interested in the Contract, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may thereupon by notice in writing rescind the Contract and the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of the Federation and the same consequences shall ensure as if the Contract had been rescinded under Clause 2 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work there-for actually performed under the Contract.

**Clause 22:** All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Federation without reference to the actual loss or damage sustained, and whether or not any damages shall have been sustained.

**Clause 22(a):** Any excess payment made to the contractor inadvertently or otherwise under this contract or any account whatever and any other sum bound to be due to Federation contractor in respect of this contract or any other contract or work order or on any account whatever may be deducted from sum whatever payable by Federation to the contractor either in respect of this contract or any work order or contract or any other account by any other department of the Government.

**Clause 23:** In the case of tender by partners any change in the constitution of the firm shall be forthwith notified by the Contractor to the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak for his information.

**Clause 24:** All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried on.

**Clause 25 :** No claims for payment of an extra ordinary nature such as claims for a bonus for extra employed in completing the work before the expiry of the contractual period at the request of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or claims for compensation where work has been temporarily brought to a standstill though no fault of the Contractor shall be allowed unless and to the extent that the same shall have been expressly sanctioned debit for payment and extradition any nature to be referred to Federation for decision of the M.D, HAFED.

**ARBITRATION CLAUSE**

**Clause 25 (a) (i):** If any dispute or difference of any kind whatsoever shall arise between the Federation/ his authorized agents and the contractor in connection with or arising out of the contract or the execution of the work that is **(i)** Whether before its commencement or during the progress of the work or after its completion, **(ii)** and whether before or after the termination abandonment or breach of the contract, it shall in the first

instance be referred to for being settled by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtakin charge of the work at the time and he shall within a period of sixty days after being requested in writing by the contractor to do so, convey his decision to the contractor, and subject to arbitration as hereinafter provided, such decision in respect of every matter so referred, shall be final and binding upon the contractor. In case the work is already, in progress, the contractor will, proceed with the execution of the work on receipt of the decision by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, in charge as aforesaid with all due diligence whether he or the Federation is authorized agent requires arbitration as hereinafter provided or not. If the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, in charge of the work has conveyed his decision to the contractor and no claim to arbitration has been filed with him by the contractor within a period of sixty days from the receipt of letter communicating the decision, the said decision shall be final and binding upon the contractor and will not be subject matter of arbitration at all. If the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak in charge of the work fails to convey his decision within a period of sixty days from the date on which request has been made to the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak request to Divisional Head that the matters in dispute be referred to arbitration as hereinafter provided.

1. All disputes of differences in respect of which the decision is not final and conclusive shall at the request in writing of either party, made in a communication sent through Registered A.D. Post be referred to the sole arbitration of any serving GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak /Divisional Head to be nominated by designation by the M.D.HAFED at the relevant time, there will be no objection to any such appointment that the arbitrator so appointed is a Federation servant or that he had to deal with the matters to which the contract relates and that in the course of his duties as a Federation servant he had expressed his views on all or any of the matters in dispute. The arbitrator to whom the matter is originally referred being transferred or vacating his office, his successor-in-office as such shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

   In case the arbitrator nominated by the M.D, HAFED is unable or HAFED unwilling to act as such for any reason, whatsoever the M.D. shall be competent to appoint and nominate any other Superintending Engineer as the case may be, as arbitrator in his place and the Arbitrator so appointed shall be entitled to proceed with the reference.

2. It is also a term of this arbitration agreement that no person other than a person appointed by the M.D, HAFED shall act as arbitrator and if for any reason that is not possible, the matter shall not be referred to arbitration at all. In all cases where the aggregate amount awarded exceeds Rs. 25,000/- (Rupees Twenty five thousand only) the arbitrator must invariably give reasons for his award in respect of each claim and counter-claim separately.

3. The arbitrator shall award separately giving his award against each claim and dispute raised by either party including any counterclaim individually and that any lump sum award shall not be legally enforceable.

4. The following matters shall not lie within the purview of Arbitration:-
   a) Any dispute relating to the levy of compensation as liquidated damages which has already been referred to the Divisional Head and its being heard or/ and has been finally decided by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, In charge of the work.
   b) Any dispute in respect of substituted, altered, additional work/Committed work/ defective work referred by the Contractor for the decision of the Divisional Head, In charge of the work, if it is being heard or has already been decided by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

c) Any dispute regarding the scope of the work or its execution or suspension or abandonment that has been referred by the contractor for the decision of the Federation and has been so decided finally by the HAFED.

5. The independent claims of the party other than the one getting the arbitrator appointed, as also counter-claims of any party will be entertained by the arbitrator not withstanding that the arbitrator had been appointed at the instance of the other party.
6. It is also a term of this arbitration agreement that where the party involving arbitration is the contractor, no reference for arbitration shall be maintainable unless the contractor, furnishes to the satisfaction of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, In charge of the work, a security deposit of a sum determined according to details given below and the sum so deposited shall, on the termination of the arbitration proceedings, be adjusted against the cost, if any, awarded by the arbitrator against the claimant party and the balance remaining after such adjustment in the absence of any such cost being awarded, the whole of the sum will be refunded to him within one month from the date of the award:-

| **AMOUNTS OF CLAIMS** | **RATE OF SECURITY DEPOSIT** |
|---|---|
| (i) For claims below Rs. 10,000 | 2% of amount claimed. |
| (ii) For claims of Rs. 10,000 and Above and below Rs. 1,00,000. | 5% of amount claimed. |
| (iii) For claims of Rs. 1,00,000 and above | 10%of amount claimed. |

The stamp fee due on the award shall be payable by the Party as desired by the arbitrator and in the event of such party's default the stamp fee shall be recoverable from any other sum due to such Party under this or any other contract.

7. The venue of arbitration shall be such place or places as may be fixed by the arbitrator in his sole discretion. The work under the contract shall continue during the arbitration proceeding.

8. Neither party shall be entitled to bring a claim for arbitration if the appointment of such arbitrator has not been applied within 6 months :-

   a) Of the date of completion of the work as certified by GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, Engineer-in-charge, or
   b) Of the date of abandonment of the work, or
   c) Of its non- commencement within 6 months from the date of abandonment, or written orders to commence the work as applicable , or
   d) Of the completion of the work through any alternative agency or means 'after withdrawal of the work from the contractor in whole or in part and /or its rescission, or
   e) Of receiving an intimation from the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, In charge of the work that final payment due to or recovery from the contractor had been determined which he may acknowledge and /or receive.

   Whichever of (a) to (e) above is the latest.
   If the matter is not referred to arbitration within the period prescribed above, all the rights and claim of any party under the contract shall be deemed to have been forfeited and absolutely barred by time even for civil litigation notwithstanding.

9. It is also a term of this arbitration agreement that no question relating to this contract shall be brought before any Civil Court without first involving and completing the arbitration proceedings as above. If the scope of the arbitration specifies herein covers issues that can be brought before the arbitrator i.e. any matter that can be referred to arbitration shall not be brought before a Civil Court. The pending of arbitration shall not restraint Federation to terminate the contract and make alternative arrangements for the completion of the work.

10. The arbitrator shall be deemed to have entered on the reference on the day he issues notices to the parties fixing the first date of hearing. The arbitrator may, from time to time, with the consent of parties enlarge the initial time for making and publishing the award.

11. It is also a term of this arbitration agreement that subject to the stipulation herein mentioned, the arbitration proceeding shall be conducted in accordance with the provision of the arbitration Act. 1940 or any other law in force for the time being.

**Clause 26:** Work shall be carried out in accordance with the Technical Specifications mentioned in this DNIT & as per relevant IS Codes. In the event of there being no specifications, then in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

**Clause 27:** In the case of any clause of work for which there is no such specification as is mentioned in rule 1, such work shall be carried out in accordance with the district specifications, and in the event of there being no district specification, than in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak.

**Clause 28 :** The expression "works" or where used in these conditions shall unless there be something either in the subject or context repugnant to such worksbe construed and taken to mean the work by or by virtue of the Contract contracted to be executed whether temporary or permanent and whether original, altered, substituted or additional.

**Clause 29:** The terms and conditions of the agreement have been explained to me/ us and I/ we clearly understand them.

**ADDITIONAL CLAUSES**

**Clause 30**: The contractor states that he is not related to any of the officers employed by the HAFED.

**Clause 31**: No pit shall be dug by the contractor near the site of the work for taking out earth for use on the work. In case of default the pit so dug will be filled in by the Federation at the cost of the contractor.

**Clause 32**: Fair wage clauses are attached.

**Clause 33**: The contractor shall have to pay GST and other applicable taxes, in accordance with the rules in force from time to time.

**Clause 34**: All payments for work done under this contract shall be made by cheque or RTGS (as applicable) to the contractor. The work covered by this contract as shown on plan which have been signed by the contractor are annexed herewith.

**Clause 35:** Should the tenderer withdraw or modify his tender within three months from the date of opening of tender, he is liable to be black listed and earnest money forfeited.

**Clause 36:** When a final bill is likely to be for a minus amount, the security deposit will be with-held till the bill is passed and the recoverable amount is first made good.

**Clause 37** : All taxes should be included in the rates to be quoted and is payable by the contractor.

**Clause 38**: The rates given are for the work inclusive of GST and other applicable taxes etc.

**Clause 39**: It will be the responsibility of the contractor to ensure that the trees at the site of work and in the vicinity or their fruit etc. are not damaged by his labour or agent. The assessed cost of such damage if any will be at the discretion of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak and shall be deducted from the bill of the contractor.

**Clause 40**: The contractor shall provide at his own cost separate latrine, bathing enclosures and platform for use of the men and women labour and keep them clean to the satisfaction of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak. He should also arrange at his own expenses for clean drinking water, housing, medical facilities necessary for the welfare of the labour employed at his work. In case of his failure, the same shall be provided by Federation at contractor's cost. Any dispute regarding this will be settled by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak whose decision will be binding.

**Clause 41**: Any material left on the site of work after one month from the date of completion of the work shall become the property of the Federation and no payment shall be made for it.

**Clause 42**: The amount of the work can be increased or decreased according to the requirement of the Federation and no claim whatsoever on this account will be entertained.

**Clause 43**: The Federation Reserves option to take away any items of the work or part thereof any time during the currency of the contract and re-allot it to another agency with due notice to the contractor without liability or compensation.

**Clause 44**: It is not obligatory on the contractor to employ labour through employment exchange but he may avail of the facilities offered by the employment exchange in case he wishes to do so.

**Clause 45**: No claim on account of fluctuation in prices due to war or any other cause will be entertained.

**Clause 46**: The contractor shall be liable to make good all damages caused by breakage from the moment the stores, pipes and fittings etc. are handed over to his charge.

**Clause 47**: No compensation whatsoever will be payable on account of any delay or default in the supply of material mentioned in the List of material to be issued to the contractor by the Federation and consequence delay in the execution of work.

**Clause 48:** GST/Taxes as applicable will be deducted from gross payment as per govt. instructions.

**Clause 49**: The contractor shall be liable to pay the ESI/CPF/EPF/ contribution, workers welfare cess etc. as applicable or as applied during the pendency of the contract under the provision of Provident Fund Act/ Labour Act to the persons engaged and shall have the registration with Regional Provident Fund Commissioner/ and Labour Officer etc. Under Provident Fund Act/ Labour Act as applicable from time to time. The Federation shall not be responsible for any default committed under these Acts.

**FAIR WAGES CLAUSES**

a) The contractor shall pay not less than fair wage to labour engaged by him on the work.
**Explanation**: 'Fair Wage' means wage whether for time or piece-work notified at the time of inviting tenders of the work and where such wages have not been so notified the wages prescribed by the Public Works Department, Building and Roads Branch, Labour Deptt. Haryana for the district in which the work is done

b) The contractor shall, notwithstanding the provisions of any agreement to the contrary, caused to be paid fair wages to labourers, and indirectly engaged on the work including any labour engaged by his sub-contractors in connection with the said work, as if the labourers had been directly employed by him.

c) In respect of labour directly employed on the works for the performances of the contractor's part of this agreement the contract shall comply with or cause to be complied with the Haryana Public Works Department Contractor's Labour's Regulations made by Government from time to time in regard to payment or wages period deductions from wages recovery of wages not paid and deduction unauthorisedly made maintenance of wage work, wage slip, publication of wages and other terms of employment inspection and submission of periodical returns and all other matters of alike nature.

d) The GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, concerned shall have the right to deduct. from the money due to the contractor, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for benefit of the workers, non-payment of wages or deduction made from his or their wages, which are not justified by the terms of the contract for non-observance of the regulations referred to in clause (c) above.

e) Vis-à-vis the Federation, the contractor, shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub-contractors.

f) The regulations aforesaid shall be deemed to be part of this contract.

g) Attendance card should invariably be issued by the contractors to their workers, which should be returned to the contactors concerned at the time of receiving payment of their wages.

h) Before making payment to the contractors the authorities concerned should obtain a certificate from the contractors that he has made payment to all the workers connected with the execution of the work for which the payment is being made.

i) Contractors employing 50 or more workers on the site of a particular work should provide facilities of housing, latrines, water and light to their workers at their own expense.

j) The normal working hours of workers employed by contractors for the execution of work allotted to them should be 8 hours per day with a break of 2 hours during summer, one hour during winter after continuous work of 4 hours at the latest. The spread over should in no case exceed 10 hours. Workers working beyond these hours should be paid overtime wages at the double the ordinary rate of their wages calculated by the hour.

## HARYANA STATE COOPERATIVE SUPPLY AND MARKETING FEDERATION LIMITED (CONTRACTOR'S LABOUR REGULATION)

### A. Short title

These regulations may be called HAFED Contractor's Labour Regulations.

### B. Definition

In these regulations, unless otherwise expressed, or indicated the following words and expression shall have the meaning hereby assigned to them respectively, that is to say.

(i) Labour means workers employed by HAFED contractor's directly or indirectly, a sub-contractor or other persons or by an agent on his behalf.
(ii) Fair wages mean, whether for item or piece work, notified at the time of inviting tenders for the work and where such wages have not been so notified the wages prescribed by the Labour Deptt. Haryana for the district in which the work is done.
(iii) Contractor shall include every person whether a sub-contractor or headman or agent employing labour on the work, taken on contract.
(iv) "Wages" shall have the same meaning as defined in the payment of Wages Act and includes time and piece rate wages.

### 1. Display of notice regarded wages etc.

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly in a clean and legible condition in conspicuous places of the work, notice in English and in the Local Language spoken by the majority of the workers, giving the rate of wages which have been certified by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, or Regional Labour Commissioner as fair wages and the hours of work for which such wages are earned and a copy of such notices to the District Labour Welfare Officer.

### 2. Payment of Wages

(i) Wages due to every worker be paid to him directly.
(ii) All wages shall be paid in current coin or currency or in both.

### 3. Fixation of Wage Periods

(i) The contractor shall fix the wage periods in respect of which the wages shall payable.
(ii) No wage period shall exceed one month.
(iii) Wages of every workman employed on the contract shall be paid before the expiry of ten days after the last of the wage period in respect of which the wages are payable.
(iv) When the employment of any worker is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before the expiry of succeeding the one on which his employment is terminated.

(v) All payment of wages shall be made on a working day except the work is completed before the expiry of the wages period in which case final payment shall be made within 48 hours of the last working day.

**Notes**: -The terms working day means a day, on which the work on which the labour is employed is in progress.

**4. Wages book and Wages Slip etc.**

(i) The contractor shall maintain a wage book of each worker in such a form as may be convenient but the same shall include the following particulars:-

a) Rate of daily or monthly wages.
b) Nature of work for which employed.
c) Total number of days worked during each wage period.
d) Total amount payable for the work during each wage period.
e) All deduction made from the wages within an indication in each case of the ground for which the deduction is made from the wage.
f) Wages actually paid for each wage period.

(ii) The contractor shall also maintain a wage slip for each worker employed on the work. The wage slip shall contain all the particulars given in the wage book.

(iii) The GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtakmay grant exemption from the maintenance of Wage Book and Wage Slips to a contractor who in his opinion may not directly or indirectly employ more than 50 persons on the work.

**5. Fine and deductions which may be made from wages**

(i) The wages of workers shall be paid to him without any deduction of any kind except the following:

a) Fines
b) Deductions for absence from duty viz, from the place or places Where by the terms of his employment is required to work.
c) The amount of deduction shall be in proportion to the period for which he was absent.
d) Deductions for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money for which he is required to account, where such damage or loss is directly attributable to his neglect or default.
e) Any other deduction which the Government may from time to time allow.

(ii) No fine shall be imposed on a worker and no deduction for damage or loss be made until the worker has been given an opportunity of showing cause against such fines or deductions.

(iii) The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to Five paise in a rupee of the wage payable to him in respect of that wage period.

(iv) No fine imposed on any worker shall be recovered from him by instalments, or after the expiry of 90 days from the date in which it was imposed.

**6. Register of Fine etc.**

(i) The contractor shall maintain a Register of fine and of all deduction for damage or loss Such Register shall maintain the reason for which fine was imposed or deduction for damage or loss made.

(ii) The contractor shall maintain, both in English and local Indian Language, a list approved by the Chief Labour Commissioner clearly stating the acts and commissions for which penalty or fine may be imposed on workmen and display it in a good condition in a conspicuous place on the work

**7. Preservation of Registers**

The wage book, the wage slips and the Register of fines, deductions required to be maintained under these regulations shall be preserved for 12 months after the date of last entry made in them.

**8. Power of Labour Welfare Officer to make Investigation / Enquiry**

The Labour Welfare Officer or a person authorized by the Government on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clause and provisions of these regulations. He shall be investigating into any complaint regarding the default made by the contractor or sub-contractor in regard to such provision.

**9. Report of Labour Welfare Officer**

The Labour Welfare Officer or any other person authorized as aforesaid shall submit a report of the result of his investigation or enquiry to the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, concerned, indicating the extent if any to which the default has been committed and the amount of fine recoverable in respect of the acts of omission and commission of the labourer with a note that necessary deduction from the contractor's bill be made and the wages and other dues be paid to the labourers concerned.

**10. Appeal against the decision of Labour Welfare Officer**

Any person aggrieved to the decision and recommendation of the Labour Welfare Officer or other person so authorized may appeal against such decision, to the Regional Labour Commissioner within 30 days from the date of decision forwarding simultaneously a copy of his appeal to GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, concerned, but subject to such appeal, the decision of the Labour Welfare Officer shall be final and binding upon the contractor.

**11. Representation of Parties**

(i) A workman shall be entitled to be represented in any investigation or enquiry under these regulations by:
   a) An officer of a registered trade union to which he is a member.
   b) An officer of Federation of trade unions to which the trade union referred it in clause (a) is affiliated.
   c) Where the worker is not a member of any registered union, an officer of registered trade union connected with, or by any other workman employed in the industry in which the worker is employed.

(ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by:
   a) An employer of an association of employers of which he is a member.
   b) An officer of an association of employers to which the association referred to in clause (a) is affiliated.
   c) Where the employer is not a member of any association of employers by an officer of an association of employers connected with or by any other employer is engaged.

**12. Inspection of Books**

The contractor shall allow inspection of Wage Book, the Wage Slips and Register of Fines and deduction to any of this worker or his agent at a convenient time and place after notice is received or to the Labour Welfare Officer or any other person authorised by the Government on his behalf.

**13. Submission of Returns**

The contractor will be regulated by (Regulation and Abolition Act 1970) and the contract labour (Regulations and Abolition Central Rule 1971) enforced by Haryana Labour and employment Department Memo No. 12 (26-78-4- Labour dated 10-6-79).

The contractor shall submit periodical returns specified from time to time.

**14. Licensing of Contractor**

Every contractor who employs or who employed on any day of the preceding 12 calendar months, 20 or more workmen, is covered by the act and is required to obtain a license. The contractor should obtain the necessary license as required under section 12 of contract labour (regulation and abolition Act 1970 before commencing the work).

**15. Amendments**

The Haryana Government may from time to time and or amend these regulations on any question as to application, interpretation or effect of these regulations the decision of the Labour Commissioner to Haryana Government in that behalf shall be final.

1. In case of duplicity/variation/contradiction of term & condition in the printed Tender Document and in special terms & conditions, terms and conditions mentioned in the Special terms & conditions will prevail.

2. The rate will be firm and biding on the contractor during the currency of contractor including extended time period. No escalation shall be paid for any increase in cost of material & labour.

**16.** The Bidder is advised to visit and examine the site conditions, approach road, traffic, location, surroundings, climate, availability of power, water and other utilities for installation & commissioning, access to site, handling and storage of materials, weather data, applicable laws and regulations, and obtain for itself on its own responsibility all information, as per their understanding, may be necessary for preparing the Bid and entering into the Contract Agreement. All the expenses of visiting the Site and its associated costs shall be borne by the Bidder. The bidder is advised to go through the documents with all details and understand the exact quantum of works. The scope of the works is in turnkey nature and no exclusions at the time of execution will be accepted.

**A. Financial Evaluation:** Once Technical Evaluation completed, all technical qualified bidders will be deemed in same position/ eligible for opening their financial bids. After opening the financial bids, the lowest amount quoted by any bidder shall be considered as L1 bidder & the necessary proceedings will be carried out with the L1 bidder only. No other technical aspects / criteria will be reviewed after once financial bids are opened.

## SECTION-4 (II)

## SPECIAL TERMS & CONDITIONS OF CONTRACT

In addition to the terms & conditions as stipulated in contract agreement, following special conditions shall also be applicable in this contract:

1. 5% security will be deducted from running bills and the 50 % of same will be refunded after 3 months from the satisfactory completion of work. Balance 50% after completion of defect liability period of two years or after submission of performance bank guarantee of equivalent amount valid upto Defect Liability period.

2. All applicable taxes (GST & others) are to be deducted from all the running bills as per standard norms of GoI.

3. Cess @ 1% of the total cost of this package of project from the payment of contractor under section-3 of the "Building & Other Construction Workers Welfare Cess Act-1996" & registration of establishment under section-7 of the "Building & Other Construction Workers" (regulation of employment and condition of service tax act 1996) shall be deducted from all running & final bills.

4. **Background of the project:**

   HAFED (hereinafter referred to as 'the Park') Invites Bid for Supply, Installation, Testing, Commissioning & obtaining NoC of Fire fighting works for Core Processing Centre Building, Dry Warehouse & Admin Block on Turnkey mode. complete in all respects at HAFED Mega Food Park, IMT Rohtak, Haryana.

   The proposed Mega Food Park is located in IMT Rohtak. The site lies in Industrial Estate IMT Rohtak. The land for the CPC site is 50 Acres which is owned by HAFED.

   The site is located on the national high way (NH-01) and lies 70 km from Delhi. All the construction works at all the buildings mentioned above have been completed. The bidders are advised to visit the site to understand the actual site conditions. However, for ease of understanding, few photographs are appended below.

**Admin Block:**

**Dry Warehouse**

**Core Processing Centre Building**


5. **Scope of works:**

a. The vendor has to design, SITC (Supply, Installation, Testing & Commissioning) & obtaining NOC from fire department on behalf of HAFED for the buildings of Core Processing Centre Building, Dry Warehouse & Admin Block on Turnkey mode.
b. The successful contractor shall be fully responsible to get the approval of complete designs & drawings by Fire Officer. Also the NOC from fire officer to be obtained by the successful contractor. HAFED shall submit the application to Fire department, the documentation part will be provided by

the contractor & the contractor shall follow up with the Fire Officer & get the NOC/ Approval letter for each buildings.

c. The BoQ attached with the tender is tentative. Bidder has to examine the BoQ & work as per actual requirement at site to get the approval from fire department. After awarding the work to successful vendor, detailed Break up of price schedule will be asked as per actual requirement at site based on the vendor's design complying the norms of the fire department & HAFED shall evaluate the same & finalize for further payment purpose. The awarded amount shall be final in all aspects & the contractor has to execute the work & obtain the NoC from Fire department within the awarded cost. The award amount shall not be executed under any circumstances. Any queries related to the addition/ deletion/ modifications on capacity/ specifications on the tentative BoQ may be raised by the bidders during pre-bid meeting only.

d. The buildings covered under this contract are: Core Processing Centre (Facilities: Cold Storage, Food Processing Line etc). Dry Warehouse (For Finished & Raw Goods), Administrative Building. The bidder may ask for as built drawings for the above structures for their further working on the requirement during pre-bid meeting.

6. The rate to be quoted by the contractor shall be inclusive of applicable GST and other taxes.

7. **Site Visit:** The bidders are advised to visit the site to understand the nature of works & the existing civil structures. In case of any queries, the same should be raised during pre-bid meeting. After award the work to the successful vendor, it will be assumed that the successful vendor has visited the site & quoted the amount as per the actual required after understanding the ground situations & all the risk factors (if any) has been accepted by the successful vendor. Once the work is awarded, any kind of extra claims will not be entertained under any circumstances. The successful bidder have to execute the work & obtain NoC within the awarded amount.

8. **Valuations of Variations: -**
   Since this is a turnkey contract, no extra items / claims will be accepted by HAFED under any circumstances.

9. **Extent of variations: -**
   Quoted rates for all items shall be firm and binding on the contractor irrespective of any variation No extra payment will be made beyond the total quoted amount. Since this is a Turnkey tender, no escalation of rates are accepted during execution of works. The entire works to be completed by the vendor within the awarded amount.

10. **Measurements: -**
    **Measurement of work executed: -**
    The contractor shall, without extra charges, provide all assistance with every appliance, labour and other things necessary for measurement and recording levels.

    Except where any general or detailed description of the work expressly shows to the contrary, measurement shall be taken in accordance with the procedure set forth in the specification notwithstanding any provisions in the relevant Indian Standard Method of Measurement or any general or local custom. In the case of items which are not covered by specification, measurement shall be taken in accordance with relevant standard method of measurement issued by the bureau of Indian Standard and if for any item no such standard is available then a mutually agreed method shall be followed.

GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak or his authorized representative may cause either themselves or through another officer of the HAFED to check the measurements recorded jointly or otherwise as aforesaid and all provision stipulated herein above shall be applicable to such checking of measurement or levels.

It is also a term of his contract that recording of measurement of any item of work in the measurement book and/ or its payment of the interim on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the Defects Liabilities Period.

11. **Monthly Payments:-**
The said statement shall be approved or amended by the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak in such a way that in his opinion, it reflects the amount due to the contractor in accordance with the contract, after deduction, of any sums which may have become due and payable by the contractor to the Employer. In case where there is difference of opinion as to the value of any item the GM's HAFED, CFP, Rohtak/Executive Engineer's, HAFED, Rohtak view shall prevail. Within the 7$^{th}$ day of the month following the receipt of the monthly statement, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall determine the outstanding amounts due to the contractor and shall issue to the contractor a certificate called "interim payment certificate" certifying the amount due to the contractor. However, the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak may recommend advance payment against on account bills when there is likely to be delay in authorizing payments for some special reasons which should be recorded.

12. The work shall be carried out as per the latest Respective Indian Standard Codes, Haryana PWD& Technical specifications mentioned in Tender Documents. In absence of specifications from Haryana PWD specifications, specifications from standard Engineering practice, IS codes and as per direction of the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall be followed.

13. The time period for completion of work shall be **Four Months** from the date of handing over of site to the agency.

14. The work shall be inspected and frequency of tests required shall be as per relevant IS Code.

15. The defect liability period shall be 24 (Twenty Four)-calendar months after commissioning of the works. Any defect in material or workmanship observed in the work during execution of work or within Defect liability period shall be rectified by agency at his own cost. In the case the contractor fails to rectify the defects within 15 days, the department shall get the work executed at his risks and costs and recovered from the Contractor.

16. Dispute arising out of this contract shall be limited to the jurisdictions of Panchkula court / Punjab & Haryana High Court, Chandigarh (as applicable) only.

17. All material to be arranged by contractor himself, shall be confirming to relevant ISI specification, duly ISI marked and as per list of approved manufactures/ makes by HAFED attached in the DNIT. Wherever referred ISI codes shall be with its latest amendments.

18. Contractor will have to supply manufacturer's certificate certifying that materials have been manufactured as per ISI specification, duly supported by necessary documentation.

19. Necessary certificate from the manufacturer for all the material brought at site shall be supplied to the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, certifying that this lot of material have been manufactured as per Standard of BIS and confirms to relevant ISI Code.

20. HAFED reserves its right to get any material tested from M/s Shri Ram Institute for Industrial research or other equivalent reputed test house to ensure for quality of material/work. Testing charges shall be borne by the Contractor, but in Case of failure of any lot of material, all the work executed with that lot of the material shall be rejected.

21. Sampling of work in progress shall be carried out by representative of GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, Contractor and shall be got tested as per approved Quality Assurance Plan from M/s Shri Ram Institute for Industrial research Delhi / M/s Delhi Test House, New Delhi and NIT Kurukshetra or any other lab as suggested by HAFED. Fee of testing shall be borne by the Contractor. But in case, if any sample fails, rectification of defective work, to be done upto the entire satisfaction of GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak, as defined in the Technical Specifications in Tender Documents, Relevant IS Codes & Haryana P.W.D. specifications as applicable.

22. All types of works to be carried out by maintaining industrial safety acts., Tools for maintaining the same at site to be arranged by the contractor at his own expenses. In case of any accidents occurred at site, Contractor is fully responsible for the same.

23. The contractor shall submit the CAR (Contractor's All Risks) Policy for the awarded value of the work and valid of the work and valid for the entire duration of the work including the extended period of work, it any. The contractor shall provide to the Federation copy of the insurance policies and document taken out by him pursuance of the contract immediately after such insurance coverage. If the contractor fails to effect and keep in force insurance, as per the terms of contract, the Federation may effect and keep in fore any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Federation as aforesaid from any money due or which may become due to the contractor, or recover the same as debit due from the contractor.

24. The contractor shall be responsible for preparing all claims and make good for all damage or loss by way of repairs and or replacement of portion of any works damaged or lost. The transfer of title shall not in any way relieve the contractor of his responsibilities during the period of the contract including the Defects Liability Period.
25. The contractor shall abide by the local laws and regulations governing labour applicable from time to time. During continuance of the contract, the contractor shall abide at all times by all existing labour enactments and rules made there under, regulations, notification and by laws (including rules), regulation, bye-laws that may be passed or notification that may be issued under any labour law in future either by the state or the Central Government or the local authority.

26. The rate to be quoted shall include GST and other applicable taxes and noting extra shall be payable to the agency on this account.

27. Nothing shall be paid for any loss and damages done to rain, floods or any other act of God and payment shall be made only for material acceptable to the department.

28. Material purchased in excess shall not be measured and paid for and if not removed within one month after completion of the work, the material shall become the property of the HAFED and no claim on this account shall be entertained.

29. The contractor shall provide suitable measuring arrangement at site for checking of various material supplied by him.

30. In case of duplicity/variation/contradiction of term & condition in the printed Tender Document and in special terms & conditions, terms and conditions mentioned in the Special terms & conditions will prevail.

31. The rate will be firm and biding on the contractor during the currency of contractor including extended time period. No escalation shall be paid for any increase in cost of material & labour.

32. **Electricity & Water**

**Electricity**
The contractor will bear all electricity & diesel charges during installation, testing, commissioning & trial run of 3 months period, at its own cost.

**Water**
Contractor is required to make his own arrangement for the water required for the installation, testing & commissioning, trial run of 3 months period, as well as for drinking and other uses of his workers at its own cost. In either case water being provided should be fit for the respective usage and the contractor shall provide the test report of water being used. In case the water is provided by HAFED the same shall be charged at the prevailing rates of HAFED water policy/norms.

33. **Taxes**
It is being specifically intimated that the bidders should include GST and other applicable taxes.

34. Complete designs of fire fighting works i.e all applicable works to be executed should be duly vetted by IIT Delhi/ Roorkee /NIT/ or any other technical body by the Contractor with the confirmation from HAFED at Contractor's own cost within 30days of issuing the Letter of Acceptance.

35. **Performance Security:**

Performance Security for SITC (Supply, Installation, Testing, Commissioning & Trial Run) & obtaining NOC from Fire department of Work which shall valid upto Defect Liability Period plus 60 days

The successful Bidder, i.e. the Bidder whose Bid is acceptable to the Employer, shall have to deposit Performance Security equal to 10% of the total contract value quoted by the bidder within 30 days of receipt of notification of award of the Contract. The performance security may be furnished in the form of Bank Guarantee from any Scheduled/ Nationalised bank in the format given in Bid Documents. The Bank guarantee for performance security shall remain in force as given in the Bid Document shall be valid up to 60 days beyond the expiry of the Defects Liability Period of two years. The extension of the Bank Guarantee will be extended and submitted by the bidder accordingly if there is any delay on the decision of HAFED.
The proceeds of the performance security shall be payable to the HAFED as compensation for any loss resulting from the Contractor's failure to complete its obligations under the Contract.

## 1. Payment (Clause16)

### I. Mobilization advance

a) The contractor can avail 20% mobilization advance for contract value @ 9% of simple interest for capital works to expedite the deployment of technical staff, establishment of office for own & employees staff, material, movement of equipment and machinery etc. at site. This advance shall be paid against bank guarantee 110% for mobilization advance from any nationalised bank of India to be given by the contractor. The Employer is rightly entitled to check that mobilisation advance is utilised for the work for which it is given. Mobilization advance shall be recovered @ 20% of gross value of work done from each running account bill, however, in any case full mobilisation advance shall be recovered before 80% of total work completed. The bank guarantee shall be released after 100% of the recovery of Mobilisation advance.

b) Bonus @ 0.5% of contract value per fortnightly shall be paid to contractor for early completion. The bonus incentive for period less than fortnight shall not be paid for.

**NOTE:**

(i) The interest rate applicable for advance will be 9% per annum (simple interest) on the outstanding advance amount. The advance shall be adjusted by recovery on pro rata basis along with interest from the 1st Supply/RA Bill onwards. The interest shall be calculated on the basis of advance adjusted from the date of cheque towards advance payment to the date of receipt of material at site, on actual number of days.

(ii) All bank guarantees should be issued by Nationalized Banks approved by RBI to be at par with Nationalized Banks for the limited purpose of acceptance of guarantee or foreign banks having branches in India.

(iii) The successful bidder may raise running bills for supply as soon as supply is completed as per the schedule and bills for Installation & Commissioning job shall be raised as applicable.

### II. Terms of Payment

**A. Terms of Payment for Supply Installation, Testing, Commissioning & Trial Run:**

(a) 70% of contract price on safe receipt of the goods at site and after inspection and approval of the SPV. 20% of mobilization advance will be recovered from each running bills on pro rata basis. A joint inspection (HAFED, PMC) shall be carried out at site to check the supplied materials/ equipment as per the technical specifications, capacity, approved make specified in tender documents. The bill shall be processed based on the Joint Inspection Report submitted by the HAFED & PMC jointly.

(b) 20% of contract price shall be paid on actual completion of installation/erection and after due inspection and approval by the SPV (against detailed break up cost to be furnished by the Contractor in advance and accepted by the SPV). A joint inspection (HAFED, PMC) shall be carried out at site to check the installation/ erection at site.

(c) The balance 10% shall be paid after successful commissioning, 3 months trial run of plant (on continuous satisfactory running of the complete plant for three month) & obtaining NOC from fire department, and acceptance by the SPV's representative, within the scope of this contract.

## SECTION 5(I)

## GENERAL CONDITIONS OF CONTRACT

1. **Definitions**

In this Contract, the following terms shall be interpreted as indicated.

a) The Contract" means the agreement entered into between the HAFED and the Contractor, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein;

b) "The Contract Price" means the price payable to the Contractor under the Contract for the full and proper performance of its contractual obligations;

c) "The Goods" means all of the equipment, machinery, and/or other materials, which the Contractor is required to supply to the HAFED under the Contract;

d) "Services" means services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training and other such obligations of the Contractor covered under the Contract;

e) "The Contractor" means the individual or firm supplying the Goods and services under this Contract.

f) "Office -in-charge" means the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak designated as such or other Officer appointed from time to time by the HAFED and notified in writing to the Contractor to act as Officer -in-charge for the purposes of contract.

g) "Works" means all goods to be provided and work (Services) to be done by the Contractor under the contract.

2. **Application**

These General Conditions shall apply to the extent that they are not superseded by provisions in other parts of the Contract.

3. **Country of Origin**

**3.1** For purpose of this Clause "origin" means the place where the Goods were mined, grown or produced, or from which the Services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially

recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

**3.2** The origin of Goods and Services is distinct from the nationality of the Contractor.

4. **Standards**

The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the authoritative standard appropriate to the Goods' country of origin and such standards shall be the latest issued by the concerned institution.

5. **Use of Contract Documents and Information**

5. 1. The Contractor shall not, without the HAFED's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the HAFED in connection therewith, to any person other than a person employed by the Contractor in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.

5. 2. The Contractor shall not, without the HAFED's prior written consent, make use of any document or information enumerated in para. 5.1 Except for purposes of performing the Contract.

5. 3. Any document, other than the Contract itself, enumerated in Para. 5.1 shall remain the property of the HAFED and shall be returned (in all copies) to the HAFED on completion of the Contractor's performance under the Contract if so required by the HAFED.

6. **Patent Rights**

The Contractor shall indemnify the HAFED against all third-party claims of infringement of patent, trademark or industrial design rights arising from use of the Goods or any part thereof in India.

**Inspection and Tests**

**8.1** The HAFED or its representative shall have the right to inspect and/or test the Goods to confirm their conformity to the Contract. The Special Conditions of Contract and/or the Technical Specifications shall specify what inspections and tests and QAP attached in the document the HAFED requires and where they are to be conducted. The HAFED shall notify the Contractor in writing of the identity of any representatives, if retained for these purposes. The contractor has to inform HAFED prior to despatch of any major equipment of the contract document. The contractor can only supply material if the inspection is found satisfactory.

**8.2** The inspections and tests may be conducted on the premises of the Contractor or its subcontractor(s), at point of delivery and/or at the Good's final destination. Where conducted on the premises of the Contractor or it's sub- contractor(s), all reasonable facilities and assistance including access to drawings and production data-shall be furnished to the inspectors at no charge to the HAFED . In case of any defects or deficiency notified by the HAFED's inspection authority, the Contractor will rectify and make good the same without delay and not proceed with further processing of such item(s) of Goods without obtaining approval from the inspection authority.

**8.3** Should any inspected or tested Goods fail to conform to the Specifications, the HAFED may reject

them and the Contractor shall either replace the rejected Goods or make all alterations necessary to meet specification requirements free of cost to the HAFED.

**8.4** The HAFED's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at the destination shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by the HAFED or its representative prior to the Goods shipment from the country of origin.

**8.5** Tests upon completion

**8.5.1** The Contractor shall give to the HAFED 21 days notice of the date after which he will be ready to make the tests of completion (the Test). Unless otherwise agreed, the Tests shall take place within 14 days after the said date on such day or days, as the HAFED shall notify the Contractor.

**8.5.2** If the HAFED fails to appoint a time after having been asked to do so, or does not attend at the time and place appointed, the Contractor shall be entitled to proceed with the Tests in his absence. The tests shall then be deemed to have been made in the presence of the HAFED and the results of the Tests shall be accepted as accurate.

**8.5.3** If the Tests are being unreasonably delayed by the Contractor the HAFED may give notice requiring the Contractor to make the tests within 21 days after the receipt of such notice. The Contractor shall make the Tests on such days within that period as the Contractor may fix and of which he shall give notice to the HAFED.

**8.5.4** If the Contractor fails to make the Tests within 21 days the HAFED may himself proceed with the Tests. All tests so made by the HAFED shall be at the risk and cost of the Contractor and the cost thereof shall be deducted from the Contractor's price. The test shall then be deemed to have been made in the presence of the Contractor and results of the tests shall be accepted as accurate.

**8.5.5** If the Goods/services or any section fails to pass the Tests, the Contractor may require such tests to be repeated on the same terms and conditions. All costs to which the HAFED may be put to by the repetition of the tests under this sub- clause or under sub clause 8.5.14 shall be deducted from the Contract Price.

**8.5.6** If the HAFED and the Contractor disagree on the interpretation of the test results each shall give a statement of his views to the other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence. The HAFED will review both the statements and render a final decision within a further period of fourteen (14) days, which shall be binding on the Contractor.

**8.5.7** If the Goods/Services or any Section fails to pass the Tests on the repetition thereof under sub-clause 8.5.4 the HAFED after due consultation with the Contractor, shall be entitled to:

a) Order one further repetition of the Tests under the conditions of sub-clause 8.5.4 or

b) Reject the Goods or a section thereof in which event the HAFED shall have the same remedies against the Contractor as are provided under sub-clause 8.5.12.

c) Issue a taking over certificate, if the HAFED so wishes, notwithstanding that the Goods are not

complete. The Contractor's price shall then be reduced by such amount as may be agreed to by the HAFED and the Contractor or failing an agreement, as may be determined through arbitration.

**8.5.8** In considering the results of tests carried out under sub-clause 8.5.11 and 8.5.14 and the HAFED shall make allowances for the effect of any use of the Goods by him on the performance or other characteristics of the Goods.

**8.5.9** As soon as the Goods/Services or any section thereof has passed the tests, the HAFED shall issue a certificate to the Contractor to that effect.

**8.5.10** The Goods and Services shall be accepted by the HAFED when they have been completed in accordance with the contract, except in minor respects that do not affect the use of the Goods for their intended purposes and having passed the tests on completion and a taking over certificate has been issued or deemed to have been issued in accordance with sub-clause 8.5.10

**8.5.11** The Contractor may apply by notice to the HAFED for a taking over certificate not earlier than 14 days before the goods will in the Contractor's opinion be complete and ready for taking over under sub-clause 8.5.9.

The HAFED shall within 28 days after the receipt of the Contractor's application either:

a) Issue the taking over certificate to the Contractor stating the date on which the works were complete and ready for taking over, or

b) Reject the application giving his reasons and specifying the work required to be done by the Contractor to enable the taking over certificate to be issued.

If the HAFED fails either to issue the taking over certificate or to reject the Contractor's application within the period of 28 days he shall be deemed to have issued the taking over certificate on the last day of that period.

If the services are divided by the Contract into sections the Contractor shall be entitled to apply for separate taking over certificate for each such section.

**8.5.12** The HAFED shall not use any part of the Goods unless taking over certificate has been issued in respect thereof.

If nevertheless the HAFED uses any part of the Goods that part which is used shall be deemed to have been taken over at the date of such use. The HAFED shall on request of the Contractor issue a taking over certificate accordingly. If the HAFED uses any part of the Goods before taking over, the Contractor shall be given the earliest opportunity of taking such steps as may be necessary to carry out the tests on completion.

**8.5.13** If the Contractor fails to remedy a defect or damage pointed out by the HAFED within a reasonable time, the HAFED may fix a final time for remedying the defect or damage.

If the Contractor fails to do so, the HAFED may:

a) Carry out the work himself or by others at the Contractor's risk and cost, provided that he does so in a reasonable manner. The costs properly incurred by the HAFED in remedying the defect or

damage shall be deducted from the Contract Price, but the Contractor shall have no responsibility for such work, or

b) Require the Contractor to grant the HAFED a reasonable reduction in the Contract Price to be agreed or fixed by arbitration or

c) If the defect or damage is such that the HAFED has been deprived of substantially the whole of the benefits of the Goods or a part thereof, he may terminate the Contract, in respect of such parts of the Goods as cannot be put to the intended use. The HAFED shall, to the exclusion of any remedy be entitled to recover all sums paid in respect of such parts of the Goods together with the cost of dismantling the same, clearing the site and returning plant to the Contractor or otherwise disposing of it in accordance with the Contractor's instructions.

**8.5.14** If the defect or damage is such that repairs cannot be expeditiously carried out on the site, the Contractor may with the consent of the HAFED remove from the site for the purpose of repair any part of the works which is defective or damaged, after furnishing a suitable guarantee as may be prescribed by the HAFED .

**8.5.15** If the replacement or renewals are such that they may affect the performance of the services, the HAFED may request that the tests on completion be repeated to the extent necessary. The request shall be made by notice within 28 days after the replacement or renewal. The tests shall be carried out in accordance with clauses 8.5.1 to 8.5.3.

**8.5.16** Until the final certificate of commissioning has been issued, the Contractor shall have the right of access to all parts of the Goods and to the records of the working and performance of the Goods and Services.

Such right of access shall be during the HAFED 's normal working hours at the Contractor's risk and cost. Access shall also be granted to any duly authorized representative of the Contractor whose name has been communicated in writing to the Contractor.

Subject to the HAFED's approval, the Contractor may also at his own risk and cost Make any tests, which he considers desirable.

**8.6** Nothing in the clause 8 shall in any way relieve the Contractor from any warranty or other obligations under this Contract.

7. Packing and Marking

9. 1. The Contractor shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to temperature, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

9. 2. The packing, marking and documents within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to Clause 18 and any subsequent instructions given by the HAFED .

9. 3. Each package shall be marked to indicate:

a) Name of the Contractor
b) Details of items in
c) Name of the Consignee
d) Purchase Order number
e) Gross, net and tare the package weights of the item
f) Destination

**10 Delivery and Documents**

Delivery of the Goods shall be made by the Contractor in accordance with the terms specified by the HAFED in its Schedule of Requirements and the Special Conditions of Contract.

**11. Insurance**

**11.1** The Goods supplied under the Contract shall be fully insured in Indian Rupees or a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage at site, delivery and up to to handing over of the plant and equipment in the manner specified in the Special Conditions of Contract.

**11.2** Where delivery of the Goods is required by the HAFED on a CIF basis, the Contractor shall arrange and pay for marine insurance naming the HAFED as the beneficiary.

**11.3** The Contractor shall provide a copy of the insurance policy along with invoice to the HAFED who will make arrangements to extend the validity of the policy, if necessary.

**11.4** Should any loss or damage occur, the Contractor should -

**a.** Initiate and pursue claim till settlement, and

**b.** Promptly make arrangements for repair and/or replacement of any damaged item/s irrespective of settlement of claim by the underwriters.

**12.** Transportation

**12.1** Where the Contractor is required under the Contract to deliver the Goods FOR DESTINATION, as specified in the schedule of requirements. Transportation shall be arranged and paid for by the Contractor, and the cost thereof shall be included in the Contract Price.

**12.3** Where the Contractor is required to effect delivery under any other terms, for example, by post or to another address in the source country, the Contractor shall be required to meet all transport and storage expenses until delivery.

**12.4** In all the cases, transportation of the Goods up to the project site shall be the responsibility of the Bidder and the cost thereof shall be included/ indicated in the contract price.

**12.5** Where the Contractor is required under the Contract to deliver the Goods CIF, no further restriction shall be placed on the choice of the ocean carrier.

**13.** Incidental Services

**13.1** As specified in the General Conditions of Contract, the Contractor may be required to provide any or all of the following services:

**a.** Performance or supervision of on-site assembly and/or start-up of the supplied Goods;

**b.** Furnishing of tools required for assembly and/or maintenance of the supplied goods;

**c.** Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods; and manuals covering the operation and maintenance of automation software and control systems.

**d.** Performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Contractor of any warranty obligations under this Contract; and

**e.** Conduct of training of the HAFED's personnel, at the Contractor's plant and/or on- site, in assembly, start-up operation, maintenance and/or repair of the supplied Goods.

**13.2** Prices charged by the Contractor for the preceding incidental services, if not included in the price for the Goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged from other parties by the Contractor for similar services.

**14. Spare Parts requirement after defect liability period:**

**14.1** As specified in the Special Conditions of Contract, the Contractor may be required to provide the materials and notifications pertaining to spare parts manufactured or distributed by the Contractor:

**a.** Such spare parts as the HAFED may elect to purchase from the Contractor, provided that this election shall not relieve the Contractor of any warranty obligations under the Contract; and

**b.** In the event of termination of production of the spare parts:

i. Advance notification to the HAFED of the pending termination, in sufficient time to permit the HAFED to procure its needed requirements; and

ii. Following such termination, furnishing at no cost to the HAFED, the blueprints, drawings and specifications of the spare parts, if and when requested.

**15. A. Defects liability:**

The defect liability period for the work is 24 months after successful commissioning of plants. During the defect liability period contractor shall be responsible for any damage, defects to equipments/ machinery/plants, services of machinery equipments as per their manual, replacement of any parts/machinery as required for proper functioning of plants.

**15.1 Completion of Outstanding Work and Remedying Defects**

In order that the Contract Documents and the Works shall be in the condition required by the Contract (fair wear and tear expected) at, or as soon as practicable after, the expiry of the Contact Period, the Contractor shall

a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, as soon as practicable after such date, and

b) execute all work of amendment, rework, and remedying defects or damage, as may be instructed by the Employer or the Employer's Representative during the Contract Period.

If any such defect appears or damage occurs, the Employer or the Employer's Representative shall promptly notify the Contractor in writing.

**15.2 Cost of Remedying Defects**

All work referred to in Sub-Clause 15.1 (b) shall be executed by the Contractor at his own cost, if the necessity for such work is due to

(a) The design of the Works,.
(b) Plant, Materials or workmanship not being in accordance with the Contract, or
(c) Failure by the Contractor to comply with any of his other obligations.

**15.3 Failure to Remedy Defects**

If the Contractor fails to remedy any defect or damage within a reasonable time, the Employer or the Employer's Representative may fix a date on or by which to remedy the defect or damage, and give the Contractor reasonable notice of such date.

If the Contractor fails to remedy the defect or damage by such date and the necessity for such work is due to a cause stated in Sub-Clause 15.2(a), (b), or (c), the Employer may (at his sole discretion):

(i) Carry out the work himself or by others, in a reasonable manner and at the Contractors risk and cost, but the Contractor shall have no responsibility for such work: the costs properly incurred by the Employer in remedying the defect or damage shall be recoverable from the Contractor by the Employer;
(ii) Require the Employer's Representative to determine and certify a reasonable reduction in the Contract Price; or
(iii) If the defect or damage is such that the Employer has been deprived of substantially the whole of the benefit of the Works or parts of the Works, terminate the Contract in respect of such parts of the Works as cannot be put to the intended use: the Employer shall then be entitled to recover all sums paid for such parts of the Works together with the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor, and Sub-Clause 15.1 shall not apply.

**15.4 Removal of Defective Work**

If the defect or damage is such that it cannot be remedied expeditiously on the Site, the Contractor may, with the consent of the Employer's Representative or the Employer, remove from the Site for the purposes of repair any part of the Works which is defective or damaged.

**15. Warranty/Guarantee**

**15.1** Contractor warrants that the Goods and equipment, supplied, installed and commissioned under the Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Contractor further warrants that the Goods supplied under this Contract shall have no defect arising from design, materials or workmanship (except insofar as the design or material is required by the HAFED's Specifications) or from any act or omission of the Contractor, that may develop under normal use of the supplied Goods in the conditions obtaining in the country of final destination. The Contractor also guarantees that the Goods supplied shall perform satisfactorily as per the signed/rated/-installed capacity as provided for in the Contract.

**15.2** This warranty/guarantee shall remain valid for 24 months and as per the original manufacturer (if it is more than 24 months) after the Goods have been commissioned/ installed at site, installed and the plant successfully tested, commissioned and accepted by the HAFED. The HAFED shall promptly notify the Contractor in writing of any claims arising under this warranty.

**15.3** Upon receipt of such notice, the Contractor shall, repair or replace the defective Goods or parts thereof within fifteen days without costs to the HAFED other than, where applicable, the cost of inland delivery of the repaired or replaced Goods or parts from the port of entry to the final destination.

**15.4** If the Contractor, having been notified, fails to remedy the defect(s) within a reasonable period, the HAFED may proceed to take such remedial action as may be necessary, at the Contractor's risk and expense and without prejudice to any other rights which the HAFED may have against the Contractor under the Contract.

**16. Payment**

**16.1** The method and conditions of payment to be made to the Contractor under the Contract shall be specified in the Special Conditions of Contract.

**16.2** The Contractor's request(s) for payment shall be made to the HAFED in writing, accompanied by an invoice describing, as appropriate, the Goods delivered and Services performed, and by shipping documents, submitted pursuant to Clause 10, and fulfilment of other obligations stipulated in the Contract.

**16.3** Payments shall be made promptly by the HAFED within thirty (30) days of submission of an invoice/claim by the Contractor.

**16.4** All payments under this contract shall be made in Indian Rupees only.

**17. Prices**

**1.** Prices charged by the Contractor for Goods delivered and Services performed under the Contract shall not vary from the prices quoted by the Contractor in its bid.

**2.** Price variation on account of change in rates of taxes and duties namely GST etc on the invoices items/services shall not be payable by HAFED.

**18. Change Orders**

**18.1** The HAFED may, at any time, by a written order given to the Contractor pursuant to Clause 31, make changes within the general scope of the Contract in any one or more of the following:

a. Drawings, designs or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the HAFED :
b. The method of shipment or packing;
c. The place of delivery; or
d. The Services to be provided by the Contractor.

**18.2** If any such change causes an increase or decrease in the cost of, or the time required for, the Contractor's performance of any part of the work under the Contract, whether changed or not changed by the order, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Contractor for adjustment under this clause must be asserted within thirty (30) days from the date of the Contractor's receipt of the HAFED 's change order.

**19.** Contract Amendment

**19.1** Subject to Clause 18, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

**20. Assignment**

**20.1** The Contractor shall not assign, in whole or in part, its obligations to perform under the Contract, except with the HAFED 's prior written consent.

**21. Subcontracts**

**21.1** The Contractor shall notify the HAFED in writing of all subcontracts awarded under the Contract if not already specified in his bid. Such notification, in his original bid or later, shall not relieve the Contractor from any liability or obligation under the Contract.

**21.2** Sub contracts must comply with the provisions of clause 3

**22.** Delays in the Contractor's Performance

**22.1** Delivery of the Goods and performance of Services shall be made by the Contractor in accordance with the time schedule specified by the HAFED in its Schedule of Requirements.

**22.2** An un-excused delay by the Contractor in the performance of its delivery obligations shall render the Contractor liable to any or all of the following sanctions:
Forfeiture of its performance security, imposition of liquidated damages, and/or termination of the Contract for default.

**22.3** If at any time during performance of the Contract, the Contractor or its subcontractor(s) should encounter conditions impeding timely delivery of the Goods and performance of Services, the Contractor shall promptly notify the HAFED in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Contractor's notice, the HAFED shall evaluate the situation and may at its discretion extend the Contractor's time for performance, in which case the extension shall be ratified by the parties by amendment of the Contract.

**23. Liquidated Damages**

**23.1** Subject to Clause 25, if the Contractor fails to deliver any or all the goods or perform the services within the times period (s) specified in the Contract, the HAFED shall, without prejudice to its other remedies under the Contract, deduct from the contract prices, as liquidated damages, a sum equivalent to:

(1) 0.5% of the full contract value for every completed week (week comprising of 7 days including holidays and any incomplete week shall be ignored for the calculations of liquidated damages) of delay in the supplies/commissioning.

(2) The total amount so deducted shall not exceed 10% of the Contract value. Once the maximum is reached, the HAFED may consider termination of the contract.

**23.1.2** The total amount so deducted shall not exceed 10% of the Contract value. Once the maximum is reached, the HAFED may consider termination of the Contract pursuant to Clause 24.

**23.2** Any incremental taxes and levies on account of delay in performance of the Contract by the Contractor shall be to the Contractor's account.

**24.** Termination for Default

**24.1** Contractors default:

**24.1.1** If the Contractor shall assign the Contract, without the consent in writing of the HAFED first obtained, or if in the opinion of the HAFED , the Contractor:

a. Has abandoned the Contract, or

b. Without reasonable excuse has failed to commence the Works or has suspended the progress of the works for twenty eight days after receiving from the HAFED written notice to proceed, or

c. Despite previous warnings by the HAFED , in writing, is not executing the works in accordance with the Contract, or neglecting to carry out his obligations under the contract so as seriously to affect the carrying out of the Works.

Then the HAFED may, after giving fourteen days notice in writing to the Contractor, enter upon the Site and expel the Contractor there from without thereby voiding the contract, or releasing the Contractor from any of his obligations or liabilities under the contract, or affecting the rights and powers conferred by the Contract on the HAFED and may himself complete the works or may employ any other Contractor to complete the Works without prejudice to any other remedy of the HAFED . The HAFED or such other Contractor shall have free use for such completion of so much of the Contractor's Equipment as may be on the Site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the inclusion of any right of the Contractor over the same.

**24.1.2** The HAFED shall, as soon as may be practicable after any such entry and expulsion by the HAFED fix and determine by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute, and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract and the value of any unused or partially used materials on the Site.

**24.1.3** If the HAFED shall enter and expel the Contractor under this Clause, he shall not be liable to pay to the Contractor any money on account of the Contract until the costs of execution and all other expenses incurred by the HAFED have been ascertained and the amount thereof certified. The Contractor shall then be entitled to receive only such sum or sums, if any, as the HAFED may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the HAFED the amount of such excess and it shall be deemed a debt due by the Contractor to the HAFED and shall be recoverable accordingly.

**24.1.4** If the HAFED pursuant to this Clause takes the Works or part thereof out of the Contractor's hands the Contractor's Liability under Clause for delay in completion shall immediately cease, without prejudice to any such liability that may at that time already be recoverable from the Contractor by the HAFED .

**24.1.5** Consequent to such termination of Contract, the HAFED shall also be entitled to recover the advance paid, if any, to the Contractor along with interest @ 18% per annum compounded quarterly on the last day of March, June, September and December on the advance paid for the entire period for which the advance was retained by the Contractor.

**24.2** Default of the HAFED

**24.2.1** In the event of the HAFED :

a. Failing to pay to the Contractor the amount due within 60 days after the same shall have become due under the terms of the Contract subject to any deduction that the HAFED is entitled to make under the Contract, or
b. Becoming bankrupt or (being a company) going into liquidation other than for the purpose of a scheme of reconstruction or amalgamation, or
c. Being unable to continue to meet his contractual obligations for unforeseen reasons due to economic dislocation

The Contractor shall be entitled without prejudice to any other rights or remedies (and in respect of paragraph (a) above as an alternative to the provisions of Clause 16 for Payment to terminate his employment under the Contract by giving 30 days prior notice in writing to the HAFED .

**24.2.2** Upon the giving of such notice the Contractor shall with all reasonable dispatch remove from the Site all Contractor's equipment brought by him thereon.

**24.2.3** In the event of such termination the HAFED shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of Sub-Clause 25.4.2 hereof but in additions payment specified therein, the HAFED shall pay to the Contractor the amount of any reasonable loss or damage to the Contractor arising out of or in connection with or by consequence of such termination.

**24.2.4** Nothing in this clause contained shall prejudice the right of the Contractor to exercise, either in lieu of or in addition to the rights and remedies in this Clause specified, any other rights or remedies to which the Contractor may be entitled.

## 25. Force Majeure

**25.1** Notwithstanding the provisions of Clauses 22, 23, 24, the Contractor shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

**25.2** For purposes of this clause, "Force Majeure" means an event beyond the control of the Contractor and not involving the Contractor's fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of the HAFED either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

**25.3** If a Force Majeure situation arises, the Contractor shall promptly notify the HAFED in writing of such condition and the cause thereof. Unless otherwise directed by the HAFED in writing, the Contractor shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

**25.4** Termination in Consequence of Force Majeure

**25.4.1** If circumstances of Force Majeure have occurred and shall continue for a period of 182 days then, notwithstanding that the Contractor may by reason thereof have been granted an extension of Time for Completion of the Works, either party shall be entitled to serve upon the other 28 days' notice to terminate the Contract. If at the expiry of the period of 28 days Force Majeure shall still continue the Contract shall terminate.

**25.4.2** If the Contract shall be terminated as aforesaid the Contractor shall be paid by the HAFED (in so far as such amounts or items hall not have already been overed by payments on account made to the Contractor) for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

a) The amounts payable in respect of any preliminary items, so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the HAFED of any such items the work or service comprised in which has been partially carried out or performed.
b) The cost of materials or goods reasonably ordered for the Works or for use in connection with the Works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery (such materials or goods becoming the property of the HAFED upon such payment being made by him).
c) A sum, to be certified by the HAFED , being the amount of any expenditure, which in the circumstances was reasonably incurred by the Contractor in the expectation of completing the whole of the Works, in so far as such expenditure shall not have been covered by the payments in this Sub-Clause before mentioned.
d) The reasonable cost of removal under Sub-Clause 2 of this Clause and (if enquired by the Contractor) return thereof to the Contractor's works in his country or to any other destination at no greater cost.
e) The reasonable cost of repatriation of all the Contractor’s staff and workmen employed on or in connection with the Works at the time of such termination.
Provided always that, against any payments due from the HAFED under this Sub-Clause, the HAFED shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Plant and materials, and any sum previously paid by the HAFED to the Contractor in respect of the execution of the Works.

## 26. Termination for Insolvency

**26.1** The HAFED may at any time terminate the Contract by giving written notice to the Contractor, without compensation to the Contractor, if:

a) The Contractor becomes bankrupt or otherwise insolvent,

b) The Contractor being a Company is wound up voluntarily by the order of a Court receiver,

liquidator or Manager appointed on behalf of the debenture holders or circumstances shall have arisen which entitle the court or debenture holders to appoint a receiver, liquidator or a Manager, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the HAFED .

**27. Termination for Convenience**

**27.1** The HAFED, may by written sent to the `Contractor, terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the HAFED's convenience, the extent to which performance of work under the Contract is terminated, and the date upon which such termination becomes effective.

**27.2** The Goods that are complete and ready for shipment within 30 days after the Contractor's receipt of notice of termination shall be purchased by the HAFED at the Contract terms and prices. For the remaining Goods, the HAFED may elect:

a. To have any portion completed and delivered at the Contract terms and prices; and/or

b. To cancel the remainder and pay to the Contractor an agreed amount for partially completed Goods and for materials and parts previously procured by the Contractor.

**28. Resolution of Disputes**

**28.1** The HAFED and the Contractor shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.

**28.2** If, after thirty (30) days from the commencement of such informal negotiations, the HAFED and the Contractor have been unable to resolve amicably a Contract dispute, either party may require that the dispute be referred for resolution to the formal mechanisms specified in the Special Conditions of Contract. These mechanisms may include, but are not restricted to, conciliation mediated by a third party, adjudication in an agreed national or international forum, and/or international arbitration. The mechanism shall be specified in the Special Conditions of Contract.

**29. Governing Language**

**29.1** The Contract shall be written in the language of the bid, as specified by the HAFED in the Instructions to Bidders. Subject to Clause 30, that language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract, which are exchanged by the parties, shall be written in that same language.

**30. Applicable Law**

**30.1** The Contract shall be interpreted in accordance with the laws of the Union of India.

**31. Notices**

**31.1** Any notice given by one party to the other pursuant to the Contract shall be sent in writing or by telegram or telex/fax and confirmed in writing to the address specified for that purpose in the Special Conditions of Contract.

**31.2** A notice shall be effective when delivered or on the notice's effective date, whichever is later.

**32. Taxes and Duties**

**32.1** A Contractor shall be entirely responsible for payment of all taxes, duties, license fees, entry tax etc. until taking over of the works by the 'HAFED '.

**33. Right to use defective Goods**

If after delivery, acceptance and installation and within the guarantee and warranty period, the operation or use of the Goods proves to be unsatisfactory, the HAFED shall have the right to continue to operate or use such Goods until rectifications of defects, errors or omissions by repair or by partial or complete replacement is made without interfering with the HAFED s' operation.

**33. Standard terms & conditions of GST**

**1.0** The price bid by the contractor shall be inclusive of all taxes including GST upto the closing date for submission of bid in the employer's country on the contractor's equipment, plant, material & supplies (payment, temporary and consumable) acquired for the purpose of the contract and on the services performed under the contract.

**2.0** The contractor shall raise taxable invoice provision of GST to HAFED.

**3.0** The transaction on which GST will be claimed from HAFED shall be included in the return to be furnished under GST law & the amount claimed from HAFED shall be amounted for in the GST returns and will we deposited with GST authorities within the time prescribed by law in this regard.

**4.0** The contractor shall indemnify HAFED for all losses caused to HAFED on account of excess charges of GST, In case it is found at a later stage that that wrong or incorrect payment has been recovered by it from HAFED on account of GST, the same will be refunded forthwith.

**5.0 Subsequent Legislation –** If, after the date of submission of tenders for the contract there occur changes to any national of state statute, Ordinance, Decree law which causes additional or reduced cost to the contractor, in the execution of the contract, such additional or reduced cost shall, be determined by GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak and shall be added to or deducted from the contract price and the GM HAFED, CFP, Rohtak/Executive Engineer, HAFED, Rohtak shall notify the contractor accordingly.

**6.**0 Income tax, labour cess and other deductions as applicable/as may be notified by union Government/State Government from time to time will be deducted from gross payment as per Govt. Instructions.

7.0 Nothing in the contract shall relive the contractor from his responsibility to pay taxes/duties/cess etc. that may be levied in the employers country on profits made by him in respect of the contract.

8.0 HAFED will not facilitate towards issuance of any certificate for availing exemption of any taxes through local administration/Deputy Commissioner or otherwise.

9.0 Tax will be deducted at source by HAFED from the payment or credit to be made to the contractor as per provisions of GST law when the provisions of section 51 of CGST Act will be made applicable of HAFED.

10.0 An undertaking in this regard be given by agency at **Annexure-I**.

**Annexure-I**

## Undertaking

1. Certified that the transaction on which GST will be claimed shall be included in the return to be furnished under GST Act and the amount claimed from HAFED shall be accounted for in the returns and will be deposited with GST authorities as required.

2. Certified that GST will not be charged on the exempt supplies made to HAFED.

3. Certified that we shall indemnify the HAFED in case is found at a later stage that wrong or incorrect payment has been received on account of GST, the same will be refunded.

(Signature)

Complete Name.....

Address.....

.....

GSTIN.....

## SECTION 5(II)

## GENERAL CONDITIONS OF CONTRACT FOR SUPPLY

**1. Scope:**

The following General Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The corresponding clause number of the General Conditions is indicated in parentheses.

**2. Definitions**

(a) The HAFED is Haryana State Cooperative Supply and Marketing Federation Limited and would include the term "Owner".

(b) The Contractor is (Name of Contractor).

**3. Country of Origin**

The place where the goods were mined, grown or produced from which the services are supplied

**4. Equivalency of Standards and Codes**

Wherever reference is made in the contract to the respective standards and codes in accordance with which goods and materials are to be furnished, and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract. Where such standards and codes are national in character, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the HAFED 's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the HAFED at least 30 days prior to the date when the Contractor desires the HAFED 's approval. In the event the HAFED determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards set forth in the documents.

**5. NA**

**6. Inspection and Tests**

**6.1** HAFED may depute any third Party inspection of all Mechanical equipment, electrical motors, pipes before dispatch to site. The inspection expenses (Travelling & arrangement) to be borne by the contractor. The HAFED (Employer) shall inform to the contractor, the name(s) of third party at appropriate time.

**6.2** The inspection of the Goods shall be carried out to check whether the Goods are in conformity with the technical specifications attached to the purchase order form and shall be in line with the inspection/test procedures laid down in the Schedule of Specifications and the Contract conditions.

**6.3** Manufacturer must have suitable facilities at their works for carrying out various performance tests on the equipment. The bidder should clearly confirm that all the facilities exist for inspection and shall be

made available to the inspecting Authority.

**6.4** A load and functional tests as indicated in the specifications must be carried out at the manufacturer's works. Reliability of the equipment shall be demonstrated to the satisfaction of the appointed inspector or inspecting Agency.

**6.5** Approved Contractor's drawings shall not be departed from except as provided in the Bidding Document.

**6.6** The HAFED shall have the right at all reasonable times to inspect, at the Contractor's premises all Contractor's drawings of any part of the work.

**6.7** The Contractor shall provide, within the time stated in the contract or in the programme, drawings showing how the plant is to be designed and any other information required for -

a. Preparing suitable foundations or other means of support.

b. Providing suitable access on the site for the plant and any necessary equipment to the place where the plant is to be erected and

c. Making necessary electrical connections from the panel board provided in the individual sections to the machines.

**6.8** Before the goods and equipment are taken over by the HAFED, the Contractor shall supply operation and maintenance manuals together with drawings of the goods and equipment as built. These shall be in such details as will enable the HAFED to operate, maintain, adjust and repair all parts of the works as stated in the specifications.

The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the contract.

Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such manuals and drawings have been supplied to the HAFED .

**6.9** The goods will be accepted after inspection by the HAFED, his representative or any inspection agency appointed by HAFED.

**7. Delivery and Documents (Clause 10)**

Upon shipment/dispatch, the Contractor shall notify to the HAFED by cable or email or fax the full details of dispatch including HAFED order no., description of the goods, quantity, mode of transport, place of loading, date of dispatch etc. The Contractor will mail the following documents to the HAFED with a copy to the Insurance Company**:**

Original and three copies of**:**

(i) The Contractor's invoice showing purchase order no. Goods description, quantity, unit price, total amount;
(ii) Delivery note/case-wise detailed packing list identifying contents of each package/ lorry receipt;

(iii) Manufacturer's/Contractor's guarantee certificate;
(iv) Inspection Certificate issued by the nominated inspection agency, and the Contractor's factory inspection report;
(v) Certificate of origin;
(vi) Insurance policy;
(vii) Any other document evidencing payment of statutory levies.
(viii) The Contractor's certificate certifying that the defects pointed out during inspection have been rectified.
(ix)

**Note:** The nomenclature used for the item description in the invoice/s, packing list/s and delivery note/s etc. Should be identical to that used in the purchase order. The despatch particulars including name of transporter, LR no. And date should also be mentioned in the invoice/s.

## 8. Insurance

(a) The **"marine / transit"** insurance to be taken by the contractor / Contractor shall be in an amount equal to 110% of the FOR Destination value of the goods from "warehouse to warehouse" on "All Risks" basis including Strike, Natural calamities but exclusive of War Risks valid for a period not less than 3 months after the date of arrival of Goods at final destination.

(b) **"Storage-cum-erection ALL Risks**" insurance for an amount equal to 110% of the contract value valid for a period not less than 3 months after installation, including one month for testing and commissioning, shall be taken by the contractor / Contractor.

OR

As an alternative to (a) & (b) above, "Marine-cum-erection ALL Risks" insurance policy, covering storage of equipment and other erection materials at site, for an amount equal to 110% of the contract value of supply, installation & commissioning and valid for a period not less than 3 months after installation, including one month for testing and commissioning, shall be taken by the contractor / Contractor.

(c) **Third Party Insurance :** Before commencing the erection work the contractor / Contractor without limiting his obligations and responsibilities, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property including that of the Owner / HAFED, or to any person including any employee of the Owner / HAFED. Such insurances shall be for an amount not less than Rs. 10.00 lakhs per occurrence with the number of occurrence unlimited.

## 9. Incidental services

**9.1** The incidental services for supply, installation and commissioning contract, as follows shall be provided by the Contractor:

(a) Furnishing of tools required for assembly and maintenance of the supplied goods for 2 years;
(b) Furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods;
(c) On-site assembly and start-up of the supplied Goods;
(d) Conduct of training of the HAFED 's personnel (approx. for 4 man-weeks); at the Contractor's

plant and/or on-site, in assembly, start-up operation, maintenance and/or repair of the supplied Goods.

(e) Furnishing of layout drawing etc. as specified in clause 3 of Special Conditions of Contract Part II.

**10. Spare Parts**

Contractor shall carry sufficient inventories to assure ex-stock supply of consumable spares such as gaskets, plugs, washers, belts, etc. Other spare parts and components shall be supplied as promptly as possible but in any case within 15 days of placement of order after defect liability period and free of cost during the defect liability period.

**11. Warranty/Guarantee (Clause 15)**

The warranty and guarantee certificates of all the components and machinery in the scope of the tender shall be submitted to HAFED at the time of Supply and Installation and the same shall hold true even if it is more than the defect liability period. Otherwise, defect liability holds true for all the equipments.

## ECTION 5(III)
## GENERAL CONDITIONS OF CONTRACT FOR INSTALLATION

**1.0 SUFFICIENCY OF TENDER**

The Contractor by bidding shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract Price, as to the possibility of executing the works as shown and described in the Contract, as to the general circumstances at the site of the works, as to the general labour position at site and to have determined the prices accordingly.

**2.0 PROGRAMME OF INSTALLATION AND COMMISSIONING**

As soon as practicable after the acceptance of the bid, the Contractor shall submit to the HAFED for his approval a comprehensive programme in the form of PERT network/ bar chart and any other form as may be required by the HAFED showing the sequence of order in which the Contractor proposes to carry-out the works including the design, manufacture, delivery to site, erection and commissioning thereof. After submission to and approval by the HAFED of such programme, the Contractor shall adhere to the sequence of order and method stated therein. The submission to and approval by the HAFED of such programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract. The programme approved by the HAFED shall form the basis of evaluating the pace of all works to be performed by the Contractor. The Contractor shall update the PERT Network every month, submit it to the HAFED and shall inform the HAFED the progress on all the activities falling on schedule for the next reporting date.

**3.0 PREPARATION OF DRAWINGS FOR APPROVAL**

The Contractor shall prepare and submit all Drawings to the HAFED for approval:

a. Within the time given in the specification or in the programme, such drawings, samples, patterns and models as may be called for therein, and in numbers therein required.

b. During the progress of works and within such reasonable times as the HAFED may require such drawings of the general arrangement and details of the works as the HAFED may require.

Wherever necessary, the Contractor would be provided with a set of architectural drawings for the buildings where the erection works would be carried out and also the equipment details/ drawings for various equipment to be handed over to the Contractor by the HAFED . The specifications/ conditions concerning the submission of drawings by the Contractor are detailed as under:

**3.1** Within four weeks from the date of receipt of the Notification of Award, Contractor shall furnish a list of all necessary drawings as briefly described below which the Contractor shall submit for approval, identifying each drawings by a serial number and descriptive title and expected date of submission. This list shall be revised and extended if necessary, during the progress of work depending on the nature of the contract also.

The HAFED/IL&FS shall signify his approval or disapproval of all drawings or such drawings that would affect progress of the contract as per the agreed programme.

If, by reason of any failure or inability of the HAFED to issue within four weeks of time in all the circumstances any drawing or order requested by the Contractor in accordance with sub clause (3) of this clause, the Contractor suffers delay and/or incurs costs then the HAFED shall take such delay into account in determining any extension of time to which the Contractor is entitled under Clause 15 hereof and the Contractor shall be paid the amount of such cost as shall be

reasonable.

i. Brief list of drawings:
ii. Equipment drawings for fabricated items.
iii. Equipment layout for production, packing and service blocks.
iv. Flow diagrams for CIP and various services.
v. Service piping layouts in production, packing and service blocks.
vi. SS piping layout in production and packing blocks.
vii. Electrical cable, conduit/cable tray/cable trench layout.
viii. Other miscellaneous drawings as required for erection work.
ix. Electrical single line diagram, PCC and MCC general arrangement drawing and wiring diagrams.
x. Automation system scheme, controls and network diagrams.

**3.2** Drawings showing fabrication details, dimensions, layouts and bill of materials submitted for approval shall be signed by responsible representative of Contractor and shall be to any one of the following sizes in accordance with Indian Standards: A0, A1, A2, A3 and A4.

**3.3** All drawings shall show the following particulars in the lower right hand corner in addition to Contractor's name:

i. Name of the HAFED .
ii. Project Title.
iii. Title of drawing.
iv. Scale.
v. Date of drawing.
vi. Drawing number.
vii. Space for HAFED reference or drawing number.

**3.4** In addition to the information provided on drawings, each drawing shall carry a revision number, date of revision and brief description of revision carried out. Whenever any revision is carried out, correspondingly revision number must be up-dated.

**3.5** All dimensions on drawings shall be in metric units.

**3.6** Drawings (three sets) submitted by the Contractor for approval will be checked, reviewed by the HAFED , and comments, if any, on the same will be conveyed to the Contractor. It is the responsibility of the Contractor to incorporate correctly all the comments conveyed by the HAFED on the Contractor's drawings. The drawings, which are approved with comments, are to be re-submitted to the HAFED for purpose of records. Such drawings will not be checked/reviewed by the HAFED to verify whether all the comments have been incorporated by the Contractor.

If the Contractor is unable to incorporate any comments in the revised drawings, Contractor shall clearly state in his forwarding letter such non-compliance along with the valid reasons.

**3.7** Drawings prepared by the Contractor and approved by the HAFED shall be considered as a part of the specifications. However, the examination of the drawings by the HAFED shall not relieve the Contractor of his responsibility for engineering design, workmanship, quality of materials, warranty obligations and satisfactory performance on installation covered under the contract.

**3.8** If at any time before completion of the work, changes are made necessitating revision of approved drawings, the Contractor shall make such revisions and proceed in the same routine as for the original approval.

**3.9** Date of submission

In the event, the drawings submitted for approval require many revisions amounting to re-drawing of the same then the date of submission of the revised drawings would be considered as the date of submission for approval.

**3.10** The Contractor shall furnish to the HAFED before the works are taken over, Operating and Maintenance instructions together with Drawings of the works as completed, in sufficient detail to enable the HAFED to maintain, dismantle, reassemble and adjust all parts of the works. Unless otherwise agreed, the works shall not be considered to be completed for the purposes of taking over until such instructions and drawings have been supplied to the HAFED .

**4.0 CONTRACTOR'S SUPERINTENDENCE (AND) DEPLOYMENT OF ERECTION TEAM AND CONDUCT OF PERSONNEL**

The Contractor shall employ one or more competent representatives, whose name or names shall have previously been communicated in writing to the HAFED by the Contractor, to superintend the carrying out of the works on the site. The said representative or if more than one shall be employed, then one of such representatives shall be present on the site during all times, and any orders or instructions which the HAFED may give to the said representative of the Contractor shall be deemed to have given to the Contractor. The said representative shall have full technical capabilities and complete administrative and financial powers to expeditiously and efficiently execute the work under the contract.

**4.1** The Contractor shall, execute the works with due care and diligence within the time for completion and employ Contractor's team comprising qualified and experienced engineers together with adequate skilled. Semi-skilled and unskilled workmen in the site for carrying out the works. The Contractor shall ensure adequate workforce to keep the required pace at all times as per the schedule of completion. Contractor shall also ensure availability of competent engineers during commissioning/start up, trial runs, Operation of the plant/equipment till handing over of the plant.

**4.2** The Contractor shall furnish the details of qualifications and experience of their senior supervisors and engineers assigned to the work site, including their experience in supervising erection and commissioning of plant and equipment of comparable capacity.

**4.3** When the Contractor or Contractor's representative is not present on any part of the work where it may be desired to give directions in the event of emergencies, orders may be given by the HAFED and shall be received and observed by the supervisors or foremen who may have charge of the particular part of the work in reference to which orders are given. Any such instructions, directions or notices given by the HAFED shall be deemed to have been given to the Contractor.

**4.4** The Contractor shall furnish to the HAFED a fortnightly labour force report showing by classifications the number of employees engaged in the work. The Contractor's employment records shall include any reasonable information as may be required by the HAFED . The Contractor should also display necessary information as may be required by statutory regulations.

**4.5** None of the Contractor's supervisors, engineers, or laborers may be withdrawn from the work without notice to the HAFED and further no such withdrawals shall be made if in the opinion of the HAFED , it will adversely affect the required pace of progress and/or the successful completion of the work.

**4.6** The HAFED shall be at liberty to object to any representative or person, skilled, semi-skilled or unskilled worker employed by the Contractor in the execution of or otherwise about the works who shall, in the opinion of the HAFED , misconduct himself or be incompetent, or negligent or

unsuitable, and the Contractor shall remove the person so objected to, upon receipt of notice in writing from the HAFED and shall provide in that place a competent representative at Contractor's own expense within a reasonable time.

**4.7** In the execution of the works no persons other than the Contractor, sub-Contractor and their employees shall be allowed on the site except by the written permission of the HAFED .

**5.0 HAFED 'S INSTRUCTIONS**

The HAFED may in his absolute discretion, issue from time to time drawings and/or instructions, directions and clarifications which are collectively referred to as HAFED 's instructions in regard to:

**5.1** Any additional drawing and clarifications to exhibit or illustrate details.

**5.2** Variations or modifications of the design, quality or quantity of work or the additions or omissions or substitution of any work.

**5.3** Any discrepancy in the drawings or between the schedule of quantities and/or specifications.

**5.4** Removal from the site of any material brought there by the Contractor, which are unacceptable to the HAFED and the substitution of any other material thereof.

**5.5** Removal and/or re-execution of any work erected by the Contractor, which are unacceptable to the HAFED .

**5.6** Dismissal from the work of any persons employed there upon who shall in the opinion of the HAFED , misconduct himself, or be incompetent or negligent.

**5.7** Opening up for inspection of any work covered up.

**5.8** Amending and making good of any defects.

**6.0 RIGHT OF THE HAFED**

**6.1 Right to direct works:**

**6.1.1** The HAFED shall have the right to direct the manner in which all works under this Contract shall be conducted, in so far as it may be necessary to secure the safe and proper progress and specified quality of the works. All work shall be done and all materials shall be furnished to the satisfaction and approval of the HAFED .

**6.1.2** Whenever in the opinion of the HAFED , the Contractor has made marked departures from the schedule of completion or when circumstances or requirement force such a departure from the said schedule, the HAFED , in order to ensure compliance with the schedule, shall direct the order, pace and method of conducting the work, which shall be adhered to by the Contractor.

**6.1.3** If in the judgment of the HAFED , it becomes necessary at any time to accelerate the overall pace of the plant erection work, the Contractor, when directed by HAFED , shall cease work at any particular point and transfer Contractor's men to such other point or points and execute such works, as may be directed by the HAFED and at the discretion of the HAFED .

**6.2** Right to order modifications of methods and equipment

If at any time the Contractor's methods, materials or equipment appear to the HAFED to be unsafe, inefficient or inadequate for securing the safety of workmen or the public, the quality of work or the rate of progress required, the HAFED may direct the Contractor to ensure safety, and increase their efficiency and adequacy and the Contractor shall promptly comply with such directives. If at any time the Contractor's working force and equipment are inadequate in the opinion of the HAFED , for securing the necessary progress as stipulated, the Contractor shall if so directed, increase the working force and equipment to such an extent as to give reasonable assurance of compliance with the schedule of completion. The absence of such demands from the HAFED shall not relieve the Contractor of Contractor's obligations to secure the quality, the safe conducting of the work and the rate of progress required by the contract. The Contractor alone shall be and remain liable and responsible for the safety, efficiency and adequacy of Contractor's methods, materials, working force and equipment, irrespective of whether or not the Contractor makes any changes as a result of any order or orders received from the HAFED .

**6.3** Right to inspect the work

**6.3.1** The HAFED 's representative shall be given full assistance in the form of the necessary tools, instruments, equipment and qualified operators to facilitate inspection.

**6.3.2** The HAFED reserves the right to call for the original test certificates for all the materials used in the erection work.

**6.3.3** In the event the HAFED 's inspection reveals poor quality of work/materials, the HAFED shall be at liberty to specify additional inspection procedures if required, to ascertain Contractor's compliance with the specifications of erection work.

**6.3.4** Even though inspection is carried out by the HAFED or HAFED 's representatives, such inspection shall not, however, relieve the Contractor of any or all responsibilities as per the contract, nor prejudice any claim, right or privilege which the HAFED may have because of the use of defective or unsatisfactory materials or bad workmanship.

## 7.0 CONTRACTOR'S FUNCTIONS

**7.1** The Contractor shall provide everything necessary for proper execution of the works, according to the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein, provided that the same can reasonably be inferred there from and if the Contractor finds any discrepancy therein, Contractor shall immediately refer the same to the HAFED whose decision shall be final and binding on the Contractor.

**7.2** The Contractor shall proceed with the work to be performed under this Contract in the best and workman like manner by engaging qualified and efficient workers and finish the work in strict conformance with the drawings and specifications and any changes/modifications thereof made by the HAFED .

## 7.3 VARIATIONS

**7.3.1.1** The HAFED shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

**a.** Increase or decrease the quantity of any work included in the contract,
**b.** Omit any such work,

**c.** Change the character or quality or kind of any such work,
**d.** Change the levels, lines, position and dimensions of any part of the works, and
**e.** Execute additional work of any kind necessary for the completion of the works and no such variation shall in any way vitiate or invalidate the contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract price.

**7.3.1.2** No such variations shall be made by the Contractor without an order in writing of the HAFED . Provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this clause, but is the result of the quantities exceeding or being less than those stated in the Contract/Bill of Quantities.

**7.3.1.3** All extra or additional work done or work omitted by order of the HAFED shall be valued at the rates and prices set out in the contract if in the opinion of the HAFED , the same shall be applicable. If the contract does not contain any rates or prices applicable to the extra or additional work, then suitable rates or prices shall be agreed upon between the HAFED and the Contractor. In the event of disagreement the HAFED shall fix such rates or prices as shall, in his opinion, be reasonable and proper.

**7.3.1.4** Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the works or to any part thereof shall be such that, in the opinion of the HAFED , the rate or price contained in the Contract for any item of the works is, by reason of such omission or addition, rendered unreasonable or inapplicable, then a suitable rate or price shall be agreed upon between the HAFED and the Contractor. In the event of disagreement the HAFED shall fix such other rate or price as shall, in his opinion, be reasonable and proper having regard to the circumstances.

Provided also that no increase or decrease under sub-clause 7.3.2.1 of this clause or variation of rate or price under sub-clause 7.3.2.2 of this clause shall be made unless, as soon after the date of the order as is practicable and, in the case of extra or additional work, before the commencement of the work or as soon thereafter as is practicable, notice shall have been given in writing:

**a.** By the Contractor to the HAFED of his intention to claim extra payment or a varied rate or price,

Or

**b.** By the HAFED to the Contractor of his intention to vary a rate or price.

**7.3.1.5** If, on certified completion of the whole of the works, it shall be found that a reduction or increase greater than 15 per cent of the sum named in the Letter of Acceptance results from the aggregate effect of all Variation Orders but not from any other cause, the amount of the Contract Price shall be adjusted by such sum as may be agreed between the Contractor and the HAFED or, failing agreement, fixed by the HAFED having regard to all material and relevant factors, including the Contractor's site and general overhead costs of the contract.

**7.3.1.6** The Contractor shall send to the HAFED 's representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the Contractor may consider himself entitled and of all extra or additional work ordered by the HAFED which he has executed during the preceding month.

No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the HAFED shall be entitled to

authorize payment to be made for any such work or expense, notwithstanding the Contractor's failure to comply with this condition, if the Contractor has, at the earliest practicable opportunity, notified the HAFED in writing that he intends to make a claim for such work.

7.4 The work shall be carried out as approved by the HAFED or his authorized representative/s from time to time, keeping in view the overall schedule of completion of the project. The Contractor's job schedule must not disturb or interfere with HAFED 's or other Contractors' or Contractors' schedules of day-to-day work. The HAFED will provide all reasonable assistance for carrying out the jobs.

7.5 Night work will be permitted only with prior approval of the HAFED . The HAFED may also direct the Contractor to operate extra shifts over and above normal day shift to ensure completion of contract as per schedule. Adequate lighting wherever required should be provided by the Contractor at no extra cost. The Contractor should\ employ qualified electricians and wiremen for these facilities. In case of Contractor's failure to provide these facilities and personnel, the HAFED has the right to arrange such facilities and personnel and to charge the cost thereof to the Contractor.

7.6 The Contractor shall, in the joint names of the Contractor and the HAFED , insure the received goods and equipment and so far as reasonably practicable the Works and keep each part thereof insured for the Contract Sum or such other value as may be mutually agreed between the HAFED and the Contractor against all loss or damage from whatever cause arising, other than the excepted risks, from the date of shipment or the date on which it becomes the property of the HAFED , whichever is the earlier, until it is taken over by the HAFED . The Contractor shall insure against the Contractor's liability in respect of any loss or damage occurring whilst the Contractor is on Site for the purpose of making good a defect or carrying out the Tests on Completion.

7.7 The HAFED shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-Contractor, save and except an accident or injury resulting from any act or default of the HAFED , his agents, or servants. The Contractor shall indemnify and keep indemnified the HAFED against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

7.8 The Contractor shall insure against such liability with an insurer approved by the HAFED , which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the works shall, when required, produce to the HAFED or HAFED 's representative such policy of insurance and the receipt for payment of the current premium.

Provided always that, in respect of any persons employed by any sub-Contractor, the Contractor's obligations to ensure as aforesaid under this sub-clause shall be satisfied if the sub-Contractor shall have insured against the liability in respect of such persons in such manner that the HAFED is indemnified under the policy, but the Contractor shall require such sub-Contractor to produce to the HAFED or HAFED 's representative, when required, such policy of insurance and the receipt for the payment of the current premium.

7.9 Whenever proper execution of the work under the Contract depends on the jobs carried out by some other Contractor, in such cases the Contractor should inspect all such erection and installation jobs and report to the HAFED regarding any defects or discrepancies. The

Contractor's failure to do so shall constitute as acceptance of the other Contractor's installation/jobs as fit and proper for reception of Contractor's works except those defects which may develop after execution. Contractor should also report any discrepancy between the executed work and the drawings.

The Contractor shall extend all necessary help/co-operation to other Contractors working at the site in the interest of the work.

7.10 The Contractor shall keep a check on deliveries of the Goods covered in the scope of erection work and shall advise the HAFED well in advance regarding possible hold- up in Contractor's work due to the likely delay in delivery of such Goods to enable him to take remedial actions.

7.11 The Contractor shall be permitted to substitute equipment of equal on better performance subject to approval by the HAFED ; which approval shall not be unreasonably withheld, provided however that the Contractor establishes to the HAFED 's satisfaction that the performance of the substituted equipment is equal or better than the performance of the equipment specified in the contract and without any increase in the Contract price.

## 8.0 ROLE OF THE HAFED VIS-A-VIS THE CONTRACTOR:

**8.1** The Goods, if any, to be supplied by the HAFED for erection, testing and commissioning by the Contractor, shall be as listed in the Contract.

**8.2** Besides the utilities/services as specified in battery limits the following assistance/ facilities shall also be provided to the Contractor by the HAFED for carrying out the installation work.

**8.2.1** Plant building for reception, processing, and packaging and for services including internal lighting will be made available by the HAFED .

**8.2.2** Necessary temporary water for carrying out the installation shall be of contractors responsibility. All necessary distribution tappings onwards shall also be the Contractor's responsibility.

**8.2.3** Necessary temporary power for carrying out the installation shall be arranged by the Contractor at Contractor's own cost. The necessary authorisation letter will be issued by the HAFED on written request by the Contractor.

The temporary power may not be reliable at the site and this could affect the welding operations and other installation works. Contractor shall provide stabilizer and Diesel Generators "as necessary", to ensure adequate quality of welds and to ensure no delay in installation due to temporary power instability. No extra cost shall be paid by the HAFED on this account.

**8.2.4** If the power is provided by the HAFED, the recovery shall be made from the total purchase order value (supply, installation and commissioning). The charges will be deducted from the labour charges of installation and commissioning and testing bills of the Contractor. However, the Contractor shall supply all the items such as switchgear, cabling etc. required for getting temporary power.

**8.3** If the Contractor suffers delay and/or incurs costs from failure on the part of the HAFEDin accordance with the mutually agreed schedule, the HAFED shall determine:

**a.** Any extension of time to which the Contractor is entitled under Clause 22 of GCC and;

## 7.0 SUPPLY OF TOOLS, TACKLES AND MATERIALS

The Contractor shall, at his own expense, provide all the necessary equipment, tools and tackles, haulage power, consumables necessary for effective execution and completion of the works during erection and commissioning.

## 10.0 PROTECTION OF PLANT

**10.1** The HAFED shall not be responsible or held liable for any damage to person or property consequent upon the use, misuse or failure of any erection tools and equipment used by the Contractor or any of Contractor's sub- Contractors even though such tools and equipment may be furnished, rented or loaned to the Contractor or any of Contractor's sub-Contractors. The acceptance and/or use of any such tools and equipment by the Contractor or Contractor's sub-Contractor shall be construed to mean that the Contractor accepts all responsibility for and agrees to indemnify and save the HAFED from any and all claims for said damages resulting from the said use, misuse or failure of such tools and equipment.

**10.2** The Contractor and Contractor's sub-Contractor shall be responsible, during the works, for protection of work, which has been completed by other Contractors. Necessary care must be taken to see that the Contractor's men cause no damage to the same during the course of execution of the work.

**10.3** All other works completed or in progress as well as machinery and equipment that are liable to be damaged by the Contractor's work shall be protected by the Contractor and protection shall remain and be maintained until its removal is directed by the HAFED.

**10.4** The Contractor shall effectively protect from the effects of weather and from damages or defacement and shall cover appropriately, wherever required, all the works for their complete protection.

**10.5** The work shall be carried out by the Contractor without damage to any work and property adjacent to the area of Contractor's work to whomsoever it may belong and without interference with the operation of existing machines or equipment.

**10.6** Adequate lighting, guarding and watching at and near all the storage handling, fabrication, pre-assembly and erection sites for properly carrying out the work and for safety and security shall be provided by the Contractor at Contractor's cost. The Contractor should adequately light the work area during night time also. The Contractor should also engage adequate electricians/wiremen. Helper etc. to carry out and maintain these lighting facilities. If the Contractor fails in this regard, the HAFED may provide lighting facilities as he may deem necessary and charge the cost thereof to the Contractor.

**10.7** The Contractor shall take full responsibility for the care of the works or any section or portions thereof until the date stated in the taking over certificate issued in respect thereof and in case any damage or loss shall happen to any portion of the works not taken over as aforesaid, from any cause whatsoever, the same shall be made good by and at the sole cost of the Contractor and to the satisfaction of the HAFED. The Contractor shall also be liable for any loss of or damage to the works occasioned by the Contractor or the Contractor's Sub-Contractor in the course of any operations carried out by the Contractor or by the Contractor's Sub-Contractors for the purpose of completing any outstanding work or complying with the Contractor's obligations.

## 11.0 UNLOADING, TRANSPORTATION AND INSPECTION

**11.1** The Contractor shall be required to unload all the Goods from the carriers, received at site after Contractor's team arrives at site. The Contractor shall plan in advance, based the information received from the HAFED, Contractor's requirement of various tools, tackles, jacks, cranes, sleepers etc. required to unload the material/equipment promptly and efficiently. The Contractor shall ensure that adequate and all measures necessary to avoid any damage whatsoever to the equipment at the time of unloading are taken. Any demurrage/detention charges incurred due to the delay in unloading the material/equipment and releasing the carriers shall be charged to the Contractor's account. The Contractor shall be responsible for receipt at site of all Goods and Contractor's equipment delivered for the purposes of the Contract.

**11.2** The Contractor shall safely transport/shift the unloaded Goods and equipment to the storage area.

**11.3** All the Goods received by the HAFED prior to arrival of the Contractor at site shall be handed over to the Contractor and there upon the Contractor shall inspect the same and furnish a receipt to the HAFED. The manner in which the inspection shall be carried out is enumerated below:

**11.3.1** The materials/equipment would be carefully unpacked by opening the wooden cases/other modes of packing's as the case may be.

**11.3.2** Detailed inventory of various items would be prepared clearly listing out the shortages, breakages/damages after checking the contents with respect to the Contractor's packing list, the HAFED's Contract and approved equipment drawings. The Contractor shall also check every equipment for any shortage/shortcoming that may eventually create difficulty at the time of installation or commissioning.

**11.3.3** All the information and observations by the Contractor shall be furnished in the form of INSPECTION REPORT' to the HAFED with specific mention / suggestions which in the opinion of the Contractor should be given due consideration and immediate necessary actions, to enable the HAFED to arrange repair or replacement well in time and avoid delays due to non-availability o f equipment and parts at the time of their actual need.

**11.3.4** The inspection for all the Goods handed over to the Contractor shall be completed within three week's period.

**11.4** The protection, safety and security of the Goods so taken over from the HAFED shall be the responsibility of the Contractor, until they are handed over to the HAFED after erection, commissioning and testing as per the terms of the Contract.

## 12.0 STORAGE OF GOODS

The Contractor shall be responsible for the proper storage and maintenance of all Goods under Contractor's custody. Contractor shall take all required steps to carry out frequent inspection of equipment/materials stored as well as erected equipment until the same are taken over by the HAFED . The following procedure shall apply for the same.

**12.1** The Contractor's inspector shall check stored and installed Goods to observe signs of corrosion, damage to protective coating to parts, open ends in pipes, vessels and equipment, insulation resistance of electrical equipment etc. The Contractor shall immediately arrange a coat of protective painting whenever required. A record of all observations made on Goods, defects noticed shall be promptly communicated to the HAFED and HAFED's advice taken regarding the repairs/rectifications. The Contractor shall thereupon carry out such repairs/ rectifications at Contractor's own cost. In case the Contractor is not competent to carry out such repairs/

rectifications, the HAFED reserves the right to have this done by other competent agencies at the Contractor's responsibility and risk and the entire cost for the same shall be recovered from the Contractor's bills.

**12.2** The Contractor's inspector shall also inspect and provide lubrication to the assembled Goods. The shafts of such equipment shall be periodically rotated to prevent rusting as well as to check freeness of the same.

**12.3** The Inspector shall check for any signs of moisture or rusting in any Goods.

**12.4** If the commissioning of Goods is delayed after installation of the Goods, the Contractor shall carry out all protective measures suggested by the HAFED during such period.

**12.5** Adequate security measures shall be taken by the Contractor to prevent theft and loss of Goods handed over to the Contractor by the HAFED. The Contractor shall carry out periodical inventory checks of the Goods received, stored and installed by the Contractor and any loss noticed shall be immediately reported to the HAFED. A proper record of these inventories shall be maintained by the Contractor. The Contractor should not sell, assign, mortgage, hypothecate or remove Goods which have been installed or which may be necessary for completion of the work without the written consent of the HAFED.

**12.6** A suitable grease recommended for protection of surfaces against rusting (refined from petroleum oil with lanclin minimum (70 deg C) and water in traces) shall be applied over all Goods as required once in every six months.

**12.7** All Goods shall be stored inside a closed shed or in the open depending upon whether they are of indoor or outdoor design. The space heaters where provided into the electrical equipment shall be kept connected with power supply irrespective of their type of storage. Where space heaters are not provided adequate heating with bulb is recommended. For transformers heating of oil shall be done by giving 440 V supply and short-circuiting the LT terminals. Frequent checks on insulation resistance are essential for all electrical equipment and record of the inspection reports and megger readings shall be maintained equipment wise. Such records shall be presented to the HAFED whenever demanded.

**12.8** All the necessary Goods required for protection as described above shall be arranged by the Contractor and such cost shall be included in the Contract Price.

## 13.0 APPROVALS

**13.1** The Contractor shall obtain the necessary statutory approvals and any other state and local authorities as may be required and the cost of obtaining such approvals shall be included in the Contract Price. All the necessary details, drawings, submission of application and proforma will be furnished by the Contractor to the HAFED for verification/ signature. The necessary application duly filled-in, together with the prescribed fees shall be submitted to the appropriate authorities by the Contractor on behalf of the HAFED . However all the actual statutory prescribed fees paid by the Contractor shall be reimbursed by the HAFED upon production of the receipt/vouchers.

**13.2** Wherever necessary or required, the Contractor shall furnish the necessary test and/or inspection certificates etc. from the appropriate authorities as per IER (Indian Electricity Rules) and other statutory regulations and the cost for obtaining these certificates shall be included in the Contract Price.

## 14.0 REVIEW AND CO-ORDINATION OF ERECTION WORK

The Contractor shall depute senior and competent personnel to attend the site co- ordination meetings that would generally be held at the site every month. The Contractor shall take necessary action to implement the decisions arrived at such meetings and shall also update the erection schedule.

## 15.0 EXTENSION OF TIME FOR COMPLETION

Should the amount of extra or additional work of any kind or any cause of delay referred to in these conditions, or exceptional or adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, as described in the General Conditions of Contract, other than through a default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the completion of the works, the HAFED shall determine the amount of such extension and shall notify the Contractor accordingly. Provided that the HAFED is not bound to take into account any extra or additional work or other special circumstances unless the Contractor has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the HAFED full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

# SECTION – 6

## TECHNICALSPECIFICATIONS

Note: Bidders must quote their prices for all the below mentioned parts:

**1.1** INTRODUCTION

**1.1.1 Scope- The scope of including all the allied works as required to make functions the recourses.**

1.1.1.1 These specifications cover water based fixed firefighting installations describedin Para 2.2.

**1.1.2** Related Documents

These General Specifications shall be read in conjunction with the general conditions of contract, tender specifications, schedule of work, drawings and other documents connected with the work. In the event of any discrepancy between these specifications and general conditions of contract and tenderspecifications, the latter shall override the former.

**1.1.3** Terminology

The definition of terms used in these specifications shall be in accordance with relevant IS. Some of the commonly used terms are defined in Appendix-B.

**1.1.4** Site Information

The tenderer should, in his own interest, visit the site and familiarize himself with the site conditions before tendering. For any clarification, tenderer may discuss withthe Engineer-in-Charge.

**1.2** CONFORMITY WITH STATUTORY ACTS, RULES, ORDERS, STANDARDS AND CODES

(i) All components and their installation shall conform to relevant Indian Standard Specifications, wherever existing, amended to date. A list of such standards is appended in Appendix-E.

(ii) As per Public Procurement (Preference to Make in India) Order (PPP-MII Order), inclusion of foreign standards/certification in tenders, thereby excluding local manufacturers, is violative of the Order.

Therefore, utmost care shall be taken to stipulate Indian Standards/certifications instead of foreign standards/certifications for various products/materials in the tender documents.

In all cases, the PPP-MII Order 2017 as amended shall be strictly complied.

(iii) All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations, 2010, NEC 2011 amended to date. They shall also conform to CPWD General Specifications for Electrical Works, Part-I (Internal)-2013, Part-II (External)- 1994, Part IV (Sub-station) 2013 and Part-VII(D G Sets)-2013 amended to date.

**1.3** SAFETY CODES AND LABOUR REGULATIONS

(i) In respect of all labour employed directly or indirectly on the work for the performance of the firefighting contractor's part of work, the contractor at his own expense, will arrange for the safety provisions as per the statutory provisions including "Safety, Health and

Environment Handbook 2019" published by CPWD, B.I.S recommendations, Factory Act, Workman's Compensation Act, CPWD Code and instructions issued from time to time. Failure to provide such safety requirements would make the tenderer liable for penalty to be decided by Engineer-in-charge. In addition, the Engineer-in- charge, shall be at liberty to make arrangements and provide facilities as aforesaid and recover the cost incurred thereon from the contractor.

(ii) The contractor shall provide necessary barriers, warning signals and other safety measures while laying pipelines, cables etc. or wherever necessary so as to avoid accident. He shall also indemnify CPWD against claims for compensation arising out of negligence in this respect. Contractor shall be liable, in accordancewith the Indian Law and Regulations, for any accident occurring due to any cause. The department shall not be responsible for any accident occurred or damage incurred or claims arising therefrom during the execution of work. Thecontractor shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the contractor due to the above provisions thereof.

## 1.4 WORKS TO BE ARRANGED BY THE DEPARTMENT

Unless otherwise specified in the tender documents, the following works shallbe arranged by the Department:

(i) Space for accommodating all the equipment and components involved in thework,
(ii) Power supply, Water supply and Drain points as per para 1.6,
(iii) Masonry ducts within and outside the building for carrying pipe lines and cables wherever specified.
(iv) Under ground and terrace tanks.

In case of composite contracts, having Firefighting work as one of the works,these arrangements shall be made by the agency/ contractor only.

## 1.5 WORKS TO BE DONE BY THE CONTRACTOR

Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, their cost shall be deemed to be includedin the tendered cost- whether specifically indicated in the Schedule of Work or not: -

(i) Foundations for equipment including foundation bolts and vibration isolationspring/pads,
(ii) Suspenders, brackets and floor/wall supports for suspending/supportingpipes.
(iii) Suspenders and/or cable trays for laying the cables,
(iv) Excavation and refilling of trenches in soil wherever the pipes are to be laid directly in ground, including necessary base treatment and supports.
(v) Sealing of all floor slab/wall openings provided by the Department or made bythe contractor for pipes and cables, from fire safety point of view, after layingof the same.
(vi) Painting of all exposed metal surfaces of equipment and components with appropriate colour as per para 1.13.
(vii) Making openings in the walls/floors/slabs or modification in the existing openings wherever provided for carrying pipe line, cables etc.
(viii) All electrical works including cable/wires, earthing etc. beyond power supply made available by the department.
(ix) Making good all damages caused to the structure during installation and restoring the same to their original finish.
(x) Approval from local fire authorities as may be required as per local bye-laws. (The contractor's responsibility shall be limited to the work executed by him.)

## 1.6 POWER SUPPLY, WATER SUPPLY AND DRAINAGE

### 1.6.1 Power Supply

(i) Unless otherwise specified, 3 phase, 415 volts, 50 Hz, AC power supply (5 kW) shall be provided by the department free of charge to the contractor at one point for installation at site. Termination switchgear however, shall be provided by the contractor. Further extension, if required, shall be carried out by the contractor.

(ii)

(a) The power supply for testing and commissioning of the complete installation shall be made available by the Department free of charge to the contractor. For this purpose, the power supply shall be given at the main incomer unit of the electrical panel to be provided by the contractor. The termination of this feeder in the main incomer unit shall be the responsibility of the contractor and nothing extra shall be paid on this account.

(b) Unless otherwise specified in the contract, further power distribution to the various equipment shall be done by the contractor.

(iii) Where the power supply has to be arranged by the Department at more than one point as per the terms of the contract, the termination of all such power feeders in the incomer of respective control panels to be provided by the contactor shall be the responsibility of the contractor and nothing extra shall be paid on this account.

(iv) The contractor shall use the power supply only for the bonafide use of the work. No major fabrication work shall be done at site. Power shall be used only for welding/cutting works. The power supply shall be disconnected in case of such default and the contractor shall then have to arrange the required power supply at his cost.

(v) In case of composite contracts, having Firefighting work as one of the works, these arrangements shall be made by the agency/ contractor only.

### 1.6.2 Water Supply

Water supply shall be made available to the contractor by the Department free of charge at only one point for installation. Further extension if required shall be done by the contractor at his cost.

In case of composite contracts, having Firefighting work as one of the works, this arrangement shall be made by the agency/ contractor only.

### 1.6.3 Drainage

(i) Drain traps in pump room shall be arranged by the department.

(ii) Piping Connections from the equipment to the drain trap shall be done by the contractor. These items of work shall be measured and paid as per contract.

In case of composite contracts, having Firefighting work as one of the works, this arrangement shall be made by the agency/ contractor only.

## 1.7 MACHINERY FOR ERECTION

All tools and tackles required for unloading / handling of equipment and materials at site, their assembly, erection, testing and commissioning shall be the responsibility of the contractor.

## 1.8 COMPLETENESS OF THE TENDER, SUBMISSION OF PROGRAMME, APPROVAL

OF DRAWINGS AND COMMENCEMENT OF WORK

(i) *Completeness of the tender*:-

All sundry equipment, fittings, assemblies, accessories, hardware items, foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other items which are useful and necessary for proper assembly and efficient working of the various equipment and components of the work shall be deemed to have been included in the tender, irrespective of the fact whether such items are specifically mentioned in the tender or not.

(ii) *Submission of programme*:-

Within fifteen days from the date of receipt of the letter of award, the successful tenderer shall submit his programme for submission of drawings, supply of equipment, installation, testing, commissioning and handing over of the installation to the Engineer-in-Charge. This programme shall be framed keeping in view the building progress and the Milestones fixed in Schedule 'F' Clause-5 of General Conditions of Contract. Items like piping etc. that directly affect the building progress shall be given priority. Hose pipes, branch pipes, first aid hose reel pipes shall be supplied just before commissioning the system.

*(iii) Submission of Drawings:-*

The contractor shall submit the drawings to the Engineer-in-Charge as per para 1.17.2 for approval before start of work.

*(iv) Commencement of work:-*

The contractor shall commence work as soon as the drawings submitted by him are approved either in full or in part as the case may be.

**1.9** DISPATCH OF MATERIALS TO SITE AND THEIR SAFE CUSTODY

The contractor shall dispatch materials to site in consultation with the Engineer- in- Charge. Suitable lockable storage accommodation shall be made available free of charge temporarily. Watch and ward however, shall be the responsibility of contractor. Programme of dispatch of material shall be framed keeping in view the building progress. Safe custody of all machinery and equipment supplied by the contractor shall be the responsibility of the contractor till final taking over by the department.

**1.10** CO-ORDINATION WITH OTHER AGENCIES

The contractor shall co-ordinate with all other agencies involved at the site of work so that the work of other agencies is not hampered due to delay in his work. Piping, cabling or any other work, which directly affect the progress of work of other agencies, shall be given priority.

**1.11** QUALITY OF MATERIALS AND WORKMANSHIP

(i) The components of the installation shall be of such design so as to satisfactorily function under all conditions of operation.

(ii) The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

(iii) All equipment and materials to be used in work shall be manufactured in factories of good

repute having excellent track record of quality manufacturing, performance and proper after sales service.

**1.12** CARE OF THE BUILDING

Care shall be taken by the contractor during execution of the work to avoid damage to the building. He shall be responsible for repairing all such damages and restoring the same to the original finish at his cost. He shall also remove all unwanted and waste materials arising out of the installation from the site of work from time to time.

**1.13** COLOUR SCHEME FOR THE EQUIPMENT AND COMPONENTS

**1.13.1** The entire metal work above ground level shall be painted with red color shadeNo. 536 of IS:5 .

**1.13.2** Pump, motor and engine shall be painted with red color shade No. 536 of IS:5

**1.14** INSPECTION AND TESTING

**1.14.1 Initial Inspection and testing**

(i) Initial inspection of materials and equipment at manufacturer's works may be done by the Engineer-in-Charge or his representative. For item/ equipment requiring initial inspection at manufacturer's works, the contractor will intimate the date of testing of equipment at the manufacturer's works before dispatch. The contractor shall give sufficient advance notice regarding the datesproposed for such tests to the department's representative(s) to facilitate his presence during testing. The Engineer-in-charge at his discretion may witness such testing. Equipment will be inspected at the manufacturer/ authorized dealer's premises, before dispatch to the site by the contractor.

(ii) The department also reserves the right to inspect the fabrication job at factory and the successful tenderer has to make arrangements for the same.

(iii) The materials duly inspected by Engineer-in-Charge or his authorized representative shall be dispatched to site by the contractor.

(iv) No additional payment shall be made to the contractor for initial inspection/testing at the manufacturer's works by the representative of the Engineer-in-Charge. However, the department will bear the expenses of its representative deputed for carrying out initial inspection/testing.

**1.14.2** Final Inspection and Testing

Final Inspection and testing will be done by the Engineer-in-Charge or his representative as per details indicated in Chapter-11.

The installation will be offered for inspection of local bodies (Chief Fire Officer). The contractor or his representative shall attend such inspection of the ChiefFire Officer, extend all test facilities as are considered necessary, rectify and comply with all observations of the Chief Fire Officer which are part of the agreement and arrange for obtaining necessary clearance certificate in favour of the department. In case the contractor fails to attend the inspection and make desired facilities available during inspection, the department reserves the rightto provide the same at the risk and cost of the contractor and impose penalty forthe same. The installation will be accepted by the department only after receiving clearance from

Chief Fire Officer for the work executed by the contractor under the agreement.

**1.14.3** Safety Measures

All equipment shall incorporate suitable safety provisions to ensure safety of the operating personnel at all times. The initial and final inspection reports shall bringout explicitly the safety provisions incorporated in each equipment.

## 1.15 GUARANTEE

(i) The contractor shall guarantee the complete system to provide the specified flow and pressure under all conditions at outlets.

(ii) All equipment shall be guaranteed for a period of 24 months from the date of acceptance and taking over of the installation by the Department against unsatisfactory performance and/or breakdown due to defective design, material, manufacture, workmanship or installation. The equipment or component or any part thereof so found defective during the guarantee period shall be repaired or replaced free of cost to the satisfaction of the Engineer-in-charge. In case, it is felt by the department that undue delay is being caused by the contractor indoing this, the same will be got done by thedepartment at the risk and cost of the contractor. The decision of Engineer- in-charge in this regard shall be final.

## 1.16 TENDER DRAWINGS, DRAWINGS FOR APPROVAL AND COMPLETION DRAWINGS

### 1.16.1 Tender Drawings

The drawings appended with the tender documents are intended to show the areas allotted for various equipment, tentative pipe routes. The equipment offered shall be suitable for installation in the spaces shown in these drawings.

**1.16.2** Drawings for approval on award of the work

The contractor shall prepare and submit following drawings and get them approved from the Engineer-in-charge before the start of the work. The approval of drawings however does not absolve the contractor of his responsibility to supply the equipment/materials as per agreement. In case of any contradiction between the approved drawings and agreement the decision of the Engineer-in-Charge shall be final and binding on thecontractor.

(a) Layout drawings of the equipment to be installed in pump room andterrace

(b) Drawings showing the details of erection of entire equipment including their foundations

(c) Plumbing drawings showing the layout of entire piping, diameter and length of pipes, hydrant, air vessel, valves and isometric drawings showing connections tovarious equipment

(d) Sprinkler drawing indicating layout and sizes of pipe, location of valves, sprinklers etc.

(e) Electrical wiring diagrams for all electrical equipment and controls including the sizes and capacities of the various cables and equipment

(f) Dimensioned drawings of all electrical and control panels

(g) Drawings showing details of supports for pipes, cable trays etc.

(h) Any other drawing(s) relevant to the work

**1.16.3** Completion Drawings

Three sets of the following laminated drawings shall be submitted by the contractor while handing over the installation to the Department. Out of this one of the sets shall be laminated on a hard base for display in the fire controlroom. In addition, one set will be given on compact disc.

(a) Installation drawings giving complete details of all the equipment, including their foundations,

(b) Plumbing layout drawings giving sizes and lengths of all the pipes and the sizes and locations of all types of valves, and including isometric drawings for the entire piping including the pipe connections to the various equipment,

(c) Line diagram and layout of all electrical control panels giving switchgear ratings and their disposition, cable feeder sizes and their layout,

(d) Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.

**1.17** DOCUMENTS TO BE FURNISHED ON COMPLETION OF INSTALLATION

Three sets of the following documents shall be furnished to the departmentby the contractor on completion of work:-

(a) Completion drawings as per Para 1.17.3

(b) 3 sets of manufacturer's technical catalogues of all equipment andaccessories.

(c) Operation and maintenance manual of all major equipment, detailing alladjustments, operation and maintenance procedure.

(d) Name plate details of all equipment.

## 2. SYSTEM AND SYSTEM REQUIREMENTS

Fire safety in buildings has become very important consideration in construction and maintenance. A normal office building has fire load in the form of large quantity of papers and furnishing. Buildings like Hospitals, Laboratories, Auditoriums, Libraries, Museums etc. require fire safety provisions by virtue of their type of occupancy and importance irrespective of their height.

The aim of fire safety measure is to provide protection to life of occupants and property in the event of fire in the building. National Building Code of India- 2016, Vol-1, Part-4 deals in detailed measures to be adopted for fire safety in buildings. The measures depend upon the occupancy, use, height and area of the building.

2.1 The broad classification of various type of occupancies into different Groups in accordance with NBC-2016, Vol-1, Part-4 is as under: -

1. Group-A Residential
2. Group-B Educational
3. Group-C Institutional
4. Group-D Assembly
5. Group-E Business
6. Group-F Mercantile
7. Group-G Industrial
8. Group-H Hazardous

For further details of classifications, NBC-2016 is to be referred.

Besides various mediums of fighting fire, water is the cheapest and the most easily available for this purpose. Water based fixed firefighting installations are most commonly provided in buildings.

The design and installation of a firefighting system is of utmost importance. The firefighting installation on completion will have to be got cleared from the local firefighting authorities (Fire Service) for its efficacy, suitability and usability by the Fire Service in the event of a fire.

Accordingly, such system shall be executed on turnkey basis to ensure proper quality of material and zero leakage system apart from use of equipment and other accessories. All the components shall be integrated to ensure proper performance at the time of fire.

**2.2** FIREFIGHTING SYSTEM:

**2.2.1** Following types of water based fixed firefighting installations are normally provided in buildings:

(i) Wet Riser
(ii) Down Comer

(iii) Wet Riser cum Down Comer
(iv) Automatic Sprinkler

**2.2.2** In all the above systems, lines are laid in and/or around the building and permanently charged with water from a pressurized supply.
In a building, any one system or a combination shall be provided as specified in Table-7 of National Building Code of India-2016, Vol-1, Part-4 as amended up to date, depending upon the occupancy, use and height for protection.

The effective capacity of Under-ground static & Terrace Water Storage Tanks and capacity of Fire Pumps etc. shall also be as specified in Table-7 of NBC- 2016. The same has been reproduced as Appendix-A of this document. The effective capacity of the reservoir shall be measured above the top of the pump casing (flooded suction).

**Note:** For additional occupancy wise requirements of various Groups mentioned in Para 2.1 above, the provisions contained in *Clause 6 of NBC 2016, Vol-1, Part-4 shall be referred to.*

**2.2.3** Municipal Regulation of the city shall also be taken in to consideration while selecting and designing firefighting system for a building.

## 2.3 SYSTEM COMPONENTS

Besides architectural and building provisions such as underground tank, pump houses, terrace tank, shafts for installation of internal hydrants, etc. firefighting systems shall generally comprise supply, installation, testing and commissioning of components as detailed in Table 2.1. Typical arrangement of installations have been indicated in Figures 1 to 6.

## 2.4 SYSTEM ENGINEERING:

The capacities and sizes of various components described above will depend upon the type and height of the building. Specifications of various components have been described in succeeding chapters. Following factors shall be taken in to consideration while designing various components.

**2.4.1** Wet Riser cum Down Comer:-

2.4.1.1 Pressure at hydraulically remote hydrant and at the highest hydrant shall notbe less than 3.5 kgf/cm$^2$. The pressure at the hydrants shall however not exceed 7 kgf/cm$^2$.

2.4.1.2 The pipe line will be designed in such a way that it should be possible to getdischarge at any location. Design parameters shall be as under:-

(i) Maximum flow velocity : 2.5 mps
(ii) Maximum Friction : 5 m per 100 m run

However, the size of wet riser shall be as given in Table 4.1 under Para 4.5.4(ii).

2.4.1.3 Main Fire Pumps (Both electrical as well as diesel) shall be selected for:

(i) Discharge : 1620 lpm/2280 lpm/2850 lpm
(To be selected from Appendix-A)

(ii) Head : 35 m + Height of terrace level hydrant above pump level + 6% ofthe maximum length of pipe from pump discharge to

any hydrant atterrace level

2.4.1.4 Terrace pump shall be selected for:

(i) Discharge : 450 lpm/900 Ipm (To be selected from Appendix- A )

(ii) Head : 20 m+ 6% of the maximum lengthof pipe from terrace pump to any hydrant at terrace level

2.4.1.5 Pressurization pump (Jockey Pump) shall be selected for :

(i) Discharge : 180 Ipm

(ii) Head : 35 m + height of terrace level hydrant above pump level

2.4.1.6 No. of Risers:- Number of risers will be decided to fulfill the followingconditions:-

(i) No corner of the building is farther than 30 m from nearest riser.

(ii) Horizontal distance between two risers shall not be more than 50 m.

(iii) Normally one riser is provided for every 1000 sq.m of plinth area or partthereof. However, the number of risers can be suitably increased to meet the givensituation.

TABLE 2.1

VARIOUS COMPONENTS OF FIREFIGHTING INSTALLATIONS

| **S. No.** | **System component** | **Wet Riser** | **Down Comer** | **Wet Riser cum Down Comer** | **Automatic Sprinkler and Wet Riser cum Down Comer** |
|---|---|---|---|---|---|
| (i) | Electric Motor Driven Fire Pump | Y | N | Y | Y |
| (ii) | Diesel Engine Driven Fire Pump(as stand by) | Y | N | Y | Y |
| (iii) | Pressurization Pump (Jockey Pump) | Y | N | Y | Y |
| (iv) | Terrace Pump | N | Y | Y | Y |
| (v) | Vertical risers in the building. | Y | Y | Y | Y |
| (vi) | Pipe network inside the building throughout the area to be protected with Sprinklers | N | N | N | Y |
| (vii) | External pipe line around the building. | Y | N | Y | Y |
| (viii) | Internal Hydrant | Y | Y | Y | Y |
| (ix) | Yard Hydrant (External Hydrants) | Y | N | Y | Y |
| (x) | First-aid hose reel. | Y | Y | Y | Y |
| (xi) | Hose Pipe and Branch Pipe. | Y | Y | Y | Y |

| | | | | | |
|---|---|---|---|---|---|
| (xii) | Air Vessels. | Y | Y | Y | Y |
| (xiii) | Fire Service Connections. | Y | N | Y | Y |
| (xiv) | Fire Service Inlet. | Y | Y | Y | Y |
| (xv) | Control components like pressure switches, flow switches level indicator, alarm etc. | Y | Y | Y | Y |
| (xvi) | Electrical Power and Control Panel with cable and earthing etc. | Y | Y | Y | Y |
| (xvii) | Pipe line accessories like Butterfly/ Sluice Valve, Non-Return Valve etc. | Y | Y | Y | Y |

'Y' Stands for: to be provided.

'N' Stands for: not to be provided.

**Internal Hydrant**: Every riser will be provided with the following at every floorincluding terrace and basement over and above sprinkler system.

(iv) Single headed outlet -2 Nos.

(v) First Aid Hose Reel -1 No.
[Length of pipe shall be such that nozzle of thehose can be taken into every room and within 6 m of any part of the rooms keeping in view layout and obstruction.]

(vi) Hose Pipe 63 mm dia, 15 m long with male and female coupling at ends. -2 Nos.

(vii) Branch pipe 63 mm dia with 20 mm nominal internal diameter nozzle and suitable for instantaneous connection. -1 No.

2.4.1.7 Yard Hydrant (External Hydrant)

2.4.1.8.1 For fighting fire from outside the building, yard hydrants are provided around the building and in the closed court yard. For connecting yard hydrants a ring of pipe shall be laid underground around the building at a minimum distance of 2 m from the face of the building. All internal risers shall be connected with this ring.
Yard hydrants shall be located at a minimum distance of 2 m but not more than 15 m from the building face. The yard hydrants shall be easily accessible and should normally be provided near boundary wall/along road. While locating yard hydrants it should be ensured that same do not become hindrance in vehicular movement or entrance to the building. Yard hydrants,should be located around the building in such a way that it should bepossible to fight fire on any face of the building from the nearest hydrant. At least one hydrant post shall be provided for every 45 m.

2.4.1.8.2 Fire Hydrants shall be of stand post type conforming to IS 908. All Yard hydrant outlets shall be situated 1 m above ground level.

2.4.1.8.3 The stand posts shall be 80 mm in diameter for single headed hydrants. The stand posts shall be painted 'fire red' as per Para 1.13. Mild steel stand post may be accepted even in cases where underground mains are of cast iron, using flanged joints.

2.4.1.8.4 Only Oblique hydrants conforming to IS 5290 with outlets angled towards ground shall be used. The hydrant couplings shall be of the instantaneous spring-lock (female) type of 63 mm diameter and valves shall be of the screwdown type.

2.4.1.8.5 Suitable pressure reducing devices shall be provided for yard as well as internal hydrants where the pressure exceeds 7 kgf/cm$^2$, considering the safety of operators.

2.4.1.8.6 All hydrants should be serially numbered.

2.4.1.8.7 Yard hydrant will include the following accessories

(i) Connection from ring main with 80 mm dia MS pipe

(ii) 63 mm dia single head landing valve - 1 No.

(iii) Butterfly/sluice valve 80 mm dia - 1 No.

(iv) Hose pipe 63 mm dia 15 m long with male and female coupling at ends - 2 Nos.

(v) Branch pipe 63 mm dia with 20 mm nominal internal diameter nozzle, suitable for instantaneous connection - 1 No.

All above components shall be housed in a suitable size MS cabinet made from 2 mm thick sheet with glass panel on front. The cabinet shall be painted red as per Para 1.13.

(Note:- In case hose pipes and branch pipes are likely to be stolen from yard hydrants, the same may be kept in a central place i.e. fire control room/ fire pump room.)

2.4.1.8 **Fire Service inlet :-** In order to facilitate feeding of water in the system by fire service, a 2/3 way 63 mm diameter collecting head shall be provided and connected with each riser/down comer and the ring main with non-return valve and butterfly/sluice valve. This should be located at a place where fire brigade tender can reach.

2.4.1.9 **Fire Service connection:** It is for feeding water to underground storage tank by fire tenders. The static water storage tank shall be provided with a fire brigade collecting head with 4 number 63 mm diameter instantaneous male inlets arranged in a valve box at a suitable point at street level. If tank is not approachable for the fire engines, the fire brigade collecting head shall be connected to the static tank by a suitable fixed galvanized iron pipe not less than 150 mm in diameter to discharge water into the tank when required.

2.4.1.10 **Fire Brigade draw out collecting head:** Each of the static water storage tanks shall also be provided with a fire brigade draw out collecting head with 63 mm diameter instantaneous male draw out arranged in a valve box at a suitable point at street level. This draw out shall be connected to galvanized iron pipe of 100 mm diameter with foot valve arrangement in the tank.

2.4.1.11 **Air Vessel**: - To counteract the water hammer effect, air vessel shall be provided at the top

of each riser.

*2.4.1.12* **Orifice Plate**: - Suitable pressure reducing devices shall be provided for yard as well as internal hydrants to control pressure to desired limit especially at lower level hydrants. *(refer Para 2.4.1.1 & 2.4.1.8.5 above)*

2.4.1.13 **Alarm for Wet Riser System: -** To indicate the flow of water in the system, turbine type alarm shall be provided at a prominent place outside the pump house in the main line before any connection is taken. The alarm will indicate the healthiness of the system and shall not be silenced till the main fire pump is in operation.

2.4.1.14 Control system-

2.4.1.15.1 The system shall be designed for operation automatically so that as and when water is drawn from the system through any hydrant, the pumps will operate automatically and feed water in to the system. However once a fire pump starts working, it will be stopped only manually (except jockey pump) or on account of any fault or non-availability of power supply to electrical pumps orlowwater levelin UG/Terrace tank.

Facility shall also be provided for manual operation. A selector switch forauto/manual selection shall be provided for each pump.

2.4.1.15.2 The control system shall be designed to provide the following sequence of operation:

i) The Pressurization Pump shall maintain pressure in the system and shall operate only on account of slow pressure loss. In case of sudden pressure loss the Pressurization Pump shall not operate. The pump shall start when the water pressure in the system falls to a pre-set value (about 0.35 kgf/cm$^2$ below normal system pressure) and shut down when the system pressure reaches the set value. Both limits shall beadjustable.

ii) Main Electric Fire Pump shall operate on account of sudden pressure loss. So long as Main Electric Fire Pump is working, other Fire Pumps will not operate. The pump shall start when the water pressure falls to a pre-set value in the system (about 1 kgf/cm$^2$).
In case, Normal Electric Supply fails while the Main Electric Fire Pump is running, the DG Set for essential supply will start within 5 seconds.

iii) The Diesel Fire Pump will start on sudden pressure loss, only in case supply to Main Electric Fire Pump is not available or within a pre-set time the Main Electric Fire Pump fails to start or fails during operation. No other pump will be working when Diesel Engine Fire Pump is in operation. Audio- Visual Alarm shall be available to indicate failure of Main Electric Fire Pump.

iv) A three attempts starting facility will be provided for diesel pump.

v) If within a pre-set time, the standby pump also fails to start or fails to develop pressure, the standby pump shall also be shut down and locked out. An audio visual alarm indication shall be given at the control panel.

vi) The Terrace Pumps will start on sudden loss of pressure only when both the Fire Pumps have either failed to start or exhausted water.

vii) In case sprinkler pump is also provided :

a) Sprinkler pump will start on pressure loss (about 1 kgf/cm$^2$) in thesprinkler header.

b) If sprinkler pump does not start in preset time or fails during operation, the main electric fire pump shall start and feed water to sprinkler system.

c) Diesel pump will start and feed water only in case supply to main electricpump is not available or within a preset time the main electric pump fails to start or fails during

operation. No other pump will be working when diesel pump is in operation. Audio-visual alarm shall be available to indicatefailure ofbothsprinkler and main electric pump.

viii) Only one pump will be working at a time. In manual mode more than onepump can be started.

ix) Water level in UG and terrace tanks shall be monitored and in case of lowwater level, pumps connected with the tank shall not operate (even on manual mode) or stop operation as the case may be. An audio-visual alarm shall be given at the control panel.

**2.4.2** **Wet Riser**:- In wet riser system all components described in 2.4.1 shall be provided except terrace pump. Terrace tank shall not be required.
Wet Riser shall be interconnected at terrace level to form a ring and cut-off shall be provided for each connection to enable repair/maintenance without affecting rest of the system.

**2.4.3** **Down Comer**:- In down comer, underground tank, fire pumps at ground level, ring main and yard hydrant will not be provided. Except these items, all other items described in 2.4.1 shall be provided. Following points are also to be taken in to consideration:

2.4.3.1 A minimum of two terrace pumps (eIectricaI) shall be provided. One pump shall act as standby.

2.4.3.2 **Down comer Pipes**: - Consideration of Para 2.4.1.6 shall apply.

2.4.3.3 All down comer pipes shall be inter connected at the terrace level. In case terraces are not interconnected, all building will be treated as individual buildings.

2.4.3.4 Fire service inlet shall be provided with each Riser/down comer for facilitating pumping of water from fire service tenders.

2.4.3.5 **Control system**: - The starting of terrace pump shall be automatic i.e. with the opening of any hydrant valve or hose reelon any floor, the pump will startautomatically with fall in line pressure. In addition start/stop push buttons shall be provided at ground floor near internal hydrant for starting the pump manually. Where fire control room has been provided, remote operation of terrace pump may be done from fire control room in place of near internal hydrant. The control panel for terrace pumps shall be provided near the pumps in a suitable enclosure to avoid unauthorized operation.

**2.4.4** Automatic Sprinkler :-

2.4.4.1 In addition to all provisions of Wet riser and Down comer system described in Para 2.4.1, in automatic sprinkler system, water lines of various size are laid throughout the area to be protected and sprinkler heads are provided atregular interval so that water from sprinkler heads cover the entire area under fire.

2.4.4.2 Sprinkler has two functions to perform i.e. to detect fire and then to provide adequate distribution of water to control or extinguish it. Sprinkler heads operate at pre- determined temperature to discharge water over the affected area below. Only those sprinkler heads operate which are in the vicinity of fire i.e. those which become sufficiently heated.

2.4.4.3 Lines for sprinklers shall be separate or common with wet riser system depending upon requirements mentioned in Appendix-A.

2.4.4.4 The area to be protected by sprinkler is divided in to various zones. For detecting operation of sprinkler in a zone, flow switches are provided which are wired to an annunciation panel installed in the Fire Control Room. In the event of operation of sprinkler(s) in an affected area, the annunciation panel will give audio-visual alarm and indicate the affected zone. This arrangement will be independent of fire alarm system.

2.4.4.5 The sprinkler shall be installed only where there is no danger of freezing ofwater in the pipes at any time.

**2.4.4.6** Details of sprinkler installations have been given in separate Chapter 9.

## 3. ARCHITECTURAL AND STRUCTURAL REQUIREMENTS

**3.1** SCOPE

This chapter outlines the general guidelines for planning the space requirements, equipment location, floor loading and other structural requirements for firefighting systems.

**3.2** Following provisions/spaces are required for firefighting system:

**3.2.1** **Static Water Storage Tanks: -** In order to ensure satisfactory supply of water for the pumps of firefighting, static water storage tanks exclusively for the purpose of firefighting shall be provided. The tank shall be provided both underground and/or at terrace. Reservoir for Wet Riser System shall be lined. The effective capacities of the reservoir above the top of the pump casing (flooded suction) for various types of occupancies shall be as indicated in Appendix- A.

While deciding the capacities of underground and terrace tanks following points shall also be taken into consideration:

(i) In case common pump house and underground tank are to be provided for more than one building in a campus, the capacity of UG tank shall be increased, if required in consultation with local Fire Brigade.

(ii) Arrangement shall be made for replenishment of water from alternative source at the rate of 1000 lpm for underground tank. When this is not feasible the capacities of storage tanks (both underground and terrace tanks) shall be increased suitably in consultation with local Fire Brigade.

(iii) Water for firefighting shall be stored in two or more interconnected compartments of equal size to facilitate cleaning and maintenance of the tanks without interrupting the water availability for firefighting.

*(iv)* The underground fire water storage tank(s) shall not be more than 7 m in depth from the level having fire brigade draw-out connection, while the draw-out connection shall not be more than 5 m away from the tank wall. *Para 2.4.1.11 above may also be referred.*

**3.2.1.1** Following factors are to be considered for deciding the location of underground water storage tank:

(i) The tank shall be by the side of road so that fire brigade personnel can drawwater from the tank or discharge water into the tank. Suitable manhole shallbe provided for this purpose.

(ii) When the slab of the tank forms a part of pathway/drive way, it shall be designed to withstand the vehicular load of 45 tonnes (or as applicable) equally divided as a four-point load.

(iii) Arrangement shall be made to replenish water by mains or alternative source.

(iv) Suitable arrangement shall be made to prevent stagnation of water in the tank. For this purpose, the tank of domestic or other water supply may be fedfrom the over flow of static water storage tank to ensure water level there in.*Figure 7 may be referred to*.

(v) The static water storage is meant for firefighting only and is not to be used for any other purpose except when the tank is to be cleaned.

(vi) There shall be no leakage in the tank.

**3.2.1.2** Following factors are to be considered for deciding the location of terracetank:

(i) The terrace tank should be easily accessible.

(ii) Connection to terrace pump shall be conveniently made.

(iii) Factors at 3.2.1.2 (iii) to (vi) shall also be considered.

(iv) The terrace tank may be of masonary, cement concrete, M.S. or plasticdepending upon relevant considerations.

**3.2.2** **Pump House**: - For installation of firefighting pumps (Main Electrical Pump, Diesel Engine Driven and Pressurization Pump) along with Electrical & Control Panel, valves, diesel tank etc., pump house is required. Following factors are to be considered:

(i) In order to provide positive (flooded) suction to fire pumps, the pumphouse shall be at a level below or equal to that of static water storage tank.

(ii) The pump house at ground level shall be easily accessible for firefighting operations and at least 6 meters away from all surrounding buildings and overhead structures. In case, the 6m spacing of pump room fromsurrounding buildings is not feasible, the provisions of Para 5.1.12 of IS 13039:2014 shall be followed.

(iii) The pump house shall not be located in the building to be protected. However, the pump house can be located in the basement subject to conditions of Clause 12.2.2 of IS 15105.

(iv) General water supply pumps can be installed in the same pump house.

(v) Size of the pump house shall be not less than 6.0 m (W) x 8 m (L) x 3.5 m (H). If two electrical pumps are to be provided, the length of the pump house shall be not less than 12 m. If the water supply pumps are to be installed in the same pump house, then either the width of pump house be increased by 1 m or length be increased by 2 m or suitably as is necessary.

(vi) Suitable ramp with proper slope and/or cutout in roof shall be provided for lowering the equipment in to the pump house. Stair case with entry door at ground level and locking arrangement shall be provided.

(vii) Ventilators at least 500 mm height shall be provided on three sides for natural light. Adequate ventilation for dissipation of heat due to operation of motors/engine shall be provided.

(viii) Proper water proofing shall be provided. A sump of size 0.6 m x 0.6 m x 0.3 m with 1(Working)+1(Standby) dewatering pumps shall be provided in the pump house in one corner adjacent with the tank wall. The floor slope will lead towards the sump so that water leakage can be pumped out.

(ix) In order to ensure that there is no leakage of water in the pump house, no pipe/ cable shall cross the pump house below ground level. Suitable opening in wall above ground level

shall be provided for crossing of pipes/cables.

(x) Installation of negative suction arrangement and submersible pumps shall not be allowed.

(xi) There shall be no beam under the floor of pump house.

(xii) The floor of the pump house shall be designed for loading of 1500 kgf/sq.m.Foundation of pumps shall be raised over finished floor and in no case flooring or RCC walls shall be damaged while installing equipment in the pump house.

(xiii) Pump house shall be separated by fire walls all around and doors shall be protected by fire doors (120 min rating).

(xiv) The pump house shall be clearly marked by luminous sign.

(xv) Typical layout of fire pump house has been shown in Figure-10.

**3.2.3 Terrace Pump** - Terrace pump is to be installed near terrace tank. The tankshall be at higher level to provide positive suction to the pump. No separate pump house is required for terrace pump. However suitable enclosure forprotection of pump is to be provided. The pump may be located in stair case mumty if suitable space is available. The pump may be located near beam so that its load is not transferred to slab.

**3.2.4 Internal Hydrant** - Internal hydrants are provided to fight fire from within the building. Following factors are considered for deciding location of internal hydrant:

(i) Internal hydrants are provided at every floor at the same location and connected with risers.

(ii) Hydrant for firefighting shall be located in the lobby in firefighting shaft. Those hydrants planned to be provided near fire exit staircase on the floor shall be within 5 m from exit door in exit access.

(iii) Numbers and location of risers shall be decided as per Para 2.4.1.6. Every wing of the building shall preferably be provided with independent hydrants.Hydrant shall be located in the center of the building so that one hydrant cancover area on both sides.

(iv) A masonry enclosure on three sides of size minimum 1200 mm wide and 800mm deep and 2100 mm height shall be provided. Cut-out of size 200 mm x 200 mm be provided in one corner in the slab for down comer/wet riser pipe. If sprinkler installations are to be provided, additional cut out of similar size for sprinkler pipe and drain pipe as the case may be, shall be provided. Steel shutter with 1250 mm glazing on top with locking arrangement shall be provided in front of the hydrant. The shutter shall be painted red as per para 1.13. Typical arrangement has been shown in Figure-8.

(v) Internal hydrant shall be easily accessible. A clear space of at least 1.5 m should be available in front of the internal hydrant for operation. Internal hydrant shall not be provided in a lockable room.

(vi) Internal hydrant shall be clearly marked with the inscription of "FIRE HOSE CABINET" of letter size 75 mm in height and 12 mm in width by luminous sign. Suitable lighting arrangement shall be provided in front of the internal hydrant. The location of such cabinets shall be shown on floor plan and duly displayed in the landing of the respective fire exit staircase.

**3.3** BUILDING TO BE SPRINKLER PROTECTED

The sprinkler pipes are installed throughout the area to be protected. The structure shall be designed to support sprinkler pipes and the contained water. Inbuilt drainage with slope shall be provided throughout the area so that in the event of operation of sprinkler, water is drained out without spreading to other parts of the building. Storage racks/platforms shall be sufficiently raised above floor.

It is essential to make provisions for avoiding water from Sprinkler/hydrant operation

entering lifts and electrical rooms.

**3.4** FIRE CONTROL ROOM

For all buildings 15 m in height or above, and apartment buildings with height 30 m and above, a fire control room (size 4 m x 4 m Approximately) shall be provided on the entrance floor of the building. One store for keeping spares for firefighting system shall also be provided adjacent with the fire control room.

## 4. PLANNING, DESIGNING AND COORDINATION

**4.1** INTRODUCTION

Planning of firefighting system is to be done right at the stage when the building plans are prepared by the Architect. Subsequently during preparation of working drawings, all architectural and structural provisions described in Chapter 3 are also to be kept in the building plans.

Careful planning from the initial stage itself will avoid changes and problems at a later stage. This chapter covers aspects of planning, designing and coordination of firefighting system.

**4.2** SCHEME

The provision of firefighting installation depends upon building use, height, floor area etc. Considering these factors, the system or a combination of systems which will be required to be adopted should be finally selected in accordance with National Building Code and regulations of local fire authorities, if applicable.

**4.3** APPROVAL OF LOCAL BODIES

In the building plans which are submitted to local bodies for approval, details of firefighting system proposed in the building are also indicated. Local bodies normally refer the same to Chief Fire Officer and recommendations of Chief Fire Officer are conveyed to the officer who submitted the plans. The proposed system should incorporate the recommendation of Chief Fire officer.

**4.4** ARCHITECTURAL PROVISION

**4.4.1** For any firefighting system, underground tank and pump house are required. These may be located anywhere in the campus subject to proper approach. The pump house should preferably be near the sub-station. It will be a good practice if all building services including firefighting are located at one place in the campus.

**4.4.2** In campus having more than one building to be protected, it is not required to have individual system for every building. A number of building in the campus can be protected by common fire pumps. However yard hydrants/internal hydrants and terrace pump shall be provided in each building. When the buildings are close by, the yard hydrants can be located insuch a way that one yard hydrant cover more than one building.

**4.4.3** In a large campus, buildings of different heights may be proposed. As per National Building Code, provision of firefighting system may not be required in building with

lesser heights. Provisions of firefighting system as indicated in NBC are mandatory minimum required for any building which does not debar higher provisions. An unsafe building in a campus will become potential danger to the safety of other buildings. If firefighting system is being provided in a campus on account of one or more buildings, it isdesirable to extend the facility to other buildings also where this may not berequired as a mandatory provision. This will ensure safety of all the building in the campus.

**4.4.4** The shafts for vertical risers are to be provided in the building. Their number and location be decided as per guidelines given in Chapter 2 and 3.

**4.4.5** Location of yard hydrant shall be selected in accordance with provision of Para2.4.1.8.

**4.4.6** Route of pipe connection from ring main to the riser shall be selected properly.Position of tie beam or any other structural member shall be checked so thatit does not come in the way of pipes.

**4.4.7** For vertical riser pipe passage, opening of 200 mm x 200 mm shall be left in slab in the internal hydrant shaft as per Para 3.2.4(iii). The opening shall be located vertically one above the other. In buildings where sprinkler system is tobe installed, additional opening of same size is to be provided within the nitch at the other corner for sprinkler pipe.

**4.4.8** Details of internal hydrant door with glass is to be provided to concerned architect/division in advance. This may be modified for architectural considerations provided the glass height is not changed. Hydrants for firefighting and hose reels shall be located in the lobby in firefighting shaft. Those hydrants planned to be provided near fire exit staircase on the floor shall be within 5 m from exit door in exit access. Such hydrant cabinet may finish with doors to meet interior finishes with requirement of glass panel to provide visibility to the installations inside and inscribed with the word: "FIRE HOSE CABINET" of letter size 75 mm in height and 12 mm in width. Such door of the fire hose cabinet need not be fire resistant rated. The location of such cabinets shall be shown on floor plan and duly displayed in the landing of the respective fire exit staircase.

**4.4.9** Sprinkler pipes are laid throughout the area to be protected. The route of pipes is to be pre-decided in consultation with the Architect. For vertical pipes, shafts for risers are to be used. Layout of horizontal pipe and location of sprinkler head are to be decided keeping in view of location of fans and fitting. In case false ceiling is being provided in the area, horizontal pipes maybe laid above false ceiling and only sprinkler head is provided below false ceiling. If the building is centrally air-conditioned, location of duct and air termination may be taken into account. Reflected ceiling plan shall be prepared indicating all services above false ceiling.

## 4.5 DESIGNING

**4.5.1** Requirement of components for various firefighting systems has been givenin Para - 2.3. Capacity of pumps shall be worked out in accordance with Para-2.4.1.

**4.5.2** Fire pumps shall be provided with positive suction and automatic starting devices capable of sequential starting of the pumps.

**4.5.3** Insertions like flexible couplings/connections, bellows, etc., in the suction and delivery piping shall be suitably planned and installed.

**4.5.4** The pipe sizes shall be selected as under :-

(i) Suction and delivery pipes of pumps shall not be less than following.

| Pump Discharge | Suction dia (mm) | Delivery dia (mm) |
|---|---|---|
| (a) 450 lpm | 50 | 50 |
| (b) 900 lpm | 75 | 50 |
| (c) 1400 Ipm | 100 | 100 |
| (d) 2280 lpm | 150 | 150 |
| (e) 2850 lpm | 200 | 150 |
| (f) 4540 Ipm | 250 | 200 |

(ii) Pipe connecting pump house to ring main shall be not less than 150 mm diameter. Higher size pipe shall be selected depending upon length of pipe and friction loss. Size of Ring main and Risers shall be as given in table below:

Table 4.1

| S. No. (1) | Size of the Mains/Risers (mm) (2) | Type of Building (3) | Remarks (4) |
|---|---|---|---|
| i) | 100 mm with single outlet landing valves | a) Residential building (A):<br>1) Dormitories<br>2) Apartments<br>3) Hotels | <br>-<br>-<br>Up to 45 m height |
| | | b) Educational buildings (B)<br>c) Institutional buildings (C)<br>d) Assembly buildings (D)<br>e) Business buildings (E)<br>f) Mercantile buildings (F)<br>g) Industrial buildings (G) | -<br>Up to 30 m height<br>-<br>Up to 45 m height<br>-<br>Up to 15 m height |
| ii) | 150 mm with single outlet landing valves | a) Hotels<br>b) Starred Hotels<br>c) Institutional buildings (C)<br>d) Business buildings (E)<br>e) Industrial buildings (G)<br>f) Storage buildings (H)<br>g) Hazardous buildings (J) | Above 45 m height<br>-<br>Above 30 m height<br>Above 45 m height<br>Above 15 m height<br>Up to 15 m height<br>Up to 15 m height |

(iii) Down comer pipe size shall be of 100 mm dia.

(iv) Where wet riser/down comers are not to be provided but hose reel and terrace tanks are to be provided, pipe of size 65 mm diameter shall be provided in between the pump and hose reel.

(v) Fire service inlet and fire service connection shall be with pipe size not less than 150

mm diameter.

(vi) All Tee off connections for landing valves from vertical risers and for external hydrants from ring main shall be with pipe size not less than 80 mm diameter.

**4.5.5 Selection of Material**:- Components like landing valve, hose coupling branch pipes etc. are available in three material i.e. Aluminum Alloy, Gun metal and Stainless steel. Aluminum Alloy is prone to wear and tear and weather conditions faster than other two materials. However being cheaper, Aluminum Alloy may be used in location where chances of pilferage are more. Stainless steel may be considered at location not very safe from theft. Gunmetal may be used in installations which are well protected.

**4.5.6 Hose Pipes/ Branch pipes**:- A minimum of two number of 63 mm diameter, 15 m long hose pipe with instantaneous coupling at both ends and one number branch pipe with nozzle shall be kept with every internal and external hydrant.

**4.5.7 Orifice Plate**:- The pressure in a firefighting system varies from point to point. The pressure will be maximum in the pump house and minimum at the farthest hydrant at terrace level. To reduce pressure to safe operating pressure at every internal/external hydrant, orifice plates are provided before connection of landing valve between the flanges of landing valve and pipe flange. The size of orifice shall be calculated as per details given inTable 4.2.

TABLE 4.2
SELECTION OF ORIFICE PLATE

| Pressure Loss$Kgf/cm^2$ | Diameter of Orifice (mm) | |
|---|---|---|
| | Pipe Size | |
| | 80 mm | 100 mm |
| 3.5 | 41.9 | |
| 3.0 | 43.0 | |
| 2.5 | 44.80 | |
| 2.0 | 46.40 | |
| 1.5 | 48.90 | 56.20 |
| 1.0 | 52.30 | 57.60 |
| 0.9 | 53.20 | 59.00 |
| 0.8 | 54.10 | 60.40 |
| 0.7 | 55.30 | 62.00 |
| 0.6 | 56.60 | 63.90 |
| 0.5 | 58.20 | 66.50 |
| 0.4 | 59.80 | 69.70 |
| 0.3 | 62.00 | 74.20 |
| 0.2 | 65.00 | 81.10 |
| 0.1 | | 82.20 |

Other suitable means may also be used for reducing the pressure apart fromorifice plates.

**4.5.8** Fire pumps shall be provided with positive suction.

## 4.6 COORDINATION

**4.6.1** *Award of Work*:- Depending upon progress of building work, the work of firefighting should be awarded well in time.

**4.6.2** *Power and Water supply for Erection*: - If the department is to provide powerand water for erection, the same should be made available before start of the work since without these facilities, firefighting work cannot be started.

**4.6.3** The Pump house and underground tank where main equipment is to be installed should be available immediately after the work has been awarded. During Construction of underground tank, 2 Nos. 200 mm diameter MS -C Class pipe with flanges on both sides shall be embedded for connection withsuction header of the fire pumps. In case separate sprinkler pumps are to be provided, additional pipes shall be embedded as per actual requirement. The pipe shall be extended at least 100 mm on both sides of the finished wall.

**4.6.4** The underground tank and Pump house shall be tested for any leakage/seepage before start of the work. It shall be ensured that both tank and pump house are free from leakage/seepage.

**4.6.5** The work of laying of pipe for sprinklers should be taken up in coordination with the duct installation in case of building being provided with central air- conditioning, otherwise after plaster work is over and one coat of white wash has been applied.

**4.6.6** The sprinkler pipes should be tested area wise and capped for connection to pipes of adjoining area.

**4.6.7** The route of external pipe i.e. pipe from pump house and ring main should be decided in coordination with other building services. Guide lines of Chapter 2 and 4 are to be followed. It will be desirable to prepare a services drawingwhere all services i.e. sewage, drainage, water supply lines, UG cable, pipes for air-conditioning and firefighting are reflected.

**4.6.8** Riser pipes shall be installed after the riser shafts are available dulyplastered.

**4.6.9** For laying of external pipes, excavation up to a depth of 1.25 m or more isto be carried out. This may cause hindrance in execution of other building works. External pipes shall therefore be laid in a phased manner in coordination with other agencies. The pipes shall be tested and earth filled back before excavation for next phase is taken up. Equipment for testing etc. should be available in advance before start of underground pipe laying work.

**4.6.10** All underground pipes are to be laid much before starting of finishing work i.e. pavement, road/ horticulture work etc. around the building.

**4.6.11** The work of installation of equipment in pump house should be carried out

simultaneously and kept ready for connection to the pipe network.

**4.6.12** Before occupation, the building is to be inspected by the representative of Chief Fire Officer and local bodies. The building will be issued N.O.C. for occupation only when all safety provisions including firefighting work are complete to the satisfaction of Chief Fire Officer. As such, firefighting work is to be completed and commissioned with temporary power supply well before other building works and services are complete.

## 5. FIRE PUMPS

### 5.1 SCOPE

This chapter covers the general requirements of water pumps for main firepump, jockey pump and terrace pump.

### 5.2 TYPE

Pumps conforming to IS 12469 shall be exclusively used for Firefighting purposes. The pumps shall be centrifugal type direct driven with a 3 phase, 415 V ± 10%, 50 Hz, A.C. motor. The standby fire pump shall be driven by diesel engine. The pumps may be either of horizontal split casing (HSC) type with operating speed not exceeding 1500 rpm, or solid casing with operating speed not exceeding 3000 rpm as specified in the tender documents.

### 5.3 RATING

The main fire pump and terrace pump shall be suitable for continuous operation in the system. The jockey pump shall be suitable for intermittent operation to buildup pressure in the system on account of leakage. The head and discharge requirements shall be as specified in the tender documents. The head shall be suitable for the system and shall take into consideration thepressure drops across the various components in the water circuit as well as the frictional losses.

The rated discharge of Electric Driven and Diesel Engine Driven pump shall be as specified in Table given in Annexure-A. Pump shall be capable of dischargingnot less than 150 percent of the rated discharge at a head of not less than 65 percent of the rated head. The shut off head shall not exceed 120 percent of the rated head in the case of horizontal Pumps.

### 5.4 MATERIAL AND CONSTRUCTION

(i) The centrifugal pumps shall conform to IS 1520.

(ii) The pump casing shall be of heavy section close grained cast iron and designedto withstand 1.5 times the working pressure. The casing shall be provided with shaft seal arrangement as well as flanges for suction and delivery pipe connections as required.

(iii) The impeller shall be of bronze, brass or stainless steel. This shall be shrouded type with machined collars. Wear rings, where fitted to the impeller, shall be of the same material as the impeller. The impeller surface shall be smooth finished for minimum frictional loss. The impeller shall be secured to the shaft by a key.

(iv) The shaft shall be of stainless steel and shall be accurately machined. The shaft shall be balanced to avoid vibrations at any speed within the operating rangeof the pump.

(v) The shaft sleeve and wearing ring etc. shall be of bronze, brass or stainless steel.

(vi) The bearings shall be ball or roller type suitable for the duty involved. These shall be grease lubricated and shall be provided with grease nipples/cups. The bearings shall be effectively sealed against leakage of lubricant or entry ofdust or water.

(vii) The shaft seal shall be mechanical type, so as to allow minimum leakage. A drip well shall be provided beneath the seal.

(viii) The pumps shall be directly coupled to the motor/diesel engine shaft through a flexible coupling protected by a coupling guard.

(ix) The pump and motor/diesel engine shall be mounted on a common robust bed plate fabricated from mild steel section. The bed plate shall have rigid, flat and true surfaces to

receive the pump and motor/diesel engine mounting feet. The pump will be perfectly aligned with the motor/engine so as to avoidany vibration during operation at all variations of load.

### 5.5 ACCESSORIES

Each pump shall be provided with the following accessories: -

(a) Sluice valves on suction and delivery.

(b) Reducers, as may be required to match the sizes of the connected pipe work.

(c) Non-return valve at the delivery.

(d) Pressure gauge at delivery side between pump and the non-return valve.

(e) Flexible coupling/connections shall be provided between Pump sets andValves on suction and delivery sides of all the pump sets.

Note:

1) No butterfly valves shall be installed inside the pump room.
2) The size of the non-return valve and cut off (Sluice valve) shall not be lessthan the size of the initial delivery pipe.

### 5.6 INSTALLATION

(i) The pump and motor/engine assembly shall be mounted and arranged for ease of maintenance and to prevent transmission of vibration and noise to thebuilding structure or to the pipe work.

(ii) The pump and motor/engine assembly shall be installed on suitable RCC foundation. The length and width of the foundation shall be such that 100 mm space is left all around the base frame. The height of foundation shall be so decided that the total weight of foundation block is 1.5 times the operating weight of the pump assembly. The foundation shall be isolated fromthe floor by vibration isolating pads. Angle iron frame of size 35 mm x 35 mm x 3 mm shall be provided on the top edges of the foundation.

(iii) More than one pump and motor assembly shall not be installed on a single base or cement concrete block.

(iv) The suction/discharge pipe shall be independently supported and their weight shall not be transferred to the pump. It should be possible to disconnect any pump for repairs without disturbing the connecting pipe line.

(v) A minimum clearance of 1 m around the main pumps shall be provided. For jockey pump-clearance of 75 cm shall be adequate.

(vi) Sufficient space is to be left in front for the radiator of diesel engine for free discharge of hot air. Arrangement for discharging hot air to outside the pump house shall be provided so that hot air does not stagnate in the pumphouse.

## 6. DIESEL ENGINE FOR FIRE PUMP

### 6.1 SCOPE

This chapter covers the details of requirements of a diesel engine for main fire pump to act as standby.

## 6.2 GENERAL

The diesel engine shall be suitable for automatic operation complete with necessary automatic starting gear, battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common bed plate, fabricated from mild steel channel.

## 6.3 DRIVE

The pump shall be only direct driven by means of a flexible coupling. The coupling between the engine and the pump shall allow each unit to be removed without disturbing the other. Coupling guard shall be provided. The speed shall be 1500 RPM.

## 6.4 DIESEL ENGINE

**6.4.1** ***Environment conditions***- The engine shall be suitable to operate under the conditions of environment at site.

**6.4.2** ***Engine Rating***- The engine shall be multi cylinder/vertical 4 stroke cycle, water cooled, developing suitable HP at the operating speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of thepower requirement of auxiliaries of the diesel engine, and after correction for altitude, ambient temperature and humidity for specified environment conditions. The engine rating shall be suitable to drive the pump at 150 percentof its rated discharge with at least 65 percent of rated head or 20% in excess of the maximum brake horsepower required to drive the pump at its duty point, whichever is higher. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run.

The engine shall be:

a) naturally aspirated, supercharged or turbo-charged and rather air or water-cooled.
b) provided with an in-built tachometer to indicate rpm of the engine.
c) suitable for cold starting for which suitable heaters shall be provided inlubricating oil.
d) able to develop full load within 15 seconds from the receipt of the signal tostart.
e) The diesel engine shall conform to BS 649/ IS 1601/ IS 10002, amended upto date.

**6.4.3** **Engine Accessories-** The engine shall be complete with following accessories:

(i) Fly wheel dynamically balanced
(ii) Direct coupling for pump and coupling guard
(iii) Radiator with hoses, fan, water pump, drive arrangement and guard
(iv) Air cleaner dry type
(v) Fuel service tank with necessary pipe work
(vi) Fuel filter
(vii) Pump for lubricating oil and lub. oil filter
(viii) Electric starting battery 12 V/24 V with 2 Nos. batteries
(ix) Exhaust silencer with necessary pipe work

(ix) Governor
(x) Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting)
(xi) Necessary safety controls
(xii) Winterisation arrangement
(xiii) Hand operated semi rotary pump for filling the service tank
(xiv) A standard kit of tools (this shall be kept on hand at all times)

**6.4.4** **Cooling System-** The engine shall be radiator water cooled. The radiator assembly shall be mounted on the engine. The radiator fan shall be driven by the engine as its auxiliary with multiple fan belts. When half the belts are broken, the remaining belts shall be capable of driving the fan. Cooling water shall be circulated by means of an auxiliary pump of suitable capacity driven by the engine in a closed circuit.

**6.4.5** **Fuel System**- The fuel system shall be gravity fed from the fuel tank to the engine driven fuel pump. The engine fuel tank shall be mounted either adjacent to the engine or suitably wall mounted on brackets. The fuel filter shall be suitably located to permit easy servicing.

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

Any valve in the fuel feed pipe between the fuel tank and the engine shall be placed adjacent to the tank and it shall be locked in the open position.

All fuel tubing to the engine shall be with M.S.'C' class pipe with flexible hose connections where required. Pipe joints shall not be soldered and plastic tubing shall not be used.

The following shall be provided:

i) A sludge and sediment trap shall be provided.
ii) An inspection and cleaning hole
iii) Means to enable the entire fuel system to be bled of air (Air relief cocks are not allowed; screwed plugs are permitted)

**6.4.6** **Lubricating Oil System**- Forced feed lubricating Oil system shall be employed for positive lubrication. Necessary lubricating oil filters shall be provided, located suitably for convenient servicing.

**6.4.7** **Starting System**- The starting system shall comprise of necessary batteries 12 Volts/ 24 Volts, starter motor of adequate capacity and axle type gear to match with the toothed ring on the fly wheel. Suitable protection to protect starting motor from excessively long cranking runs shall be suitably integrated with engine protection system.
The capacity of the battery shall be suitable for meeting the needs of the starting system.

The battery capacity shall be adequate for 10 consecutive starts without recharging with

cold engine under full compression.

Three attempt starting facility shall be provided. If the engine fails to start after third attempt, the engine shall be locked out and suitable audio-visual alarm shall be given to indicate engine failure. The starter motor used for automatic starting may also be used for manual starting provided there are separate batteries for manual starting.

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

**6.4.8** ***Exhaust System***- The exhaust system shall be complete with residential grade silencer suitable for outdoor installation and silencer piping shall be extended up to 1 m, outside pump house duly insulated with 50 mm thick glass wool and 1.0 mm thick aluminum sheet cladding.
Retrofitted emission-control equipment shall be used having a minimum specified PM-capturing efficiency of at least 70%, type approved by one of the five CPCB recognized labs. (Recommendations of National Clean Air Program 2019 launched by Ministry of Environment, Forest and Climate Change)

**6.4.9** ***Engine shut down mechanism***- This shall be manually operated and shallreturn automatically to the starting position after use.

**6.4.10** ***Governing System***- The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed atmaximum pump load.

**6.4.11** ***Engine Instrumentation*** - Engine instrumentation shall include the folIowing:-

(i) Lub.oil pressure gauge
(ii) Lub.oil temperature gauge
(iii) Water temperature gauge
(iv) Tachometer
(v) Hour meter

The instrumentation panel shall be suitably mounted on the engine.

**6.4.12** ***Engine protection devices*** - Following engine protection and automatic shutdown facilities shall be provided:-

(i) Low lub. oil pressure.
(ii) High cooling water temperature.
(iii) High lub. oil temperature.
(iv) Over speed shut down

**6.4.13** ***Pipe work***- All pipe lines with fittings and accessories required shall beprovided for fuel oil, lub.oil and exhaust systems.

**6.4.14** ***Anti vibration mounting***- Suitable vibration mounting duly approved by engineer-in-charge shall be employed for mounting the unit so as to minimize transmission of vibration to the structure.

***6.4.15*** Battery Charger-
Battery of diesel engine operated fire pump shall have separate charger from emergency

power supply circuit. Necessary float and boost charger shall be incorporated in the control section of power and control panel with manual selection of boost charge, to keep the battery under trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided. Where separate batteries are provided for automatic and manual starting, the charging equipment shall be capable of trickle charging both the batteries simultaneously. Equipment shall be provided to enable the state of charge of the batteries to be determined.

**6.4.16** The engine installation shall be approved by the representative of engine manufacturer (who shall carry out after sales service under AMC).

**6.4.17** The following spare parts shall be supplied with the engine and kept on hand:

a) Two sets of fuel filters, elements and seals;
b) Two sets of lubricating oil filters, elements and seals;
c) Two sets of belts(where used);
d) One complete set of engine-joints, gaskets and hoses;
e) Two injector nozzles;
f) One complete set of piston rings for each cylinder; and
g) One inlet valve and one exhaust valve).

## 7. PIPE WORK

### 7.1 SCOPE

This chapter covers the requirements of pipe work in firefighting installations.

### 7.2 PLUMBING DESIGN

Pipe sizes shown in tender documents are purely for contractor's guidance. The contractor shall be responsible for selection of sizes as per detailed engineering to be done by him. Plumbing design to be done by the contractor shall incorporate the following: -

(i) (a) Sluice valves shall be provided at suction and delivery sides of pumps.
(b) External hydrant
(c) Fire service connection/inlet.
(d) Test valve.
(e) Drain connections.

(ii) For testing the system healthiness and automatic operation on daily basis, one test pipe with sluice valve shall be provided in common discharge header. For avoiding wastage of water, this pipe shall discharge water inthe tank.

(iii) Non-return valve shall be provided at the delivery of each pump and fireservice inlet. This shall be of swing type.

(iv) Air release valves with ball valve shall be provided in the piping system for venting trapped air with a size of 25 mm for pipes up to 100 mm and 40 mm for larger pipes.

(v) Plumbing drawings showing the sizes of pipe, valves, layout and other details shall be prepared and shall be got approved from the Engineer-in- Charge before the execution of the plumbing work.

### 7.3 PIPE MATERIALS

Pipes shall be of the following materials:

(a) Mild steel heavy class (C-class) conforming to IS:1239 for sizes up to 150 mm.

(b) Welded black steel pipe, Class 2, conforming to IS: 3589, for sizes greater than 150 mm. These pipes shall be factory rolled and fabricated from minimum 6mm thick M.S. Sheet for pipes upto 350 mm diameter and from minimum 7 mm thick M.S. sheet for pipes of 400 mm diameter and above.
MS pipes may be allowed for extension of existing systems which are laid with CI pipes.

(c) Cast iron double flanged pipe, Class-A conforming to IS 1536 or IS: 1537 (to be provided only in underground application).
**Note:** For pipe work of Automatic Sprinkler System inside the building, Stainless Steel Pipes and fittings of grade AISI 304 as per JIS standard 3448 are also permitted particularly where replacement of pipes is not easy like areas above false ceiling etc., subject to the condition that these pipes with associated fittings are suitable to safely withstand the system test pressures.

(d) (i) GI Pipe medium Class (B-class) conforming to IS:1239 (For Drain)
(ii) Cadmium plated steel nuts/bolts/washers shall be used.
(iii) Flex drop of stainless steel metallic pipe with mounting accessories, frame for installation on false ceiling.

## 7.4 PIPE JOINTS

i) Electric welding joints shall be provided in the MS pipe work. Flanged joints shall be provided for connections to valves, pumps, air vessels etc. and also on straight lengths at suitable points to facilitate erection and subsequent maintenance.

ii) For connection of C.I.Pipe, fittings shall also be of C. I. heavy grade conforming to IS:1538. The flanges shall be smooth faced and neoprene gasket shall be provided between joints. All bolt holes in flanges shall be drilled. The drilling of each flange shall be in accordance with the relevant Indian Standards. Where un-avoidable and to connect underground pipe with risers, MS pipe may be used in the form of distant pieces. The joint between C.I. and MS pipe shall be flanged type. MS pipe laid at such locations shall be provided anti-corrosive treatment as per Para 7.5.

iii) Mild steel flanges shall be in accordance with Table - 17 of IS : 6392 i.e. “Plate Flanges for Welding" and flange thickness shall be as under. Gasket thickness shall not be less than 3 mm.

| Pipe diameter | Flange Thickness |
|---|---|
| 200 mm | 24 mm |
| 150 mm and 125 mm | 22 mm |
| 100 mm and 80 mm | 20 mm |
| 65 mm | 18 mm |
| 40 mm and below | 16 mm |

iv) Fittings installed underground shall be of cast iron ‘heavy’ grade conforming to IS 1538 whereas those installed above ground shall normally be of medium grade wrought steel or mild steel conforming to IS 1239 (Part 2) or malleable iron fittings conforming to IS 1879.

v) All hardware items such as Nuts, Bolts, Washers shall be of appropriate size. Washers shall be used on both sides of the bolt.

## 7.5 ANTI-CORROSIVE PROTECTION ON UNDER GROUND MS PIPE

Corrosion protection tape shall be wrapped on MS pipes to be buried in ground. This corrosion protection tape shall comprise of coal tar/asphalt component supported on fabric of organic or inorganic fibre and minimum 4 mm thick and conform to requirement of IS : 10221-

Code of practice forcoating and wrapping of underground mild steel pipe line. Before application of corrosion protection tape all foreign matter on pipe shall be removed with the help of wire brush and suitable primer shall be applied over the pipe thereafter. The primer shall be allowed to dry until the solvent evaporates andthe surface becomes tacky. Both primer and tape shall be furnished by the same manufacturer. Corrosion protection tape shall then be wound aroundthe pipe in spiral fashion and bounded completely to the pipe. There shall be no air pocket or bubble beneath the tape. The overlaps shall be 15 mm and 250 mm shall be left uncoated on either end of pipe to permit installation and welding. This area shall be coated in situ after the pipe line is installed. The tapes shall be wrapped in accordance with the manufacturer's recommendations. If application is done in cold weather, the surface of the pipe shall be pre- heated until it is warm to touch and traces of moisture are removed and then primer shall be applied and allowed to dry.

Holiday Testing for wrapping and coating is essential. Holiday testing may preferably be carried by flexible and detachable ring probe, which will enable the entire $360^{o}$ of the surface of the pipe to be scanned.

At least 10 percent of all the welded joints shall be radio graphically tested and half of the joints radio graphed shall be the 'field joints'.

## **7.6** VALVES

Each pump shall be provided with a non-return valve and a sluice valve on the delivery side, the sluice valve being installed on the upstream side of the non- return valve. A pressure gauge shall also be provided between the pump and the non-return valve. The size of the non-return valve and cut off (sluice) valve shall not be less than the size of the initial delivery pipe and, in no case, less than the delivery outlet of the pump. No butterfly valves shall be installed inside the pump room.

Sluice valve shall conform to IS: 780.

Butterfly valve, wherever used, shall conform to IS:13095.

All valves shall be suitable to with-stand the pressure in the system and rating shall be PN 1.6. All valves shall be right handed (i.e. handle or key shall be rotated clock wise to close the valve), the direction of opening and closing shall be marked and an open/shunt indicator fitted.

(i) The material of valves shall be as under: Body - Cast iron
Disc - Cast Bronze or Stainless Steel Seat- Either integral or Nitrile rubberO-ring - Nitrite/ Silicon

(ii) Non return valves shall be swing check type in horizontal run and lift check type in vertical run of pipes. Air release valves shall be of gunmetal body.

## **7.7** ISOLATION VALVES :

(i) Isolation valves shall be provided in the network to enable isolation of any section of the network without affecting the flow in the rest. These valves are distributed according to the general layout of the installation. The isolation valves shall be normally located near the loop junctions. Additionalvalves shall be provided in the segments where the length of the segment exceeds 300 m.

(ii) Cut-off valves shall conform to IS 780 (PN 1.6 rating)/IS 14846, Class 3.

(iii) Butterfly valves can be accepted subject to the condition that the valves of diameter

exceeding 150 mm shall necessary be of gear operated.

(iv) All Cut-off valves shall be of the right-hand type and enclosed in properly constructed surface boxes, at least 1 $m^2$ in area so as to allow for broken joints being easily remade. The top of the surface box shall be 80 mm above ground level, except where it is located on a road. Valve wheels shall have an arrowhead engraved or cast thereon showing direction for turning open and close.

It is recommended that the position of the surface box be indicated by an iron plate painted fire red with distinct lettering. Such plates shall also show the open and close direction as cast or indicated on the valves and the serial number of the sluice valve.

(v) Locations where vehicles can pass shall be avoided for provision of valve below ground. (CPWD Specs Para 7.10 (xii))

(vi) In case of installations in earthquake prone zones, flexible couplings shall be used for jointing purposes at required locations.

**7.8** Valves in fixed firefighting installations shall have supervisory switch with its signalling to fire alarm panel or to have chain(s), pad lock(s), label and temper-proof security tag(s) with serial number to prevent tempering/unauthorized operation. These valves shall be kept in their intended 'open' position.

**7.9** STRAINERS

Stainless steel strainers shall have minimum 1 mm thick screen with 3 mm perforations. Strainers shall be provided with flanges.

**7.10** ORIFICE PLATE

Orifice plate shall be made of 6 mm thick stainless steel and shall have an identification tag projecting beyond any flange between which it is clamped. The orifice shall be plain central hole without burs and diameter not less than one-half of the internal diameter of the pipe to which it is fitted.

**7.11** INSTRUMENTS

(i) Pressure gauge of appropriate range and 150 mm diameter size shall beprovided.

(ii) The pressure gauge shall be duly calibrated before installation and shall be complete with shut off valve.

**7.12** AIR VESSEL

Air vessel shall be provided on top of each riser and shall be fabricated out of 8 mm thick M.S. Sheet. The ends shall be dished. This shall be of 250 mm diameter, 1.2 m high and installed vertically on suitable legs. The legs shall be provided with M.S. Plate of size 75 mm x 75 mm x 5 mm at the bottom so that the legs do not puncture the roof. The legs shall be grouted in CC foundation. Flange connection shall be provided for connection with wet riser pipe. Air release valve and pressure gauge with shut off valve shall be provided. The air vessel shall be tested at 25 $kgf/cm^2$ pressure before installation.

**7.13** INSTALLATION

(i) The installation work shall be carried out in accordance with the detailed drawings prepared by the contractor and approved by the Engineer-in-charge.

(ii) In pipe above ground level, expansion loops or joints shall be provided to take care of expansion or contraction of pipes due to temperature changes.

(iii) Tee-off connections shall be through equal or reducing tees, otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.

(iv) Open ends of piping shall be blocked as soon as the pipe is installed to avoid entrance of foreign matter.

(v) Piping installation shall be supported on or suspended from structure adequately. The contractor shall provide, clamps, hangers etc. in accordance with Para 7.16.

Proper lines and levels shall be maintained while installing exposedpipes.

(vi) Pipe supports in pump house shall be floor mounted and of mild steel/ G. I. Spacing of pipe supports shall not be more than that specifiedbelow:

| Nominal Pipe Size (mm) | Spacing (m) |
|---|---|
| 20 and 25 | 2.00 |
| 32 to 125 | 2.50 |
| 150 and above | 3.00 |

Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stress on the pipes.

(vii) Anti-vibration pads, springs or liners of resilient and non-deteriorating material shall be provided at each support, so as to prevent transmission ofvibration through the supports.

(viii) Pipe sleeves of diameter larger than the pipe by least 50 mm shall be provided wherever pipes pass through walls and the annular spaces shall befilled with felt and finished with retaining rings.

(ix) (a) Vertical risers shall be parallel to walls and column lines and shall be straight and in plumb. Risers passing from floor to floor shall be supported ateach floor by clamps as per Para 7.16.

(b) The space in the floor cut outs around the pipe work shall be closed using cement concrete (1:2:4 mix) or steel sheet, from the fire safety considerations, taking care to see that a small annular space is left around the pipes to prevent transmission of vibration to the structure.

(c) Riser shall have suitable supports at the lowest point.

(x) Where mild steel pipes shall be buried under ground the same shall be treated in accordance with Para 7.5 before laying. The top of the pipes shall be not less than 1m below the ground level. Where this is not practicable, permission of the Engineer-in-charge shall be obtained for burying the pipesat lesser depth. Masonry or C.C.blocks shall be provided for supporting the pipes at interval in accordance with Para 7.11(vi). After the pipes have beenlaid, the trench shall be refilled with the excavated soil in layers of 20 cm and rammed and any extra soil shall be removed from the site of work by the contractor.

(xi) Underground pipe shall be laid at least 2m away from the face of the building preferably along the roads and foot paths. As far as possible laying of pipes under road, pavement and large open spaces shall be avoided. Pipes shall not be laid under buildings and where unavoidable, these shall be laid in masonry trenches with removable covers and cut-off valves shall be provided at points of entry and exit.

(xii) Pipe over ground shall be painted in red color as per Para 1.13. Suitable identification shall be provided to indicate the run of underground pipe wherever the route of underground pipe cannot be ascertained from the location of yard hydrant/isolating valves.

(xiii) It shall be made sure that proper noiseless circulation is achieved in the system. If proper circulation is not achieved due to air-bound connections, the contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above

rectification, including the tearing up and refinishing of floors, walls, etc. as required.

## 7.14 FLUSHING ARRANGEMENT

Flushing connections with isolation valves should be provided at suitable locations in the firewater ring main.

## 7.15 PRESSURE TESTING

(a) All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 10 kgf/sq.cm for a period not less than 24 hours. While Hydro Testing, inclusion of cut-off valves in the mains to be tested can be avoided. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-Charge.

(b) Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.

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

(d) Pressure gauges may be capped off during pressure testing of the installation.

## 7.16 PIPE SUPPORTS

For installing pipes vertically or horizontally inside the building standard pipesupports of reputed make shall be used. Following supports shall be used.

(i) Split pipe support clamps with rubber lining for vertical, horizontal and roofhanging.

(ii) Clevis Hangers for horizontal supports to adjust varying heights.

(iii) Sprinkler Hangers for horizontal supports for pipes from 15 mm dia to150mm dia.

Fastners and fully threaded rods shall be used for installing the pipe supports. The sizes of pipe supports and installation shall be in accordance with manufacturer's recommendations. Some of the typical supports are shown in the Figure-9.

For pipes of size 100 mm and above, with the prior approval of Engineer-in- Charge, 'U' clamp with dash fastener may be used for supporting horizontal pipe from ceiling.

## 7.17 MEASUREMENT

Measurements of plumbing work shall be on following basis:-

(a) Piping shall be measured along the centre line of installed pipes including allpipe fittings and accessories but excluding valves and other terms for which quantities are specifically indicated in the schedule of work. No separate payment shall be made for fittings and accessories.

(b) The rates for piping work shall include all wastage allowances, flanges pipe supports, hangers, excavation, refilling, testing, nuts and check nuts, vibration isolators, suspension where specified or required, and any other item required to complete the piping installation. None of these items will beseparately measured and paid.

## 8. FIREFIGHTING ACCESSORIES

### 8.1 SCOPE

This chapter covers landing valves, first aid hose reels, hose pipes, branch pipes etc., which are vital tools for firefighting.

### 8.2 LANDING VALVE

Landing valves are provided in the system for connection of hose pipes for discharging water for fighting fire by fire brigade or trained personnel.

**8.2.1** The landing valves shall be as per IS: 5290

**8.2.2** Material of construction

(i) Body, outlet and cap etc. : Bronze or Aluminum alloy or stainless steel

(ii) Spindle : Brass for Bronze body, stainless steel for Aluminum alloy and stainless steel body.

(iii) Hand wheel : Mild steel or cast iron.

**8.2.3** The water discharge shall be not less than 900 lpm for single head valves at 7kgf/cm$^2$ pressure.

**8.2.4** Installation

8.2.4.1 The landing valve shall be fitted to a T-connection of the riser at the landing in such a way that the valve is in the center of the internal hydrant opening and at a height of 900 mm from floor level.

8.2.4.2 The valve base shall be vertical and the valve facing outside. There should beno hindrance in operation of the handle.

### 8.3 FIRST AID HOSE REEL

First Aid Hose Reel is meant for delivering small quantity of water in earlystage of fire and can be operated even by untrained personnel, and thus provides a most effective firefighting facility. It shall consist of 20 mm (nominal internal) diameter hose tubing length wrapped around a reel with water inlet pipe, stop valve and shut-off nozzle. The entire assembly is mounted on a wall bracket and can swing 180 degrees. The water inlet shall be connected directlyto the riser/down-comer mains by means of 37 mm socket and valve. Thehose tube can be pulled out easily for the purpose of discharge of water on fire.

**8.3.1** First aid hose reel shall be as per IS-884. The coupling, branch pipe and nozzleshall be as per IS:8090.

**8.3.2** Material of Construction -

(i) Hub and sides : Aluminum Alloy / Mild steel / Aluminum sheets.

(ii) Wall Bracket : Cast iron / Mild steel.

(iii) Hose tube (20 mm) (nominal internal dia) :Thermoplastic (Textile Reinforced) Type-2 as per IS-12585

(iv) Nozzle with branch Pipe : Brass

(v) Stop Valve(Ball Valve) : Gun metal

Normally M S construction is used. Other material may be used in areashaving corrosive atmosphere.

**8.3.3** The water flow rate shall be not less than 24 lpm and the range of jet shall benot less than 6 m.

**8.3.4** lnstallation

8.3.4.1 First aid hose reels are installed with internal hydrant (Para 2.4.1.7.) space for which is provided as per Para 3.2.4. Where space is not provided, first aid hose reel shall be installed in suitable size MS cabinet made from 2 mm thick sheet with glass door. The cabinet shall be painted red as per Para 1.13. The size of the cabinet shall be such that there is no obstruction in swinging the hose reel. The location of cabinet shall be such that it does not form an obstruction in passage/escape route.

8.3.4.2 The length of hose tube shall be such that the nozzle of the hose can be taken into every room and within a range of 6 m from any part of theroom.

8.3.4.3 There shall be no obstruction in swinging the hose reel and should be installed above landing valve where provided.

8.3.4.4 The inlet valve shall be at 900 mm above floor level.

8.3.4.5 Hose reel bracket should be firmly grouted on the wall with the help of rawl bolts.

**8.4** FIRE HOSE DELIVERY COUPLING, BRANCH PIPE AND NOZZLES:-

8.4.1 These are important accessories used for firefighting operations.

8.4.2 Material of Construction

8.4.2.1 Copper Alloy

8.4.2.2 Aluminum alloy

8.4.2.3 Stainless Steel

8.4.3 Delivery Hose Couplings

8.4.3.1 The delivery hose couplings consist of male half coupling and female half coupling. Grooves are provided on outer side on both coupling for binding hose pipes with wires. In female coupling spring loaded cam tooth is provided for holding male half coupling in position. Male half coupling and female half coupling are provided on both sides (i.e. on

one side male and on other side female) of hose pipes. Two or more pipes can be joined together with the helpof these couplings instantaneously.

8.4.3.2 **Sizes**:- These are available in two sizes i.e. 63 mm and 70 mm. Normally size 63mm is used.

8.4.4 **Branch Pipe and Nozzle** :- Branch Pipes with nozzle are mounted at the end ofhose pipe. Branch pipe is properly finished and free from sharp edges. During operation, a fireman has to hold the branch pipe. One end of branch pipe is fixed with hose coupling and the other end is threaded to fit the nozzle.
Nozzle is tapered pipe with one end threaded internally which is fixed on branchpipe. The size of other end i.e. nozzle shall be 20 mm (nominal internal diameter).

Spare Branch pipes and nozzles to the extent of 10 percent of the above requirements, with a minimum of two sets, shall always be kept readily available in fire control room/pump room.

## **8.5** FIRE SERVICE INLET AND FIRE SERVICE CONNECTION

8.5.1 These are provided for connection of fire service hose pipes for either directly pressurizing the system with their pumps or filling water in the tank from a distance. In the first case non-return valve with butterfly valve shall be provided for holding water pressure. Fire service inlet shall be provided with each wet riser/down comer and the ring main. The arrangement has been shown in Fig.5. These are fixed to 150 mm diameter pipe and located in MS Box made of2 mm thick mild steel sheet with openable glass cover.

8.5.2 These shall be as per IS: 904.

8.5.3 Material of Construction

8.5.3.1 Copper Alloy

8.5.3.2 Aluminum Alloy

## **8.6** HOSE PIPES

8.6.1 Hose pipes shall be rubber lined woven jacketed and 63 mm in diameter. They shall conform to Type A ( Re-inforced rubber lined ) of IS: 636. They shall be flexible and capable of being rolled. Length of hose pipe will be 15 m.

8.6.2 The hose pipe shall be complete with male and female coupling at the ends as per Para 8.4.3.

Besides keeping hose pipe with internal hydrant and yard hydrant, spare hose pipes to the extent of 10 percent of the above requirements, with a minimum quantity of 30 m shall always be kept readily available in fire control room/pump room. Such spare hose shall be in 15 m lengths, readily attached to couplings.

# **9. AUTOMATIC SPRINKLER SYSTEM**

## **9.1** SCOPE

This chapter covers the general requirement of selection, design, installation, testing, commissioning and maintenance of automatic sprinkler system for firefighting in buildings used for other than industrial, storage purpose, hotels and mercantile buildings.

9.1.1 **References**: For additional information regarding definitions, planning, design, hydraulic calculations, tables etc. following documents are to be referred to:

(i) IS: 15105: - Design and Installation and Maintenance of FixedAutomatic Sprinkler Fire Extinguishing Systems- Code of Practice (First Revision).

(ii) IS: 9972: - Specification for Automatic Sprinkler Heads for Fire Protection Service (First Revision).

## **9.2** INTRODUCTION

Firefighting installations described in Para 2.2.1 (i) to (iii) are to be operated manually. Delay in undertaking manual operation due to late detection and or response, may result in spread of fire. In automatic sprinkler system, sprinkler heads are provided throughout the areas to be protected at specified locations such as roof or ceiling, walls, between racks, below obstructions and fitted with water supply lines permanently charged with water under specified pressure. The sprinklers operate at pre-determined temperature to discharge water over the affected area below and provide anadequate distribution of water to control or extinguish fire. Only those sprinklers which are in the vicinity of fire that is those become sufficiently heated operate. Operation of sprinkler results in flow of water which initiatesfire alarm. Thus sprinklers perform two functions i.e. first to detect fire and then to provide an adequate distribution of water to control or extinguish it. Water distribution from ceiling level, cools down the hot gas which forms beneath the ceiling of enclosure in which fire is developing. This will prevent spread of fire to adjoining areas and contain damage to limited area.

It should not be assumed that the provision of sprinkler system entirely obviates the need for other means of fighting fire and it is important to consider the fire precaution in the premises as awhole.

The system shall be installed only where there is no danger of freezing of water in the pipes at any time.

Typical layouts of sprinklers have been shown in Figure 11.

## **9.3** CLASSIFICATION OF OCCUPANCIES AND PROVISION OF AUTOMATIC SPRINKLER FIRE SYSTEM

Sprinklers are provided in industrial and non-industrial buildings. The design of sprinkler installation depends upon type of occupancy. For the purpose of designing and installation of automatic sprinkler system, buildings are categorized under the following classes in IS: 15105.

(a) Light hazard class

(b) Moderate/Ordinary hazard class

(c) High hazard class

(d) Storage hazards

For details of classifications, IS: 15105 is to be referred. Light Hazard Occupancies shall be understood as those with low fire loads and with materials within having low rates of heat release. Light Hazard Occupancies are of non-industrial type subject to the condition that "No single compartment greater than 210 $m^2$ are allowable within light hazard occupancies and such compartments shall be fire separated by walls having 30 min rating and doors. Otherwise the sprinkler system shall be designed as per Ordinary Hazard

Occupancy."

Office buildings (excluding store rooms), education institutions, hospitals (excluding kitchens, stores, utilities), libraries, museums, nursing homes, prisons and residential apartments are classified under light hazard occupancies.

Airport terminal buildings, car parking areas within building or basement, departmental stores/retail shops are classified under ordinary hazard class.

In order to satisfy above conditions, all buildings classified under Light Hazard shall be designed under Ordinary Hazard class. Accordingly these specifications cover Ordinary Hazard class only.

## **9.4** PLANNING

9.4.1 Automatic sprinklers shall be installed wherever required in terms of Table 7 of Part-4, Vol-1 of NBC 2016 (amended up to date). These requirements for installation of automatic sprinkler system have been reproduced in Appendix-A.
Automatic Sprinklers shall also be installed in false ceiling voids exceeding 800 mm in height.

Ramps at all levels shall also be protected with sprinklers

Pressure in the sprinkler installation piping shall not exceed 7 bar and pressure at the most remote sprinkler at any level shall not be less than 0.5 bar and also not more than 5 bar.

Extent of Sprinkler Protection: -

Sprinklers shall be provided, but for following exceptions:

(a) Areas, rooms or places where the water discharged from a sprinkler may pose a fire or explosion or toxic hazard. In such areas alternative arrangement shall be made.

(b) Stairs, spaces below stair headings (but not rooms above a stair) and lift wells. Any part of the building not provided with sprinkler protection shall be fire separated by walls. Fire doors not less than 1 hour in fire resistance shall be provided in the opening of such walls.

(c) Wash rooms, toilets and WCs (but not cloak rooms) of area less than $5m^2$. If area of these rooms exceed $5m^2$, these shall be provided with sprinkler protection unless fire separated by walls and all openings in the walls are protected.

(d) Sprinklers shall not be required in electrical equipment rooms where all ofthe following conditions are met:

i) The room is dedicated to electrical equipment only.

ii) Only dry-type electrical equipment is used.

iii) Equipment is installed in a 120 minutes fire-rated enclosure including protection for penetration in walls.

iv) Cable coating is done in trays or trenches to prevent flame spread.

v) Storage is not permitted in the room.

In addition, for firefighting provisions to be provided for Substation/Transformers, Electrical MV main distribution panel and lift panel*Clause 3.4.6.3 and 3.4.6.4, Page-22-23 of NBC 2016, Vol-1, Part-4 may be referred to.* (*see* Appendix-G)

(e) Rooms like server room or electrical control room where alternate protection by other automatic extinguishing systems, (for example gas, powder and water spray).

(f) In areas having height 17 m or above such as in atria, sprinkler installations may be rendered ineffective and hence may be avoided.

9.4.2 The area to be protected by sprinkler is divided in to various zones. For detecting

operation of sprinkler in a zone, flow switches are provided which are wired to an annunciation panel installed in the Fire Control Room. In the event of operation of sprinkler(s) in an affected area. The annunciation panel will give audio-visual alarm and indicate the affected zone. This arrangement will be independent of fire alarm system.

9.4.3 Design, Density and Assumed Maximum Area of Operation (AMAO):- This is different for different hazards classified in Para 9.3. For moderate hazard, water discharge shall be at least 5 litre/min/$m^2$ over an assumed area of operation covering 360 $m^2$.

9.4.4 Sprinkler Spacing, Arrangement, Distribution and Locations:- Sprinkler heads may be installed on ceiling and or side walls. For selection of number of sprinkler and their location in a given area, following factors shall be considered:

(i) Maximum Area Coverage per Sprinkler

(a) Ceiling sprinkler — 12 $m^2$

(b) Side wall sprinkler :

- Combustible ceiling — 7.5 $m^2$
- Non-Combustible ceiling — 9 $m^2$

(ii) Maximum Distance between Sprinklers

(a) Ceiling sprinkler — 3.5 m

(b) Side wall sprinkler

- Combustible ceiling — 2.7 m
- Non-combustible ceiling — 3 m

(iii) Minimum Distance between Sprinklers — 1.8 m
(for Ceiling as well as Sidewall sprinklers)
Note: In case of intermediate ceiling suspended sprinklers, protecting commodities in racks, distance lower than 1.8 m may be considered if necessary.

(iv) Maximum distance of sprinklers end walls : (for ceiling & sidewall sprinklers) — it shall not exceed from half of the allowable distance between sprinklers
Note: For ceiling sprinklers:

a) where the external walls are combustible or built with metallic or otherwise or open sided; and in case of open joisted ceilings or where the roof has the rafters exposed, the distance between the boundary and the sprinklers shall not exceed 1.5 m.

b) Distance shall be measured perpendicular to the wall.

(v) Sprinklers shall not be located at a distance less than 100 mm from the wall (for ceiling sprinklers).
Sprinklers shall not be located at a distance less than 100 mm from the end wall (for sidewall sprinklers)

While designing sprinklers installation, the recommendation of sprinkler manufacturer shall be considered. Typical layout of side wall sprinklers has been shown in Figure 14.

9.4.5 **Spacing below Sprinkler Heads**: - Clear minimum space of 0.5 m shall be maintained below the deflector of sprinkler head.

**9.4.6 Ceiling Sprinkler deflector location and orientation in relation to buildingstructure**:

**9.4.7** ***9.4.7.1 Roofs and ceilings*:**

For conventional and spray type of sprinklers, the sprinklers shall be installed in such a way that the deflectors are at distances below ceilings as shown in Table9.1.

**Table 9.1 Sprinkler Location Below Ceilings**
[Clause 9.4.7.1]

| S. No. | Type of ceiling | Distance below ceilings (in mm) | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Preferred |
| (1) | (2) | (3) | (4) | (5) |
| i) | Combustible, asbestos cement sheets,wired glass and other types of frangible | 75 | 300 | 150 |
| ii) | Combustible with exposed rafters and/or open joists | 75 | 150 | - |
| iii) | Non combustible - either plane or arched or sloping | 75 | 450 | 300 |

**9.4.8 Sidewall Sprinkler Deflector Location and Orientation in relation to building structure:**

i) Distance between sprinklers and the ceiling shall not exceed 150 mm. If specifically approved for use and listed so, the distances between ceilings and the sprinklers can be increased up to 450 mm.

ii) Vertical side wall sprinkler deflectors shall be located not more than 150 mm or less than 100 mm from the wall from which they are projecting.

iii) Sprinklers shall be so located to minimize obstructions (to discharge) either on parallel or perpendicular sides thereof. If required, additional sprinklers shall be provided to obviate the obstructions.

iv) **Sidewall Sprinkler Obstruction:** Sprinklers shall be located at least 1.2 m away from any lighting, fan and similar fixtures either in front of or on the same wall where the sprinklers are mounted. For any obstruction (to discharge) including lighting, fan and the like beyond 1.2 m, distances A and B (as indicated in Fig.
9.2 and 9.3) shall be maintained as per the Tables 9.2 and 9.3 given below. In case these distances can not be maintained, the sprinkler shall not be allowed at such location. (*See* Fig. 9.2 and 9.3).

v) Clearance between the top of storage if any to the deflector shall not be less than450 mm.

vi) Side wall sprinklers in rooms shall neither be installed above the grills of air conditioner nor within 450 mm thereof on the same wall.

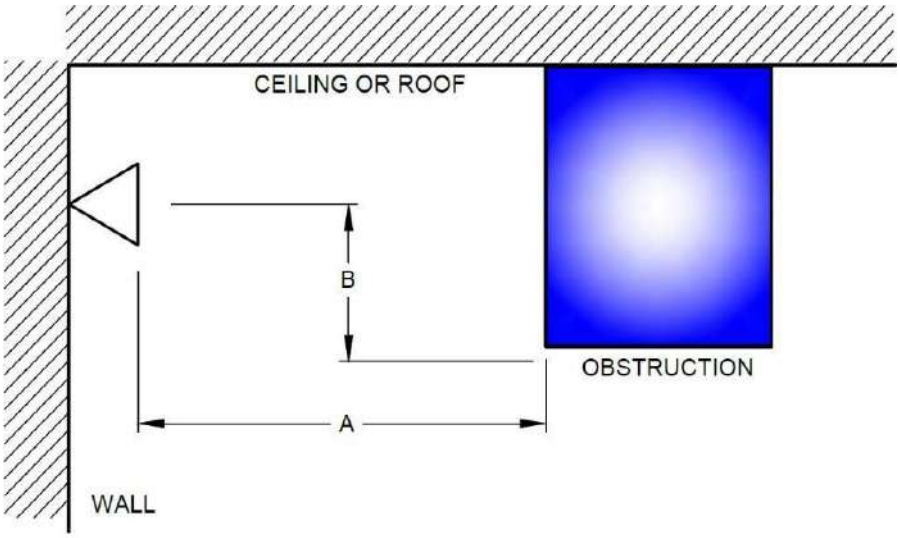
**Table 9.2 Sidewall Sprinkler Location in Relation to Obstructions**
(lighting, fan and similar fixtures) **-Facing across the wall** (*see* Fig. 9.2)(*Clause* 9.4.8 iv)

| **S. No.** | **Distance (A) between Sprinklersand the Obstruction on Side (mm)** | **Maximum allowable Distance (B) between Deflector above bottom of Obstruction when Sprinkler can be allowed** |
|---|---|---|
| | | **(mm)** |
| (1) | (2) | (3) |
| a) | Up to 1200 | Not allowed |
| b) | More than 1200 but less than 1500 | 25 |

| | | |
|---|---|---|
| c) | More than 1500 but less than 1650 | 50 |
| d) | More than 1650 but less than 1800 | 80 |
| e) | More than 1800 but less than 1950 | 100 |
| f) | More than 1950 but less than 2100 | 150 |
| g) | More than 2100 but less than 2250 | 180 |
| h) | More than 2250 but less than 2400 | 230 |
| i) | More than 2400 but less than 2550 | 280 |
| j) | More than 2550 | 350 |

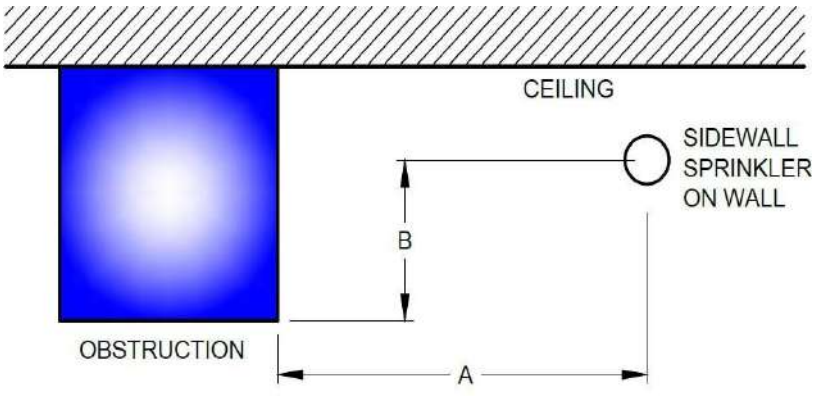
**Table 9.3 Sidewall Sprinkler Location in Relation to Obstructions** (lighting, fanand similar fixtures)-**Along the same wall** (*see* Fig. 9.3) (*Clause* 9.4.8 iv)

| **S. No.** | **Distance (A) Between Sprinklersand the Obstruction on Side (mm)** | **Maximum allowable Distance (B) between Deflector above bottom of Obstruction when Sprinkler can be allowed (mm)** |
|---|---|---|
| (1) | (2) | (3) |
| a) | 100 to 150 | 25 |
| b) | More than 150 but less than 300 | 50 |
| c) | More than 300 but less than 450 | 80 |
| d) | More than 450 but less than 600 | 115 |
| e) | More than 600 but less than 750 | 150 |
| f) | More than 750 but less than 900 | 180 |
| g) | More than 900 but less than 1050 | 200 |
| h) | More than 1050 but less than 1200 | 230 |
| i) | More than 1200 but less than 1350 | 250 |
| j) | More than 1350 but less than 1500 | 300 |
| k) | More than 1500 but less than 1650 | 330 |
| l) | More than 1650 but less than 1800 | 350 |
| m) | More than 1800 but less than 1950 | 380 |
| n) | More than 1950 but less than 2100 | 430 |
| o) | More than 2100 but less than 2250 | 450 |




ELEVATION VIEW

Fig.9.2SIDEWALLSPRINKLERFACINGOBSTRUCTION




ELEVATION VIEW

v) Horizontal sidewall sprinkler shall be located not more than 100 mm and are allowed to be

located with their deflectors less than 100 mm from the wall on which they are mounted.

vi) Deflectors of the sprinklers shall be aligned parallel to the ceilings or roofs.

vii) When installed under a sloped ceiling (1 in 6), sidewall sprinklers shall be located at the high point of slope and positioned so as to discharge down the slope.

viii) Where verticle side of a beam/projection from a wall is used for installing a sidewall sprinkler, additional sprinklers shall be installed below the soffit if the width of beam or projection from the wall exceeds 200 mm.

ix) When soffits used are within 200 mm in width or projection from the wall, additional sprinklers shall not be required subject to the deflector of the sprinklers falling within prescribed distance as contained in 9.4.8 (ii), (vi) & (vii) above.

9.4.9 Concealed Spaces:-

9.4.9.1 If the height of the concealed space at roof and floor is not greater than 0.8m, the spaces shall be sprinkler protected only if they contain combustible materials or are constructed with combustible materials. Electrical cables with voltage less than 250 V, single phase, with a maximum of 15 cables per tray, are allowed.

9.4.9.2 Spaces between roofs and ceiling more than 0.8 m deep shall be sprinkler protected as follows:-

(i) Concealed spaces less than $5m^2$ in area shall not require sprinkler protection.

(ii) Sprinkler heads shall be provided considering the space as any other area in the building.

(iii) Sprinkler heads may be connected individually with the range/distribution pipes below, which shall be sized by taking the room and concealed space sprinklers cumulatively.

(iv) Sprinkler heads for concealed space and for the room may be connected with separate range/distribution pipes connected, with common feed pipe. The common feed pipes shall be not less than 65 mm diameter.

9.4.10 **Obstruction below Sprinklers:-** Sprinklers shall be fitted under the following types of obstruction which are either:

(a) more than 0.8 m wide and less than 150 mm from the adjacent walls or partitions

OR

(b) more than 1 m wide.

9.4.11 **Pipe Sizing and Design: -** Sprinkler heads located as per Para 9.4.5 to 9.4.10 shall be connected with pipe lines permanently charged with water. Depending upon location of sprinkler heads and site conditions, sprinkler heads may be connected with range and distribution pipes. A number of options have been indicated in Figure-12.

The pipes connecting the sprinkler heads are to be sized depending upon number of sprinkler heads and arrangement of their connection. Main elements of a sprinkler installation are shown in Figure-11. Various pipes connecting the sprinkler heads are termed as below:

(a) Range Pipe
(b) Distribution Pipe
(c) Main Distribution Pipe
(d) Riser

Sizes of pipes are to be calculated from various tables and hydraulic calculations given in IS: 15105.

Pipe sizes shall be determined using one of the following methods:

a) **Pre-calculated system:** applicable only where light and ordinary occupancies where the aggregate floor plate area (in one or more floors combined) is 5000 $m^2$ or less (except where gridded or looped layouts areused).
Pre-calculated pipework is applicable only to the extensions of old pre- calculated systems.

b) **Fully calculated system**: applicable for
   i) Light and ordinary occupancies where the aggregate floor plate area (inone or more floors combined) exceeds 5000 $m^2$.
   ii) High hazard occupancies,
   iii) Storage occupancies, and
   iv) All occupancies where conventional and special sprinklers are used likeESFR, LD, EC, intermediate, etc.

Some guidelines relating to pre-calculated system are givenbelow:

a) Pipe less than 25 mm diameter is not to be used.
b) There shall not be more than 6(Six) sprinklers in any range.
c) Range and distribution pipe nominal sizes shall be selected from Table 9.4 and Table 9.5 respectively.

TABLE 9.4
**RANGE PIPE NOMINAL SIZES FOR VARIOUS PIPE LAYOUTS IN MODERATE/ORDINARY HAZARD INSTALLATIONS**

| | **Range Pipe Layout** | **Pipe Nominal Bore (mm)** | **Maximum Number of Sprinklers to be fed by Pipe of size listed** |
|---|---|---|---|
| | (1) | (2) | (3) |
| (a) | (1) Range(s) at remote end of each distribution pipe spur in end feed layout: | | |
| | (i) Last two ranges in two end-side layout | 25 | 1 |
| | | 32 | 2 |
| | (ii) Last three ranges in three end-side layout | 25 | 2 |
| | | 32 | 3 |
| | (2) Last range in all other layouts. | 25 | 2 |
| | | 32 | 3 |
| | | 40 | 4 |
| (b) | All other ranges in case of1(i), 1(ii) & (2) above | 25 | 3 |
| | | 32 | 4 |
| | | 40 | 6 |

TABLE 9.5

**DISTRIBUTION PIPE NOMINAL SIZE IN MODERATE/ORDINARY HAZARDINSTALLATIONS AND MAXIMUM NUMBER OF SPRINKLERS**

| **Distribution Pipes** | **Type of Layout** | **Distribution Pipe Nominal (mm)** | **Maximum Number of Sprinklers to be fed by Pipe size listed** |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| (a) At extremitiesof the Installation | Two end side layouts | 32 | 2 |
| | | 40 | 4 |
| | | 50 | 8 |
| | | 65 | 16 |
| (b) Last three ranges | All other layouts | 32 | 3 |
| | | 40 | 6 |
| | | 50 | 9 |
| | | 65 | 18 |
| (c) Between design points and the Installation Control Valve | All | To be calculated as per **10.4.4** (b) of IS15105 | |

Typical pipe sizes for sprinkler installation have been shown in Figure-13.

9.4.12 **Components of sprinkler system**:- Following types of valves are used in theinstallations:

(a) Stop Valves
(b) Test Valves
(c) Drain Valves
(d) Flushing Valves
(e) Check Valves
(f) Installation Control Valves
(g) Pre action valves
(h) Subsidiary valves

The location of above valves shall be as under:

9.4.12.1 **Test Valve**. - For testing hydraulic alarm or electric alarm by drawing water from downstream side, test valve shall be connected with downstream of the water flow alarm.

9.4.12.2 **Drain Valve:** - For drainage of system, drain valve 50 mm diameter shall be provided

down stream of Installation Control Valve or any subsidiary stop valve.
A common valve can perform the functions of test and drain. The outlet shall be connected with a 50 mm diameter G.I. drain pipe along with riser pipes as shown in figure No. 3 and 4.

9.4.12.3 **Flushing Valve:-** If the water used for sprinkler is not potable, flushing valves shall be provided at the end of a distribution pipe. The valve size shall be same as distribution pipe. Valve outlet shall be fitted with a brass plug and extended to not more than 3 m above floor.

9.4.12.4 **Check Valve:-** Check valve shall be provided where more than one water supply is available and same shall be fitted on each water supply pipe.

9.4.12.5 **Subsidiary Stop Valve:-** Subsidiary stop valve which shall be of the same diameter as the pipe line in which they are fitted shall be provided to control water supply to sprinklers of highly sensitive areas like computer rooms.

9.4.12.6 Installation Control Valve (ICV)**: -** A sprinkler installation shall be fitted with a suitable Installation Control Valve to control the water supply to the installation. The valve set shall comprise of:

(a) a main stop valve.
(b) an alarm valve.
(c) a water motor alarm.

The alarm valve shall be fitted immediately downstream of the main stop valve of each building/block and before any connection is taken off to supply any part of the installation.

The Installation Control Valve shall be placed externally in the vicinity of the main entrance of the building protected at an easily accessible place so that the alarm bell sound is heard by the inhabitants/passer-by. The valve shall be secured open by a pad locked or rivetted strap and protected against impact damage.

If there are genuine constraints in locating the Installation Control Valve outside the buildings, this may be located inside the building in the vicinity of main entrance (subject to approval of authorities concerned). Installation Control Valve in such cases, shall be located away from any exposure to damage and personnel shall be normally available in the vicinity of the location to get alerted by alarm operation. Also, electrically operated sirens interfaced with the opening of the alarm valve of ICV, shall be provided outside the building. In no case, Installation Control Valve shall be provided inside basement or inside pump room.

A plan of the risk with the position of Installation Control Valve shall be placed in a conspicuous location. A location plate shall be fixed near the Installation Control Valve bearing the following words in raised letters:

| **SPRINKLER ALARM** |
|---|

9.4.12.7 **Water motor alarm**: Water motor alarm shall be provided very close to the alarm valve. Strainer shall be fitted between the alarm valve and the motor nozzle connection. The water outlet shall be positioned so that any flow of water can be seen. The

alarm device shall provide audibility level of 85 dB above the back ground noise IeveI.

9.4.12.8 **Pressure Gauges:** - Pressure gauges shall be provided immediately aboveand below each alarm valve.

Stop cock shall be provided before pressure gauges for removal without interruption of water supply of the installation. Pressure gauges shall be as per IS: 3624.

**9.5** SPRINKLERS TYPE

Sprinklers shall be as per IS: 9972 and following types:

*9.5.1* According to type of discharge *(Refer Figure - 15):*

a) Conventional pattern
b) Spray pattern
c) Side wall pattern

9.5.2 According to mounting pattern:

a) Pendent sprinkler
b) Up right sprinkler
c) Horizontal sprinkler

9.5.3 Ceiling sprinkler According to Release Mechanism:

a) Fusible element sprinkler
b) Glass bulb sprinkler

9.5.4 According to Orifice Size:

a) 10 mm
b) 15 mm
c) 20 mm
d) 25 mm

9.5.5 According to Temperature Rating:

Sprinkler shall have one of the following temperature rating and shall becorrespondingly color coded:

(a) Fusible Link Type

| Temp. Rating °C | Color Code |
|---|---|
| 68/74 | Natural |
| 93/100 | White |
| 141 | Blue |
| 182 | Yellow |
| 227 | Red |

(b)

| Glass Bulb Type Temp. Rating | Color of bulb Liquid |
|---|---|
| 57 | Orange |
| 68 | Red |
| 79 | Yellow |
| 93 | Green |
| 141 | Blue |
| 182 | Mauve |
| 204/260 | Black |

**9.6** SELECTION OF TEMPERATURE RATING

Temperature rating of a sprinkler should not be less than 30° C more than the highest anticipated temperature of the location of installation. Under glazed roofs or where there are roof sheets of PVC or similar plastic material, sprinkler shall be rated 73° C to 100°C.

**9.7** SELECTION OF ORIFICE SIZE

In moderate hazard applications, sprinklers of orifice size 15 mm shall be used.

**Table-9.6 Types of sprinkler**

| S. No. | HAZARD CLASS | SPRINKLER PATTERN | NOMINAL ORIFICE NOT LESS THAN MM |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | Light | Standard, Spray, Flush, Sidewall types | 10-15 |
| ii) | Ordinary | All except sidewall types | 15 |
| iii) | High | Standard, spray pattern only | 15-25 |
| iv) | Storage | Standard, spray pattern only | 15-25 |

**9.8** SIZE OF INSTALLATIONS

The protected floor area to be controlled by any one Installation Control Valve shall not exceed 12000 $m^2$.

As far as possible one area shall be controlled by one Installation Control Valve. If the area is quite large, more than one Installation Control Valve should be planned. Details of area controlled by an Installation Control valve shall be exhibited near it.

If there are more than one block in a campus, each block shall be providedwith different Installation Control valve.

**9.9** PROTECTION OF SPRINKLERS

Any sprinkler installed in a position of risk or accidental damage shall be fitted with a metal guard suitable for sprinkler service.

**9.10** WATER SUPPLY ARRANGEMENT FOR SPRINKLER

9.10.1 Pump- Details of pumps to be installed for sprinkler installation are given in Appendix-A. For large installations, separate jockey pump shall be provided for sprinkler system. All pumps shall have common discharge header. If two electrical pumps are to be provided one non-return valve shall be provided in the header such that sprinkler pump will not feed other system.

9.10.2 Water Storage Tank- The water storage tank shall be combined for other firefighting system and sprinkler installation and the capacity shall be as given in Appendix 'A'.

**9.11** SPRINKLER ANNUNCIATION PANEL AND ALARM

Electrically operated alarm shall be provided for indication of operation of sprinkler in an area. Water flow switches shall be installed in main distribution pipes which shall be wired to sprinkler annunciation panel. In the event of operation of a sprinkler, the flow switch will operate and give signal to the annunciation panel to indicate operation of sprinkler in the area. This will initiate an electrically operated alarm. The system shall be independent of fire alarm system and compatible with BMS. Necessary potential free contacts for use in BMS should be provided.

9.11.1 Construction Details

(i) The Panel shall be fabricated out of not less than 2 mm thick MS sheet and powder coated after 7 tank treatment process and shall be totally enclosed dust damp and vermin proof. Suitable knockout shall be provided for the entry of cables. The panel shall be designed such that the equipment for power supply, battery charging are housed in independent compartments. Sealed maintenance free batteries shall also be accommodated inside the panel.

(ii) Indicating lamps control switches, buttons and fuses shall be suitably located in the front and properly labeled.

(iii) The indicating lamps shall be LED type of following colors. The flow switch operation conditions shall be indicated by twin lamps.

(a) Red to indicate flow switch operation.

(b) Amber to indicate fault condition.

(c) Green to indicate healthy condition.

(iv) The test buttons to test the indication lamps shall be provided.

(v) The panel control shall be microprocessor type.

(vi) The primary function of the panel shall be to respond automatically to theoperation of one or more flow switches to give alarm and to indicate area/areas where the device has activated. The operation of one or more flow switches shall result in simultaneous alarm given by the following:-

(a) External alarm hooter(s) (provided outside the building to be protected).

(b) A visible indication on panel.

(c) Audible alarm on panel itself (common for all zones)

(vii) The panel shall indicate the fault within the system and immediate faultwarning shall be given by an audible and visible signal on the panel in case of open circuit, short circuit and earth fault in cable between flowswitch and annunciation panel.

(viii) The panel shall be complete with mimic diagram for the areas covered by different flow switches. The layout of mimic diagram shall be got approved from Engineer-in-Charge.

(ix) Battery backup with trickle cum boost charger shall be provided for operation of the system. Indication of mains failure and the state of charge of the batteries shall be provided. The batteries shall be sealed maintenance free. The capacity of the battery shall be 12 Volt, 2 Nos. 24Ah each. All standard accessories shall be provided.

**9.12** INSTALLATION

The installation shall be carried out as per Chapter 7 and 11. Followingadditional points are to be taken care for sprinkler installations:

9.12.1 For fixing sprinkler heads, 15 mm diameter M.S. Socket is to be welded to range pipes at the locations as per drawings. Dead plug shall be fixed in the socket.

9.12.2 If sprinkler head is to be provided away from range pipe, M.S. Pipe nipple of suitable size be used to extend the sprinkler head and socket is welded at desired location.

9.12.3 After completion of work in sections, pressure testing at 7.5 kgf/cm$^2$ pressure shall be carried out for 24 hrs.

9.12.4 After completion of the entire work, pressure testing of entire pipe work shallbe carried out for 24 hrs. at a pressure of 7.5 kgf/cm$^2$. The drop of pressure up to 0.5 kgf/cm$^2$ shall be accepted.

9.12.5 The lines shall be flushed before completion of building work so that any foreign matter which might have entered the system is taken out. The pressurization pump (Jockey Pump) be operated and valves opened at different locations.

9.12.6 During occupation of the building, sprinkler heads shall be provided in place of dead plugs. Teflon tape shall be used on threaded portion. The sprinkler heads shall be properly tightened in the socket.

9.12.7 When all sprinklers heads are installed, pressure is built up in the system by pressurization pump slowly and in case no leak is found, desired pressure is developed and maintained. In case any leak is detected, the same shall be attended before pressurizing the system further.

**9.13** COMMISSIONING

As soon as the work is complete, the system shall be commissioned andmade available for use in accordance with Para 11.6.

**9.14** Spare Sprinklers to be Kept in Stock :

A stock of spare sprinklers shall be maintained in the premises so that prompt replacement

is possible after the operation/damage of sprinkler heads. The spares shall be kept in an easily accessible location under conditions where the temperature does not exceed 38°C.

The guidelines as in Table 9.7 shall be followed in respect of stocking spare sprinkler heads.

Spanners or wrenches for the sprinklers shall also be kept along with the spare sprinklers in readiness.

**Table 9.7**

| Guidelines for stocking spare sprinkler | | | |
|---|---|---|---|
| S. No. | HAZARD CLASS | All state capitals and within 200Km thereof | Other locations |
| (1) | (2) | (3) | (4) |
| i) | Light | 5 sprinklers of each type | 15 |
| ii) | Moderate/Ordinary | 15 sprinklers of each type | 25 |
| iii) | High & storage | 30 sprinklers of each type | 50 |
| Note- When there is more than one installation within a complex, the above quantity shall also be increased in proportion. Each type of sprinkler used in the installation such as conventional or spray or ceiling/flush or sidewall sprinklers and appropriate temperatures shall be stocked as per the above requirements. | | | |

## 10. ELECTRICAL WORK

### 10.1 SCOPE

This chapter covers the requirements for the electrical worms associated with firefighting installations, namely, motors, switch boards, power cabling, control wiring, earthing and remote control-cum-indicating panels.

### 10.2 GENERAL

(i) Unless otherwise specified in the tender specifications, all equipment and materials for electrical works shall be suitable for operations on 415 V / 240 V + 10% (3 phase/single phase), 50 Hz AC system.

(ii) All electrical works shall be carried out complying Central Electricity Authority (Measures Relating To Safety and Electric Supply) Regulations, 2010 and NEC 2011, as amended up to date.

(iii) All parts of electrical works shall be carried out as per appropriate CPWD General Specifications for Electrical works, namely, Part I (Internal) 2013, Part II (External) 1994 work, and Part IV (Sub-station)- 2013 all as amended up to date.

(iv) All materials and components used shall conform to the relevant IS specifications amended to date.

### 10.3 POWER SUPPLY

Power supply to following systems and equipment, where provided, shall be from normal and emergency (standby generator) power sources with changeover facility:

a) Fire pumps
b) Pressurization and smoke venting; including its ancillary systems such as dampers and actuators.
c) Terrace pump
d) Fireman's lifts (including all lifts).
e) Exit signage lighting.
f) Emergency lighting.
g) Fire alarm system.
h) Public address (PA) system (relating to emergency voice evacuation and annunciation).
i) Magnetic door hold open devices.
j) Lighting in fire command center and security room.

The generator shall be capable of taking starting current of all the fire and life safety systems and equipment as above. Where parallel HV/LV supply from a separate substation fed from different grid is provided with appropriate transformer for emergency, the provision of generator may be waived inconsultation with the Authority.

The electric supply to the pumping set(s) shall be entirely independent of all other equipment in the premises that is even when the power throughout the entire premises is switched off, the supply to the pump shall continue to be available un-interrupted. This can be achieved by taking the connection for the pump(s) from the incoming side of the main L.T. breaker. In case, where parallel HV/LV supply from a separate substation fed from different grid is provided with appropriate transformer for emergency connected to a

common bus bar, the connection may be taken through the bus bars.

The power supply to the panel/distribution board of these fire and life safety systems shall be through fire proof enclosures or circuit integrity cables or through alternate route in the adjoining fire compartment to ensure supply of power is reliable to these systems and equipment. It shall be ensured that the cabling from the adjoining fire compartment is protected within the compartment of vulnerability. The location of the panel/distribution board feeding the fire and life safety system shall be in fire safe zone ensuring supply of power to these systems.

Circuits of such emergency system shall be protected at origin by an automatic circuit breaker so set as to permit the motor to be overloaded during an emergency to the maximum limit permissible by the manufacturer. Further, the no volt coil/the under voltage release of that circuit breaker shall be removed. Master switches controlling essential service circuits shall be clearly labeled.

10.3.1 Independent supply shall be provided for water supply pumps if installed in the same pump house.

10.3.2 If the fire pump house is away from the sub-station building, the route of the cable shall not pass under the building or permanent structure. Cable shall be laid along the route which is safe from fire.

10.3.3 Sufficient spare power shall always be available to drive pumping sets at all times throughout theyear. Suitable capacity ACBs/SDFUs shall be provided inthe electrical panel for extending supplies to fire pumps. Such switches shall be suitably marked "FIRE SWITCH" and shall not be switched-off without permission/intimation to appropriate authority. In case any maintenance/repair work is to be carried out on the electrical panel where from supplies to fire pumps have been extended, alternative arrangement shall be made to ensure that power supply to fire pumps continue to be available for operation any time.

## **10.4** MOTORS

The motors shall be squirrel cage AC induction type. The motors shall be suitable for continuous duty and rating necessary to drive the pump at 150 percent of its rated discharge with at least 65 percent rated head. The motorshall be totally enclosed fan cooled type confirming to protection clause IP 21 of IS: 4691. The class of insulation shall be 'F'. The synchronous speed shall be 1500/3000 rpm as per requirement of the pump. The motor shall conform to IS:325.

## **10.5** MOTOR STARTER

(i) The motor starter shall conform to IS: 1822 "Motor starters of voltage not exceeding 1000 volts" and shall be air insulated and suitable for 415 V, $\pm$ 10%, 50 Hz, 3 phase AC supply and shall be integrated in the panel.

(ii) Starter for the motor shall be direct on line (D.O.L) for motors up to and including 7.5 H.P. rating and automatic star-delta type for motors of higher ratings unless otherwise specified in the tender specifications. However, for main Fire Pump & Sprinkler Pump Soft Starters may be used.

(iii) Each starter shall be provided with the following protections: -

(a) Thermal overload on all the three phases with adjustable settings,

(b) Independent single phase preventer. (Current sensing type).

(iv) Adequate number of extra NO/NC contacts for interlocks, indicating lamps, remote operation etc. shall be provided on the starter/ contactor.

(v) Under voltage/No volt trip shall not be provided.

## 10.6 SWITCH BOARDS

(i) The main switch board shall be floor mounted, free standing or wall mounted cubical type and shall be factory built fabricated by one of the approved switch board manufacturer. The board shall be fabricated from 2.0 mm thick CRCA sheet and powder coated after 7 tank treatment process. The board shall be fabricated with IP 42 degree of protection. It shall be suitable for terminationof the incoming cable(s) from bottom.

(ii) The capacity of switch gear shall be suitable for the requirements of motor fed/ controlled. Starting currents shall be duly considered.

(iii) Switch fuse units shall be used up to and including 32 A and SDFU shall be usedfor 63 A and above. ACB shall be used for 630 A and above ratings.

(iv) All Switch fuse units/SDFUs shall be of AC 23 duty as per IS: 4064-1978 as amended up to date. They shall be complete with suitable HRC cartridge type fuses.

(v) Switch boards shall house starters for motors with independent current sensing type single phase preventor for each starter.

(vi) Volt meter with selector switch, a set of indicating lamps and fuses for voltmeter and lamps shall be provided. Ammeter with CTs, and selector switch shall be provided with each motor starter. Instruments shall be flush mounted with the panel and have a class index not higher than 1.0. The instruments and accessories shall be provided whether or not specifically indicated in the tender specifications.

(vii) The fabrication of switchboard shall be taken up only after the drawings for the fabrication of the same are approved by the Engineer-in-charge.

(viii) Switchboards shall be fabricated as per specifications indicated in sub-para above.

(ix) The layout shall be designed for convenient connections and inter- connections with the various switchgear. Connections from individual compartments to cable alleys shall be such as not to shutdown healthy circuits in the event of maintenance work becoming necessary on a defective circuit.

(x) Care shall be taken to provide adequate clearances between phase bus bars aswell as between phase bus bars, neutral and earth.

(xi) Where terminations are done on the bus bars by drilling holes therein, extra cross section shall be provided for the bus bars. Alternatively, terminations may be made by clamping.

(xii) Provision shall be made for proper termination of cables at the switchboards such that there is no strain either on the cables, or on the terminators. Cables connected to the upper tiers shall be duly clamped within the switchboard.

(xiii) Identification labels shall be provided against each switchgear and startercompartment, using plastic/aluminum engraved labels.

(xiv) Metallic danger board conforming to relevant IS shall be fixed on each electrical switchboard.

## 10.7 SYSTEM CONTROLLER

For controlling operation of pumps as per Para 2.4.1.14 and indicating fault, system controller shall be provided. The system controller shall consist of relays, timer, contactors etc. and shall be designed to operate the fire pumps with interlocking and fault indication as described in Para 2.4.1.15. Annunciation window shall be provided to indicate following faults:

(i) Low water level in UG tank

(ii) Low water level in terrace tank.

(iii) Main pump failed to start.

(iv) Main pump failed during operation.

(v) Diesel pump failed to start.

(vi) Diesel pump failed during operation

(vii) Supply to Main Pump failed

(viii) Supply to Pressurization Pump failed

(ix) Supply to Terrace Pump failed.

Suitable sensors, differential pressure switches, monitors shall be provided at respective locations. The control system shall be operational on 12 Volt/24 Volt DC starting batteries of engine. Battery chargers shall be provided to ensure that the batteries remain charged. Batteries shall be sealed maintenance free type.

## **10.8** REMOTE INDICATING PANEL

(i) The remote indicating panel shall be provided in the fire control room. This panel shall have necessary status indication of all electric motors.

(ii) Back indication to show the status of operation of all the motors, pressure in the system, water level in underground and overhead tank etc. shall be provided.

(iii) Panel shall be fabricated from not less than 1.6 mm thick CRCA sheet and powder coated after 7 tank treatment process. The panel shall be dust, damp and vermin proof. This shall be of wall mounting type. This shall be complete with necessary termination arrangements, multicore cables, tag blocks, control transformer, designation plastic labels, double earth studsetc. as required.

## **10.9** POWER CABLING

(i) Unless otherwise specified, the power cables shall be XLPE insulated, PVC outer sheathed aluminum conductor, armoured cables 1100 V grade. The power cables shall be of 2 core for single phase, 4 core for sizes up to and including 25 sq.mm for 3 phase and 3-1/2 core for sizes higher than 25sq.mm for 3phase.
Alternatively, XLPE/PVC insulated copper cable (single core/multicore armoured/un-armoured) of grade 1100 V shall be used.

**For main power cable(s)** from LT Room to Fire Pumps Panel, if the cable(s) is taken in cable trench duly filled with sand & with proper distancing from other cables within the cable trench, or in fire rated shaft, then the cable(s)of above type be used. However, if the cable(s) is likely to be exposed to fire, then fire survival cable(s) shall be used.

(ii) Power cables shall be of sizes to meet the starting and running current of motors fed and shall be as approved by the Engineer-in-Charge, after taking into consideration the load, the length of cabling.

(iii) Cables shall be laid in suitable metallic trays suspended from ceiling, or mounted on walls. Cable ducts shall not be provided in pump rooms. Cable trays shall be of perforated steel sheet with adequate structural strength and rigidity. Necessary supports and suspenders for cable trays shall be provided by the contractor as required.

## **10.10** CONTROL WIRING

(i) Control wiring shall be done using ISI marked PVC insulated and PVC sheathed, 2.5 sq.mm, 250 V grade, armoured multi-core copper conductor cable. The control cable shall also be laid in the same manner as power cable.

(ii) The number and size of the control cables shall be such as to suit the control system design adopted by the contractor.

(iii) Runs of control wires within the-switchboard shall be neatly bunched and suitably supported/clamped. Means shall be provided for easy identification ofthe control wires.

(iv) Control wiring shall correspond to the circuitry/sequence of operations and interlocks approved by Engineer-in-Charge.

**10.11** EARTHING

(i) Provision of earth electrodes and the type of earthing shall be as specified in the tender specifications.

(ii) The earth work shall be carried out in conformity with CPWD Specifications for Electrical works (Part-I), Internal 2013.

(iii) Metallic body of all motors, medium voltage equipment and switch boards shall be connected by two separate and distinct earth conductors to the earth stations of the installations. Looping of such body earth conductors is acceptable from one equipment, or switch board to another.

(iv) The size of earth conductors for body earthing of equipment shall be 2 Nos. 6 mm dia copper wire/2 Nos. 25 x 3 mm G.I. strip

(v) Armoring of cables shall be connected to the body of the equipment/switch board at both the ends. Compression type glands shall be used for all such terminations in the case of PVC/XLPE cables.

**10.12** PAINTING

All panels shall be supplied with the manufacturer's standard finish paintingor as indicated in the Schedule of Work.

## 11. INSTALLATION, TESTING AND COMMISSIONING

**11.1** SCOPE

This chapter covers the requirement of Installation, testing and commissioning of firefighting system.

**11.2** PREPARATION AND APPROVAL OF DRAWING

On award of the work, the contractor has to prepare working drawings as per Para 1.17.2 and submit to the Engineer-in-charge for approval. The work is to be executed as per approved drawings. The stage of approval of drawings is therefore very important. All drawings should be carefully and critically examined before approval. The requirements of various components of firefighting system have been described in previous chapters dealing with the components. However, generally following points are to be taken care while examining and approving the drawings.

**11.2.1** Site survey should be carried out in detail.

**11.2.2** In addition to building plans, layout plan along with landscape plan/horticulture plan and other services plans should be consulted while deciding route of underground pipes from pump house and around the building.

**11.2.3** As far as possible, underground pipe are not to be laid under road, pavement, building and

long open spaces. The locations along road, foot path in earth may be preferred.

**11.2.4** The location of yard hydrants, fire service inlet and fire service connection are to be decided based on consideration of Para 2.4.1.8 to Para 2.4.1.10. However necessary adjustments are to be made so that these components do not become hindrance in vehicular movement and entrance to the building. Requirement of other building services are also to be given due consideration. Symmetry should be maintained for aesthetic considerations.

**11.2.5** Pipe sizes are to be decided in accordance with provision of Para 2.4.1.2 and4.5.4.

**11.2.6** **Pump House**:-The layout of equipment in pump house is very important fromoperation and maintenance considerations. The requirement of pumps and engine have been described in Chapter 5 and 6. In case other equipment i.e.

water supply pumps etc. are to be installed in the same pump house, sufficient space shall be left for them as well. The dimensioned foundation drawing of pumps should be available for marking in the pump room layout. The layout is to be prepared in such a way that it should be possible to maintain any equipment without disturbing the adjoining equipment. Electrical panels are to be installed at a location which is easily accessible near the entrance to the pump house and there should be no possibility of water dripping over or near the electrical panel. Typical layout of fire pump house is shown in Figure -10.

**11.2.7** **Terrace Pumps:-** The location of pumps and terrace pipe may be decided keeping in view location of terrace tanks for firefighting and other services. The pipe line should not cause undue hindrance for movement of maintenance personnel at the terrace.

**11.2.8** **Electrical Panel** :- Complete wiring drawing, layout etc. are to be examined to ensure that provisions of agreement are incorporated in the drawing. Sizes of various panel and mounting arrangement may be decided keeping in view ease of operation and aesthetic consideration as well.

**11.3** INSTALLATION:-

The requirements of installation of various components have been described in previous chapters. However, following precautions are to be taken during execution of the work.

**11.3.1** The pump and motor/engine are to be perfectly aligned on the base plate so that there is no vibration during operation. All nuts, bolts, washers shall be of adequate size and galvanized.

**11.3.2** The pipe supports should be decided in a way that the weight of pipes and valves are not transferred to the pumps and supports do not cause hindrance in movement inside the pump house. As far as possible, floor supports may be provided in pump house.

**11.3.3** All valves shall be installed at a height and in a position that their operation by right hand is conveniently possible.

**11.3.4** All pressure gauges should be installed so that the dial is vertical and is visible while entering the pump house.

**11.3.5** Electrical panels should not be installed at floor level. The panels shall be sufficiently raised above ground level. If panels are to be mounted on wall, an angle iron frame shall be provided so that at least 75 mm space is left behind the panels. The panels shall be easily approachable.

**11.3.6** Cable trays are to be used for laying of power and control cable inside pump house. No cable is to be laid at floor level/in trench. Cable tray layout should give neat appearance. All cable tray shall be adequately supported from the ceiling/floor.

**11.3.7** Drain pump shall be installed in the sump provided as per Para 3.2.2 (viii). The pump shall operate automatically for which water level sensor shall be provided.

**11.3.8** In no case any structural member i.e. RCC wall, column, beam and floor are to be damaged during installation. Mechanical fasteners are to be used for grouting support. U.G. tank wall is not to be used for any support. No pipe/cable is to cross the pump house below ground level. Openings above ground level are only to be used for this purpose.

**11.3.9** The engine installation work shall be carried out in accordance with the requirement of engine manufacturer and be got approved by the manufacturer or their authorized service center. The exhaust pipe shouldbe suitably extended outside the pump house so that smoke does not effect nearby structure. Fuel tank shall be properly supported and located in a way that the same does not cause hindrance in movement in the pump house.

**11.3.10** While excavating for laying of external pipes, suitable sign board/ barricading shall be provided to ensure that no person falls in the trench.

**11.3.11** The width and depth of trench shall be adequate for laying the pipe 1m below ground level.

**11.3.12** No earth or any other matter is to be allowed to enter the pipes. The ends shall be kept closed always.

**11.3.13** The anticorrosive treatment is to be applied on the entire length laid underground in accordance with Para 7.5. The treatment is not to be damaged.

**11.3.14** Pressure testing is to be carried out in sections before filling the earth back in the trench.

**11.3.15** The earth filling is to be done in layers of 20 cm each and properly rammed so as to avoid possibility of settlement. Surplus earth/ malba shall be removed from the site by the contractor.

**11.3.16** Where pipes crossing road likely to have heavy traffic, additional protection over pipe shall be provided to ensure that pipe is not damaged. However, semi-circular RCC Pipes shall be provided over cast iron pipes at road crossings.

**11.3.17** External hydrants and fire service connection/ inlet shall be located parallel to the nearby road/ foot path so as to give proper appearance. Foundation shall be raised from below ground level and shall be properly plastered in plumb. The hydrants shall be facing the road/ approach. There shall be no obstruction in approaching the hydrants for operation.

**11.3.18** Risers shall be parallel to the wall and in plumb. Adequate supports shall be provided from the wall. Opening around the pipe in slab shall be filled with CC and finished with plaster.

**11.3.19** Internal hydrant shall be provided in the center and facing outside for ease of operation. Sufficient space shall be provided around the handle for operation. There shall be no

hindrance in moving the first aid hose reel.

**11.3.20** Terrace pipes shall be supported on CC pedestals of adequate height. The pipe route shall be such as no hindrance is created in movement at the terrace. Pipes shall be sufficiently raised above terrace. It is to be ensured that water proofing isnot damaged during laying of pipes.

## 11.4 TESTING

### 11.4.1 Initial Testing

11.4.1.1 During laying of pipes, the same shall be subjected to 10 kgf/cm$^2$ hydraulic pressure for a period of 24 hours, in sections.

11.4.1.2 After completion of the work, all vaIves/ fittings shall be installed in positionand entire system shall be tested for 24 hours at a pressure of 10 kgf/ cm$^2$. The drop of pressure up to 0.5 kgf/cm$^2$ shall be accepted.

### 11.4.2 Final Testing

11.4.2.1 After completion, all operation checks as per Para 2.4.1.14 shall be carried out for automatic operation of the systems. For this purpose, landing valves may be opened at different locations. The exercise shall be repeated couple of times to ensure trouble free operation of the system.

11.4.2.2 ***Flow Test:*** - The design flow of pumps shall be checked. The pump shall be operated after opening a number of landing valves at different locations. Design pressure is to be maintained in the pump house. Water discharge is tobe measured by drop in level in UG tank for a certain period. All pumps shallbe tested one by one. The flow rate shall be not less than as specified while maintaining the design pressure in pump house.

## 11.5 INSPECTION BY LOCAL FIRE OFFICER

After completion of the work and testing to the entire satisfaction of Engineer-in- Charge, the installation shall be offered for inspection by Chief Fire Officeror his representative. Testing as desired by the Fire Officer shall be carried out. The contractor will extend all help including manpower during testing. The observations of Chief Fire Officer shall be part of the agreement. These shall be attended by the contractor. Nothing extra shall be paid for testing asabove.

## 11.6 COMMISSIONING

**11.6.1** **Flushing the System**: Before commissioning, the entire system shall be flushed to ensure that any earth/ foreign matters which might have enteredduring installation are taken out. For this, pump may be operated and valvesopened at different locations.

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

**11.6.3** The firefighting system shall be maintained and manned from the very first day of its

commissioning.

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

**APPENDIX —B**

## TERMINOLOGY

For the purpose of these Specifications, the following definitions shall apply:

1. **Air Release Valve:** A device by which the trapped air inside a riser main is expelled by water as the system is being charged.
2. **Air Vessel**: A cylindrical vessel installed in the wet-riser system at the bottom and top levels to counteract the water hammer effects.
3. **Authority concerned:** An Organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving or accepting equipment, materials, an installation, or a procedure.
4. **Automatic Fire Detection and Alarm System:** A system comprising components and sub-systems required for automatically detecting smoke, heat or fire, initiating an alarm and other actions as appropriate. This system also includes manually operated electronic fire alarm (MOEFA) system.

   **Note-** MOEFA System (with or without automatic fire detection and alarm system) includes all or some of the components such as manual call stations (initiating an alarm for fire and other actions as required), talk-back system and public address system.
5. **Automatic Sprinkler System:** A system of water pipes fitted with sprinkler heads at suitable intervals and heights, and designed to actuate automatically, control or extinguish a fire by the discharge of water.
6. **Building, height of:** The vertical distance measured in the case of flat roofs, from the average level of the ground around and contiguous to the building or as decided by the Authority to the terrace of the last liveable floor of thebuilding adjacent to the external wall; and in the case of pitched roofs, up to the point where the external surface of the outer wall intersects the finished surface of the sloping roof; and in the case of gables facing the road, the mid- point between the eaves level and the ridge. Where the building is located in a sloped terrain, height shall be determined from the lowest level (that is approachable by the fire service vehicles) to the terrace level. Architectural features serving no other function except that of decorations, shall be excluded for the purpose of measuring heights.
7. **Down-Comer:** An arrangement for firefighting within the building by means of down-comer pipe connected to terrace tank through terrace pump, gate valve and non-return valve and having mains not less than 100 mm internal diameter with landing valves on each floor/landing. It is also fitted with inlet connectionsat ground level for charging with water by pumping from fire service appliancesand air release valve at roof level to release trapped air inside.
8. **Dry Riser**: An arrangement of firefighting within the building by means of vertical rising mains not less than 100 mm internal diameter with landing valves on each floor/landing which is normally dry but is capable of being charged with water usually by pumping from fire service appliances.
9. **Fire Compartment:** A space within a building that is enclosed by fire barrier orfire resistant walls on all sides, including the top and bottom.
10. **Fire Pump**: An electric/diesel pump installed at static water tank to charge the wet riser systems.
11. **Fire Resistance Rating:** The time that a material or construction will withstand the standard fire exposure as determined by the fire test done in accordance with the standard methods of fire tests of materials/structures as per the accepted standard.
12. **Fire Service Connections**: This is a 4-way collecting breeching with blank caps (without non-return valve) fixed to a 150 mm diameter pipe which is connected to the fire tank for filling from external source:

13. **Fire Service Inlet**: A 2- or 3-way collecting head with non-return valves fitted to the down comer/wet riser main, so that in case of need, fire service can directly pressurize the system with their pump.
14. **Foot Valve**: A valve fixed in the suction strainer of the fire pump which opens only inwards to allow in-rush of water into the pump suction and fire pump when the fire pump is actuated automatically/manually.
15. **High Rise Building**: A Building 15 m or above in height (irrespective of its occupancy).
16. **Hose Reel:** Firefighting equipment, consisting of a length of tubing fitted with a shut-off nozzle and connected to a reel, with a permanent connection to a pressurized water supply.
17. **Jockey Pump**: A pump of small capacity which is set to come into operation, automatically with drop in static pressure in the system and to automatically stop when the pre-set pressure is attained.
18. **Landing valve**: An assembly comprising valve(s) and outlet(s) connection from a riser system.
19. **Priming Tank**: A small tank erected in/over the pump house above the firefighting pumps to keep the pump casing and suction of the fire pump permanently flooded.
20. **Pressure Switch:** A switch connected on delivery line of fire pump or in the body of hydro-pneumatic tank at pre-set pressure level so designed to automatically start the fire pump or jockey pump, as the case may be, when the pressure in the system falls below the pre- set level.
21. **Pump Panel**: Panel comprising starting, stopping and indicating devices of fire pumps.
22. **Stand-by Pump**: A pump of same capacity as fire pump, driven by a diesel engine or connected to any other alternate source of electric supply.
23. **Static Water Tank:** Underground or surface water tank, constructed to store water for firefighting purpose.
24. **Terrace Pump**: An electricity driven pump, located on the terrace connected to a terrace tank with gate valve on suction side and to the internal hydrant system with non-return valve on delivery side.
25. **Terrace Tank**: A concrete/masonry/plastic steel tank constructed or erected on terrace of building for firefighting purpose.
26. **Wet-Riser:** An arrangement for firefighting within the building by means of vertical rising mains of not less than 100 mm internal nominal diameter with landing valves on each floor/landing for firefighting purposes and permanently charged with water from a pressurized supply.
27. **Wet-Riser-cum-Down Comer:** An arrangement for fire lighting within the building by means of vertical rising mains of not less than 100 mm. internal diameter with landing valves on each floor/landing connected to terrace tank for firefighting purpose, through a terrace pump, gate valve and non-return valve near the tank and to a fire pump, gate and non-return valves, over the static tank.

## C.1 INTRODUCTION

This appendix cover suggestive guidelines for maintenance and operation of the Wet Riser System.

### C.1.1 OBJECTIVE:-

(i) To keep the entire system fully operational and functional at all times.

(ii) In case full system cannot be kept functional for unavoidable reason, as much as possible, the installation shall be retained functional by isolating the defective section.

## C.2 MAINTENANCE REQUIREMENT OF SYSTEM COMPONENTS

For maintaining firefighting system following points are to be taken care of:-

**C.2.1** To ensure availability of water in UG tank and terrace tank all the time and tomaintain the tanks in clean condition.

**C.2.2** To ensure that the piping system is free from leakage. Any portion found tobe leaking is to be isolated, rectified and connected with healthy systemin shortest possible time.

**C.2.3** To ensure that all pumps are in good running condition. Any pump found to bedefective is to be isolated by closing valves and attended immediately and put in to service in minimum time.

All pump glands shall be maintained in efficient working condition and the packing renewed as required to maintain the efficiency.

All working parts shall be kept clean and lightly oiled. Any necessary repairs shall be put in hand and carried out immediately.

**C.2.4** To ensure availability of power for electrical pumps, working of starters,switch gear and other electrical components.

**C.2.5** To ensure healthiness ofdieselengine starting system, battery voltage, battery charger and availability of adequate diesel for engine operation.

**C.2.6** To check all landing valves of internal and external hydrants, isolating valvesand replace the defective ones whenever necessary

**C.2.7** To check automatic operation of entire system by opening landing valves at different locations.

**C.2.8** To conduct fire drill at regular interval.

## C.3 PERIODICAL TESTING

For achieving the objectives of Para C.1.1 and meeting the requirement of Para C.2 periodical testing and checking the system is essential. Various activities and their duration have been tabulated in Table C.1.

## C.4 PROCEDURE

**C.4.1** Though the firefighting system operation is automatic, however for daily checking and attending to the system in case of operation, a trained pump operator shall be available round the clock.

**C.4.2** Operation and Maintenance instructions shall be available in the pump room and fire control room.

**C.4.3** Water for firefighting purpose is not to be used for any other purpose. However in order to avoid stagnation, the same shall be changed / cleaned regularly.

**C.4.4** Maintaining Diesel Engine is very important for the system operation since during fire, power supply is deliberately or un-deliberately switched off. Annual Maintenance Contract (AMC) of engine shall be given to the authorized service center of engine manufacturer. Adequate diesel should either be available in the pump house or nearby so that operation is not discontinued for want of diesel.

**C.4.5** Hydrant Mains / Ring Mains shall be tested once a fortnight with a pump delivering at its maximum pressure. A running test with two or more hose lines each 30m long operating shall be carried out.

**C.4.6** If any out let is found to be defective and replacement is not easily available the whole assembly should be removed and be replaced by blank off plate so that the system remains operational.

**C.4.7** Hose reels shall be subjected to regular inspection to ensure that all valve are functional, out let nozzle not choked. At least once in a year the same shall be subjected to operation to ensure that hose reel is in good condition and that the coupling joints are water tight. Flow should also be checked for the leakage of hose reel.

**C.4.8** All hydrants shall be examined systematically once a week to ensure that valves and spring catches are maintained in good condition.

Spare washers shall be kept for hydrant valve seats.

**C.4.9** **Cut**-off valves shall be thoroughly overhauled annually to remove sludge and other foreign matter collected in the valve seating.

**C.4.10** All isolating valves shall be checked for operation. The valves in closed position be opened and closed couple of times and the valves in open position be closed and opened couple of times so that when required, the valves perform their function.

**C.4.11** All hose boxes/hose stations shall be inspected externally once every week to ensure that the equipment installed therein is intact. Further, the hose boxes/hose stations shall be cleaned internally and externally once amonth.

When the hose gets worn out at the tail end of the coupling(s), it is permissible to cut the end(s) of the hose. However should the lengths of the hose after cutting(s) fall below 90 percent of its original, the hose shall be discarded.

A hose register shall be kept showing Information such as date purchased, date brought into use, date cut (if reduced in length), is useful. Any hose becoming inefficient through use, neglect or from any other cause, shall be discarded.

Fire protection hose shall 'not be used for purposes other than fire protection and drill.

Hose pipes and their couplings shall be checked to ensure there is no

leakage during their use. The female coupling cam tooth mechanism be operated and lubricated for ensuring ease of operation.

**C.4.12** Power supply to the pump house is not to be discontinued for any reason. Alternative arrangement shall be made in case any feeding switch gear is under repair / replacement.

**C.4.13** It has to be ensured that there are no obstructions in front of the hydrants impending accessibility

## C.5 FIRE DRILL

For making the users familiar with the system, Fire Drills shall be conducted for high rise buildings, in accordance with the fire safety plan, at least once every three months for buildings during the first two years. Thereafter, fire drills shall be conducted at least once every six months.

All occupants of the building shall participate in the fire drill. However, occupants of the building, other than building service employees are not required to leave the floor or use the exits during the drill.

A written record of such drill shall be kept on the premises for a three years period and shall be readily available for fire brigade inspection.

For other buildings, fire drill shall be carried out once in six months.

Local fire service and nodal officer-in-charge of various parts of the building shall be involved in conducting fire drill. Operation of the system shall be demonstrated so that all users are confident of the system and aware of their duties and responsibilities during fire.

For further details, Annexure D- Guidelines for fire drill and evacuation procedures for high rise buildings of *Vol-1, Part-4 of NBC 2016 may be referred.*

TABLE C.1

**PERIODICAL TESTING AND MAINTENANCE CHART**

| S. No. | System Component | Activity | Duration |
|---|---|---|---|
| 1. | Water Tanks | (i) Level Check | Daily |
| | | (ii) Cleaning | Once in a year |
| 2. | Pumps | (i) Running | Daily (for min. 5 minutes) |
| | | (ii) Test flow | Annually |
| | | (iii) Lubrication | Quarterly |
| | | iv)Gland packing check | Weekly |
| | | *Electrically Driven Pumps:* | |
| | | i) Bearing grease cup | Weekly |
| 3. | Engine | (i) Running | Daily (for 5 minutes) |

| | | | |
|---|---|---|---|
| | | (ii) Lubrication | Quarterly |
| | | (iii) Battery Status | Weekly |
| | | (iv) Fuel Tank check | Daily |
| | | (v) Servicing | As per engine manufacturer's recommendations. |
| 4. | Motor | (i) Running | Daily |
| | | (ii) Starter contact checking | Weekly |
| | | (iii) Insulation Resistance | Half yearly |
| 5. | Hydrant Mains / Ring Mains | i)Testing | Fortnightly |
| 6. | Piping | (i) Pressure | Daily |
| | | (ii) Flushing | once in a year |
| 7. | Hydrants | examination | Weekly |
| 8. | Valves (Landing, Cut -off and Isolation) | (i) operation and oilingif necessary<br>(ii) Overhauling of all Cut- off valves | Monthly<br>Annually |
| 9. | Valves (Suction and Delivery) | (i) Examination | Half yearly |
| 10. | Electrical Panels and Control System | (i) Operation | Monthly |
| | | (ii) Connection and system components | Quarterly |
| 11. | Hose boxes | i) External Inspection<br>ii) Internal and External cleaning | Weekly<br>Monthly |
| 12. | Hose Reel and Hose Pipes | (i) Physical check | Monthly |
| | | (ii) Operation check | Annually |
| | | (iii) Replacement | Depending upon physical condition. |
| 13. | Fire Brigade Connections/ Inlet | (i) Physical check | Monthly. |
| | | (ii) Operation check | Annually |
| 14. | Instantaneous Coupling | (i) Physical check | Monthly. |
| | | (ii) Lubrication | Once in Six months. |
| 15. | Painting | (i) Out Door | Once in a year. |
| | | (ii) In Door | Once in two years. |

APPENDIX-D

## MAINTENANCE OF AUTOMATIC SPRINKLER SYSTEM

D.1 Maintenance of other firefighting installation has been described in Appendix- 'C' which hold good for sprinkler installations also. In addition following points shall be taken care.

D.1.1 Sprinkler shall not be re-conditioned orrepaired. Used and/or defective sprinklers shall be replaced by new ones.

D.1.2 Sprinklers shall not be painted after installation.

D.1.3 Spare Sprinklers - A stock of spare sprinklers shall be kept in Fire Control Room so that prompt replacement is possible after operation/damage of a sprinkler head. A minimum of 5% of the installed capacity or 25 sprinklers of all types whichever is more shall be kept in stock. Spanners for sprinklers and Teflon tape shall also be kept along with spare sprinklers in readiness.

D.1.4 As far as possible, the installation shall be maintained in operating condition byblanking off pipe work feeding the inoperative part or parts where work is taking place.

D.1.5 The inoperative part, if defective shall be attended to and connected with the operative system.

*D.1.6 Action following sprinkler operation*

D.1.6.1 Following the operation of sprinklers, the operated head shall be replaced with new ones and water supply shall be restored.

D.1.6.2 The sprinklers in the vicinity of the operated sprinklers shall also be checked fordamage by heat or any other cause and replaced if necessary.

D.1.6.3 The sprinkler pump shall not be shut off until complete extinguishment of the fire. The starting of the pump shall be automatic but the stopping of the pump after an extinguishment shall be manual.

D.1.7 All piping shall be examined to determine its conditions at least once a year.

D.1.8 All Installation Control Valves and associated equipment shall be serviced and tested annually.

D.1.9 Discharge test of sprinklers shall be carried out at least once in six months.

D.1.10Manual testing of the system shall be carried out once in six months.

D.1.11 When normally opened valves are closed following system operation or test, suitable procedure shall be instituted to ensure that they are re-opened.

D.1.12 The entire system shall flushed at least once in a year. D.1.13The sprinkler bulbs shall be kept free from paint or dust.

D.2 MAINTENANCE GUIDELINES

Following guidelines shall be followed for sprinkler maintenance.

D.2.1 Maintenance and testing shall be carried out ina planned and systematic manner and records kept.

D.2.2 Only trained personnel shall be engaged in the work. Contract with qualified agency for service, test and operation is recommended.

D.2.3 Other firefighting installations are operated manually i.e. to operate a first aid hose reel or internal/external hydrant a person is required. As such during fire, when the system is in operation, somebody in the building is aware of it. In caseof sprinkler operation, no one will come to know. For looking after sprinkler installation following personnel shall be available at all hours.

(a) A trained pump operator shall be available in the pump room.

(b) Depending upon the size of installations at least two or more trained personnel shall be available in fire control room.

APPENDIX—E

## LIST OF RELEVANT INDIAN STANDARDS

| S. No | IS No. | Title |
|---|---|---|
| 1) | lS-8757 | Glossary of terms associated with Fire safety |
| 2) | IS-884 | Specification for first-aid hose reel for firefighting |
| 3) | IS-901 | Specification for couplings, double male and double female instantaneous pattern for firefighting, |
| 4) | IS-902 | Specification (for suction hose couplings for firefighting Purposes (third revision) |
| 5) | IS-903 | Specification for fire hose delivery couplings, branch pipe,nozzles and nozzle spanner. (fourth revision) |
| 6) | IS-904 | Specification for two and three- way suction collecting heads for firefighting purposes. |
| 7) | IS-907 | Specification for suction strainers, cylindrical type for firefighting purpose. (second revision) |
| 8) | IS-908 | Specification for fire hydrant, stand post type. (second revision) |
| 9) | IS-909 | Specification for underground fire hydrant. Sluice valve Type |
| 10) | IS-636 | Specification for Non percolating flexible firefighting delivery hose. |
| 11) | IS-7637 | Glossary of terms for firefighting equipment. |
| 12) | IS-937 | Specification for washers for water fittings for firefighting purposes. |
| 13) | IS-1641 | Code of practice for fire safety of buildings (general):General Principles for fire grading and classification. |
| 14) | IS-1642 | Code of practice for fire safety of buildings (General) : Details of construction. (second revision) |
| 15) | IS-1643 | Code of practice for fire safety of buildings (general) 'Exposure hazard. (first revision) |
| 16) | IS-1644 | Code of practice for fire safety of buildings (general):Exit requirements and personal hazard. (second revision) |
| 17) | IS-1646 | Code of practice for fire safety of buildings(general): Electrical installations. (third revision) |
| 18) | IS-2871 | Specification for branch pipe, universal for firefighting purposes. |
| 19) | IS-2930 | Functional requirements for hose Iaying tender for fire brigade use. |
| 20) | IS-5290 | Specification for landing valves. |
| 21) | IS-8090 | Specification for couplings, branch pipe, nozzle, used in hose reel tubing for firefighting. |
| 22) | IS-8442 | Specification for stand post type water and foam monitor for firefighting (first revision) |
| 23) | IS-9972 | Specification for automatic sprinkler heads. (first revision) |
| 24) | IS-11101 | Specification for extended branch pipe for fire brigade use |
| 25) | IS -12349 | Fire protection Safety sign. |

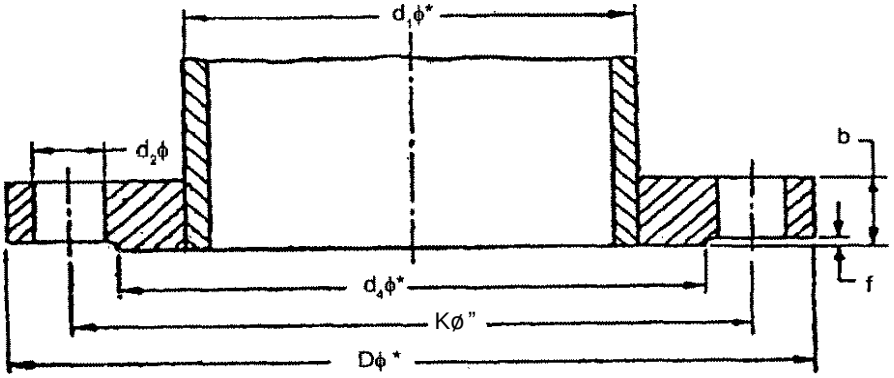
| | | |
|---|---|---|
| 26) | IS -12407 | Graphic symbols for fire protection plan. |
| 27) | IS -9668 | Code of practice for provision and maintenance of watersupplies and firefighting. |
| 28) | IS -3844 | Code of practice for installation and maintenance ofinternal fire hydrants and hose reel on premises. |
| 29) | IS -12585 | Specification for thermoplastic house (Textile Reinforced) for Water General purpose. |
| 30) | IS -10221 | Code of practice for coating and wrapping of underground mild steel pipe lines. (first revision) |
| 31) | IS-15105 | Design and installation of fixed automatic sprinkler fire extinguisher system-Code of Practice. |
| 32) | IS -325 | Three phase induction motors. |
| 33) | IS-1822 | AC Motor starter for voltage not exceeding 1000 volts. |
| 34) | IS -3624 | Pressure and vacuum gauges. |
| 35) | IS-1520 | Horizontal centrifugal pumps for clear, cold, fresh water. |
| 36) | IS-1239 | Mild steel tubes, tubulars and other wrought steel fittings. |
| 37) | IS -3589 | Specification for Steel pipes for water, and sewage |
| 38) | IS -6392 | Steel pipe flanges. |
| 39) | IS -778 | Specification for copper alloy gate, global and check valves and water works purpose (fourth revision) |
| 40) | IS -2592 | Recommendation for methods of measurement or fluidflow be means of orifice plates and nozzles. |
| 41) | IS -732 | Code practice for electrical wiring installations. |
| 42) | IS 900 | Code of practice for installation and maintenance of induction motors. |
| 43) | IS -1248 | Direct acting electrical indicating analogue electrical Measures and their accessories general requirement instruments. |
| 44) | IS-2516 | A. C. Circuit breakers for voltages not exceeding 1000 volts. |
| 45) | IS -4047 | Heavy duty air break switches and composite units of air break switches and fuses (for voltage not exceeding 1000 volts. |
| 46) | IS -2208 | HRC cartridge fuse links up to 650 volts. |
| 47) | IS -1554 (Part I) | PVC insulated (heavy duty) electric cables for workingvoltage up to and including 1100 volts. |
| 48) | IS:1536 | Specification for Centrifugally Cast (Spun) Iron pressure pipes for water, gas & sewage (first revision) |
| 49) | IS 1537 | Specification for Vertically Cast Iron pressure pipes for water, gas & sewage (first revision) |
| 50) | IS:1538 | Specification for Cast Iron Fittings for pressure pipes for water, gas & sewage (third revision) |
| 51) | IS:780 | Sluice valve for water works purposes (50 to 300 mm size) |
| 52) | IS:13095 | Butterfly valves for general purpose. |
| 53) | IS:13039 | Code of practice for provision and maintenance of External Hydrant System (first revision) |

**IS : 6392 - 1971**

**TABLE 17 PLATE FLANGES FOR WELDING**

**(Clauses 4.1 and 5.1)**

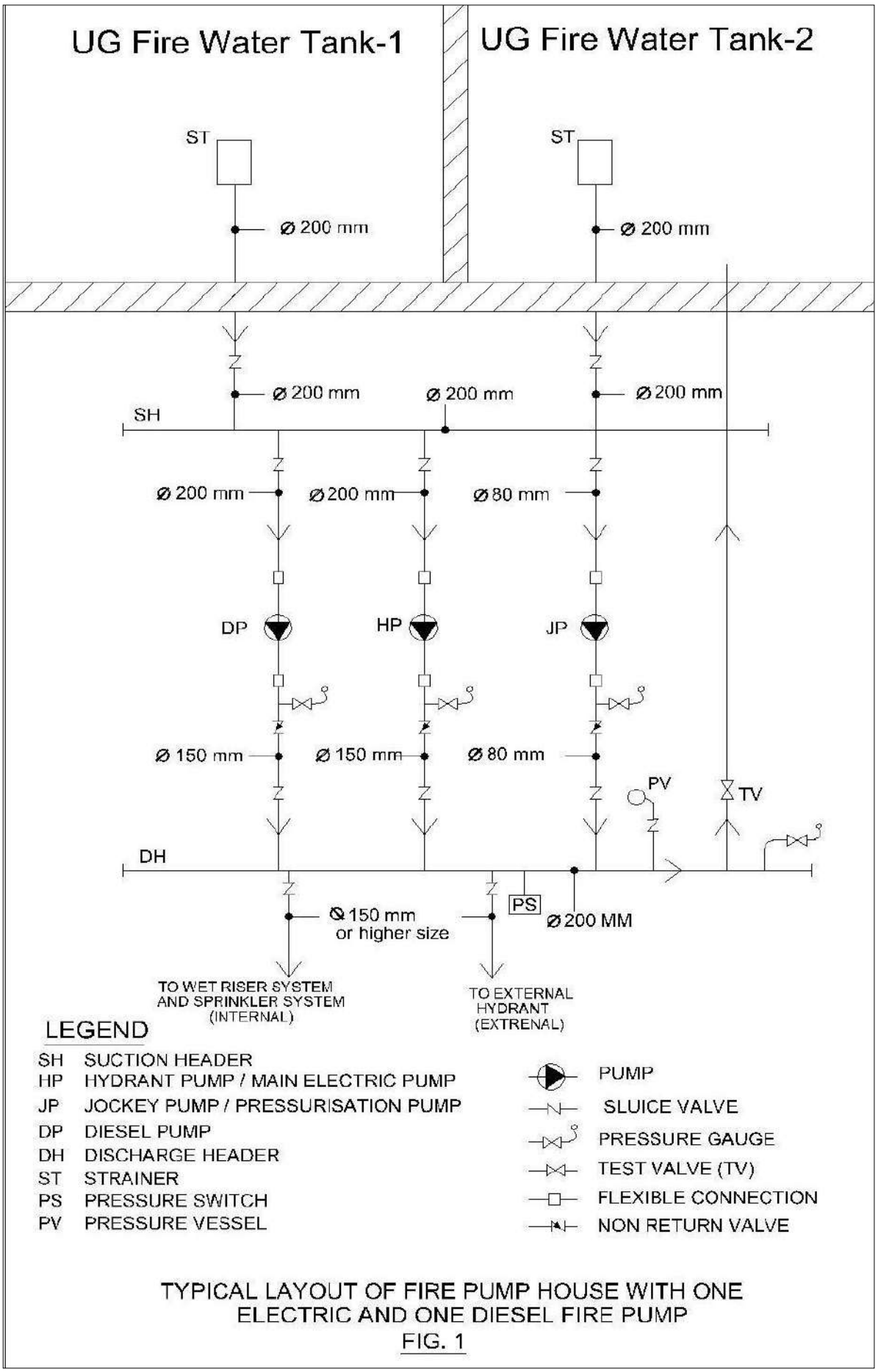
Nominal Pressure 1.6N/mm$^2$All dimensions in millimeters




* These dimensions are not to scale

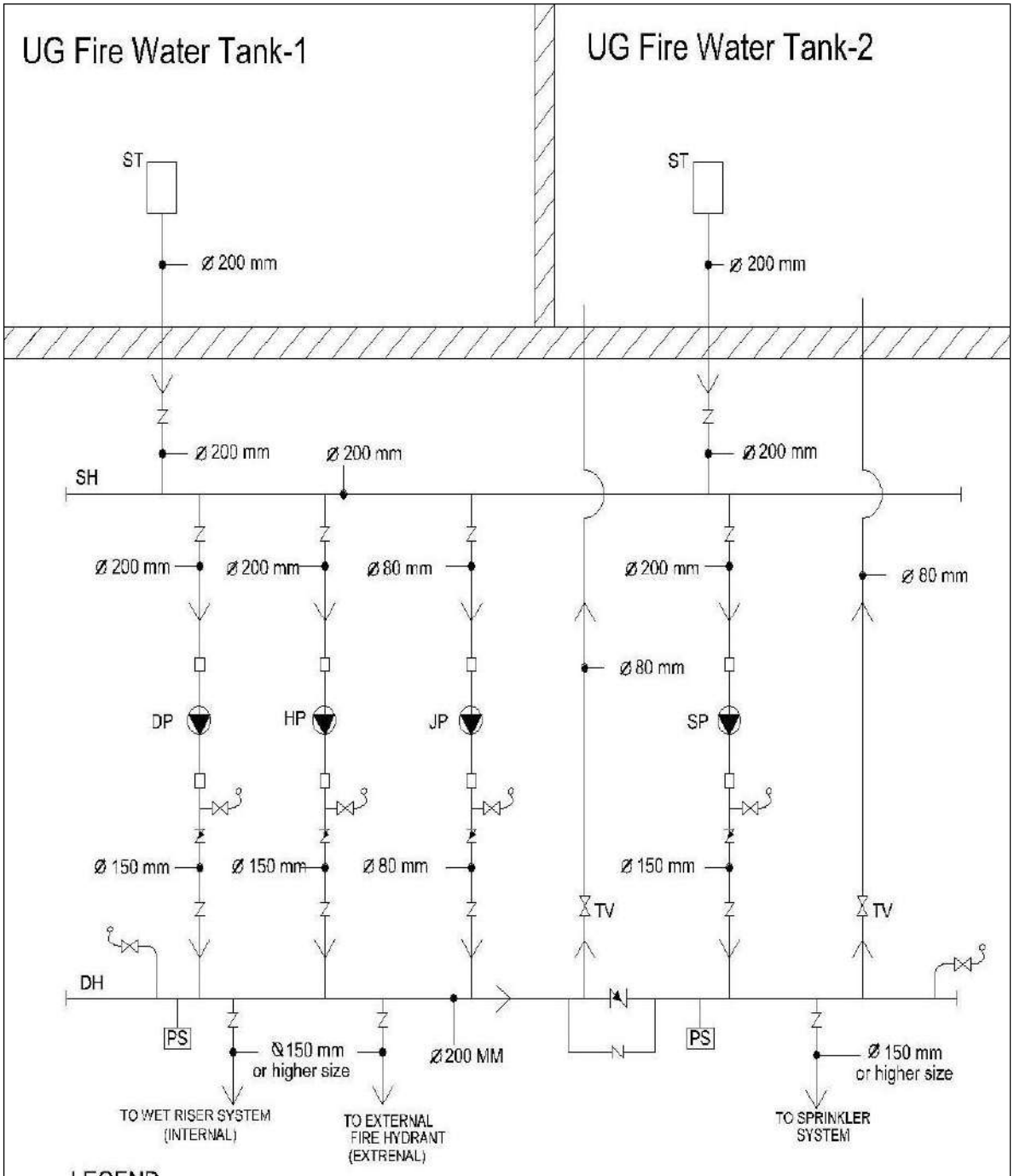
| Nominal Size | Pipe outer diameter d1ø | Flange | | Raised Face | | Bolting | Drilling | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dø | b | d4ø | f | | No. | d2ø | Kø |
| 10 | 17.2 | 90 | 14 | 40 | 2 | M12 | 4 | 14 | 60 |
| 15 | 21.3 | 95 | 14 | 45 | 2 | M12 | 4 | 14 | 65 |
| 20 | 26.9 | 105 | 16 | 58 | 2 | M12 | 4 | 14 | 75 |
| 25 | 33.7 | 115 | 16 | 68 | 2 | M12 | 4 | 14 | 85 |
| 32 | 42.4 | 140 | 16 | 78 | 2 | M16 | 4 | 18 | 100 |
| 40 | 48.3 | 150 | 16 | 88 | 3 | M16 | 4 | 18 | 110 |
| 50 | 60.3 | 165 | 18 | 102 | 3 | M16 | 4 | 18 | 125 |
| 65 | 76.1 | 185 | 18 | 122 | 3 | M16 | 4 | 18 | 145 |
| 80 | 88.9 | 200 | 20 | 138 | 3 | M16 | 8 | 18 | 160 |
| 100 | 114.3 | 220 | 20 | 158 | 3 | M16 | 8 | 18 | 180 |
| 125 | 139.7 | 250 | 22 | 188 | 3 | M16 | 8 | 18 | 210 |
| 150 | 168.3 | 285 | 22 | 212 | 3 | M20 | 8 | 22 | 240 |
| 175 | 193.7 | 315 | 24 | 242 | 3 | M20 | 8 | 22 | 270 |
| 200 | 219.1 | 340 | 24 | 268 | 3 | M20 | 12 | 22 | 295 |
| 250 | 273 | 405 | 26 | 320 | 3 | M24 | 12 | 26 | 355 |
| 300 | 323.9 | 460 | 28 | 378 | 4 | M24 | 12 | 26 | 410 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 350 | 355.6 | 520 | 32 | 438 | 4 | M24 | 16 | 26 | 470 |
| 400 | 406.4 | 580 | 36 | 490 | 4 | M27 | 16 | 30 | 525 |
| 500 | 508 | 715 | 44 | 610 | 4 | M30 | 20 | 33 | 650 |
| 600 | 609.6 | 840 | 52 | 725 | 5 | M33 | 20 | 36 | 770 |
| 700 | 711.2 | 910 | 58 | 795 | 5 | M33 | 24 | 36 | 840 |
| 800 | 812.8 | 1025 | 64 | 900 | 5 | M36 | 24 | 39 | 950 |
| 900 | 914.4 | 1125 | 72 | 1000 | 5 | M36 | 28 | 39 | 1050 |
| 1000 | 1016 | 1255 | 78 | 1115 | 5 | M39 | 28 | 42 | 1170 |
| 1200 | 1220 | 1485 | 94 | 1330 | 5 | M45 | 32 | 48 | 1390 |




TYPICAL LAYOUT OF FIRE PUMP HOUSE WITH ONE ELECTRIC AND ONE DIESEL FIRE PUMP

FIG. 1



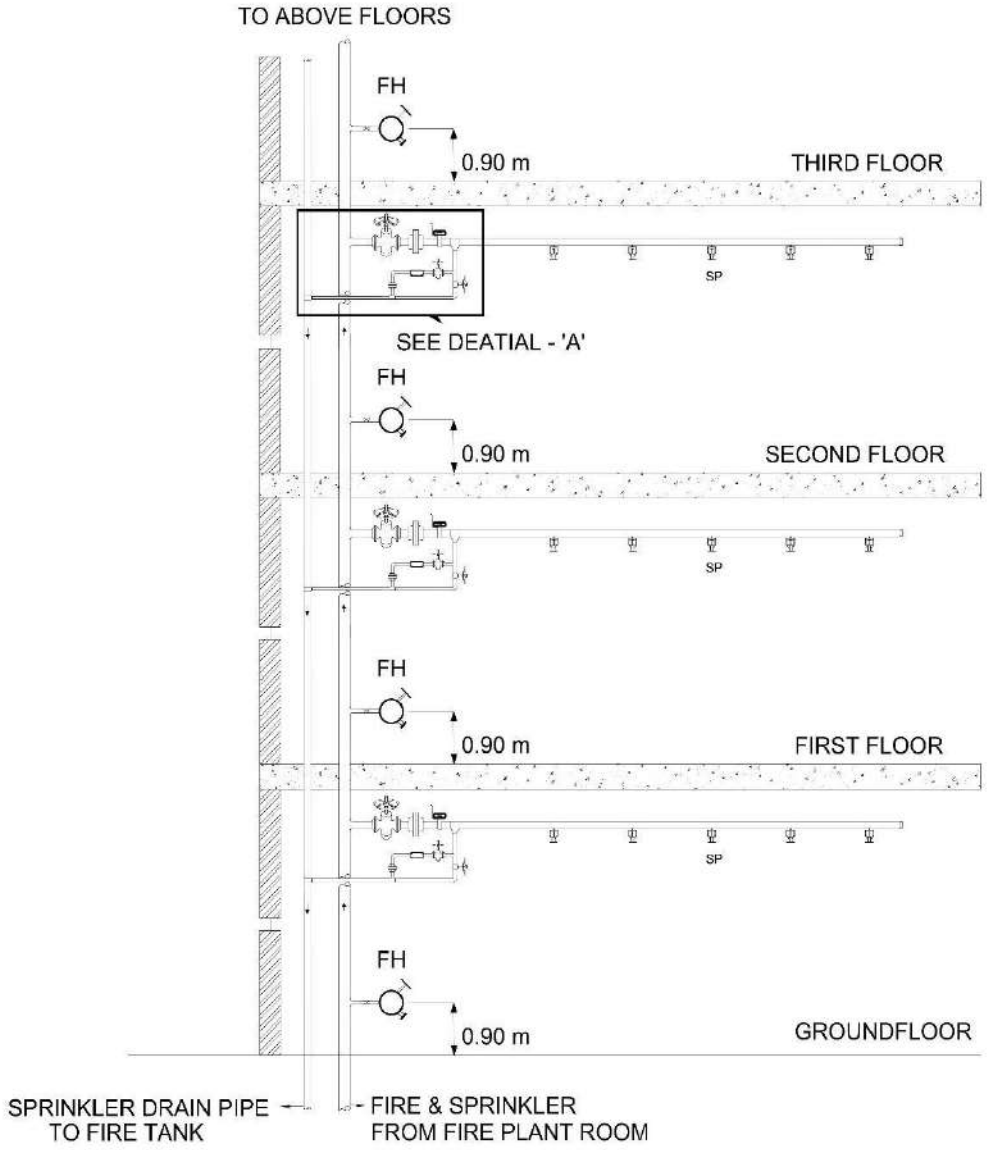

LEGEND

SH SUCTION HEADER
HP HYDRANT PUMP / MAIN ELECTRIC PUMP
JP JOCKEY PUMP / PRESSURISATION PUMP
DP DIESEL PUMP
SP SPRINKLER PUMP
DH DISCHARGE HEADER
ST STRAINER
PS PRESSURE SWITCH
PV PRESSURE VESSEL

PUMP
SLUICE VALVE
PRESSURE GAUGE
TEST VALVE (TV)
FLEXIBLE CONNECTION
NON RETURN VALVE

TYPICAL LAYOUT OF FIRE PUMP HOUSE WITH TWO ELECTRIC AND ONE DIESEL FIRE PUMP

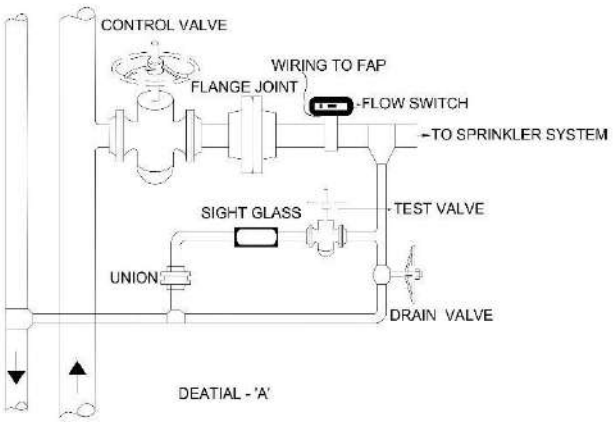
FIG. 2




ELEVATIONAL VIEW

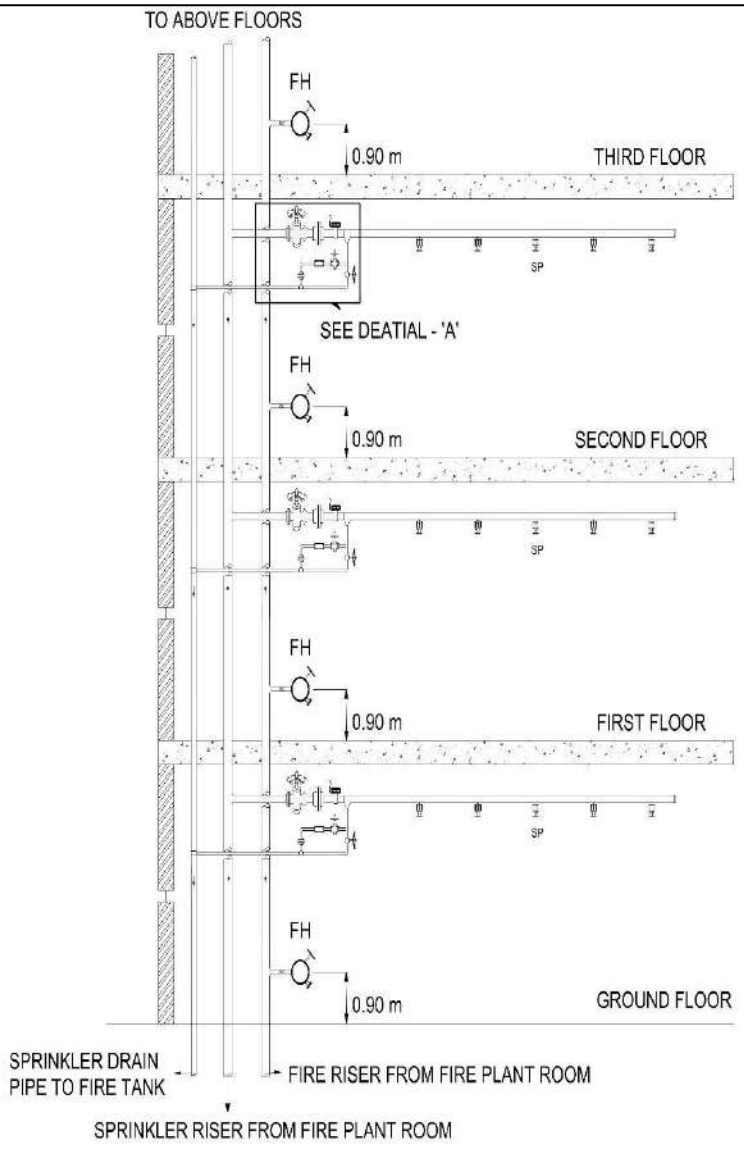
LEGEND

| | |
|---|---|
| F-1 | ELECTRICAL FIRE PUMP |
| F-2 | DIESEL DRIVEN FIRE PUMP |
| F-3 | JOCKEY PUMP |
| PV | PRESSURE VESSEL |
| FH | FIRE HYDRANT |
| | VALVE |
| | FLEXIBLE CONNECTION |
| | NON-RETURN VALVE |
| | SPRINKLER |




TYPICAL SYSTEM OF PUMPING WITH ONE ELECTRIC, ONE DIESEL FIRE PUMP

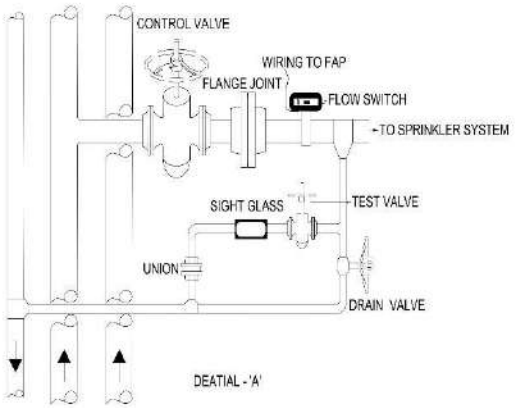
FIG.3




ELEVATIONAL VIEW

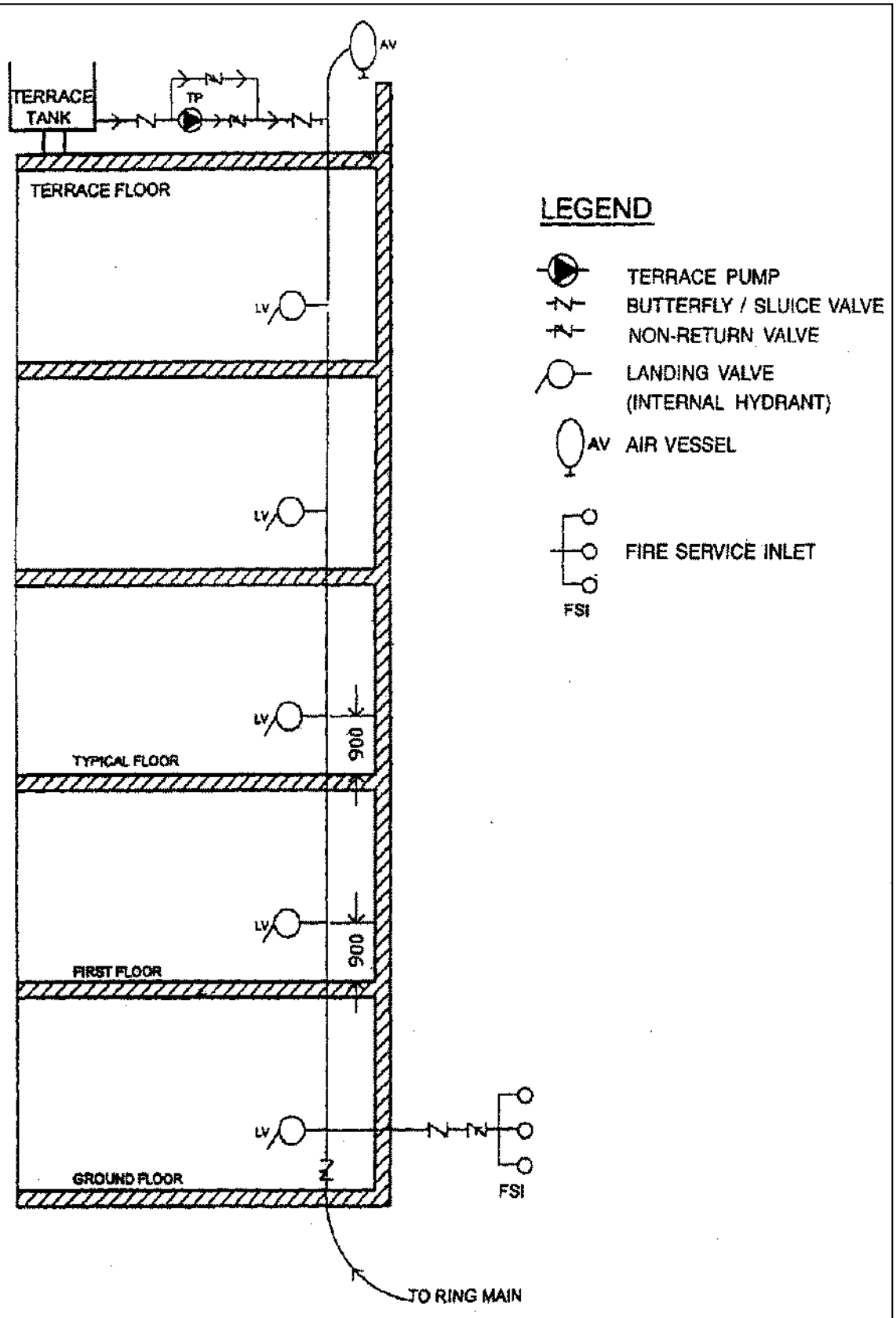
LEGEND

| | |
|---|---|
| F-1 | DIESEL DRIVEN FIRE PUMP |
| F-2 | EL. HYDRANT FIRE PUMP |
| F-3 | JOCKEY PUMP |
| F-4 | EL. SPRINKLER PUMP |
| PV | PRESSURE VESSEL |
| FH | FIRE HYDRANT |
| FAP | FIRE ALARM PANEL |
| SP | SPRINKLER |
| | VALVE |
| | FLEXIBLE CONNECTION |
| | NON-RETURN VALVE |
| | SPRINKLER |



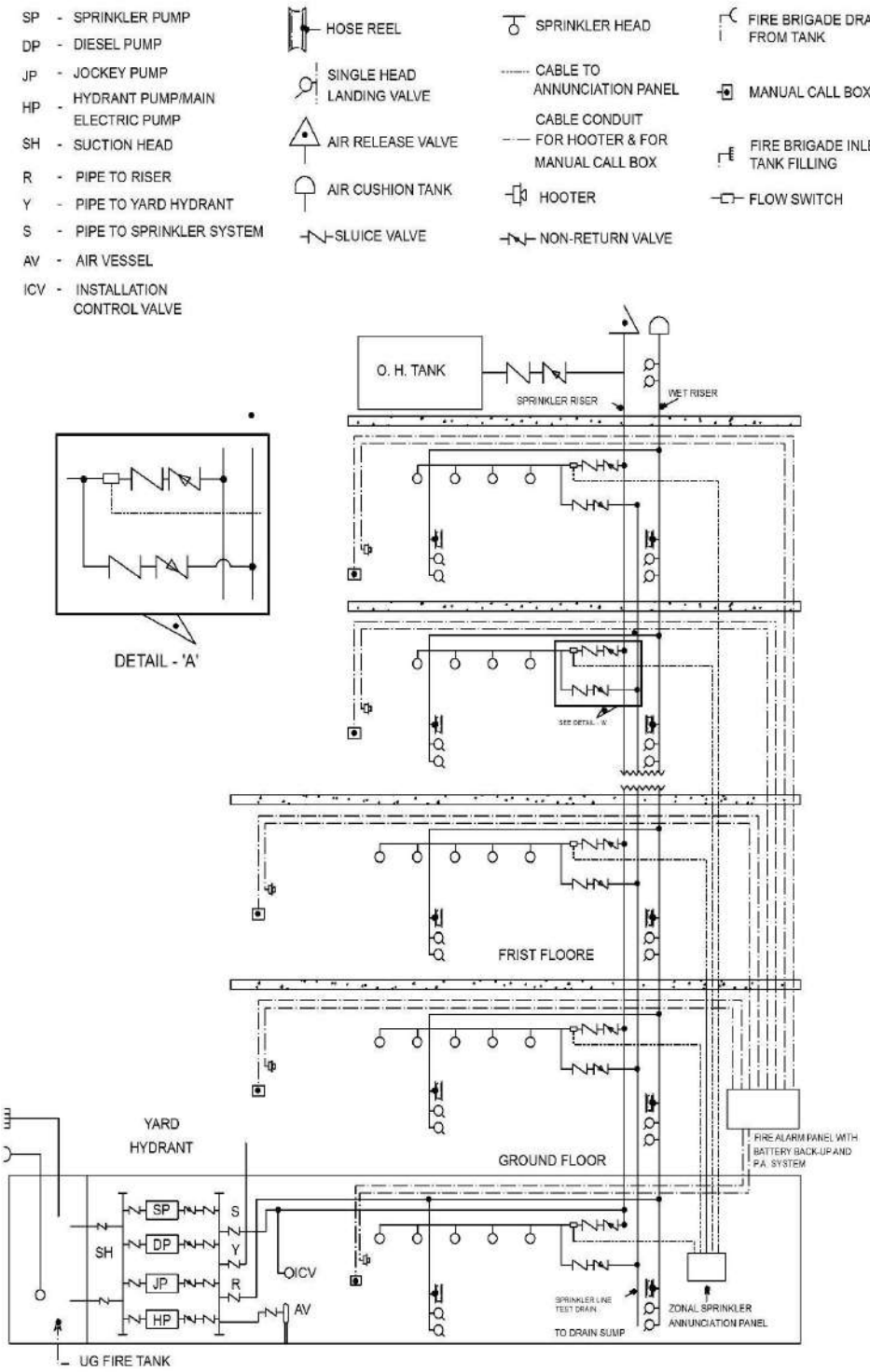

TYPICAL SYSTEM OF PUMPING WITH TWO ELECTRIC, ONE DIESEL FIRE PUMP

FIG.4




**TYPICAL ARRANGEMENT OF DOWN COMER SYSTEM**

**Fig. 5**




TYPICAL ARRANGEMENT OF WET RISER AND TOTAL SPRINKLER SYSTEM OF BUILDING

FIG. 6