REF: HCC/ENGG-12/PT-67/2018-19 **DATE: 13/07/2018**

M/s _____
_____
_____
_____

Dear Sirs,

SUB: MISCELLANEOUS WORKS AT DOIMUKH DEPOT , YUPIA , PAPUMPARE DISTRICT , ARUNACHAL PRADESH

Tender No: **HCC/ENGG-12/PT-67/2018-19**

Sir,

1) We propose to invite Public Tender in TWO BID System for the subject work.
2) We request you to submit your lowest quotation for the work contained in the tender.
3) Your offer complete in all respects must be uploaded in the prescribed manner on our e-tendering portal "https://iocletenders.nic.in" on or before **07/08/2018@ 15:00 hrs.**
4) In case of Earnest Money Deposit (EMD) is by way of Bank Guarantee, the original EMD Instrument (amount as per NIT) in a sealed envelope may please be dropped in Contract Cell dept. tender box kept in our office at address given below.

   Indian Oil Corporation Limited

   Contract Cell, 6th Floor, Small Wing,

   G-9, Ali Yavar Jung Marg, Bandra East, Mumbai – 400051
5) Bidders are requested to go through the "Bidders Manual Kit" available in the homepage of the e-tendering portal i.e. https://iocletenders.nic.in to have a clear understanding of the steps to be followed for bid submission. The "Bidders Manual kit" is for general reference only and the tenderers have to abide by the terms and conditions of this tender.
6) For detail about process of payment of online EMD, bidders shall refer to "Special Instructions to the Bidder (SITB)" and "FAQs – Online EMD Facility in IOCL e-Tendering" documents attached separately along with the tender.
7) Tenderers must note that Indian Oil will not be responsible for delay in submission of online tender & receipt of Original EMD Instrument on or before due date & time of bid submission as mentioned in the NIT.
8) Tenderers must also note that before the bid is uploaded, the bid comprising of all attached documents should be digitally signed using digital signatures as specified in the tender.
9) Any query with regard to non-issuance of the tender documents or rejection of the tender may be forwarded to Shri. Dipayan Sarkar (Contracts), IOCL, Mumbai. E-mail: dipayansarkar@indianoil.in
10) Tenderers to please note that Pre-Bid Conference shall be held at our office at Mumbai on **26/07/2018at 11:00 hrs** wherein all the clarifications with regard to Technical/ Commercial conditions shall be given. Tenderers are advised to ensure that the queries must reach office of the Corporation latest by **26/07/2018** for this purpose. The queries in editable form may be sent on email to dipayansarkar@indianoil.in

11) Tenderers also may note that after the clarifications are given in Pre Bid conference, no further deviation shall be permitted and all decisions taken by IOCL in the pre-bid conference shall be binding on all bidders. All are requested to attend the Pre Bid conference.

NOTE:

a) Tenderers are advised to visit the E Tender portal regularly for updates. In case of any corrigendum or sale date extension, the same shall be issued in the E Tender portal only. No separate publication shall be done in newspapers/print media.

b) All parties are requested to start the submission process of bids at least 4 hours prior to the due date & time of bid submission to avoid problem in submitting documents due to last minute rush.

Thanking you,

Yours faithfully

For Indian Oil Corporation Limited

Dy. General Manager (HCC)

Note: All Pages/Documents to be signed with Digital Signature with E- Tender Submission

INDEX

PUBLIC e-TENDER NOTICE – Press Advertisement

IndianOil	**IndianOil**	IndianOil

Marketing Division - Head Office

Notice Inviting e-Tender

NIT No./ Name of work

HCC/ENGG-12/PT-67/2018-19 : MISCELLANEOUS WORKS AT DOIMUKH DEPOT , YUPIA , PAPUMPARE DISTRICT , ARUNACHAL PRADESH

E Tender ID: 2018_MKTHO_79075_1

Downloading Period: **13/07/2018@17.00 hrs to**

07/08/2017@15:00 Hrs

Contact Person: Shri. Dipayan Sarkar(Contracts)

Ph: 022-26447376

Email: dipayansarkar@indianoil.in

Visit https://iocletenders.nic.in for downloading Tender documents and participating in e-tenders

Note: Any addendum/ Corrigendum/ Sale Date Extension in respect of the tender shall be issued on our website **https://iocletenders.nic.in** only & no separate notification shall be issued in the press. Bidders are therefore requested to regularly visit our website to keep themselves updated.

NOTICE INVITING e-TENDER

1.	TENDER NO.	:	**HCC/ENGG-12/PT-67/2018-19**
2.	E-Tender ID	:	**2018_MKTHO_79075_1**
3.	NAME OF WORK	:	**MISCELLANEOUS WORKS AT DOIMUKH DEPOT , YUPIA , PAPUMPARE DISTRICT , ARUNACHAL PRADESH**
4.	ESTIMATED VALUE OF WORK	:	**₹ 13,16,49,519.47** (Including GST)
5.	PLACE OF WORK	:	**DOIMUKH DEPOT , YUPIA , PAPUMPARE DISTRICT , ARUNACHAL PRADESH**
6.	TENDER FEE	:	**Nil** since an e-TENDER
7.	EARNEST MONEY DEPOSIT	:	**₹ 9,08,248/- (BG/ NEFT/ RTGS)** Exemption from submission of EMD: a. Parties registered with any of the following agencies/bodies as per Public Procurement Policy for Micro & Small Enterprises(MSE) Order 2012 are exempted categories from payment of EMD provided that the registration certificate issued by any one of these below mentioned agencies must be valid as on close date of tender . Bidders who have applied for registration or renewal of registration with any of these agencies/bodies but have not obtained the valid certificate as on close date of tender are not eligible for exemption. **i.** District Industries Centre(DIC) **ii.** Khadi and Village Industries Commission (KVIC) **iii.** Khadi and Village Industries Board **iv.** Coir Board **v.** National Small Industries Corporation(NSIC) **vi.** Directorate of Handicraft and Handloom **vii.** Udyog Aadhar Memorandum (UAM) **viii.** Any other body specified by Ministry of MSME Note: Against UAM, copy of acknowledgement generated online shall be acceptable The above exemption shall be irrespective of their status as micro, small or medium enterprise. The exemption shall also be irrespective of whether they are registered for the tendered item and shall be applicable for procurement, works and services. a. PSUs (Central & State) and JVs of IOCL.
8.	TENDER DOWNLOAD PERIOD FROM e-TENDER PORTAL:		
	a) Starts on	:	**13/07/2018@ 17:00 HRS.**
	b) Ends on	:	**07/08/2018@ 15:00 HRS.**
9.	PRE BID MEETING	:	**26/07/2018@ 11:00 HRS at IOCL, Marketing Head Office, Mumbai - 400051.**

10.	SUBMISSION OF TENDER INTO e-TENDER PORTAL:		
	a) Starts on	:	**01/08/2018@ 15:00 HRS.**
	b) Ends on	:	**07/08/2018@ 15:00 HRS.**
11.	DUE DATE FOR OPENING OF TENDER:		
12.	Opening of Tender (Technical Bid Only)		**08/08/2018@ 15:00 HRS.**
13.	Work Completion	:	**Total completion period – 8 months**

Note:

a. In case EMD is submitted by way of BG (from Nationalized/ Scheduled Bank as per the format enclosed in the tender document), the validity of the same should be **06 (SIX)** Months from the last date of submission of tender. If needed, validity of BG should be extended further by the bidder on request from IOCL.

b. In case of Bank Guarantee, bidder shall upload scanned copy of BG as exemption document. Original BG shall be sent by the bidders /bank to Tender Issuing Authority as mentioned in the tender & it should reach to Tender Issuing Authority within 7 working days of IOCL from the date of opening of technical bids. For the purpose of receipt of BG, the time recorded in the receipt/DAK section against receipt shall also be considered as receipt time. Only those Original BG instruments found matching with the copy submitted in the e-portal shall be considered as valid. If the original BG instrument is not received by the due date and time as specified above, the bid shall be summarily rejected.

c. BG should be submitted only in a sealed envelope of the issuing Bank and should not be in open condition. If BG towards EMD is submitted in any manner other than aforesaid, the Tender is liable to be rejected.

d. If the original BG instrument is not received by the due date and time as specified above, the bid shall be summarily rejected.

e. Scanned copy of the EMD instrument or exemption certificate in case of NSIC or exempted category must be uploaded in the EMD packet in the e-tender portal.

f. As per Public procurement Policy for Micro & Small Enterprises (MSEs) Order 2012, MSEs must be registered with any of the following in order to avail the benefits/ preferences available vide Public Procurement Policy MSEs Order 2012.

- District Industries Centre (DIC)
- Khadi & Village Industries Commission (KVIC)
- Khadi & Village Industries Board (KVIB)
- Coir Board
- National Small Scale Industries Corporation (NSIC)
- Directorate of Handicraft & Handloom
- Udyog Aadhar Memorandum (UAM)
- Any other body specified by the Ministry of MSME.

Note: Against UAM, acknowledgement copy generated online shall be applicable.

The registration certificate issued from any of the above agencies submitted with the bid

must be valid as on the close date of tender. The MSEs who have applied for registration or renewal of registration but have not obtained the valid certificate as on the close date of tender shall not be eligible for exemption/ preference.

g. Apart from exempted categories, Bidders not submitting original EMD instrument in the tender box at the above mentioned address on or before due date and time of bid submission mentioned above shall be rejected outright.

h. Bidders not paying EMD or not submitting valid exemption certificate on or before tender submission date and time will be summarily rejected.

i. Requests for payment of pending dues from IOCL towards EMD/ Tender Fee shall not be entertained.

j. All parties are requested to start the submission process at least 4 hours prior to the submission end date to avoid problem in submitting documents due to last minute rush.

Tenders in two bid system (a) Technical bid with commercial terms and (b) Price Bid are invited from reputed, established and financially sound parties for the works specified in the above NIT.

Parties, meeting the following qualifying parameters as per details mentioned below, only need apply:

PRE QUALIFICATION CRITERIA (PQC):

COMMERCIAL CRITERIA:

Experience of having successfully completed similar works during last 5 (Five) years up to the last day of the month previous to the one in which tenders are being invited , should be either of the following:

The executed value of completed similar works shall be exclusive of service tax.

MONETARY LIMITS:

SN	QUALIFYING PARAMETERS
1.	Parties who have successfully completed similar works defined above only need to apply:
a)	Three similar completed works each costing not less than the amount equal to **₹ 3,94,94,856/- (OR)**
b)	Two similar completed works each costing not less than the amount equal to **₹ 5,26,59,808/-** (**OR)**
c)	One similar completed work costing not less than the amount equal to **₹ 6,58,24,760/-**
2.	**TURNOVER:** Annual Turnover during any of the last three preceding financial year, ending **31st March 2018** as applicable should be at least **₹ 7,89,89,712/-** Turnover for this purpose should be as per audited Balance Sheet of the tenderer. However, if the tenderer is not required to get its accounts audited under Section 44AB of The Income Tax Act, 1961, certificate from a Practicing Chartered Accountant towards the turnover of the tenderer along with copies of its Income Tax Return should be obtained. For tenders invited during April-September , in case of non availability of audited balance sheet (profit & loss account statement)/ published accounts of the immediate preceding year , the audited balance sheet (P&L statement)/published account of 4th

	preceding financial year shall also be acceptable. Audited Balance Sheet (P&L statement) / published accounts on a calendar year basis shall also be acceptable. Definition of turnover: Total revenue as per schedule III of companies act , 2013 (earlier revised schedule VI of companies Act , 1956) shall be considered as turnover. Published Annual report shall also be acceptable. (The balance sheet copy MUST bear the Registration Number of the authorized Chartered Accountant and its SEAL. This is not applicable for published annual reports)

OTHER COMMERCIAL CRITERIA:

Following Copy of documents should also be uploaded with the Technical/ Commercial Bid;

i. Power of Attorney/ board resolution (as applicable) in favour of tender signing authority.
ii. Partnership deed or Certificate of Incorporation with memorandum & articles of association.
iii. PAN Card.
iv. Registration with PF Commissioner.
v. GST Registration certificate.
vi. Other undertaking & Declarations required as per the proforma enclosed in the tender.
vii. Compliance to Integrity Pact
viii. Standard declarations as applicable.

SIMILAR WORKS

Experience in successful completion of the following shall be taken as similar works for the purpose of qualification.

"Civil works/ Fabrication & Erection of Structural Steel Works (Buildings / Sheds / Steel Towers / Gantry) meeting monetary limit as per NIT"

The contractor should have satisfactorily completed the work under a single order meeting above mentioned monetary limit directly from any Company or subcontracting from the main contractor. The Contractor should produce sufficient proof for such sub contract from main contractor, which may include the copy of work order of main contractor to the sub contractor, completion certificate, proof of payment received in the form of bank statement / payment advise ,TDS or any other document/s, to establish the genuineness of such sub contract. Rate contract / partially completed work order/running work order shall not be considered under similar work criteria.

Work Orders executed for similar works during the last FIVE YEARS as explained above. For this, a copy of Work Orders, Completion Certificate indicating the value of work/Work Order reference with completion date or final Payment Details indicating the Work Order Reference and completion date will have to be submitted. It may be noted that the tenderer can submit above such Work Order(s) duly executed, with Completion Certificate indicating the value of work or Payment Details i.e. TDS certificates/ Bank Statement for proof of payments. In case of completion certificate issued by Private parties, along with the completion certificate they also need to submit the payment detail i.e. TDS certificates/ Bank Statement for proof of payments for the same.

Parties, who have carried out such works, shall only be considered. Applicants not fulfilling the above qualifying parameters need not apply.

Evaluation Criteria:

a) The evaluation of bids shall be on the basis of minimum cost of all the items comprising of composite works of supply & erection/installation. The minimum overall quoted rate shall be arrived on the basis of percentage (excess/at par/below) quoted by bidders in % in the BOQ containing all the items with rate & amount for the subject work and then the item wise GST rate submitted by the bidder in the technical bid shall be added over the quoted amounts of the bidders for arriving at the minimum overall amount. Bidders are required to fill Service Accounting Code/HSN & GST Rate (%) in the technical bid. Filling of Service Accounting Code/HSN & GST Rate (%) in the technical bid is mandatory and non-submission of the same is liable for rejection of their bid.

b) The lowest tender shall mean lowest acceptable rate quoted by the L1 party (with or without negotiations as the case may be) considering aggregate sum of all the items.

c) No Negotiation will be conducted with the bidders as a matter of routine. However, Corporation reserves the right to conduct negotiations.

d) Placement of the Contract for the technically qualified tenderer on the lowest price as explained above shall be done in the manner explained below:

I. Work order shall be placed on L1 bidder.

II. In case of tie between two or more bidders at L-1 position, the following shall be done:

- All the L-1 bidders shall be asked to submit discount bid in terms of percentage discount over previous quoted amount in a sealed envelope after taking the approval of the competent authority. Above exercise shall be an offline activity outside the e-portal.
- The sealed envelopes shall be opened by jointly by one member from tendering group and one from finance. The bidders while seeking revised bids, shall be advised to witness the opening of sealed envelopes.
- In case there is tie again, the bidder with the highest turnover worked out to three decimal point in any of the last three years as submitted.

The tenderers are advised to submit their offers strictly as per the terms and conditions and specifications contained in the tender document and not put forth conditions/ counter conditions. Conditional tenders received subsequent to the pre bid meeting shall be liable for rejection. The Corporation reserves the right to accept any tender in whole or reject any or all tenders without assigning any reasons.

Other Salient Points:

- The tenders will be summarily rejected if requisite EMD or EMD exemption document is not submitted as mentioned in NIT.
- The offers shall be scrutinized and evaluated based on the qualifying parameters mentioned above and on the basis of the uploaded documents in e-tender portal.
- Bidder has to commit adoption of the Integrity Pact Program of IOCL through executing an Integrity Agreement and declarations.
- The Bidders shall upload legible scanned copy of necessary documents in support of required

qualification and experience along with their offer as per instruction given in the Special Instructions to Bidders.

- ***Notwithstanding any other condition/ provision in the tender documents, in case of ambiguity or incomplete documents pertaining to PQC, bidders shall be given only one opportunity with a fixed deadline after bid opening to provide complete & unambiguous documents in support of meeting the PQ criteria. In case the bidder fails to submit any document or submits incomplete documents within the given time, the bidders tender will be rejected.***
- Legal dispute, if any, arising during the evaluation of the tender shall be within the jurisdiction of local courts situated at Mumbai and after placement of LOA, the jurisdiction of local courts at Mumbai will be applicable.
- Documents required to be submitted against proof of completion (for works):
  - i. In case of Work Order issued from Government Bodies/PSUs – Copies of Contract Document along with either completion certificates OR duly Certified copy of bill/Invoice. Copy of contract document may not be insisted if completion certificate/Bill/Invoice copy specifies details otherwise required like date of PO/contract agreement , Contract value, Execution value , date of completion and other requirements if any.
  - ii. In case of Work Orders from Private parties – Certificate from CA certifying value of work done with TDS certificates (where applicable) / bank statement shall be required in addition to that specified in (i). TDS certificates / Bank statements shall be used as corroborative evidence only.
  - iii. In case of foreign currency transaction to Indian firms, proof of remittance shall also be required. The exchange rate of conversion from foreign currency to INR as per SBI TT selling rate as on the last day of the month previous to the one in which the tender was invited will be considered.
- Bidders may note that the following are attached separately and uploaded in the e-tendering portal:
  - i. Special Instructions to bidders for participating in e-tendering.
  - ii. FAQ's –online EMD facility in IOCL e-tendering &
  - iii. Format for Acceptance of Tender Terms and Conditions.
- L1 Bidder will have to present original documents for verification to the tender inviting authority, within 7 days from date of intimation.
- Physical/ Manual Bids shall not be accepted. Bids shall be accepted only though e-Tendering portal. No manual bid shall be permitted along with electronic bids. In case of receipt of manual bids apart from specifically requested offline documents in the tender, same shall be returned to the bidder. Additional documents received through email shall also be ignored for the purpose of evaluation, unless specifically advised by the Tender Issuing Authority.
- Tender Document can be downloaded from https://iocletenders.nic.in and on line bids are required to be submitted with Digital signatures on the system.
- IOCL reserves the right of cancellation of the tender without assigning any reasons whatsoever.
- IOC shall not be bound to accept the lowest tender and reserves right to accept any tender. Decision of IOCL, in this connection shall be final.
- Canvassing for information or submission of forged or false documents / information by any Bidder shall make the offer invalid. In addition, action shall also be taken by IOCL for forfeiture of EMD as well as putting the Bidder on Holiday list.

- No suo – motto reduction in prices quoted by the bidder shall be permitted after opening of the bids. If any bidder unilaterally reduces the prices quoted by them after opening of bids, the bid of such bidder will be summarily rejected.
- Bidders may note that negotiations will not be conducted with the bidders as a matter of routine. However, Corporation reserves the right to conduct such negotiations. Bidders will have to attend to the office of the Corporation for negotiations/ clarifications required in respect of their bids without any commitment on the part of the Corporation. In case of negotiation, the Bidder should send the confirmation of such negotiation so as to reach the office of the Corporation within 7 days from the date of negotiations failing which the Corporation reserves the right to ignore the bid.
- Affiliates of a firm are not permitted to make separate bids directly or indirectly. 2 or more Parties who are affiliates of one another can decide which affiliate will make a bid. Only one affiliate may submit a bid. If two or more affiliates submit a bid, then all of them are liable for disqualification.
- Consultants or their subsidiary company or companies under the management of consultant, are not eligible to quote for the execution of the same job for which they are working as consultant.
- It will be treated that a person shall be deemed to have submitted more than one bid if a person bids in an individual or proprietorship format and/or in a partnership or association of persons format and/or in a Company format.
  a. A company shall for this purpose include any artificial person whether constituted under the laws of Indian or of any other country.
  b. A person shall be deemed to have bid in a partnership format or in association of persons format if he is a partner of the firm which as submitted the bid or is a member of any association of persons which has submitted a bid.
  c. A person shall be deemed to have bid in a Company format if, the person holds more than 10% (ten percent) of the voting share capital of the company which has submitted a bid, or is a Director of the Company which has submitted a bid, or holds more than 10% (ten percent) of voting share capital and/or is a Director of a holding Company which has submitted the bid.
- Bids from **Consortium or MOU parties** shall not be accepted. Also **credentials of Consortium or MoU Parties** submitted by **one of the Consortium partners** shall not be accepted.
- Each tenderer can submit only one tender bid as explained above. In other words multiple bidding is not permitted. In case tenderer submits more than a bid, then all of them are liable for disqualification.
- JVs registered under the Indian Companies Act as on date of submission of bid are permitted. In such cases, all credentials to be submitted for qualification in the tender shall be in the name of JV.
- The language of all the documents to be in the Tender shall be in English. For all documents in other than English, translated document through a Sworn/ Certified Translators shall be submitted as part of the bid documents at no extra cost to IOCL.
- The tender being at National Level, bid from Foreign entities shall not be accepted.

All Bidders must have Type II or above Digital Signature Certificate and have to register themselves in the above website in order download the tender and Bid for the same.

Dy General Manager (HCC)

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LIST OF DOCUMENTS REQUIRED

Following points to be noted by the Bidder and quote accordingly;

i. All required documents are to be submitted only with technical/ commercial bid. No other extra documents other than the listed documents should be attached with the technical/ commercial bid. No documents/conditions should be attached with the price bid. Corporation reserves the right for outright rejection of conditional bids.

ii. Non-submission of all required documents or incomplete submission of any documents may result in rejection of the tender.

iii. Submission of duly signed Integrity Pact agreement, along with tender is a mandatory pre requisite for bids to be eligible for further evaluation. The intergrity pact agreement consists of (1) covering letter from the bidder to IOCL and (2) Integrity Agreement consisiting of 10 (Ten) articles. Bidders should mandatorily sign and submit the complete Integrity Agreement consisting of 10 articles in order to be eligible for further evaluation in this tender. The signed IP should be complete in all respect and is required to be uploaded in the tender e-tender portal along with the bid. Bid not having the duly signed IP agreement attached with it will be summarily rejected. Partial submission of IP document will also not be considered.

1. PRE-QUALIFICATION CRITERIA DOCUMENTS:

1.1 COMMERCIAL CRITERIA:

Following documents MUST be uploaded in the Technical/ Commercial Bid packet for consideration of the offer (In the absence of these documents, the tender is liable for rejection):

i. Work Order(s) (indicating detailed schedule/items/BOQ/SOR of work) in support of Qualifying Work Order(s) value as per qualifying parameters. Completion certificate indicating Work order reference & date, nature of completed works, date of completion & final completed value of work.

Note:

- In case of Work Order issued from Government Bodies/PSUs – Copies of Contract Document along with either completion certificates OR duly Certified copy of bill/Invoice. Copy of contract document may not be insisted if completion certificate/Bill/Invoice copy specifies details otherwise required like date of PO/contract agreement , Contract value, Execution value , date of completion and other requirements if any.
- In case of Work Orders from Private parties – Certificate from CA certifying value of work done with TDS certificates (where applicable) / bank statement shall be required in addition to that specified in (i). TDS certificates / Bank statements shall be used as corroborative evidence only.
- In case of foreign currency transaction to Indian firms, proof of remittance shall also be required. The exchange rate of conversion from foreign currency to INR as per SBI TT selling rate as on the last day of the month previous to the one in which the tender was invited will be considered.

ii. Copy of Audited BALANCE SHEET & PROFIT/ LOSS account statements for the financial years (FY) 2014-15, 2015-16 & 2016-17.

Note:

- Turnover for this purpose should be as per audited Balance Sheet of the Bidder. However, if the Bidder is not required to get its accounts audited under Section 44AB of The Income Tax Act, 1961, certificate from a Practicing Chartered Accountant towards the turnover of the Bidder along with copies of its Income Tax Return should be obtained.
- Tenders invited during April – September, in case of non availability of audited balance sheets (Profit & Loss Account Statement)/ published accounts of the immediate preceding year, the audited balance sheet (P&L Statement)/ published account of 4th preceding financial year shall also be acceptable.
- Audited Balance Sheet / published accounts on a calendar year basis shall also be acceptable.

1.2 OTHER COMMERCIAL CRITERIA:

Following Copy of documents should also be uploaded with the Technical/ Commercial Bid;

i. Power of Attorney/ board resolution (as applicable) in favour of tender signing authority.
ii. Partnership deed or Certificate of Incorporation with memorandum & articles of association.
iii. PAN Card.
iv. Registration with PF Commissioner.
v. GST Registration certificate.
vi. Other undertaking & Declarations required as per the proforma enclosed in the tender.
vii. Compliance to Integrity Pact.
viii. Standard declarations as applicable.

Note: Notwithstanding any other condition/ provision in the tender documents, in case of ambiguity or incomplete documents pertaining to PQC, bidders shall be given only one opportunity with a fixed deadline after bid opening to provide complete & unambiguous documents in support of meeting the PQ criteria. In case the bidder fails to submit any document or submits incomplete documents within the given time, the bidders tender will be rejected.

2. TENDER REJECTION:

The TENDER SHALL STAND SUMMARILY REJECTED inter-alia on following grounds:

i. Nonsubmission of EMD instruments and proof towards exemption, if claimed within due date & time as per NIT.
ii. Bidder not meeting qualifying parameters.
iii. Non-withdrawal of conditions imposed in tender document & conditions imposed during negotiations subsequent to Price Bid opening.
iv. Bidder submitting fabricated/false/ forged documents along with tender documents.

3. TO BE FURNISHED ON LETTER-HEAD:

Form of tender/ Declarations/ Undertakings (from page No.15 to 33) are to be duly filled-in the relevant details and taken prints of the Bidders' letter head and uploaded.

TECHNICAL BID/ COMMERCIAL BID ABSTRACT

(MUST BE FILLED BY THE TENDERER AND SUBMITTED ALONG WITH TECHNICAL BID)

SN	DETAILS	IOC's REQUIREMENT	DETAILS FURNISHED BY TENDERER
1	Earnest Money Deposit	**As per NIT**	
2	a. Mode of EMD b. Details of EMD (BG no ; date; Banker)	BANK GUARANTEE / NEFT /RTGS	
3	Income Tax Assessment/ Returns for the past 3 financial years. (FY 14-15; 15-16,16-17) **PAN**	To enclose copies of returns filed Furnish copy of PAN	
4	GST registration number of Arunachal Pradesh/Undertaking for obtaining GST of Arunachal pradesh	To be furnished	
5	Value of similar works executed (Copies of Work order, Work completion certificate, and Final bills to be enclosed).	**As per NIT**	
6	Annual Turnover (audited Balance Sheet, Profit & Loss account statement to be enclosed).	**As per NIT**	
7	List of clients with WO copies	To be enclosed	
8	Credentials	To be enclosed	
9	Validity of tender	**04 (FOUR) months**	
10	Completion time	**As per NIT**	
11	Tender documents to be signed on all pages with seal & submitted	To be digitally singed, uploaded & confirmed	

SN	DETAILS	IOC's REQUIREMENT	DETAILS FURNISHED BY TENDERER
12	Equipment/machinery questionnaire	To be furnished	
13	Experience questionnaire	To be furnished	
14	Confirm that there are no deviations from tender conditions	To be furnished	
15	Confirm that scan copy of EMD instrument is uploaded in technical bid packet	To be confirmed	
16	Confirm that Prebid minutes have been uploaded in technical bid pocket with signature & stamp	To be confirmed	
18	Confirm that the Price bid does not contain any condition	To be confirmed	
19	Mobilization advance	As per tender & payment Terms.	Yes/ No (vendor to confirm in the bid)
20	Any other relevant information	May be furnished	

SIGNATURE OF TENDERER:

SEAL & DATE

ADDRESS

FORM OF TENDER (TECHNICAL BID)

(To be filled up by the Tenderer)

For Commercial Bid

Serial No. Date:

From

_____

_____

_____

To

Indian Oil Corporation Ltd.

(MARKETING Division)

_____Project

Tender No. _____

Dear Sirs,

Having examined the Tender Documents consisting of the Tender Notice, General Instructions to Tenderers, General Conditions of Contract, Special Instructions to Tenderers, Special Conditions of Contract, Specifications, Plans (Exhibits _____ to _____), Drawings (Exhibits _____ to _____) Time Schedule, Form of Contract, Form of Schedule of Rates, and Addendum(a) to the Tender Documents, and having understood the provisions of the said Tender Documents and having thoroughly studied the requirements of Indian Oil Corporation Ltd. relative to the work tendered for in connection with the _____(Name of the Refinery/Project) and having conducted a thorough study of the job site(s) involved, the site conditions, soil conditions, the climatic conditions, labour, power, water, material and equipment availability, the transport and communication facilities, the availability and suitability of borrow areas, the availability of land for right of way and temporary office accommodation and quarters and all other facilities and things whatsoever necessary for or relative to the formulation of the tender or the performance of work, I/we hereby submit my/our tender offer for the performance of proposed work in accordance with the terms and conditions and within the time mentioned in the Tender Documents.

I/We further undertake to keep my/our this tender offer open for a period of not less than 4 (four) months from the scheduled date of opening of Tenders as specified in the General Instructions to Tenderers forming part of the Tender Documents.

I/We hereby further state that I/We/None of us (in the case of partnership firm) and none of our Directors (in the case of a Company) was/were employed as Directors of Indian Oil Corporation Ltd., during the period of 2 (two) years immediately preceding the date hereof OR I/We hereby declare that I/Shri _____one of our partners (in the case of partnership firm/Directors in the case of a Company) was employed as a Director in Indian Oil Corporation Ltd., during the period of 2 (two) years immediately.

Preceding the date hereof and that I/Shri _____ have/has obtained previous permission of Indian Oil Corporation Ltd. to make this tender.

I/We have annexed to this Bid the following documents:

(i) Schedule of Rates in the prescribed form.

(ii) Original Power of Attorney or other proof of authority of the person who has signed the Tender OR copy of Power of Attorney attested by a Gazetted Officer or a Notary Public in proof of the authority of the person who has signed the Tender.

(iii) Information regarding tenderer in the form annexed to the Form of Tender.

(iv) Information regarding experience of the tenderer in the performance of work of a comparable nature in the form annexed to the Form of Tender.

(v) Information regarding construction Organization and equipment in the form annexed to the Form of Tender.

(vi) Set of Tender Documents, as issued duly signed.

(vii) Additional Documents as listed below.

I/We hereby undertake that the statements made herein/information giver in the Annexures referred to above are true in all respects and that in the event of any such statement or information being found to be incorrect in any particular, the same may be construed to be a misrepresentation entitling Indian Oil Corporation Ltd. to avoid any resultant contract.

I/We further undertake as and when called upon by Indian Oil Corporation Ltd. to produce, for its inspection, original(s) of the document(s) of which copies have been annexed hereto.

I/We confirm having deposited Earnest Money of `_____ (Rupees_____) as detailed hereunder (Strike off whichever is not applicable)

(Signature(s) of the Tenderer(s))

Name & Designation of
authorized person
signing the Tender on behalf of
the Tenderer (s)
Full Name and address of the Bidder(s)

Witness :
Signature :
Name :
Occupation :

Name & Designation of authorized
person signing the Tender on
behalf of the Tenderer (s)
Full Name and address of the Bidder(s)

Witness :
Signature :
Name :
Occupation :

FORM OF TENDER (PRICE BID)

(Note: Tenderers to note that while submitting the Form of Tender (Price Bid) in respective letter heads, it is advised strictly that the price MUST NOT be disclosed in the form since the tender is of 2 bid type. The space provided shall be written as "AS PER ENCLOSED BOQ". Tenders received with disclosing of the price in any place other than the price bid shall be liable for rejection)

For Price Bid

Serial No. - Date:

From

_____

To -

Indian Oil Corporation Ltd.

(MARKETING division)

_____ PROJECT

Tender No._____

Dear Sirs,

Having examined the Tender Documents consisting of the Short Tender Notice, General Instructions to Tenderers, General Conditions of Contract, Special Instructions to tenderers, Special Conditions of Contract, Specifications, Plans (Exhibits _____to _____), Drawings (Exhibits _____ to _____)Time Schedule, Form of Contract, Form of Tender, Form of Schedule of Rates, and Addendum(a) to the Tender Documents, and having understood the provisions of the said Tender Documents and having thoroughly studied the requirements of Indian Oil Corporation Ltd. relative to the work tendered for in connection with the _____ (Name of the Refinery/Project) and having conducted a thorough study of the job site(s) involved, the site conditions, soil conditions, the climatic conditions, labour, power, water, material and equipment availability, the transport and communication facilities, the availability and suitability of borrow areas, the availability of land for right of way and temporary office accommodation and quarters aid all other facilities and things whatsoever necessary for or relative to the formulation of the tender of the performance of work, I/we hereby submit my/our tender offer for the performance of proposed work in accordance with the terms and conditions and within the time mentioned in the Bid Documents at the rate(s) quoted by me/us in the accompanying Schedule of Rates based on the Form of Schedule(s) of Rates included within the Tender Documents and arrived at a total contract value of `_____ (Rupees _____only) based on an application of the rates tendered in the accompanying Schedule(s) of Rates to the relative quantities indicated in the Form Schedule(s) of Rates forming part of the Tender Documents.

If the work or any part thereof is awarded to me/us, I/We undertake to perform the work in accordance with the Contract Documents as defined in the Form of Contract forming part of the Tender Documents and accept the terms and conditions of Contract as laid down therein and undertake within 10 (ten) days of receipt of acceptance of Tender to pay to and/or deposit with the Accounts Officer, -_____ (Name of the Refinery/Project) Indian Oil Corporation Ltd. (Refineries/Pipelines/ Marketing Division) a sum which together with the amount of earnest money deposited by me/us in terms hereof, shall make 2½% (two and one-half percent) of total contract

value as specified in the Acceptance of tender for the purpose of security deposit, by any one or more of the modes of payments specified in this behalf in the General Conditions of Contract, and to commence work at each job site(s) involved within 10 (ten) days of handing over the job site or any part thereof to me/us, and to sign the formal Contract in the terms of the form of contract forming part of Tender Documents, within 10 (ten) days of receipt of Letter of Acceptance from and on behalf of Indian Oil Corporation Ltd, in this behalf failing which Indian Oil Corporation Ltd., shall be at liberty, without reference to me/us and without prejudice to any of its rights or remedies, to terminate the Contract and/or to forfeit the earnest money deposited in terms hereof.

I/We further undertake to keep my/our this tender offer open for a period of not less than 4 (four) months from the scheduled date of opening of Tenders as specified in the General Instructions to Tenderer forming part of the Tender Documents.

I/We have annexed to this Bid the following documents:

(i) Schedule of Rates in the prescribed Form.

(ii) Original Power of Attorney or other proof of authority of the person who has signed the Tender OR copy of Power of Attorney or other authority duly certified by a Gazetted Officer or a Notary Public in proof of authority of the person who has signed the Tender.

I/We hereby undertake that the statements made herein/information given in the Annexures referred to above are true in all respects and that in the event of any such statement or information being found to be incorrect in any particular, the same may be construed to be a misrepresentation entitling Indian Oil Corporation Ltd. to avoid any resultant contract.

I/We further undertake as and when called upon by Indian Oil Corporation Ltd. to produce, for its inspection, original(s) of the document(s) of which copies have been annexed hereto.

[Signature(s) of the Tenderer(s)]

Name & Designation of authorized person

signing the Tender on behalf of the Tenderer (s)

Full Name and address of the Bidder(s)

Witness :

Signature :

Name :

Occupation :

UNDERTAKING BY THE TENDERER(S)

NAME OF WORK:

_____

_____

Tender No. : _____

We confirm that we have quoted the rates in the tender considering Inter-alia the

1. Tender Document(pages)
2. Additional Document(s) (if any pages)
3. BOQ Document (Price Bid Format)
4. Corrigendum (if any pages)
5. Pre Bid Meeting Minutes (if any pages)

We _____ (Name of the Tenderer) hereby certify that we have fully read and thoroughly understood the tender requirements and accept all terms and conditions of the tender including all corrigendum/addendum issued, if any. Our offer is in confirmation to all the terms and conditions of the tender including all corrigendum/addendum, if any and minutes of the pre-bid meeting. In the event our offer is found acceptable and contract is awarded to us, the complete tender document shall be considered for constitution of Contract Agreement.

SIGNED FOR AND ON BEHALF OF TENDERER(S)

Name of Tenderer(s)

Date : _ _/_ _/_ _ _ _

Place :

Seal & Signature of Tenderer

NOTE: This declaration should be signed by the Tenderer's authorized representative on COMPANY LETTERHEAD who is signing the Bid and scanned copy to be uploaded.

INTEGRITY AGREEMENT

Covering Letter required to be signed and submitted by the tenderer

Ref: Dated:

To,

Indian Oil Corporation Limited

Sub: Submission of Offer for Tender no. _____ for _____

Dear Sir,

The Bidder acknowledges that Indian Oil Corporation Limited (IOCL) has signed the MOU with Transparency International India for the adoption of the Integrity Pact Program and stands committed to following the principles thereof as enumerated in the Integrity Agreement enclosed with the tender document.

The Bidder agrees that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the enclosed Integrity Agreement, which is an integral part of tender documents, failing which the tenderer will stand disqualified from the tendering process. The Bidder acknowledges that the Bid would be kept open in its original form without variation or modification for a period of _____ days (state the number of days from the last date for the receipt of tenders stated in the NIT) AND THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

Bidder confirms acceptance and compliance with the Integrity Agreement in letter and spirit and further agrees that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when bid is finally accepted by IOCL. The Bidder acknowledges and accepts the duration of the Integrity Agreement, which shall be in line with Article 8 of the enclosed Integrity Agreement.

Bidder acknowledges that in the event of Bidder's failure to sign and accept the Integrity Agreement, while submitting the Bid, IOCL shall have unqualified, absolute and unfettered right to disqualify the tenderer and reject the Bid in accordance with the terms and conditions of the tender.

Yours faithfully,

(Duly authorized Signatory of the Bidder)

(Note - One copy of this letter along with the Integrity Agreement duly signed must be returned along with the offer).

To be signed by the bidder and same signatory competent/authorized to sign the relevant contract on behalf of IOCL.

(_____ _____Division)

Tender no. :_____

INTEGRITY AGREEMENT

This Integrity Agreement is made at _____ on this _____ day of _____, 2016 BETWEEN

Indian Oil Corporation Limited, a company duly incorporated and validly existing under the provisions of Companies Act, 1956 and having its registered office at Indian Oil Bhavan, 9, Ali Yavar Jung Marg, Bandra (East), Mumbai 400051 (hereinafter referred as the 'Principal/Owner', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns) And

…… (name and address of the Individual/firm/Company/consortium members through _____(mention details of duly authorized signatory) hereinafter referred to as the "Bidder/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns.

Preamble

WHEREAS the Principal/Owner has floated a tender (Tender No. :) (hereinafter referred to as "Tender") and intends to award, under laid down organizational procedures, contract/s purchase order/work order for ……..(name of contract/order) or items covered under the tender hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS, in order to achieve these goals, the Principal/Owner has appointed Independent External Monitors (IEM), to monitor the Tender process and the execution of the Contract for compliance with the principles as laid down in this Agreement.

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesseth as under:

Article 1: Commitment of the Principal/Owner

1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

   a) No employee of the Principal/ Owner, personally or through any of his/her family members, will, in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

   b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the

Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal Code (IPC) /Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2-Commitments of the Bidder(s)/Contractor(s)

1) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or document provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder(S)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(S)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participates in a tender on behalf of one manufacturer, he would not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/ parallel tender for the same item. Copy of CVC guidelines dated 21/4/2004 is annexed hereto as **Annexure A.**

e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose (with each tender as per proforma enclosed) any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

2) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Article 3. Disqualification from Tender Process and exclusion from future contracts

1. If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner is entitled to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate the Contract, if already executed or exclude the Bidder/ Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be for a period of 1 year to 3 years as per the procedure prescribed in the guidelines for holiday listing of the Principal/Owner.
2. The Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right to resort to and impose such exclusion.
3. Apart from the above, the Principal/Owner may take action for banning of business dealings/holiday listing of the Bidder/Contractor as deemed fit by the Principal/Owner.

Article 4-Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(/Contractor(s):

1) **Forfeiture of EMD/Security Deposit**: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated the Contract or has accrued the right to terminate the Contract according to Article 3, the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the Earnest Money Deposit/ Bid-Security amount of the Bidder/Contractor.

2) **Criminal Liability**: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of PC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to the Chief Vigilance Officer.

Article 5- Previous Transgression

1) The Bidder declares that no previous transgressions occurred in the last 3 years with any other Company in any country confirming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the Tender process.
2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/ Contractor as deemed fit by the Principal/ Owner.
3) If the Bidder/Contractor can prove that he has resorted \recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion as per laid down organizational procedures, revoke the exclusion prematurely.

Article 6- Equal Treatment of all Bidders/Contractors/Subcontractors

1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any

violation(s) of the principles laid down in this agreement/Pact by any of its Sub-contractors,/ sub-vendors.

2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 7-Independent External Monitor (IEM)

1) The Principal/Owner has appointed competent and credible Independent External Monitor(s) (IEM) for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

2) The IEM is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairman, Indian Oil Corporation Limited.

3) The Bidder(s)/Contractor(s) accepts that the IEM has the right to access, without restriction, to all Project documentation of the Principal/Owner including that provided by the Contractor. The Contractor will also grant the IEM, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his or any of his Sub-Contractor's project documentation. . The IEM is under contractual obligation to treat the information and documents of the Bidder(s)/Contractor(s)/Subcontractor(s) with confidentiality.

4) In case of tenders having estimated value of Rs 150 Crores or more, the Principal/Owner will provide to the IEM sufficient information about all the meetings among the parties related to the Project and shall keep the IEM apprised of all the developments in the Tender Process.

5) As soon as the IEM notices, or believes to notice, a violation of this Pact, he will so inform the Management of the Principal/Owner and request the Management to discontinue or take corrective action, or to take other relevant action. The IEM can in this regard submit non-binding recommendations. Beyond this, the IEM has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

6) The IEM will submit a written report to the Chairman, Indian Oil Corporation Limited within 6 to 8 weeks from the date of reference or intimation to him by the Principal/Owner and, should the occasion arise, submit proposals for correcting problematic situations.

7) If the IEM has reported to the Chairman, Indian Oil Corporation Limited a substantiated suspicion of an offence under the relevant IPC/PC Act, and the Chairman, IOCL has not, within reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the IEM may also transmit the information directly to he Central Vigilance Commissioner.

8) The word "IEM" would include both singular and plural.

Article 8 - Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the Contract or till the continuation of defect liability period, whichever is more and for all other Bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/determined by the Chairman, IOCL.

Article 9-Other Provisions

1) This Pact is subject to Indian law, place of performance and jurisdiction is the Head Office/Head quarters of the Division of the Principal/Owner, who has floated the Tender.
2) Changes and supplements need to be made in writing. Side agreements have not been made.
3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.
4) Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
5) Any dispute or difference arising between the parties with regard to the terms of this Agreement/Pact, any action taken by the Owner/Principal in accordance with this Agreement/ Pact or interpretation thereof shall **not** be subject to arbitration.

Article 10- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Pact will have precedence over the Tender/Contract documents with regard any of the provisions covered under this Pact.

IN WITNESS WHEREOF the parties have signed and executed this Pact at the place and date first above mentioned in the presence of following witnesses:

_____

(For and on behalf of Principal/Owner)

_____

(For and on behalf of Bidder/Contractor)

WITNESSES:

1. _____ (signature, name and address)

_____

2. _____ (signature, name and address)

_____

Note: In case of Purchase Orders wherein formal agreements are not signed references to witnesses may be deleted from the last part of the Agreement.

PROFORMA OF DECLARATIONS TO BE FURNISHED BY THE TENDERERS

D E C L A R A T I O N - `A'

We declare that we have complied with the conditions of GCC & Purchase agreement

Date :

Place :

Tenderer's signature

Seal

D E C L A R A T I O N - `B'

We declare that we do not have any employee who is related to any officer of the Corporation/ Central/ State Governments of India.

OR

We have the following employees working with us who are near relatives of the Officer/ Director of the Corporation/ Central/ State Government in India.

Name of the employee of the Tenderer	Name & designation of the Officer of the Corporation/ Central/ State Governments

Date :

Place :

Tenderer's Signature

Seal

D E C L A R A T I O N - `C'

The Tenderer is required to state whether he is a relative of any Director of Indian Oil Corporation or the Tenderer is a firm in which any Director of our Corporation or his relative is a partner or any other partners of such a firm or alternately the Tenderer is a private company in which Director of Indian Oil Corporation is a member or Director.

S/N	PARTICULARS	DETAILS
1	Name of the Tenderer and his relations with the Director in our Corporation.	
2	Name of the Director of the Corporation who is related to the Tenderer.	
3	Name of the Director of the Corporation who is a member or a Director of the firm.	

Date : **Tenderer's**

Place : **Signature & Seal**

DECLARATION – 'D'

Tenderer is required to state whether they have employed any retired Director and above rank officer of Indian Oil Corporation Limited in their firm. If so, details hereunder to be submitted.

S/N	PARTICULARS	DETAILS
1	Name of the person	
2	Post last held in IOC	
3	Date of retirement	
4	Date of employment in the firm	

Date : **Tenderer's**

Place : **Signature & Seal**

Note:

a. A separate sheet may be attached, if the above is not sufficient.

b. Strike out whichever is not applicable. If the tenderer employs any person subsequent to signing the above declaration and the employee/s so appointed happens to be the near relatives of the Officer/Director of the Corporation/Central/State Governments, the tenderer should submit another declaration furnishing the name/s of such employee/s who is/are related to the officer/s of the Corporation/ Central/ State Governments.

c. List of Directors of IOC board is attached.

STATEMENT OF CREDENTIALS

(to be furnished by the tenderer)

NOTE:

1. To be filled and signed with stamp by contractor.
2. Incorrect/ false declaration will result in disqualification.
3. Necessary supporting documents to be enclosed.
4. Corporation reserves the right to assess the tenderer's capacity and capability if necessary by visiting/ inspecting recently executed / under 1execution of works

SL NO	PARTICULARS	DETAILS
1	NAME OF THE FIRM	
2	DATE/ YEAR OF ESTABLISHMENT	
3	STATUS OF COMPANY (PRIVATE/ PARTNERSHIP / PROPREITARY/ PVT./ PUBLIC LTD/ PSU ETC)	
4	NAMES OF PARTNERS/ DIRECTORS/ OWNERS & THEIR BIO-DATA A. B. C.	
5	AUTHORISED SIGNATORY	

	A. B. C.	
6	PERMANENT INCOME TAX NUMBER (ATTACH LATEST COPY OF ITCC)	
7	NAME OF BANKERS, BRANCH & LOCATION:	
8	PF REGISTRATION NUMBER: (ENCLOSE COPY OF CERTIFICATES)	
9	REGISTRATION WITH OTHER COMPANIES: (ENCLOSE COPIES OF CERTIFICATES)	
10	IF SIMILAR WORKS EXECUTED FOR M/S. INDIAN OIL CORPORATION LIMITED IN THE PAST YEARS, FURNISH DETAILS OF WORK ORDER, DATE OF COMPLETION, ETC:	
11	CAPACITY TO LIAISE WITH LOCAL PANCHAYAT/ MUNICIPALITY / MUNICIPAL CORPORATION AS THE CASE MAY BE:	
12	CAPACITY TO LIAISE WITH LOCAL ELECTRICITY AUTHORITY:	
13	ANY OTHER INFORMATION DESIRED TO BE FURNISHED BY TENDERER:	

(*) – ATTACH DOCUMENTS IN PROOF OF ABOVE DETAILS REQUESTED FOR.

SIGNATURE OF TENDERER

DATE

ADDRESS/ SEAL

PROFORMA OF DECLARATION OF BLACK LISTING/ HOLIDAY LISTING

(FORMAT TO BE TYPED ON TENDERERS' LETTERHEAD AND SUBMITTED ALONG WITH TECHNICAL BID DOCUMENTS WITH SIGNATURE AND STAMP)

In the case of a Proprietary Concern:

I hereby declare that neither I in my personal name or in the name of my Proprietary concern M/s _____ which is submitting the accompanying Bid//Tender nor any other concern in which I am proprietor nor any partnership firm in which I am involved as a Partner, are presently or have during the past three years, been placed on any black list or holiday list declared by Indian Oil Corporation Ltd. Or by any department of any Government (State, Provincial, Federal or Central) or by any Public Sector Organization in India or in any other country nor is there pending any inquiry by Indian Oil Corporation Ltd. Or any Department of the Government or by any Public Sector Organization in India or in any other country, in respect of any corrupt or fraudulent practice(s) against me or any other of my proprietorship concern(s) or against any partnership firm(s) in which I am or was at the relevant time involved as a partner, except as indicated below:

(Here give particulars of blacklisting or holiday listing, and /or inquiry and in absence thereof state "NIL")

In the case of a Partnership Firm:

We hereby declare that neither we, M/s _____, submitting the accompanying Bid/Tender nor any partner involved in the said firm either in his individual capacity or as proprietor or partner of any other firm or concern presently are or within the past three years have been or has been placed on any blacklist or holiday list declared by Indian Oil Corporation Ltd. Or by any department of Government (State, Provincial, Federal or Central) or by any Public Sector Organization in India or in any other country nor there is any pending inquiry by Indian Oil Corporation Ltd. Or by any Department of any Government (State, Provincial, Federal or Central) or by any Public Sector Organization in India or in any other country, in respect of corrupt or fraudulence

practice(s) against us or any partner or any partner or any other concern or firm of which he is proprietor or partner, except as indicated below:

(Here give particulars of blacklisting or holiday listing and/or inquiry and in the absence thereof state "NIL")

In the case of Company:

We hereby declare that neither we or a parent, subsidiary or other company under direct or indirect common parent (associate company) are presently nor have within the past three years been placed on any holiday list or black list declared by Indian Oil Corporation Ltd. Or by any Department of any Government (State, Provincial, Federal or Central) or by any Public Sector Organization in India or in any other country; and that there is no pending inquiry by Indian Oil Corporation Ltd or by any Department of any Government (State, Provincial, Federal or Central) or any Public Sector Organization in any country against us or a parent or subsidiary or associate company as aforesaid in India or in any other country, in respect of corrupt or fraudulent practice(s), except as indicated below:

(Here give particulars of black listing or holiday listing and/or inquiry and in the absence thereof state "NIL")

It is understood that if this declaration is found to be false in any particular, Indian Oil Corporation Ltd. Shall have the right to reject my/our bid, and if the bid has resulted in a contract, the contract is liable to be terminated without prejudice to any other right or remedy (including black listing or holiday listing) available to Indian Oil Corporation Ltd.

Place: Signature of Bidder

Date: Name of Signatory

LIST OF BOARD OF DIRECTORS

1. **Shri Sanjiv Singh**
Chairman
Indian Oil Corporation Limited
Corporate Office
Plot 3079/3, Sadiq Nagar
J.B.Tito Marg
New Delhi-110 049.

2. **Shri A.K.Sharma**
Director (Finance)
Indian Oil Corporation Limited
Corporate Office
Plot 3079/3, Sadiq Nagar
J.B.Tito Marg
New Delhi-110 049.

3. **Shri Anish Aggarwal**
Director (Pipelines)
Indian Oil Corporation Limited
A-1, Udyog Marg
Sector-1
Noida-201 301.

4. **Shri G.K.Satish**
Director (Planning & Business Development)
Indian Oil Corporation Limited
IndianOil Bhavan
No.1, Sri Aurobindo Marg
Yusuf Sarai
New Delhi-110 016.

5. **Dr.S.S.V.Ramakumar**
Director (R&D)
Indian Oil Corporation Limited
R&D Centre
Sector 13
Faridabad-121 002.
Haryana.

6. **Smt. Urvashi Sadhwani**
Sr. Advisor
Ministry of Petroleum & Natural Gas
Shastri Bhavan
Bhavan, New Delhi – 110 001

7. **Shri Ashutosh Jindal**
Joint Secretary(M)
Ministry of Petroleum & Natural Gas
Shastri Bhavan
New Delhi – 110 001.

8. **Shri Sanjay Kapoor**
SCO 3, First Floor, Sector 11,
Panchkula-134 112.
Haryana

9. **Shri Parindu K.Bhagat**
A/F/1, Shapath Tower-IV
Opp.Karnavati Club, Above Central Bank
S.G.Highway
Ahmedabad-380 015.

10. **Shri B.V.Rama Gopal**
Director (Refineries)
Indian Oil Corporation Limited
SCOPE Complex Core 2
7, Institutional Area
Lodhi Road,New Delhi – 110 003.

11. **Shri Samirendra Chatterjee**
71 Vikramshila Apartments
IIT Delhi Campus
Hauz Khas
New Delhi-110 016.

12. **Shri Vivek Rae**
Flat No.171
Gulmohar Enclave
New Delhi-110 049.

13. **Shri Chitta Ranjan Biswal**
Plot No.36, Prashasan Nagar
Road No.72, Jubilee Hills
Hyderabad-500 033.

14. **Dr.Jagdish Kishwan**
B 702, True Friends Apartments
Sector-6, Plot-29
Dwarka,
New Delhi-110 075.

15. **Shri Sankar Chakraborti**
SMERA Ratings Limited
102, 1st Floor, Sumer Plaza
Marol Maroshi Road
Andheri (East)
Mumbai – 400 059.

16. **Dr. B. Mahadevan**
Indian Institute of Management Bangalore
116, Faculty Quarters
Bannerghatta Road
Bangalore-560 076.

17. **Shri Dharmendra Singh Shekhawat**
D.S.Shekhawat & Associates
S.No.-201-202, Venkateshwara Tower,
Central Spine, Vidhyadhar Nagar,
Jaipur-302 023.

18 **Shri Ranjan Kumar Mohapatra**
Director (Human Resources)
Indian Oil Corporation Limited
Corporate Office
Plot 3079/3
Sadiq Nagar
J.B.Tito Marg
New Delhi-110 049.

19 **Shri Vinoo Mathur**
Tower 10 / Flat 902
Vipul Belmonte, Golf Course Road, Sector 53
Gurugram – 122 002.

ABBREVIATIONS & NOTATIONS

UNLESS OTHERWISE SPECIFIED FOLLOWING NOTATIONS/ ABBREVIATIONS SHALL BE APPLICABLE TO DOCUMENT

MM/mm	- MILLIMETER
SQMM/sqmm/mm2	- SQUARE MILLIMETER
CM/cm	- CENTIMETER
SQCM/Sqcm	- SQUARE CENTIMETER
SFT/sft	- SQUARE FEET
M/m/rm/RM	- METRE / RUNNING METRE
SQM/sqm/m2	- SQUARE METRE
CUM/cum/m3	- CUBIC METRE
KG/kg	- KILOGRAM
MT	- METRIC TONNE
MS	- MILD STEEL
DIA/dia/Φ	- DIAMETER
NO (S) / Nos. / nos.	- NUMBER(S)
PCC	- PLAIN CEMENT CONCRETE
RCC	- REINFORCED CEMENT CONCRETE
E-I-C	- ENGINEER - IN - CHARGE
IS/BIS	- INDIAN STANDARD
API	- AMERICAN PETROLEUM INSTITUTE
JOB	- JOB LUMPSUM
LS	- LUMPSUM
EMD	- EARNEST MONEY DEPOSIT
ISD	- INITIAL SECURITY DEPOSIT
BG	- BANK GUARANTEE

SPECIAL CONDITIONS OF CONTRACT

1.0 TENDER FEE AND EARNEST MONEY DEPOSIT:

1.1 **TENDER FEE**: Tender fee is **"NIL"** since e-TENDER.

1.2 **EARNEST MONEY DEPOSIT (EMD)**: Tenderers are requested to submit earnest money deposit **as per NIT**. Mode of submission of EMD:

a) NEFT/ Net Banking as per procedure detailed on the e-tender web site

b) EMD in the form of a bank guarantee issued by scheduled banks (as per the format furnished in the tender) shall be accepted only when the amount of the BG is not less than Rs. 1 Lac as per clause 4.19 of Instruction to tenderers of GCC enclosed. Such bank guarantee shall be issued by a scheduled bank in India acceptable to the owner and shall be strictly in the format prescribed by the Corporation for the specific purposes for which the BG is required to be furnished

1.2.1 Tenders received without EMD shall be rejected outright.

1.2.2 EMD of bidders disqualified during techno-commercial bid evaluation shall be released immediately after technical evaluation is approved by the competent authority.

1.2.3 EMD of bidders qualified in techno-commercial bid but unsuccessful in price bid stage shall be released immediately after final approval of the proposal by the competent authority.

1.2.4 EMD of the successful bidder shall be released / adjusted after submission of initial security deposit or full security deposit.

1.2.5 EMD of parties who submit EMD through NEFT or net banking shall be returned only to the bank accounts from which the EMD was initially issued.

1.2.6 EMD will not carry any interest.

1.2.7 Tenderers may note that that the EMD shall be forfeited in case of following situations in addition to those contained in GCC:

- Canvassing of information or submission of forged/ false documents/ information by tenderers.
- Backing out after placement of work order.

1.2.8 **Exemption from submission of EMD:**

a. Parties registered with any of the following agencies/bodies as per Public Procurement Policy for Micro & Small Enterprises(MSE) Order 2012 are exempted categories from payment of EMD provided that the registration certificate issued by any one of these below mentioned agencies must be valid as on close date of tender . Bidders who have applied for registration or renewal of registration with any of these agencies/bodies but have not obtained the valid certificate as on close date of tender are not eligible for exemption.

i. District Industries Centre(DIC)
ii. Khadi and Village Industries Commission (KVIC)
iii. Khadi and Village Industries Board
iv. Coir Board
v. National Small Industries Corporation(NSIC)
vi. Directorate of Handicraft and Handloom
vii. Udyog Aadhar Memorandum (UAM)
viii. Any other body specified by Ministry of MSME

Note: Against UAM, copy of acknowledgement generated online shall be acceptable

The above exemption shall be irrespective of their status as micro, small or medium enterprise. The exemption shall also be irrespective of whether they are registered for the tendered item and shall be applicable for procurement, works and services.

b.PSUs (Central & State) and JVs of IOCL

2.0 COMPLETION TIME:

2.1 The site handing over will be given depending upon the work front availability. In case the site is handed over simultaneously for all work fronts, total completion period will be 8 months from * Zero date. Further, if the site handing over is done in phased manner in view of work front availability/HOLD due to unforeseen reasons, the completion schedule will be as per the table given below.

Sl. no	Description	Completion time
A	All civil works, Electrical works,Providing furniture,Supplying/Fabrication/Erection/ Painting of structural steel works etc. except in railway siding area	* Zero date to 6 months.
B	All civil works, Electrical works, Supplying/Fabrication/Erection/ Painting of structural steel works etc. in railway siding area	* Zero date to 4 months

The period of hindrances / suspension of work including mansoon season (July –Sept) after handing over of site/during pedency of the work (as decided by Site In-charge), the same will be offset while calculating the actual completion time period.

* *Zero date shall be taken as from the date of handing over of respective site.*

2.2 Entire work should be completed in a duration **as per NIT** from the date of handing over the site which will be taken as the 10th day from the date of issue of Commencement order or the actual date of handing over the site whichever is later failing which price adjustment for delay in completion shall be made as per clause 4.4.0.0, section 4 of GCC. Such price adjustment for delay in completion needs to be passed on by the successful bidder as discount and needs to be reflected in the tax invoice or through credit note.

2.3 In partial modification to Clause 4.4.0.0, Section 4 of the GCC, "Price Adjustment for delay in completion shall be deducted at applicable percentage from RA bills, on cumulative value of works done up to the concerned RA bill. However, in cases of abandonment of site/termination, price adjustment for delay shall be applied in line with GCC clause 7.0.9.0 on the total contract value as specified in the acceptance of tender"

2.4 This will be in addition to and without prejudice to the other rights available to the Corporation under the said GCC.

3.0 DOCUMENTS: These special terms and conditions shall be read in conjunction with the technical specifications, drawings, GCC and any other document forming a part of the tender, wherever the tender so requires.

4.0 VALIDITY OF TENDER: The tender will be valid for a period of **04 (FOUR) months (120 days)** from the date of opening the tender. IOC reserves the right to place work order at anytime within 4 months from date of opening of tender. Once work order is placed the rates shall

remain firm till completion of entire work in all respects except for items specifically covered specifically under escalation/de-escalation in the tender.

5.0 **SECURITY DEPOSIT:**

The successful tenderer shall pay security deposit up on placement of work order in line with relevant GCC clauses.

6.0 The tenderers must note that the rates and amount indicated in the schedule of works shall be applicable for all leads and lifts and reach involved.

7.0 The Corporation reserves the right to operate or not operate or partly operate any item mentioned in the schedule.

8.0 The rates quoted for all items below the ground level shall be inclusive of adequate shoring, shuttering, bailing out sub soil water (if found necessary) etc. complete. The successful tenderer shall be responsible for implementation of all precautionary measures for ensuring safety for all materials and labour till such time the work is completed in all respects and handed over to the Corporation.

9.0 The Corporation reserves the right to accept any tender in whole and reject any or all tenders without assigning any reasons. Decision of Corporation in this regard will be final.

10.0 Any additional work that may become necessary during course of execution of works as authorized by the Site In-charge shall be immediately got approved prior to taking up the work duly forwarding the details, nature of works etc as per relevant clause of the GCC.

11.0 In case the contractor fails to adhere to the time limit specified above or if the rate of progress is considered not satisfactory, the Corporation will be at liberty to terminate the contract and get the same executed by any other agency entirely at the cost and risk of the original contractor and in line with provisions available under the GCC.

12.0 **NATURE AND SCOPE OF WORK:** The scope of work shall be as per the SOW and specification enclosed along with the tender and generally comprises of the following but not limited to :

12.1 **Fall Arrestor system :** This system shall be constructed at siding area as per the drgs no. PC-00088-5211-0255, PC-00088-5211-0256 & PC-00088-5211-0257. There is end mast arrangement of fall arrestor and intermediate mast arrangement, every intermediate mast is 9 meters apart from one another as shown in the above mentioned drawings.

12.2 **Siding crossover arrangement :** This system shall be constructed at siding area as per the drgs no. PC88-5211-0953 & PC-00088-9512-0270. On the side where unloading header lines are kept every crossover arrangement is kept at 30 meters apart from one another. Hence total 24 nos. cross over are considered and on the other side total 8 nos cross over are considered (approx 70-80 mtrs apart). The platform adjacent to rail line / unloading points to be kept continuous throughout the 700 meter length.

12.3 High Mast Tower Foundation/ Light pole Foundation as per the requirement at site.

12.4 Plastering works Boundary wall: Plastering works in existing boundary wall

12.5 Painting works : This item consist of painting of boundary wall , dyke wall , chain link fencing, pedstrals etc. cement concrete tiles on road shoulder.

12.6 Road Shoulder works: This item is considered for shoulder (1 meter on both side) of roads inside the plot (road length of 3425 mtrs approx.).

12.7 Chain link fencing works : This item is considered for chain link fencing (length 720 + 360 = 1080 meters) for the additional land in front of siding entrance and area between TWD siding and P/H area .

12.8 Concrete flooring under the pipeline: This item is considered for concreting works below the pipeline laid for products , fire hydrant etc.

12.9 Gate : This item is considered for gate of 8 mtr length at entrance of siding.

12.10 Cable Trustle : This item is considered for cable trustle/structure (above ground) around the siding area (total length of siding 750 meter , trustle at every 1.5 meter i.e 500 cable trustle approx).

12.11 Supply of furniture.

12.12 Electrical works for illumination of perimeter of depot.The illumination level of 5 lux covering mimimum 20 m on both the side of the perimeter to be maintained for CCTV covering.

12.13 Supply and laying of RCC pipes.

12.14 Painting road surface marking.

12.15 Providing and applying road marking strips (retro-reflective).

12.16 Construction of brick masonry manhole.

12.17 Construction of brick masonry chamber for underground C.I. inspection chamber.

12.18 Supply and erection of various types of signage boards and wind sock.

12.19 All other works as contained in the schedule of works

12.2 Tenderers are advised to inspect the site and ascertain the conditions including leads/ lifts involved/ approach to vehicles/ power/ water etc prior to quoting the amount.

12.3 Additional detailed civil specifications are also enclosed as Civil Vol.1 and Civil vol. 2 which may also be reffered during execution of work.

13 Location of site:

13.1) **SITE DATA**

13.1a) STATE WHERE LOCATED	-	ARUNACHAL PRADESH
13.1b) NEAREST IMPORTANT TOWN	-	ITANAGAR
13.1c) NEAREST AIRPORT	-	LILABARI AIRPORT
13.1d) NEAREST RAILWAY STATION	-	GUMTO
13.1e) GSTIN of IOCL of Arunachal Paredesh	**-**	**12AAACI1681G1Z0**

14 Water Supply:

The contractor shall arrange water/procure water required for the work at his own cost for all leads and lifts. IOCL shall not be responsible for supplying water and Contractor shall ensure timely and adequate supply of water to meet the schedule.

The quality of water used should be suitable for the intended purpose and should have no harm to human and environment; the contractor shall produce the quality check report of approved laboratory whenever deemed necessary by IOCL or the consultant.

15 Power Supply:

15.1 The contractor shall make his own arrangement for power required for the work at his cost. DG set of suitable capacity may be installed and operated by the contractor at his cost.

IOCL shall not be responsible for power supply and contractor shall ensure proper supply of electricity to meet the schedule.

The electrical works shall be carried out through Licensed Electrical personnel only.

In case, electrical power is given by the Corporation at its discretion then, the electrical charges incurred on monthly basis shall be deducted from the bills payable to the contractors as per the prevailing tariff indicated in the electricity bills. The successful contractor shall make all arrangements to draw power from a single point in the depot as per directions at site including all necessary electrical cables, panel boards, energy meters etc. In such an event, the Corporation shall not be responsible for any power outages occurring during the contract period. However, the tenderers may note that there is no commitment on part of the Corporation to provide electrical power at site.

16 Contractor's Scope Of Supply:

16.2 All materials including moorum/earth required for filling ,cement, reinforcement, structural steel, consumables, testing appliances, tools and tackles necessary for completing the work shall be procured & supplied by the Contractor at his own cost unless otherwise specified in the schedule. No claim/ delay on this account will be entertained by the Corporation.

16.3 IOCL reserves the rights in selection of best make of materials to be procured by the contractors & contractor shall procure the same only up on the approval by site in charge. If contractor brings defective/ sub standard materials to site, it shall be the responsibility of the contractor for the removal and disposal of the same at his cost. The corporation shall not entertain any claim from the contractor in this account in case the contractor fails to remove such materials within 15 days after issuing notice in writing to the contractor. Corporation reserves the right to dispose such materials at the entire risk and cost of the contractor.

17 **Order of Precedence:** In case of contradiction between Indian Standards, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings, Schedule of Rates, the following shall prevail in order of precedence;

a. Formal contract
b. Acceptance of tender
c. Price schedule annexed to the letter of acceptance
d. Agreed variations annexed to the letter of acceptance
e. Addenda to tender documents
f. Special terms and conditions of contract
g. Integrity Pact
h. Special Instruction to Tenderers
i. General conditions of contract
j. Instructions to tenderers

A variation or amendment issued after the execution of the formal contract shall take precedence over the formal contract and all other Contract Documents. Notwithstanding the sub divisions of the tender document into several sections and volumes, every part of each

shall be deemed to be supplementary of every other part and shall be read with and into the contract so far as it may be practicable to do so.

18 Special Clauses On Taxation:

Clause No.	Description
	DEFINITIONS
1	Contractual period / Work Completion Period /Contractual Delivery Date / Contractual Completion Period shall mean the Scheduled Delivery / Completion Period as mentioned in the LOA (Letter of Acceptance) or Purchase Order or Work Order and shall also include approved extensions, if any.
	GENERAL
1	Where any portion of the GCC/any other section of tender, is repugnant to or at variance with any provision of the Standard Taxation Condition (STC), then the provision of the STC shall be deemed to override the provisions of the GCC and shall, to the extent of such repugnance or variations, prevail.
2	For the purpose of this STC, the term "tax" in addition to tax imposed under CGST (Central Tax)/SGST (State Tax)/IGST (Integrated Tax)/UTGST (Union Territory Tax)/ GST Compensation Cess Acts, also includes any duties, cess or statutory levies levied by central or state authorities.
3	Rate variation in Taxes and any new promulgated taxes after last date of the submission of price bid only on the final product and/or services (applicable to invoices raised on IOCL) within the contractual delivery date /period (including extension approved if any) shall be on IOCL's Account against submission of documentary evidence. Further , in case of delay in delivery of goods and/or services, any upward rate variation in Taxes and any new promulgated taxes imposed after the contractual delivery date shall be to the Seller's / Contractor's Account. Similarly in case of any reduction in the rate(s) of the Taxes between last date of submission of price bid relevant to the Contract and the date of execution of activities under the contract, the Contractor shall pass on the benefit of such reduction to IOCL with the view that IOCL shall pay reduced duty/Tax to Govt.
4	Wherever any escalation / de-escalation linked to raw material price (Basic price excluding taxes) is allowed as per terms of the contract, Variation to the extent related to escalation / de-escalation of value of material shall be allowed without Tax unless specified otherwise.

5	It would be the responsibility of the contractor to get the registration with the respective Tax authorities. Any taxes being charged by the Contractors would be claimed by issuing proper TAX Invoice indicating details /elements of all taxes charged and necessary requirements as prescribed under the respective tax laws and also to mention his correct and valid registration number(s) along with IOCL's registration number as applicable for particular supply on all invoices raised on IOCL. Contractor to provide the GSTIN number from where the supply is proposed to be under taken. Further the HSN Code / Service Accounting Code (SAC) as applicable for the subject tender needs to be provided in the columns provided in the technical bid. In case the contractor is opting for Composition scheme under the GST laws (i.e Section 10 of the CGST Act, 2017 and similar provisions under the respective State / UT law), the contractor should confirm the same. Further the contractor to confirm the issuance of Bill of Supply while submission of tender documents and no GST will be charged on IOCL. In case the contractor is falling under Unregistered category, the contractor should confirm the same.
6	The contractor would be liable to reimburse or make good of any loss/claim by IOCL towards tax credit rejected /disallowed by any tax authorities due to non deposit of taxes or non updation of the data in GSTIN network or non filling of returns or non compliance of tax laws by the Contractor by issuance of suitable credit note to IOCL. In case, contractor does not issues credit note to IOCL, IOCL would be constrained to recover the amount including interest payable alongwith Statutory levy/Tax, if any, payable on such recovery.
7	Tax element on any Debit Note / Supplementary invoice, raised by the contractor will be reimbursed by IOCL as long as the same is within the permissible time limit as per the respective taxation laws and also permissible under the Contract terms and conditions. Contractors to ensure that such debit Notes are uploaded while filing the Statutory returns as may be prescribed from time to time.
8	The contractor will be under obligation for quoting/charging correct rate of tax as prescribed under the respective Tax Laws. Further the Contractor shall avail and pass on benefits of all exemptions/concessions/benefits/waiver or any other benefits of similar nature or kind available under the Tax Laws. In no case, differential Tax Claims due to wrong classification of goods and/or services or understanding of law or rules or regulations or any other reasons of similar nature shall be entertained by IOCL.
9	In case, IOCL's Input Tax Credit (ITC) is rejected on account of wrong levy of tax i.e. payment of Integrated Tax in place of Central Tax+ State/Union Territory Tax or vice versa, the contractor is liable to make good the loss suffered by IOCL by issuance of suitable credit note to IOCL. In case, contractor does not issue credit note to IOCL, IOCL would be constrained to recover the amount including interest payable alongwith Statutory levy, if any, payable on such recovery.
10	In case the contractor is opting for Composition scheme under the GST laws, in such event the evaluation of his bid will be based on the Quoted Price. In case the contractor is falling under Unregistered category, then GST liability, if any, on IOCL will be included for the purpose of evaluation.
11	In case, IOCL is eligible to avail Input TAX Credit (ITC), the same shall be reduced from the delivered price to arrive at the net landed cost.
12	IOCL shall reimburse GST levied as per invoice issued by the Contractor as prescribed under section 31 of the CGST Act and respective states and Rules.

13	To enable IOCL to avail ITC, the contractor/supplier shall furnish/submit any and all certificates, documents and declarations as are required by IOCL to avail of the ITC with respect to GST reimbursed by IOCL on materials sold to IOCL.
14	Invoice should be raised as per Tax Rates mentioned in the BIDs and in case at the time of raising Invoice if the invoices raised are not as per Tax rates mentioned in the bid, payment will be limited to the rate quoted as per BID subject to increase /decrease in Rates after last date of submission of Price Bid provided delivery is within the Contractual period.
15	**ROAD PERMIT /WAY BILL**
15.1	IOCL will issue Road Permit/Way Bill, by whatever name it is called, to the Contractor only in those cases where materials is purchased by IOCL directly and/or IOC is statutorily required to issue the Road permit/Way Bill, by whatever name it is called. Contractor will be under obligation for proper utilization of road permits for the specific supply and in case of seizure of goods/vehicle; the Contractor will be wholly responsible for release and reimburse the litigation cost to IOCL.
15.2	IOCL shall on no account be responsible for delay or hold up due to the timely non availability of such documents as are required to be furnished by the owner to obtain the Road Permit/Way bill, by whatever name it is called. However, IOCL shall make best efforts to provide sufficient number of Road Permits/way bill, by whatever name it is called. On demand to avoid any delay or Hold up.
16	**Works Contract / Composite Supply / Mixed Supply**
16.1	Works contracts as defined under the GST law includes Contracts for Building, Construction, Fabrication, Completion, Erection, Installation, Fitting out, Improvement, Modification, Repair, Maintenance, Renovation, Alteration or Commissioning of any immovable property wherein transfer of goods is involved in the execution of such contracts. Composite Supply has been defined as supply in which two or more supply of goods or service or both or any combination are naturally bundled and supplied in conjunction with each other in the ordinary course of Business, and then the rate as applicable for principal supply will be applicable on the entire transaction. Mixed supply has been defined as supplies of goods or service or both which are made in conjunction with each other for a single price and which does not constitute a composite supply then the rate as applicable for the highest rate will be applicable. In view of the above various definitions under GST law, bidders are required to evaluate the jobs to be undertaken covered under the tender and quote accordingly by taking in to account the nature of Job read with the legal provision. The place of supply in relation to an immovable property shall be the location at which the immovable property is located or intended to be located.
16.2	In case, IOCL is eligible to avail Input TAX Credit (ITC), the same shall be reduced from the delivered price to arrive at the net landed cost. IOCL shall reimburse GST levied as per TAX invoice issued by the Contractor as prescribed under respective GST Acts and Rules. In case the contractor is not permitted to issue Tax Invoice the same should be clearly mentioned in the Bid.
16.3	To enable IOCL to avail ITC, the contractor/supplier shall furnish/submit any and all certificates, documents and declarations as are required by IOCL to avail of the ITC with respect to VAT reimbursed by IOCL on materials sold to IOCL
16.4	Invoice should be raised as per Tax Rates mentioned in the BIDs and in case at the time of raising Invoice if the invoices raised are not as per Tax rates mentioned in the bid, payment will be limited to the rate quoted as per BID subject to increase /decrease in Rates after last date of submission of Price Bid provided delivery is within the Contractual period.

17	**Income Tax**
	a. The contractor shall be exclusively responsible and liable to pay Taxes on Income arising out of payment made out of the contract. b. Wherever withholding tax i.e. Tax deduction at source (TDS) is applicable under the Income tax Act, 1961 the same will be deducted from the Invoices raised and TDS Certificate as per provision of the Income tax Act and Rules shall be issued to the contractor. c. PAN is mandatory. If PAN is not provided TDS would be deducted at higher rate as per the provisions of Income Tax Act.

18.1 Once the offer is accepted and agreement executed, the rates shall be valid till the completion of works in all respects except for items specifically covered under escalation /de-escalation. However, any variation in rates of taxes shall be dealt in line with the above mentioned clauses

19 Labour Agreement:

The Contractors who are working in the establishments through Contract Labour shall be fully responsible for observance of all rules and regulations as per the Contract Labour (Regulation and Abolition) Act 1971 and obtain a licence from the Assistant Labour Commissioner (Central) concerned and produce the same to IOCL. In this connection, tenderers shall abide by all the conditions of Appendix I and Appendix II enclosed with the GCC. The Principal Employer certificate shall be given on written request from contractor by IOCL.

20 PF Registration:

The tenderers shall indicate his/ their PF code number in the Statement of Credentials enclosed with the tender along with PF registration certificate failing which the tender shall be liable to be rejected. The successful tenderers shall abide by all the requirements and submit copies of all registers/ returns etc filed by them before the Corporation releases final dues.

21 Measurements For Works/Record Measurements/ Bills:

21.1 All the payment for quantities certified in the running account/ final bill shall be as per the details recorded in the standard measurement book/ SAP SES of the Corporation and jointly signed by the Contractor/ site engineer of IOC/Consultant.

21.2 Method of measurement shall be strictly in accordance with the technical specification for this work.

21.3 The payment shall be as per the details entered in the standard Measurement Certificate bills of the Corporation.

22 On Account Payments:

22.1 On Account Bills shall be paid for the work done, measured and certified. The value of an account bill shall be not less than Rs. 1 Crore (Rs One crore).

22.2 **Mobilisation Advance:** In partial modification of Clause 6.4.5 of GCC, the CONTRACTOR may (if specified by him in his bid and accepted by the OWNER) be allowed a Mobilization advance/ advance for an amount equivalent to up to 10% (ten per cent) of the Total Contract Value

excluding GST component. Such advance shall be released in 2 instalments as per the following :

- ✓ Mobilization advance up to 5 % of the Total Contract value
- ✓ Advance up to 5% after full recovery of previous instalment of mobilization advance paid including interest.

22.3 The payment of Mobilization Advance / advance shall be subject to the fulfilment of the following conditions:

a) The CONTRACTOR shall have signed and sent back a copy (or copies if so required) of the Acceptance of Tender issued by the OWNER in token of unqualified acceptance thereof.

b) The CONTRACTOR shall have furnished the Initial Security Deposit as stipulated in Clause 2.1.1.0 of GCC and associated clauses hereof.

c) The CONTRACTOR shall have executed the formal contract in terms of the Form of Contract.

d) The contractor shall have made a formal application for the release of the Mobilisation Advance / Advance and shall have furnished a Bank Guarantee of an amount equivalent to 110% of the Advance from a Bank in a format approved by the OWNER.

~~e)~~ The outstanding balance of the Mobilisation Advance / Advance shall carry interest at 1% (ONE PERCENT) above the State Bank of India declared rate of cash credit advances prevailing on the date of opening of price bids.

f) Without prejudice to any other mode of recovery available to the OWNER, the Mobilisation advance / Advance, together with interest thereon calculated on the reducing balance, shall be recovered at the rate of 10% (ten percent) of the gross certified amount of each Running Account Bill, till the advance, together with the interest accrued thereon, is recovered in full. The unrecovered balance if any, and interest may be recovered from the Final Bill of the CONTRACTOR and/or from any other amount due to the CONTRACTOR under any other contract or otherwise.

g) (i) If the OWNER is satisfied that *25%* (twenty five per cent) of the Mobilisation Advance / Advance and interest accrued till then on the Mobilisation Advance has been repaid to or recovered by the OWNER, the OWNER may on the application of the CONTRACTOR, if the Bank Guarantee submitted by the CONTRACTOR covers and secures only the Mobilisation Advance / Advance, permit the CONTRACTOR to substitute the Bank Guarantee by a Bank Guarantee acceptable to OWNER for an amount reduced by 25% (twenty five per cent).

(ii) The provisions of paragraph (i) hereof above, shall mutatis mutandis apply to the OWNER's satisfaction that the CONTRACTOR has repaid 50% (fifty per cent) and/or 75% (seventy five per cent), as the case may be, of the Mobilisation Advance/ advance, and interest accrued till then on the Mobilisation Advance / Advance.

h) All other conditions stipulated in Clause 2.1.2.0 hereof shall be applicable to the advance(s).

i) In partial modification of Clause 2.1.2.0 (a), the Composite bank Guarantee will be for a value equivalent to 110% of advance or 10% of the Total Contract Value, whichever is greater and shall be kept valid up to 3 (three) months beyond the expiry of the Defect liability period.

22.4 IOCL however reserves the right to discontinue/ stop further payment of mobilization advance if the progress of work is not in line with the progress of work as per the PERT chart (Construction Programme) submitted by contractor and agreed by IOCL or at the discretion of

the Engineer In Charge, if in his wisdom it is felt that the further release of mobilization advance shall be detrimental to the interest of the company. The decision of the Engineer In-Charge shall be final in this case.

22.5 Contractor has to submit copies of No Due Certificate/ Royalty Receipts as applicable from respective State Government Authorities for materials like imported earth, sand used for filling works at the time of RA/ Final bills. In the case of non-submission of such receipts by the Contractor, IOCL shall reserve its rights to deduct such amounts on account of Royalty at the rates specified by concerned State Government Departments from time to time. Deductions if any on this account shall be as per the theoretical consumption or actual consumption of the item at site, whichever is higher.

23 Price Adjustment For Delay In Completion:

23.1 The contractual price payable shall be subject to adjustment by way of discount if the units are mechanically completed or the contract works are finally completed subsequent to the date of mechanical completion/ final completion specified and as per provisions indicated in clause 4.4.0.0, Performance of work, Section 4 of GCC. Such price adjustment for delay in completion needs to be passed on by the successful bidder as discount and needs to be reflected in the tax invoice or through credit note.

23.2 In partial modification to Clause 4.4.0.0, Section 4 of the GCC, "Price Adjustment for delay in completion shall be deducted at applicable percentage from RA bills, on cumulative value of works done up to the concerned RA bill. However, in cases of abandonment of site/termination, price adjustment for delay shall be applied in line with GCC clause 7.0.9.0 on the total contract value as specified in the acceptance of tender"

24 Special Clause:

24.1 Successful tenderer shall abide all safety/security regulations that need to be followed inside a petroleum depot premises & as per the instruction of IOC officials.

24.2 Successful tenderer shall ensure that the sales representative of paint manufacturer must collect the paint sample as per the paint manufacturer procedure, in the presence of IOC and applicator's representative and sent to paint manufacturer's lab for testing.These sample checks to be carried out on random basis to ensure the paint quality ,at no extra cost.

24.3 The contractor is required to take necessary care to protect to the existing nearby structure while carrying out his scope of work. Any damage caused to other property shall be rectified at his own cost.

24.4 Many works executed may need clearance from an Acceptance Committee formed by Corporation at any stage of the work. Contractor shall render full cooperation and comply with all the observations, instructions of the Committee at no extra cost to IOC.

24.5 The contractor shall cooperate with other contractors for smooth execution of project related works. Along with the works covered under this contract other works shall be carried simultaneously by other Contractors. The Contractor shall extend full co-operation to the Contractors and the works, shall be carried out in such a way as not to affect the progress of the project. Any damage caused to other works shall be rectified by the Contractor at their entire risk and cost.

25 Approved brand PPC cement (equivalent to 33 grade) may also be used for concreting works.

26 The goods bearing the ISI Mark will be given preference.

26.1 Safety Practices during construction OISD GDN 192 (Revised Apr'16) shall be followed against Para 10.0.2.0 of GCC.

27 Bill Of Quantities:

27.1 Bill of quantities is approximate and payment shall be made as per actual certified measurements. The contractor is not entitled for any sort of compensation towards excess materials procured / stored during the progress of works.

27.2 After the placement of the order the successful tenderer shall not be allowed to sublet or assign any part of the work order without Corporation's prior written consent. In case sub contractors are engaged by the successful tenderer with prior permission from IOCL on award of works, it will be mandatory on part of the main contractor to furnish a NO DUE UNDERTAKING from the sub contractor (on their letter heads) to IOCL before final payments are cleared by the Corporation.

28 Authorized Representative:

The successful tenderer within 10 days of receipt of acceptance of tender, name an engineer responsible for the job at site on behalf of the contractor as per clause 4.0.3.0 and 4.0.3.1, Performance of work, section 4, of GCC, bidder should give in writing to the Corporation, the name of his authorized and qualified engineer who will supervise the work and shall remain at the site during execution of the job.

29 Site Condition & Cleaning:

29.1 The site will be handed over to the party on "as is where is" basis.

29.2 The Contractor shall take care for cleaning the working site from time to time for easy access to work site and also from safety point of view.

29.3 Working site should be always kept cleared up to the entire satisfaction of the Site Engineer. Before handing over any work to owner, the contractor in addition to other formalities to be observed as detailed in the document, shall clear the site to the entire satisfaction of Engineer-in-Charge.

30 MISCELLANEOUS REQUIREMENTS:

30.1 It shall be contractor's responsibility to obtain approval for any revision and/or modifications decided by the contractor from the Owner/Engineer-in-Charge before implementation. Also such revisions and/or modification if accepted / approved by the Owner/Engineer-in-Charge shall be carried out at no extra cost to the owner.

30.2 Any changes required during and/or after approval for detailed construction drawings due to functional requirements or for efficient running of system keeping the basic parameters unchanged and which has not been indicated by the Contractor in the data / drawings furnished along with the offer, will be carried out by the contractor at no extra cost to the owner.

30.3 All expenses towards mobilization & demobilization including bringing in equipment, clearing the site etc. shall be deemed to be included in the prices quoted and no separate payments on account of such expenses shall be entertained.

30.4 It shall be entirely Contractor's responsibility to provide, operate & maintain necessary construction equipments, scaffoldings and safety gadgets, cranes and other lifting tackles, tools and appliances to perform the work in a workman like and efficient manner & complete all jobs as per time schedules.

30.5 Preparing approaches and working area for movement and operation of the cranes, leveling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, facilities such as railway siding, local labour etc., to provide suitable allowances in his quotation. The Contractor, at his

own cost, may have to build temporary access roads to aid his own work which shall also be taken care while quoting for the work.

30.6 The procurement and supply in sequence and at the appropriate time of all materials & consumables shall be entirely the Contractor's responsibility. Rates for execution of work will be inclusive of supply of all these items.

31 SAFETY PRECAUTIONS & HOT WORK :

31.1 Contractor shall have to take all safety precaution for carrying out hot work in the premises after obtaining hot work permit from location in charge at his own cost as directed by the Site In-charge/ Engineer-In-Charge. Necessary safety equipment such as safety belts, helmets and other equipments are to be positioned by the contractor and use as per requirement.

31.2 Safety distance as per PESO Rules and Oil Industry Safety Directorate shall be maintained strictly during construction.

31.3 Any casualty or damage caused to property or person by any untoward incidents while executing this contract will be at the contractor's risk and cost.

31.4 The contractor shall also abide by hot work permits to be taken on day to day basis from the location as per policy of the Corporation.

31.5 The successful tenderer shall be responsible for observance of all conditions as per Appendix III furnished along with GCC with regard to safety.

32 SECRECY AGREEMENT:

CONTRACTOR shall as a part of his obligation sign an agreement for secrecy of the drawings / documents with IOC. CONTRACTOR, hereby, expressly undertake to keep all the drawings/documents as well as other Technical information given in the CONTRACT-DOCUMENT secret and shall not divulge or leak or otherwise cause to be known to the competitors or others having any interest in such process in anyway the contents in any form, shape or method.

33 DELETION/ MODIFICATION OF CLAUSE(S) IN GCC:

33.1 Following clauses forming part of the GCC issued along with the tender are deleted:

a. Clause 2.6.1.0 and 2.6.2.0 – General, section 2 of GCC.

b. Clause 3.6.4.0 – Section – 3 of GCC on Materials, Labour & Equipment.

c. Clause 4.5.1.1 – The clause shall partly be modified. Duration of 30 days shall be read as 20 days.

d. Clause no. 3.0 – Instruction to tenderers of GCC.

e. Clause no. 9.0 – Arbitration and alternative dispute resolution machinery of GCC.

33.2 Conciliation Rules: Not withstanding any other dispute resolution provided under the GCC, with a view to a speedy resolution, the Contractor & Owner may at any time endeavor to settle through Conciliation a dispute referable for settlement by Conciliation under & in accordance with the Indian Oil Corporation Limited Conciliation Rules, 2014 (hereinafter called as "said Rules") as amended from time to time. The said rules may be downloaded from the Owner's website www.iocl.com & if not available a copy thereof may be obtained from the Owner on written request.

34 INTEGRITY PACT

Tenderer shall sign and submit along with the technical bid in all respects the enclosed Integrity Agreement, which is an integral part of tender documents, failing which the tenderer will stand disqualified from the tendering process.

35 **PROJECT MANAGEMENT TEAM:**

35.1 The successful bidder shall be required to position an effective project management team at site consisting of a minimum of designated project manager, QC/QA Engineer and dedicated HSE engineer as per the qualifications tabulated below.

35.2 The successful bidder shall place exclusive team of project management for this contract.In case of existing running contract at the same site, the same project management team should not be utilized for this.If bidder fails to deploy the separate project management team exclusive for this contract,deduction towards project management team will be done from contractor's bill.

35.3 The table stipulates only the minimum qualification of manpower required at site for the three functions and additional engineers / technical staff shall be positioned based on the requirements at site at no additional financial implication to IOCL.

SN	Project Manager	QC / QA / Planning Engineer	HSE Manager	Recovery for non-deployment per month per engineer **(in `)**		
				Project Manager	QC / QA / Planning Engineer	HSE Manager
1	1 Engineer with 8 years experience	3 Engineers (civil engg) with 4 years experience	1 Engineer with 2 years experience	50,000.00	35,000.00	25,000.00

Note: In case the Engineer concerned is holding diploma qualification against Engineering graduation, the requirement of site experience shall be increased by 2 years.

36 PENALTY CLAUSE IN CASE OF BREACH OF SAFETY:

The penalty along with applicable taxes (like GST etc.) to be recovered for breach of safety during execution of works shall be levied by the Corporation as below:

a. Violation of applicable safety, health and environment related norm, a penalty of Rs 5000 + applicable tax per occasion.

b. Violation as above resulting in;

- Any physical injury, a penalty of 0.5% of the contract value (max. of Rs 2 lacs + applicable tax) per injury in addition to Rs 5000 + applicable tax as mentioned above.
- Fatal accident, a penalty of 1% of the contract value (max. of Rs 10 lacs + applicable tax) per fatality in addition to Rs 5000 + applicable tax as mentioned above.

37 ACCEPTANCE OF WORK ORDER:

37.1 After communication of the Corporation's acceptance of the contractor's tender, if the contractor fails to return the duplicate copy of the work order and agreement duly signed in token of their acceptance within 10 days, the EMD is liable to be forfeited by the Corporation, with or without any further reference to the contractor.

37.2 On acceptance of the quotation, the successful contractor will have to execute an agreement with the corporation covering all aspects of the contract in standard form (issued by IOCL), immediately before commencement of the works. The intending tenderers should acquaint themselves with the provisions of standard agreement prior to quoting.

37.3 When the party signing the agreement is not the sole proprietor, necessary power of attorney authorizing the person who is acting on behalf of the firm should be produced before execution of the agreement.

37.4 If the Contractor does not start the work by the above stated period and if the Corporation is not satisfied with the reason for not starting the work in time or if Contractor refuses to carry out the work due to any other reason, the Corporation can cancel that work order by giving a Registered Notice after the expiry of the specified period as per the order and the same work shall be carried out by any other Contractor at the entire risk and cost of original Contractor.

37.5 In the event of such cancellation, the ISD/SD for the subject work, Earnest Money Deposit and/or Permanent Earnest money Deposit will be forfeited and the empanelment of the contractor in all categories shall be cancelled forthwith, without any further intimation to the contractor. In addition, the Corporation also reserves the right to holiday list the contractor in the event of such default in completion of acceptance formalities of the work order.

38 EXECUTION OF WORKS:

38.1 The contractor shall submit on receipt of the work order and before starting the work, shall submit a detailed construction programme (PERT/ MS PROJECT/BAR CHART) chart adhering to the completion time quoted in the work order. The program thus submitted shall form a part of the contract and shall be binding on the contractor. However, the corporation reserves the right to alter the programme if necessary. No claim whatsoever of the contractor on this account will be entertained.

38.2 Contractor shall consider provision of necessary Acoustic DG sets, wiring, poles, light fixtures, Distribution boards, so as to illuminate the site & to carry out works beyond sunset. The rates quoted shall be inclusive of the above.

38.3 Tenderer should submit in the bid, list of minimum construction equipment, tools & tackles to be deployed at site for completion of the work within the stipulated completion time. On award of works, the details submitted by the successful tenderer shall be reviewed by IOCL during the Kick Off Meeting & approved along with Construction Program to be adhered to for execution of works within the stipulated timelines.

38.4 All materials required for execution of work must be got approved by our site representative before they are brought to the site and also before being actually put to use. All facilities/equipment required for prior inspection of materials and subsequent inspection of work to be made available by the Contractor for inspection by IOCL and/ or authorized personnel of IOCL.

38.5 The works at site will be supervised by IOC site engineer and/or by Project Management Consultant (PMC) agency appointed by IOC. It shall be the responsibility of the contractor to

ensure that the works are carried out with due inspection of works by Site Engineer /PMC agency as per approved QAP at every stage of work.

38.6 Further it shall also be the responsibility of the successful tenderer to submit bills for payment, which are duly certified by Site Engineer/PMC agency. Bills shall be processed for the works completed, measured and entered in the MB duly signed by successful tenderer and Site Engineer /PMC agency.

39.**0** Testing Of Materials/ Works :

39.1 The Contractor shall carry out the various tests as enumerated in the technical specifications of this tender document and the technical documents that will be furnished to him during the performance of the work and no separate payment shall be made unless otherwise specified in schedule of rates.

39.2 All the tests either on the field or at outside Govt. laboratories /Govt Engg College concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.

39.3 The work is subject to inspection at all times by the Site Engineer/ Engineer-in-Charge/ PMC. The Contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical documents and the relevant codes of practice furnished to him during the performance of the work.

39.4 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectifications at his own cost.

39.5 All results of inspection & tests will be recorded in the inspection reports, Performa, which will be approved by the Site Engineer/ Engineer-in-Charge. These reports shall form part of the completion documents.Inspection & acceptance of works shall not absolve the Contractor from any of his responsibilities under this Contract.

39.6 The contractor shall establish the Site lab. For conducting various test like Moisture content of the fill material and quality of fill material, Degree of compaction test ,Compressive strength of CC cubes,Bricks , sand sieve analysis etc and other test as per relevant IS codes with proper equipments and qualified personnel to carry out such tests at site at no extra cost.However, IOCL/PMC would also send the samples for conducting various tests as per relvant IS codes to Govt. Lab/Govt.Engg college as and when required (in addition to the site test) and the payment of the same will be made by the successful bidder or will be deducted from their bills.

40 CLEARING THE SITE OF WORKS:

40.1 Contractor shall arrange to dispose off debris and any other waste product created while carrying out the work, outside Corporation's premises. The Contractor shall take due care while disposing of such waste materials and ensure that any rules/ regulations laid down by Municipal Corporation or any other statutory body are not violated. The Contractor shall be responsible and answerable to any complaint arising out of improper disposal of waste material. Quoted rate shall involve the cost of same and no extra payment shall be made towards this account.

40.2 The Contractor shall clear the site of works as per the instructions of the Site Engineer. The site of works shall be cleaned of all men, site equipment, materials, etc and shall be delivered back to the Corporation in a clean and neat condition as required by the Site

Engineer within a period of one week after the job is completed after ensuring that all surfaces spoiled during the works such as floors, walls, glass panels, etc are spotless clean.

40.3 In case of failure to do so by the Contractor, the Corporation shall have the right to get the site cleared at the risk and cost of the Contractor.

41 **PAYMENT SCHEDULE:**

1.	For items like Reinforcement Steel, Cables, Lighting fixtures,Pannel,Other electrical items, fall arrestor system etc.	
a.	On supply of materials / items to site including test certificates as applicable	**Up to 70%**
b.	After installation/ erection	**25%**
c.	In final Bill & after successful commissioning	**5%**
2.	Structural Steel including Gratings	
a.	After supply of materials at site as per requirement including test certificate as applicable	**Up to 70%**
b.	After fabrication, erection & welding	**15%**
c.	After blasting & painting	**10%**
d.	Balance in final bill	**05%**
3.	Balance all Civil works like RCC hume pipes,signage,Furniture etc.	
a.	Upon completion in running bills	**Up to 95%**
b.	In final Bill & after successful commissioning	**5%**

41.1 Following minimum documents/ activities shall be completed before submission of final bills:

- As built drawings.
- Copy of test certificates, Warranty certificates as applicable.
- Material reconciliation statements & documentation of site records as applicable.
- Any other specific documentation required by IOCL.
- Cleaning & clearing of site.

42 **TYPOGRAPHICAL OR CLERICAL ERRORS:**

The Corporation's clarifications regarding partially omitted particulars or typographical or clerical errors shall be final and binding on the Contractor.

43 At all places in the GCC enclosed with the tender document, **OWNER** shall mean **INDIAN OIL CORPORATION LIMITED**, MARKETING DIVISION, HEAD OFFICE, with its office at NO. G9, ALI YAVAR JUNG MARG, BANDRA (E), MUMBAI – 400051. The court of jurisdiction for all matters under the tender shall be at **MUMBAI.**

44 ORIGINAL DOCUMENT VERIFICATION:

44.1 Document verification with originals shall be carried out after opening of price bids for the short listed bidder(s) only. Since documents are submitted by the bidder(s) in the tender, the responsibility of authenticity of documents shall be with the bidder(s).

44.2 Shortlisted bidder(s) shall be required to present their original documents to the tender inviting authority within a period of 7 days from the date of intimation by IOCL. In the event of failure of such bidder(s) to get the documents verified as per the specified time schedule, the EMD of the bidder(s) shall be forfeited. In case it is observed that if any bidder(s) submitted forged documents / credentials, necessary action for holiday listing of the bidder(s) shall be carried out including forfeiture of EMD

44.3 It must be noted that notarized copy in lieu of producing original documents will not be acceptable to the Corporation.

LIST OF DRAWINGS

SL. NO.	DESCRIPTION	No. of Sheets	DRAWING/DOCUMENT NO.
1	Typical detail of fall arrestor – General Arrangement	1 of 1	PC-00088-5211-0255
2	Typical detail of fall arrestor – Intermediate mast arrangement and detail	1 of 1	PC-00088-5211-0256
3	Typical detail of fall arrestor – End mast arrangement and detail	1 of 1	PC-00088-5211-0257
4	Piping plan and sectional view for wagon unloading system	1 of 1	PC88-5211-0953
5	Wagon unloading platform – Layout of foundation , Plinth beam , plan at base plate level and base plate details	1 of 1	PC-00088-9512-0270
6	Overall layout drawing (Product , Hydrant , Utility & OWS)	1 of 1	PC88-5211-0617

Note:

1. The drawings above are indicative. Vendors are advised to visit the site & changes as per site requirement shall be made for execution of works. Detailed drawings shall be issued during Construction to the successful bidder. However, fabrication details drawings will have to be prepared by successful bidder for IOCL/PMC approval at no extra cost.
2. Drawings for 20 mtr.High mast tower, compound details, and Gate details will be provided to successful bidder during execution of Job.

SITE DATA & OTHER DETAILS:

INTRODUCTION

Indian Oil Corporation Limited (IOCL) intends to build a petroleum storage Depot at Yupia, Papumpare District, Arunachal Pradesh. Total area of land in possession of IOCL is approximately 27.01 acres and is vacant Government land. Projects & Development India Limited (PDIL) as an Engineering Project Management Consultant (EPMC).
This document defines the minimum requirements for scope of work of General Civil Contractor and guidelines to the Contractor for the complete General civil works pertaining to, but not limited to the job listed below at Doimukh Depot.

3.0) PROJECT DATA

3.1) SITE DATA
3.1a) STATE WHERE LOCATED - ARUNACHAL PRADESH
3.1b) NEAREST IMPORTANT TOWN - ITANAGAR
3.1c) NEAREST AIRPORT - LILABARI AIRPORT
3.1d)NEAREST RAILWAY STATION - GUMTO

4.0) SCOPE OF SUPPLY
4.1) OWNER'S SCOPE OF SUPPLY - NIL

4.2) CONTRACTOR'S SCOPE OF SUPPLY -

All materials and consumables required for satisfactory completion of the job shall be supplied by contractor. Contractor's scope shall also include arranging of all tools, tackles, equipments, machinery and labour required for satisfactory completion of the job.

5.0) POWER, WATER & OTHER FACILITIES

The CONTRACTOR shall be responsible to provide within the scope of work all facilities, consumables and utilities necessary for performance of the work including (but not limited to) water, power, transportation, labour, tools, construction and testing equipment, machinery and land at or about the job site(s) for the CONTRACTOR's field offices, stores; residential accommodation for CONTRACTOR's staff; quarry rights and borrow areas and making access roads to or about the job site(s) and CONTRACTOR's offices, stores, accommodation, borrow areas.

The OWNER does not warranty or undertake the provision of any facility, consumable or utility whatsoever to the CONTRACTOR.

Any assistance which the OWNER renders to the CONTRACTOR in terms hereof or otherwise relative to the work by provision of any facility, utility, consumables for the performance of any of' his obligations under the Contract, shall not be a ground for extension of time for completion or other claim whatsoever.

CONSTRUCTION POWER

The contractor shall make his own arrangement for power required for the work at his cost. DG set of suitable capacity may be installed and operated by the contractor at his cost. IOCL shall not be

responsible for power supply and contractor shall ensure proper supply of electricity to meet the schedule.

The electrical works shall be carried out through Licensed Electrical personnel only.

In case, electrical power is given by the Corporation at its discretion then, the electrical charges incurred on monthly basis shall be deducted from the bills payable to the contractors as per the prevailing tariff indicated in the electricity bills. The successful contractor shall make all arrangements to draw power from a single point in the depot as per directions at site including all necessary electrical cables, panel boards, energy meters etc. In such an event, the Corporation shall not be responsible for any power outages occurring during the contract period. However, the tenderers may note that there is no commitment on part of the Corporation to provide electrical power at site.

CONSTRUCTION WATER

The contractor shall arrange water/procure water required for the work at his own cost for all leads and lifts. IOCL shall not be responsible for supplying water and Contractor shall ensure timely and adequate supply of water to meet the schedule.
The quality of water used should be suitable for the intended purpose and should have no harm to human and environment; the contractor shall produce the quality check report of approved laboratory whenever deemed necessary by IOCL or the consultant.

The owner shall not take any guarantee for the supply of water and will not relieve the contractor of his responsibility in making his own arrangement and for the timely completion of the various works as stipulated.

LAND

The OWNER may at his discretion and convenience, if it has sufficient available land at its disposal, provide land to the CONTRACTOR near or about the job site, for the construction of the CONTRACTOR's field office(s), stores and Yard required for or in connection with the execution of the work(s). Such land shall be utilised by the CONTRACTOR only for the purpose of the contract and for the duration of the contract.

The CONTRACTOR shall at his own cost and initiative construct temporary buildings or other accommodation necessary for the purpose and make suitable arrangements for water and power supply thereto and for provisions of sanitary, drainage and dewatering arrangements thereof in accordance with plans / designs / layouts previously approved by the Site Engineer in this behalf.

ACCESS TO SITE

The CONTRACTOR shall construct, if necessary at his own cost and initiative, temporary access road to the site from the main public feeder road(s) and from borrow areas and shall so align such roads

or ways so as not to interfere with the construction of the site or hamper construction of pavement roads by or on behalf of the OWNER or other CONTRACTORS operating at or about the job site.

The CONTRACTOR shall, if so required or relative to the performance of any other work at the site or construction of permanent roads, suspend, discontinue use of and / or re-route any access road constructed by him. No suspension, discontinuance or re-routing as aforesaid shall form the basis of any claims by the CONTRACTOR against the OWNER for compensation of damages or ground for extension of time for completion or other claim whatsoever.

SPECIAL INFORMATION

The tenderer shall before tendering and shall be deemed before tendering to have undertaken a thorough study of the proposed work, the job site(s) involved, the site conditions, soil conditions, the terrain, the climatic conditions, the labour, power, material and equipment availability and transport and communication facilities, the availability and transport suitability or borrow areas, the availability of land for right of way and temporary office and accommodations, quarters, and all other facts and facilities necessary or relevant for the formulation of the tender, supply of materials and the performance of the work. Without prejudice to the foregoing, the tenderers may be allowed access to any information regarding the site of the work, the investigations conducted relative thereto, such as soil investigation etc. But, these shall be only indicative in nature and the tenderers are expected to collect their own data for preparation and submission of their tender. Any claim at a later date based on either incorrectness or inadequacy of the information/data made available by the OWNER/consultant to a tenderer shall not be entertained. The OWNER/Consultant shall be fully absolved of any and all liabilities in this regard.

ADDITIONAL TECHNICAL SPECIFICATIONS

- General
- Site Grading Work
- Earthwork
- Reinforced Concrete And Allied Works
- Form Work
- Steel Reinforcement
- Brick Work
- Structural Steel Works and Electro forged gratings
- Plastering
- Floor and Floor Finishes

SPECIFICATIONS:

1.0 GENERAL :

1.1 The detailed specifications given hereafter are for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards.

1.2 It may also be noted that the specification are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings.

1.3 The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard engineering practice.

1.4 In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence.

1.6 In case any difference or discrepancy between the specifications and the drawing, the drawing shall take precedence.

1.7 Unless specifically otherwise mentioned, all the applicable latest codes and standards published by the Bureau of Indian Standards and all other standards, shall govern in all respects of design, workmanship, quality, properties of materials, method of testing and method of measurements.

****

SPECIFICATION FOR SITE GRADING

1.0 SCOPE

This specification shall govern all clearing, grubbing, excavating, area filling, grading and compacting soils for areas designated on the drawings. The work shall include excavation, hauling, dumping and spreading of soil, undercutting to remove unstable soil areas, compacting existing soil surfaces and bottom of excavated areas to receive fills, compacting excavated areas for subgrade, placing and compacting soils in fills, pumping to keep excavated areas dry, final grading of designated areas, disposing off unsuitable and excess excavated materials and incidentals thereof.

2.0 GENERAL

2.1 Work to be provided for by the Contractor

The work to be provided for by the Contractor, unless specified otherwise, shall include but not be limited to the following:

Furnish all labour, supervision, services, earth-moving machineries and equipment, tools and plants, survey instruments, transportation etc., required for the work.

Prepare and submit working drawings showing the approaches, slopes, berms, sumps for dewatering, space for temporary stacking of spoils, disposal area, borrow pits, fencing etc. and all other details as may be required by the Owner/ Consultant.

To carry out and submit to the Engineer, results of soil compaction tests whenever required by the engineer to assess the degree of compaction.

d) If blasting is resorted to, necessary licenses to be procured from the proper authorities.

2.2 Work to be provided for by others

No work under this specification will be provided by any agency other than the Contractor unless specifically mentioned elsewhere in the Contract.

However, the Owner reserves the right to award the whole work to one Contractor or to split up the work for awarding to two or more Contractors.

2.3 Codes and Standards

All work under this specification, unless specified otherwise, shall conform to the latest revision and/or replacements of the following or any other relevant Indian Standard Specifications and Codes of Practice. In case any particular aspect of work is not covered specifically by Indian Standard Specification any other standard practice as ma y be specified by the Engineer shall be followed:

IS 3764 - Indian Standard for Safety Code for Excavation Work.

IS 1200 - Indian Standard Method of Measurement of Building (Part-I) and Civil Engineering Work Part-I - Earthwork.

IS 4701 - Indian Standard Code of Practice for Earthwork on Canals.

IS 4081 - Safety Code for Blasting and Related Drilling Operations.

2.4 Conformity with Designs

The Contractor shall carry out the work as per the drawings issued to him and/or Contractor's drawings which are approved by the Consultant.

2.5 Materials to be used

2.5.1 General

All materials required for the work shall be of best commercial variety and as approved by the Owner/ Consultant.

2.5.2 Borrow Material

Borrow material required for area filling shall be excavated from approved locations and levels and shall consist of selected material, approved by the Engineer, free from roots, vegetations, decayed organic matter, harmful salts and chemicals, free from lumps and clods. If specified, clean graded sand, free from harmful and deleterious materials from approved quarries, shall be used as fill material.

2.6 Quality Control

The Contractor shall establish and maintain quality control for the various aspects of the work, method, materials, equipment and Laboratory used. The quality control operation shall include but not be limited to the following items of work:

a) Lines, Levels and Grades:

i) Periodic Surveys

ii) Establishment of markers, Boards etc.

iii) Checking levels and slopes of the graded surface.

b) Area filling:

i) Checking the quality of fill material

ii) Checking moisture content of the fill

iii) Checking the degree of compaction.

2.7 Information regarding Site Conditions

Boring and sub-surface data regarding the nature of soil, rock, sub-soil water etc. shown on drawings or otherwise furnished to the Contractor shall be taken as a guidance only and variation therefrom shall not affect the terms of the Contract. The Contractor must satisfy himself regarding the character and volume of all work under this contract and expected surface, sub-surface and/or sub-soil water to be encountered. He must also satisfy himself about the general

conditions of site and ascertain the existing and future construction likely to come up during the execution of the Contract so that he may evolve a realistic programme of execution.

3.0 EXECUTION

3.1 Setting Out

Within 15 days of award of Contract, the Contractor will prepare and submit to the Consultant, detailed drawings of the excavation and filling work necessary, as proposed to be executed by him, showing the dimensions as per drawings and specification, adding his proposals for slopes, approaches, dewatering sumps, berms etc. On receiving the approval from the Engineer with modifications and corrections if necessary, the Contractor will set out the work from the control points as shown in the drawings and fix permanent points and markers for future checking. These permanent points and markers will be checked by the Engineer and certified by him after which, the Contractor will proceed with the work. Engineer shall be provided with necessary men, material and instruments for such checking. It should be noted that this checking by the Engineer prior to start of the work will in no way absolve the Contractor of his responsibility of carrying out the work to true lines, levels and grades as per drawing and subsequent corrections, if any. In case any errors are noticed in the Contractor's work at any stage, the same shall be remedied by the Contractor at his own cost.

3.2 Initial Levels

Initial levels either in a definite grid pattern or as directed by the Engineer will be taken by the Contractor jointly with the Engineer over the original ground prior to starting actual excavation work and after setting out. These initial levels will be used for preparing cross-sections for volume measurement or for cross-checking the depths obtained from tape measurements.

3.3 Clearing and Grubbing etc.

3.3.1 Scope

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil not exceeding 150 mm in thickness, rubbish etc., which in the opinion of the Engineer arc unsuitable for incorporation in the works, from the area specified. It shall also include dismantling and removing old structures in the area as may be specified on the drawings or by the Engineer. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

3.3.2 Preservation of Property/Amenities

Trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and other facilities outside the specified area are not to be disturbed or damaged in any manner. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional works to that effect. Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan

including the procedure to be followed for disposal of waste materials, etc., and the schedules for carrying out temporary and permanent erosion control works as directed by the Engineer.

3.3.3 Methods, Tools and Equipments

Considering the urgency of the work, the filling work at site shall be done by employing mechanical means of adequate capacity and numbers. Only such methods, tools and equipment as are approved by the Engineer shall be adopted for the Work. If the area has thick vegetation / roots / trees, a crawler or pneumatic-tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps, if any. Trees if any, stumps, etc., falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the existing ground level. Also, all vegetation such as roots, under-growth, grass and other deleterious matter unsuitable for incorporation in the fill shall be removed between fill lines to the satisfaction of the Engineer. On areas beyond these limits, trees and stumps required to be removed as directed by the Engineer shall be cut down to 1 m below ground level so that these do not present an unsightly appearance.

All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding area.

Anthills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several metres, shall be suitably treated.

3.3.4 Disposal of Materials

All materials arising from clearing and grubbing operations shall be the property of Government and shall be disposed of by the Contractor as directed by the Engineer, at specified spots with all lifts.

3.3.5 Measurements for Payment

Clearing and grubbing for fill shall be measured on area basis in terms of square meters. Clearing and grubbing areas shall be deemed to be a part of works preparatory to other construction and shall be deemed to have been included in the rates quoted for the fill construction item and no separate payment shall be made for the same. Cutting of trees up to 300 mm in girth including removal of stumps and roots shall be considered incidental to the clearing and grubbing operations. Removal of stumps left over after trees have been cut by any other agency shall also be considered incidental to the clearing and grubbing operations.
Cutting, including removal of stumps and roots of trees of girth above 300 mm and backfilling to required compaction shall be measured in terms of number according to the sizes given below:-I) Above 300 mm to 600 mm ii) Beyond 600 mm. For this purpose, the girth shall be measured at a height of 1 metre above ground or at the top of the stump if the height of the stump is less than one metre from the ground.

3.3.6 Rates

The Contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment, safety measures, safety equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300 mm in girth as well as stumps left over after cutting of trees carried out by another agency, excavation and back-filling to required

density, where necessary, and handling, salvaging, piling and disposing of the cleared materials with all lifts.

The Contract unit rate for cutting (including removal of stumps and roots) of trees of girth above 300 mm shall include excavation and backfilling to required compaction, handling, salvaging, and disposing of the cleared materials with all lifts.

Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

3.4 Classification

Materials involved in earthwork shall be classified under the following categories. No distinction will be made whether the material is dry or wet. The Engineer's decision in regard to such classification shall be final and binding on the Contractor :

a) Ordinary and hard soil

This shall include clay, silt, sand, moorum, shingle, kankar, gravel, loam, peat, ash and other similar materials in soft, hard or dense state which can generally be excavated with ordinary spade, pick axe, shovel etc. and does not require the use of wedges, pneumatic breaking equipment and/or blasting for removal. It shall also include loose rock boulders present in the soil, with dimensions not exceeding 500 mm in any direction. Breaking of consolidated brick ballast and mud concrete shall be considered equivalent to excavation work under this type of soil.

b) Soft and Decomposed Rock

This shall include rocks like chalk, slate, mica schist, laterite and other similar materials which in the opinion of the Engineer is rock, but does not require blasting for removal and could be removed with picks, hammers, crow bars, wedges, pneumatic breaking equipment etc. It shall also include boulders with dimensions greater than 500 mm but not exceeding 1000 mm in any direction. The mere fact that the Contractor resorts to blasting for his own convenience shall not mean that the rock will be classified as hard rock.

Excavation in macadam and tarred roads and pathways, brick work etc. shall be considered at the same rate as excavation of this type of soil.

c) Hard Rock

This shall include rocks occurring in large masses which cannot be removed except by blasting. Harder varieties of rock such as trap, with or without veins and secondary mineral which in the opinion of the Engineer require blasting for removal shall also be considered as hard rock. It shall also include boulders bigger than 1000 mm in any direction. Construction in concrete, both reinforced and unreinforced, which is required to be dismantled during earthwork, shall be measured under this item, unless a separate provision is made in the schedule of Quantities for the same.

3.5 Earthwork in Excavation

3.5.1 General

All excavation shall be done to the minimum dimensions as required for safety and working facility. Prior approval of the Engineer shall be obtained by the Contractor, in each individual case, for the method he proposes to adopt for the excavations including dimension, side slopes, dewatering, disposal, etc.

This approval, however, shall not in any way make the Engineer responsible for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner.

Prior to starting the excavation, the ground level at the location shall be checked jointly with the Engineer.

The rough excavation may be carried up to a maximum depth of 150 mm above the final level. The balance shall be excavated with special care. If directed by the Engineer, soft and undesirable spots shall be removed even below the final level. The extra excavation shall be filled up as instructed by the Engineer and the Contractor shall be paid for the extra excavation and the filling at the appropriate item rates.

If the excavation is done to a depth greater than that shown on the drawing, or directed by the Engineer, due to the Contractor's fault, the excess depth shall be filled up to the required level at the latter's cost with selected earth and compacted to 95% of modified Proctor Density or as directed by the Engineer.

The excavation shall be carried out as per the approved proposal, modified and corrected where necessary by the Engineer. The work shall be carried out in a workmanlike manner without endangering the safety of nearby structures or works roads, railway tracks, cables, pipelines etc. if any, and without causing hindrance to other activities in the area. As the excavation reaches the required dimensions, lines, levels and grades, the work will be checked by the Engineer thoroughly and the balance work will be carried out carefully to avoid any over-excavation.

On completion, the work will be finally checked and approved by the Engineer.

In cases where excavation in soil, soft and decomposed rock and/or hard rock are involved, the soil or soft and decomposed rock layers, shall be removed by turn and levels of the underlying rock surfaces observed to enable measurements. Further work shall be resumed after getting clearance from the Engineer.

3.5.2 Excavation in Hard Rock

Overburden, if any, consisting of top soil, ordinary and hard soil, soft and decomposed rock as per classification of soil, which do not require blasting shall be completely stripped off and the levels of the hard rock surface shall be taken to enable measurement. Further work in hard rock shall be resumed after clearance from the Engineer.

Personnel deployed for rock excavations shall be protected from all hazards such as loose rock/boulder rolling down and from general slips of excavated surfaces. Where the excavated surface is such that it is not stable against sliding, necessary supports, props, bracings or bulkheads shall be provided and maintained during the period of construction. Where danger exists of loose rock/boulder falling from the excavated surfaces deeper than 2 metres, steel mesh anchored to the lower edge of excavation and extending over and above the rock face, adequate to retain the dislodged material shall be provided and maintained.

In case where blasting, though otherwise required, is prohibited for any reasons, the excavation shall be carried out by chiseling, wedging or any other approved method. All loose or loosened rock in the sides shall be removed by barring, wedging, etc. The unit rate for excavation in hard rock shall include the cost of all these operations.

3.5.3 Blasting

a) General

Excavation shall be continued in hard rock to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by the Engineer. As far as possible all blasting shall be completed prior to commencent of construction. At all stages of excavation, precautions shall be taken to preserve the rock below and beyond the lines for the excavation, in the soundest possible condition. The quantity and strength of explosive used, shall be such as will neither damage nor crack the rock outside the limits of excavation. All precautions, as directed by Engineer, shall be taken during the blasting operations and care shall be taken that no damage is caused to adjoining buildings or structure as a result of blasting operations. In case of damage to permanent or temporary structures, Contractor shall repair the same to the satisfaction of Engineer at his cost. As excavation approaches its final lines and levels, the depth of the charge holes and amount of explosives used shall be progressively and suitably reduced.

Unless otherwise stated herein, I.S. Specification IS:4081 "Safety Code for Blasting & Related Drilling Operation" shall be followed.

Specific permission of Engineer will have to be taken by Contractor for blasting rock and he shall also obtain a valid Blasting license from the authorities concerned.

Contractor shall obtain necessary license for storage of explosives, fuses and detonators issued to him from owner's stores or from supplier arranged by him, from the authorities dealing with explosives.
The fees, if any, required for obtaining such license, shall be borne by Contractor. Contractor shall have to make necessary storage facilities for the explosives etc. as per rules of local, State and Central Govt. authorities and statutory bodies/ regulations.

In no case shall blasting be allowed closer than 30 metres to any structure or to locations where concrete has just been placed. In the latter case the concrete must be at least 7 days old.

Contractor shall employ a competent experienced supervisor and licensed blaster in-charge of each set of operation, who shall be held personally responsible to ensure that all safety regulations are carried out.

Before any blasting is carried out, Contractor shall intimate Engineer and obtain his approval in writing for resorting to such operations. He shall intimate the hours of firing charges, the nature of explosive to be used and the precautions taken for ensuring safety.

The blasting of rock near any existing buildings, equipments or any other property shall be done under cover and Contractor has to make all such necessary muffling arrangements. Covering may preferably be done by M.S. plates with adequate dead weight over them. Blasting shall be done with small charges and where directed by Engineer, a trench shall have to be cut by chiseling prior to the blasting operation separating the area under blasting from the existing structures.

When excavation has almost reached the desired level, hand trimming shall have to be done for dressing the surface to the desired level. Any rock excavation beyond an over break limit of 75 mm shall be filled up as instructed by Engineer, with concrete of strength not less than M 100. The cost of filling such excess depth shall be borne by Contractor and the excavation carried out be yond the limit specified above will not be paid for. Stepping in rock excavation shall be done by hand trimming.

Contractor shall be responsible for any accident to workmen, public or Owner's property due to blasting operations. Contractor shall also be responsible for strict observance of rules, laid by Inspector of Explosives, or any other authority duly constituted under the State and/or Union Government.

Storage, handling and use of explosives shall be governed by the current explosive rules laid down by the Central and the State Governments. The Contractor shall ensure that these rules are strictly adhered to. The following instruction, wherever found in variance with the above rules, shall be considered as superseded by the above rules.

No child under the age of 16 and no person who is in a State of intoxication shall be allowed to enter the premises where explosives are stored nor they shall be allowed to handle the explosives.

b) Storage of Explosive

Storage of explosives shall be governed by the current Explosive Rules, Explosives shall be stored in a clean, dry, well ventilated magazine to be specially built for the purpose. Under no circumstances should a magazine be erected within 400 m of the actual work site or any source of fire. A space surrounding the magazine shall be fenced in. The round inside the fence shall be kept clear and free from trees, bushes etc. The admission to this fenced space shall be by one gate only and no person shall be allowed inside this fence without permission of the Officer-in-charge. The clear space between the fence and the magazine shall not be less than 90m.The magazine shall be perfectly well drained.

Two lightning conductors shall be provided to the magazine, one at each end. The lightning conductors shall be tested once in every year.

Fuses and detonators shall be stored in separate magazines. However, detonators can be kept in an annexe adjoining the magazine provided that their number does not exceed 25,000 and that the annexe is so constructed that not less than 60 cm masonry and 100 cm of air space shall intervene between any detonators in such annexe and the interior of the main magazine. Cases containing explosives are not to be opened in a magazine. Explosive in open cases are not to be received into a magazine. Explosives which appear to be in a damaged or dangerous condition are not to be kept in an y magazine, but must be removed without delay to a safe distance and destroyed.

Artificial light is not to be allowed in any magazine. No smoking shall be allowed within 100 m of a magazine.

Magazine shoes without nails shall be used while entering the magazine.

The mallet, levers, wedges etc. for opening barrels or cases are to be of wood. Inside a magazine the cases of explosives are to be carried by hand and shall not be rolled or dragged. Explosives which have been issued and returned to the magazine are to be issued first; otherwise those which have been longest in store are to be issued first.

Cases of explosives must be kept clear of the walls and floors for free circulation of air on all sides, special care is to be taken to keep the floor free from grains of powder or portions of explosive matter fallen on the floors due to leakage of cases etc.

The magazine shall not be opened during any dust storm or thunderstorm nor shall any person be allowed in the vicinity of the magazine.

All magazines shall be officially inspected at definite intervals and a record kept of the results of such inspections.

c) Carriage of Explosives

Detonators and explosives shall be transported separately to the blast site. Explosives shall be kept dry and away from the direct rays of the sun, naked lights, steam pipes or heated metal and other sources of heat. Before explosives are removed, each cage or package is to be carefully examined to ascertain that it is properly closed and shows no sign of leakage.

No person except the driver shall be allowed to travel on a vehicle conveying explosives. No carriage or vessel shall be used for transporting explosives unless all iron or steel therein with which a package containing any explosive is likely to come in contact is effectually covered with lead, leather, wood, cloth or other suitable material. No lights shall be carried on the vehicle carrying explosives.

No operation connected with the loading, unloading and handling of explosives shall be conducted after sunset.

d) Use of Explosives

The Contractor shall appoint an agent who shall personally superintend the firing and all operations connected therewith. The contractor shall satisfy himself that the person so appointed is fully acquainted with the responsibilities imposed on him.

Holes for charging explosives shall be drilled with Pneumatic drills, the drilling pattern being so planned that the rock pieces after blasting will be suitable for handling.

The hole diameter shall be of such a size that cartridges can easily pass down them and undue force is not required during charging. Charging operations shall be carried out by or under the personal supervision of the shot firer. Wrappings shall never be re moved from explosive cartridges. Only wooden rods shall be used for loading and stemming shot2holes. Only one cartridge at a time shall be inserted and gently passed home with the wooden tamping rod.

Only such quantities of explosives as are required for the particular amount of work to be d one shall be brought to the works. Should any surplus remain when all the holes have been charged, it shall be carefully removed to a point at least 300 m from the firing point.

The explosives shall be fired b y means of an electric detonator placed inside the cartridge. For simultaneous firing of a number of charges the electric detonators shall be connected with the exploder through the shot firing cable in a simple series circuit. Due precautions shall be taken to keep the firing circuit insulated from the ground, bare wires, rails, pipes or any other path of stray current and to keep the lead wires short circuited until ready to fire. Any Kinks in detonator leading wire shall be avoided.

For simultaneous firing of a large number of shot holes, use of cordtex may be done. Cordtex shall be initiated by an electric detonator attached to its side with adhesive tape, connecting wire or string.

All connections shall be made by the authorized shot firer himself. The shot firing cable shall not be dragged along the ground to avoid possible damage to the insulation. The shot firing cable shall be tested for continuity and possible short circuiting before it is used each time.

The shotfirer shall always carry the exploder handle on his person until he is ready to fire shots. The number of shots fired at a time shall not exceed the permissible limits.

Before any blasting is carried out, it shall be ensured that all workmen, vehicles and equipment on the site are cleared from an area of minimum 3 metres radius from the firing point, or as required by statutory regulations, at least ten minutes before the time of firing by sounding a warning siren. The area shall be encircled by red flags.

At least five minutes after the blast has been fired in case of electric firing or as stipulated in the regulations the authorized shot firer shall return to the blast area and inspect carefully the work and satisfy himself that all charged holes have exploded. Cases of misfired unexploded charges shall be exploded by drilling a parallel fresh hole not less than 600 mm from the misfired hole and by exploding a new charge. The authorized shot firer shall be present during removal of the debris liable to contain unexploded explosives near the misfired hole. The workmen shall not return to the site of firing until at least half an hour after firing.

Adequate safety precautions as per building bye-laws, safety code, statutory regulations etc. shall be taken during blasting operations.

3.5.4 Disposal

The excavated spoils will be disposed off in any or a combination of some of the following manners, as directed by the Engineer:

a) By stacking separately the materials suitable for area filling and materials not suitable.

b) By stacking it temporarily for use in backfilling at a later date.

c) i) By either spreading
or
ii) Spreading and compacting at designated disposal areas.

d) By selecting the useful material and stacking it neatly in areas designated by the Engineer for use in back-filling or other purposes by some other agency.

3.5.5 Dewatering

All areas shall be kept free of water. Grading in the vicinity of excavations shall be controlled to prevent surface water running into excavated areas. The Contractor shall remove by pumping or other means approved by the Engineer, any water inclusive of rain water and subsoil water accumulated in the area. Method of dewatering shall be got approved by the Engineer.

3.6 Treatment of Slips

The Contractor will take all precautions to avoid high surcharges and provide proper surface drainage to prevent flow of water over the sides. These precautions along with proper slopes, berms, and control of ground water should cause no slips to occur. If however slips do occur due to causes beyond control of the Contractor, the same shall be re moved by him and payment shall be made to him on appropriate item rate of earthwork. Slips caused due to negligence of the Contractor will be cleared and backfilled later by him at his own expenses.

3.7 Earthwork in Filling

3.7.1 General

Description: These specifications shall apply to the work of filling the general area, leveling and consolidation of all backfill to specified standards using approved material obtained from borrow areas or other sources. All fills shall be constructed in accordance with the requirements of these specifications and in conformity with the lines, levels, grades, and cross-sections as directed by the Engineer.

3.7.2 Materials and General Requirements

3.7.2.1 Physical requirements:

The materials used in the filling shall be granular soil, moorum, gravel, a mixture of these or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the filling.

The following types of material shall be considered unsuitable for filling:

Materials from swamps, marshes and bogs;
Peat, log, stump and perishable material; any soil that classifies as OL, OI, OH or Pt -in accordance with IS: 1498 and
Clay having liquid limit exceeding 70 and plasticity index exceeding 45

Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 per cent when tested as per IS: 2720 - Part 40) shall not be used as a fill material.

Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO3) per litre when tested in accordance with BS: 1377 Test 10, but using a 2:1 water-soil ratio shall 'not be deposited within 500 mm or other distance described in the Contract, of concrete, cement bound materials or other cementitious materials forming part of the Permanent Works. .

Materials with a total sulphate content (expressed as SO3) exceeding 0.5 per cent by mass, when tested in accordance with BS: 1377 Test 9 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the fill and 50 mm for fills However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle, size shall not be more than two-thirds of the compacted layer thickness.

Ordinarily, only the materials satisfying the density requirements given in Table-1 shall be employed for the construction of the fill.

TABLE-1. DENSITY REQUIREMENTS OF FILL MATERIALS

S.No.	Type of Work	Maximum laboratory dry unit weight when tested as per IS: 2720 (Part 8)
1.	Filling up to 4 metres Height, not subjected to flooding.	Not less than 16.0 kN/cu.m.

Notes:
This Table is not applicable for lightweight fill material e.g. cinder, fly ash etc.
The Engineer may relax these requirements at his discretion taking into account the availability of materials for construction and other relevant factors.
The material to be used should also satisfy design CBR at the dry unit weight applicable as per Table -2.

3.7.2.2 General requirements:

The materials for fill shall be obtained from approved sources.

3.7.3 Borrow materials: Where the materials are to be obtained from designated borrow areas, the location, size and shape of these areas shall be as indicated by the Engineer and the same shall not be opened without his written permission. Where specific borrow areas are not designated by the Employer / the Engineer, arrangement for locating the source of supply of material for the fill as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Haulage of material to fill or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Should the Contractor be permitted to remove acceptable material from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising there from.

Material of specifications not acceptable for filling (i.e. not fulfilling these specifications) shall not be brought to the site.

The Contractor shall ensure that he does not adversely affect the stability of fills by the methods of stockpiling materials or use of plants.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer.

TABLE-2. COMPACTION REQUIREMENTS FOR FILL

Type of work/ material		Relative compaction as percentage of max. laboratory dry density as per IS: 2720 (Part 8)
1.	Fill area under main structures	Not less than 95
2.	Expansive Clays	Not allowed

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

The values of maximum dry density and optimum moisture content obtained in accordance with IS 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
The Dry density-moisture content -CBR relationships for light, intermediate and heavy compactive efforts (light corresponding to IS: 2720 (Part 7), heavy corresponding to IS: 2720 (Part 8) and intermediate in-between the two) for each of the fill materials he intends to use in the subgrade.

Once the above information has been approved by the Engineer, it shall form the basis for compaction.

Construction Operations

3.7.4.1 Setting out

After the site has been cleared to Clause 1, the work shall be set out to true to lines, curves if any, slopes, grades and sections as shown in the drawing or as directed by the Engineer. The Contractor shall provide at his cost all labour, survey instruments, and materials such as strings, pegs, nails bamboos, stones, lime, mortar, concrete etc required in connection with the setting out and establishment of bench marks. The Contractor shall be responsible for the maintenance of benchmarks and other marks and stakes as long as in the opinion of the Engineer they are required for the work.

The limits of fill shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork.The fill area shall be built sufficiently wider than the design dimension so that surplus material may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.

3.7.4.2 Dewatering

If the fill is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by pumping, as directed by the Engineer and the area shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the surroundings. If the fill is to be constructed under water, Clause 3.4.2 shall apply.

3.7.4.3 Compacting ground supporting the fill

Wherever necessary and possible, the ground supporting the fill shall be suitably compacted to the levels shown in table-2. Where so directed by the Engineer, any unsuitable material occurring in the fill area shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Filling work shall not proceed until the fill area has been inspected by the Engineer for satisfactory condition and approved.

3.7.4.4 Spreading material in layers and bringing to appropriate moisture content

The fill material shall be spread in layers of uniform thickness not exceeding 200 mm compacted thickness over the entire width of fill by mechanical means, finished by a motor, grader and compacted as per Clause 3.3.5. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the fill.

Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, dicing or harrowing until uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the fill area is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS: 2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with IS: 2720 (Part 7) or IS: 2720 (Part 8) as the case may be.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a max. size of 75 mm when being placed in the fill.

Areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including earlier and other fills and cuttings, such faces shall be benched (continuous horizontal benches each at least 300 mm wide shall be cut into the old slope for ensuring adequate bond with the fresh embankment material to be added, immediately before placing the subsequent fill.

All permanent faces of side slopes of fills and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

3.7.4.5 Compaction

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Rollers of the type, size and capacity as directed and approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of vibratory roller of 80 to 100 kN static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.

The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted to the densities specified in Table-2. Subsequent layers shall be placed only after the finished layer has been tested (see next paragraph) and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture / density gauge used in accordance with agreed procedure and the gauge is calibrated to provide results identical to that obtained from tests in accordance with IS: 2720 (Part 28). A record of the same shall be maintained by the Contractor.

Control shall be exercised on each layer by taking at least one measurement of density for each 1000 sq. m (or as decided by the Engineer) of compacted area or such numbers to yield the minimum number of test results for evaluating a day's work on statistical basis. The determination of density shall be in accordance with IS: 2720 (Part 28). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 determinations. The number of tests in one set of measurements shall be 6 (if non-destructive tests are carried out, the number of tests shall be doubled) as long as it is felt that sufficient control over borrow materials and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance criteria shall be subject to the condition that the mean density is not less than the specified density plus; [(1.65 – 1.65/(no. of samples)0.5] times the standard variation.
When density measurements reveal any soft areas in the fill, further compaction shall be carried out as directed by the Engineer. If in spite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

3.7.4.6 Drainage

The surface of the fill at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

3.7.4.7 Repairing of damages caused by rain/spillage of water

The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density in accordance with Clause 3.3.5. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery/equipment for the purpose.

3.7.4.8 Finishing operations

Finishing operations shall include the work of shaping and dressing the side slopes to conform to the levels, grades and dimensions shown on the drawings or as directed by the Engineer. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the fill with the adjacent terrain.

3.7.5 Construction of Fill under Special Conditions

3.7.5.1 Construction of fill over ground incapable of supporting construction equipment:

Where fill is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geo-synthetic material or such means to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the fill could be constructed in the approved manner over such ground by the use-of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the fill shall be constructed as specified in Clause 3.3.

3.7.5.2 Fill construction under water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

3.7.5.3 Settlement period

Where settlement period is specified in the Contract, the fill shall remain in place for the required settlement period before excavating or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the Contract or as directed by the Engineer.

3.7.6 Plying of Traffic

Construction and other vehicular traffic shall not use the prepared surface of the fill without the prior permission of the Engineer. Any damage arising out of such use shall, however, be made good by the Contractor at his own expense as directed by the Engineer.

3.7.7 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of the Engineer

3.7.8 Fill Strength

It shall be ensured prior to actual execution that the borrow area material to be used in the fill satisfies the requirements the Engineer in terms of CBR.

3.7.9 Measurements for Payment

Fill construction shall be measured separately by taking cross sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic metres by the method of average end areas.

Fill construction under water shall be measured in cum.

3.8 Approaches and Fencing

The Contractor shall provide and maintain proper approaches for workmen and for inspection. The roads and approaches around the area shall be kept clear at all times so that there is no hindrance to the movement of men, material and equipment of various agencies connected with the Project. Sturdy and elegant fencing is to be provided around the top edge of the excavation as well as the bottom of the fill at the surplus disposal area where dumping from a high bench is in progress, if directed by the Engineer.

3.9 Lighting

Full scale area lighting is to be provided if night work is permitted or directed by the Engineer. Even if no night work is in progress, red warning lights should be provided at the top in edges of the excavated area and the edges of the fill, unless otherwise permitted by the Engineer.

4.0 **TESTING AND ACCEPTANCE CRITERIA**

4.1 Excavation

On completion of excavation, the dimensions of the area will be checked as per the drawings after the area is completely dewatered.

The work will be accepted after all undercuts have been set right and all over excavations filled back to required lines, levels and grades by compacted earth, at the Contractor's cost.

Over excavation of the sides will be made good free of cost by the Contractor. The excavation work will be accepted after the above requirements are fulfilled & all temporary approaches encroaching inside the required dimension of the excavation have been re moved.

4.2 Area-filling

The degree of compaction required will be as per the stipulations laid down in appropriate sections of this specification. The actual method for measuring the compaction achieved will be as per IS 10379. The work of area filling will be accepted after the Engineer is satisfied with the degree of compaction achieved.

5.0 **INFORMATION TO BE SUBMITTED**

5.1 With Tender

Following details of Machineries, transport vehicles, equipment proposed to be used for excavation, area-filling and compaction have to be submitted along with the tender:

Equipment, machinery & earthmoving vehicles, available with the Contractor and proposed to be used for excavation and haulage giving details regarding make, model, capacity, year of manufacture, numbers available for this contract and condition of contract.
Equipment proposed to be used for area filling and compaction giving similar details as in item 5.01.00 (i) above.
Method of transportation.

5.2 After Award

After award of contract the successful bidder shall submit the following for approval and adoption:

Within 15 days of Award of the contract, the Contractor shall submit a detailed programme of work as proposed to be executed giving completion dates of excavation of the various areas and the time required for area-filling and compaction. The programme should also show how the excavation and area - filling quantities will be balanced, minimizing temporary stacking of spoils. It is to be noted that the Engineer even after initial approval of the programme, may instruct to enhance or retard the progress of work during the actual execution, in order to match with overall construction schedule without attracting any claims from the Contractor. The initial programme being submitted by the Contractor should have sufficient flexibility to take care of such reasonable variations.
Within 15 days of award, the Contractor shall submit drawings showing details of slopes, approaches, sump pits, dewatering lines, borrow pits, if any, fencing etc. for approval of the Engineer for adoption.

6.0 **RATES**

6.1 Excavation and Disposal

The rates of earthwork for all types of soils, soft and decomposed rock and hard rock and leads as listed in the Schedule of Items will include the cost of all materials consumed, hire charges of tools and plants and equipment, cost of labour, insurance, taxes, duties and royalties, security and safety arrangements, power, fuel, lubricants, services, accommodations, supervisions, overheads, profits etc.

The rates of excavation should also include the cost of dewatering. The Contractor will have to give a rebate for non-compaction in case the excavated material is stacked for use in back-fill by some other agency at a later date or dumped and spread in the disposal area with nominal compaction.

6.2 Area-Filling by Excavated Earth and Compaction

The rates to be quoted for this item should be complete in all respects including transporting earth available from excavation under Cl. 6.1 and include all the components of cost listed under Cl. 6.1. No extra will be payable for filling at any depth.

6.3 Area-Filling by Earth brought from Borrow Pits or Stacks left by other Agencies

In case sufficient earth of proper quality is not available from the excavated spoils, the Engineer may direct area filling to be done by bringing earth from borrow pits or selectively from stacks left by other agencies. The material in the stacks which are considered by the Engineer to be unfit for use in the fill shall be carted away by the Contractor to the disposal area.

The rate to be quoted against the relevant item of the schedule should be complete in all respects and include all the components of cost listed under Cl.No. 6.1 of this specification. No extra will be payable for filling at any depth.

6.4 Dewatering

The rate for any dewatering of the area during the period of contract, original or extended, shall be deemed to have been included in the unit rate of excavation.

7.0 **MEASUREMENT**

7.1 Excavation and Disposal

Actual quantity of excavation required and approved by the Engineer shall be measured in Cum. Necessary disposal of the spoil for filling or stacking as described in the Schedule of Items shall be included in the quoted rate.

The measurement may be done by direct tape measurement or by cross sections derived from initial and final levels.

7.2 Area Filling with Earth from Stacks

Actual quantity of filling as worked out from the contour drawings.

SPECIFICATION FOR EARTHWORK

1.0 SCOPE :

1.1 This specification covers the general requirements of earth work in excavation in different materials, site grading, filling in areas as shown in drawing, filling back around foundations and disposal of surplus spoils or stacking them properly as shown on the drawings and as directed by Engineer-In-charge and all operations covered within the intent and purpose of this specification.

1.2 For carrying out earth work excavation in different material, conveyance and disposal of surplus spoils or stacking them properly, contractor shall furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials, any temporary works. Consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with specification requirements.

1.3 Contractor shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works such as earthwork in excavation for grading, basement,

foundations, plinth fillings, roads, drains cable trenches, pipelines etc. such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at a 6 metres intervals or nearer as determined by the Engineer-In-charge based on ground profile. These shall be checked by the Engineer-In-charge and therein after properly recorded.

1.4 The excavation shall be done to correct lines and levels. This hall also include, wherever required, proper shoring to maintain excavation and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.

1.5 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, and riprap with regular slope as directed by the Engineer-In-charge within the lead specified and leveling the same so as to provide natural drainage. Rock/ soil excavated shall be stacked properly as directed by the Engineer-In-charge. As a rule, all softer material shall be laid along the centre of the heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately.

2.0 APPLICABLE CODES:

2.1 The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

IS 965 : Equivalent metric units for scale, dimensions and quantities in general construction work.

IS 1200 (Part 1) : Methods of measurement of building and civil engineering works: Part 1 Earthwork.

IS 2720 (Part 2) : Methods of test for soils: Part 2 Determination of water content.

IS 2720 (Part 7) : Method of test for determination of moisture (Part-7) content dry density relation using light compaction.

IS 2720 (Part 8) : Method of test for determination of moisture (Part-8) content dry density relation using heavy compaction.

IS 2720 (Part 25) : Method of test for determination of consolidation (Part-25) properties.

IS 2720 (Part 28): Method of test for determination of dry density of (Part-28) soils by the sand replacement method.

IS 2720 (Part 29) : Method of test for determination of dry density of (Part-29) soils by the sand replacement method.

IS 3764 : Excavation work - Code of Safety.

IS 4082 : Recommendations of stacking and storage of construction materials at site.

3.0 SITE CLEARANCE:

3.1 The area to be excavated/ filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc. and other objectionable matter. If any roots or stumps of trees are

met during excavation, they shall also be removed. The material so removed shall be burnt or disposed off as directed by the Engineer-In-charge. Where earth fills is intended, the area shall be stripped of all loose/ soft patches, top soil containing objectionable matter/materials before fill commence.

4.0. PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITY, ETC.:

4.1 All gold, silver oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of the department and the contractor shall duly preserve the same to the satisfaction of the department and from time to time deliver the same to such person or persons as the department may from time to time authorize or appoint to receive the same.

5.0 CLASSIFICATION OF EARTH WORK:

5.1 All materials to be excavated shall be classified by the Engineer-In-charge, into one of the following classes and shall be paid for at the rate tendered for that particular class of material. No distinction shall be made whether the material is dry, moist or wet. The decision of the Engineer-In-charge regarding the classification of the material shall be final and binding on contractor and not be a subject matter of appeal or arbitration.

5.2 The earth work will be classified under any of the following categories :

5.2.1 Ordinary & Hard Soils :

5.2.1.1 These shall include all kinds of soils containing kankar, sand, silt, murrum and/ or shingle, gravel, clay, loam, peat, ash, shale, etc., which can generally be excavated by spade, pick axes and shovel and which is not classified under “soft and decomposed rock” and “hard rock” defined below. This shall also include embedded rock boulders not longer than one metre in any direction and not more than 200 mm in any one of the other two directions.

5.2.2 Soft and Decomposed Rock:

5.2.2.1 This shall include rock, boulders, slag, chalk, slate, hard mica schist, laterite and all other materials which in the opinion of the Engineer-In-charge is rock, but does not need blasting and could be removed with picks, hammer, crow bars, wedges and pneumatic breaking equipment. The more fact that contractor resorts to blasting for reasons of his own shall not qualify for classification under ‘hard rock’.

5.2.2.2 This shall also include excavation in macadam and tarred roads, pavements and rock boulders not longer than one metre in any direction and not more than 500 mm in any one of the other two directions. Masonry to be dismantled will also be measured under this item.

5.2.3. Hard Rock:

5.2.3.1 This shall include all rock occurring in large continuous masses, which cannot be removed except by blasting/pneumatic hammering for loosening it. Harder varieties of rock with or without veins and secondary minerals, which in the opinion of the Engineer-In-charge required blasting, shall be considered as hard rock. Boulders of rock occurring in such sizes and not classified under 6.2.1 and 6.2.2 above shall also be classified as hard rock. Concrete work both reinforced and

unreinforced to be dismantled will be measured under this item, unless a separate provision is made in the schedule of quantities.

6.0 EXCAVATION :

6.1 All excavation work shall be carried out by mechanical equipments unless in the opinion of the Engineer-In-charge the work involved and time schedule permit manual work.

6.2 Excavation for permanent work shall be carried out strictly to the dimensions given in the drawing or as specified by the Engineer-In-charge. Rough excavation shall be carried out to a depth 300 to 150 mm above the final excavation level. The balance shall be excavated with special care. Soft pockets shall be removed even below the final level and extra excavation filled up as directed by the Engineer-In-charge. The final excavation if so instructed by the Engineer-In-charge should be carried out just prior to laying the mudmat.

6.3 The contractor may excavate outside the lines shown on the drawing or as directed by the Engineer-In-charge for facility of work or similar other reasons and also backfill later at his own cost if so approved by the Engineer-In-charge. Should any excavation be taken below the specified elevations the contractor shall fill it up with concrete of the same grade as in the foundation resting thereon upto the required elevation. No extra shall be claimed by the contractor on this account.

6.4 All excavations shall be done to the minimum dimensions as required for safety and working facility. Prior approval of Engineer-In-charge shall be obtained by the contractor in each individual case for the method he proposes to adopt for the excavation, including dimensions, side slopes, dewatering, disposal, etc. However, this approval shall not in any way relieve the contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur the slipped material shall be removed and the slope dressed to a modified stable slope. Removal of the slipped earth will not be paid for if the slips are due to the negligence of the contractor.

6.5 Excavation shall be carried out with such tools, tackles an equipments as described herein before. Pneumatic hammering or other methods may be resorted to in the case of hard rock, however not without the specific permission of the Engineer-In-charge.

6.6 The Engineer-In-charge may also direct that in some extreme cases the rock may be excavated by heating and sudden quenching for splitting the rock. Firewood shall be used for burning and payment shall be made for such work as called for in the schedule of quantities.

6.7 STRIPPING LOOSE ROCK :

6.7.1 All loose boulders, semi detached rocks (along with earthy stuff which might move therewith) not directly in the excavation but so close to the area to be excavated as to be liable in the opinion of the Engineer-In-charge to fall or otherwise endanger the workmen, equipment, or the work, etc. shall be stripped off and removed away from the area of the excavation. The method used shall be such as not to shatter or render unstable or unsafe the portion which was originally sound and safe.

6.8 EXCAVATION IN HARD ROCK:

6.8.1 Unless otherwise stated herein , I.S. specification "IS:4031 (Safety Code for Blasting and Related Drilling Operations)" shall be followed. After removal of overburden, if any, excavation shall be continued in rock to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by the Engineer-In-charge. At all stages of excavation precautions shall be taken to preserve the rock below and beyond the lines specified for the excavation in the soundest possible condition. In case of damage to permanent or temporary structures the contractor shall repair the same to the satisfaction of the Engineer-In-charge at his cost. No blasting can be allowed for excavation of hard rock without prior permission of Engineer-in-charge.

6.8.2 Specific written permission of the Engineer-In-charge will have to be taken by the contractor for blasting rock. The contractor shall also obtain a valid blasting license from the authorities concerned. If permission for blasting is refused by the Engineer-In-charge the rock shall be removed by wedging, pick, barring, heating and quenching or other approved means. All loose or loosened rock in the sides shall be removed by barring, wedging, etc. The unit rates for excavation in hard rock shall include the cost of all these operations.

6.8.3 The contractor shall also obtain necessary license for storage and use of explosives for the work from the authorities dealing with explosives if permission for blasting is granted. The fees, if any, required for obtaining such license shall be borne by the contractor. The contractor shall have to make necessary storage facilities for the explosives as per rules of local, state and central government authorities and statutory bodies/ regulations. Explosives shall be kept dry and shall not be exposed to direct rays of sun or be stored in the vicinity of fire, stoves, steam pipes or heated metal etc. No explosive shall be brought near the work in excess of quantity required for a particular amount of firing to be done and surplus left after filling the holes shall be removed to the magazine. The magazine should be built as far as possible from the area to be blasted. The Engineer-In-charge's prior approval shall be taken for the location proposed for the magazine.

6.8.4 In no case blasting shall be allowed closer than 30 metres to any structure or to locations where concrete has just been placed. In the latter case the concrete must be at least 7 days old.

6.8.5 If blasting operation carried out under permission the following points shall be observed :

6.8.5.1 The contractor shall employ competent and experienced supervisor an licensed Blaster-In charge of each set of operation who shall be held personally responsible to ensure that all safety regulations are carried out.

6.8.5.2 Before any blasting is carried out the contractor shall intimate the Engineer-In-charge and obtain his approval in writing for resorting to such operations. He shall intimate the hours of firing charges, he nature of explosive to be used and the precautions taken for ensuring safety.

6.8.5.3 The contractor shall ensure that all workmen and the personnel at site are excluded from an area within radius of 200 metres from the firing point at least 15 minutes before firing time by sounding warning siren. The area shall be encircled by red flags. Clearance signal shall also be sounding a distinguishing siren.

6.8.5.4 The blasting of rock near any existing buildings, equipment or any other property shall be done under cover and the contractor has to make all such necessary muffling arrangements as stated hereinafter under "Controlled Blasting". Blasting shall be done with small charges only and where directed by the Engineer-In-charge. A trench shall have to be cut by chiseling prior to the blasting operation separating the area under blasting from the existing structures.

6.8.5.5 The firing shall be supervised by a supervisor. If the blasts do not tally with the number fired, the misfired holes shall be carefully located after half an hour and when located, the same shall be exploded by drilling a fresh hole along the misfired hole (but not nearer than 600 mm from it) and by exploding a new charge.

6.8.5.6 A wooden tamping rod with a flat shall be used to push cartridges home and metal rod or hammer shall not be permitted. The charge shall be placed firmly into place and not rammed or pounded. After a hole is filled to the required depth, the balance of the hole shall be filled with stemming which may consist of sand or stone dust or similar inert material.

6.8.5.7 The contractor shall preferably fire the explosives electrically.

6.8.5.8 Holes for charging explosive shall be drilled with pneumatic drills, the drilling pattern being so planned that rock pieces after blasting will be suitable for handling without secondary blasting.

6.8.5.9 When excavation has almost reached the desired level hand trimming shall have to be done for dressing the surface to the desired level. Any rock excavation beyond an over break limit of 225 mm shall be filled up as instructed by the Engineer-In-charge with concrete of mix 1:3:6. The cost of filling such excess depth shall be borne by the contractor and the excavation carried out beyond the limit specified above will not be paid for. Stepping in rock excavation shall be done by hand trimming.

6.8.5.10 The contractor shall be responsible for any accident to workmen, public or department's property due to blasting operations. Contractor shall also be responsible for strict observance of rules laid down by Inspector of Explosives or any other Authority duly constituted under the state and/ or central government.

6.8.6 Controlled Blasting Instructions:

6.8.6.1 Rock blasting shall be carefully controlled so that rock pieces do not fly out of the pits and thus endanger the installations around. Contractor shall follow the detailed procedure as given below and carefully watch the blasting operations. Based on observations he should set his norms for quantities of charge, depth of holes etc. in consultation with the Engineer-In-charge within the limits specified below.

6.8.6.2 Material for the charge shall be either gun powder or gelatin. The ingredients of the gun powder shall be of best available quality. The composition shall be as per manufacturer's specification meant specifically for rock blasting. The same shall be best make and approved by the Engineer-In-charge before actual use.

6.8.6.3 Quantity of charge: Initially 75 to 80 mm of charge fill shall be used an observations made whether blasting is under full control.If necessary charge may be gradually increased to 150 mm.

Depth of hole : 1500 to 1650 mm.

Diameter of hole : 30 to 40 mm.

Embedment of fuse : Fuse end shall be embedded to a depth of
Inside charge : ½ to 2/3 of the depth of the charge.
Distance of firing end of the : 15 to 30 metres.
Fuse from the charge

Time of the blast after firing the fuse : 120 to 150 seconds.

Disposition of hole : 1.20 to 1.80 metre apart both ways.

Inclination : Inclination of the hole to be pointed
: towards the non-developed side of
: the site.

Number of holes to be taken : Minimum 8 Numbers and Maximum
Up per blast : 20 Numbers.

6.8.6.4 Protective Measures:

6.8.6.4.1 The holes are to be covered with 3.0 mm thick square steel plate of minimum area from 0.60 m2 to 1.00 m2.

6.8.6.4.2 A steel mesh made out of reinforcement rods of not less than 20 mm diameter @ 150 mm centers both way shall be placed over the steel plates.

6.8.6.4.3 Six to eight layers of sand filled bags shall be placed over the mesh suitably covering the whole region under blasting operations.

6.8.6.4.4 The steel mesh shall be inspected after every operation and all twist shall be removed before reuse to the satisfaction of the Engineer-In-charge.

6.8.6.5 Feeding the Charge:

6.8.6.5.1 At the bottom of the hole 50 to 75 mm depth shall be filled with dry powder.

6.8.6.5.2 Then the gun powder shall be fed into the hole to the desired length and lightly tamped with a rod.

6.8.6.5.3 The fuse wire shall then be inserted to a depth of ½ to 2/3 of the charge.

6.8.6.5.4 The rest of the hole shall then be filled with dry brick powder or dry murrum.

6.8.6.6 Precautions to be taken when the water table is encountered:

6.8.6.6.1 When the drilled hole encounters water, the charge shall be fed into a steel tube or a plastic tube and inserted to the bottom of the hole.

6.8.6.6.2 In case the contractor prefers to use gelatin for blasting wherever water table is encountered, the method of blasting, the quantity of charge shall be got approved from the Engineer-In-charge before proceeding with the work.

6.8.7 Particular care should taken to preserve rock below and beyond excavation limits in soundest possible manner. Rough excavation should be carried out 150 to 300 mm above the final excavation level. The excavation shall then be done to the specified level with special care. Over break in the hard rock at bottom beyond 225 mm shall not be permitted and if it is exceeded the same shall have to be made good by the contractor at his own cost by filling the same with cement concrete of grade not less than 1:3:6.

6.8.8 After removal of overburden and thereafter excavation of soft rock if excavation is required to be continued in rock to such width, lengths, depths and profiles as shown on the drawing or such other lines and grades as may be specified by the Engineer-In-charge, the excavation in hard rock shall be done by chiseling if in the opinion of Engineer-In-charge blasting cannot be permitted.

6.8.9The contractor shall also at his own expenses and without any extra charges make provision of pumping, bailing and draining water at the ground level to the safe distance so as not to cause any flooding at site. He shall also keep all foundation pits free of water while the concreting work is in progress and till the Engineer-in-charge considers it necessary.

6.8.10 The rate quoted by the contractor for item of excavation in foundation / excavation over areas includes removing and disposing off vegetation, grass, cut plantation, shrubs, bushes, plants, trees of whose girth is not more than 600mm diameter when measured at 1.0 meter height above ground level. No extra payment / measurement on account of this made.

7.0 **FILL AND BACK FILLING:**

7.1 All fill material will be subjected to the approval of Engineer-In-charge. If any material is rejected by the Engineer-In-charge the contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be deposited /disposed off as directed by the Engineer-In-charge after the fill work is complete.

7.2 No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by the Engineer-In-charge.

7.3 To the extent available selected surplus spoils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth to fill up the mixture used for filling.

7.4 If any selected fill material is required to be borrowed, contractor shall make arrangements for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of the Engineer-In-charge. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc. Top soil containing salts/ sulphates and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by the Engineer-In-charge. The contractor shall make necessary access roads to borrow areas and maintain the same at his own cost if such access road does not exist.

7.5 As soon as the work in foundations has been accepted and measured the spaces around the foundations, structures, pits, trenches etc. shall be cleared of all debris and filled with selected/ approved earth in layers not exceeding 150 mm each layer being watered, rammed and properly consolidated before the succeeding one is laid. Each layer shall be consolidated to the full satisfaction of the Engineer-In-charge. Filled earth shall be rammed with approved compaction method. Usually no manual compaction shall be allowed unless the Engineer-In-charge is satisfied that in some cases manual compaction by tampers cannot be avoided. The final back-fill surfaces shall be trimmed and leveled to proper profile as directed by the Engineer-In-charge of indicated on the drawings.

7.6 Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and approved by the Engineer-In-charge. The backfilling material shall be

properly consolidated by watering and ramming taking due care that no damage is caused to the pipes.

7.7 Where the trenches are excavated in soil the filling from the bottom of the trench to the level of the centre line of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 80 mm. Backfilling above the level of the centre line of the pipe shall be done with selected earth by hand compaction of other approved means in layers not exceeding 150 mm.

7.8 In case of excavation of trenches in rock the filling upto a level 300 mm above the top of the pipe shall be done with fine materials such as earth, murrum etc. The filling upto the level of the centre line of the pipe shall be done by hand compaction in layers not exceeding 80 mm whereas the filling above the centre line of the pipe shall be done by hand compaction or approved means in layers not exceeding 150 mm. The filling from a level 300 mm above the top of the pipe to the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 150 mm mixed with fine material as available to fill up the voids.

7.9 The filling in the trenches shall be carried out simultaneously on the sides of the pipe to avoid unequal pressure on the pipes.

7.10 Plinth filling shall be carried out with approved material as described hereinbefore in layers not exceeding 150 mm watered and compacted mechanically. The Engineer-In-charge may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level the surface shall be flooded with water for at least 24 hours unless otherwise directed by the Engineer-In-charge. The surfaces shall then be allowed to dry and again compacted as specified above to avoid settlements at the later stage. The finished level of the filling shall be trimmed to specified the level, slope etc.

7.11 Site grading shall be carried out as indicated in the drawings and as directed by the Engineer-In-charge. Any excavation/ filling for site grading shall be carried out as specified in the specifications given above unless otherwise indicated below:

7.11.1 If no compaction is called for the fill may be deposited to the full height in one operation and leveled. If the fill has to be compacted, it shall be placed in layers not exceeding 225 mm and leveled uniformly and compacted as indicated in the specifications given above before the next layer is deposited.

7.11.2 To ensure that the fill has been compacted as specified, if required field and laboratory tests shall be carried out by owner.

7.11.3 Field compaction test shall be carried out at different stages of filling and also after the fill to the entire height has been completed. This shall hold good for embankment as well.

7.11.4 The contractor shall protect the earth fill from being washed away by rain or damaged in any other way. If any slip occurs the contractor shall remove the affected material and make good the slip at his own cost.

7.11.5 The fill shall be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

7.11.6 If specifically permitted by the Engineer-In-charge compaction can be obtained by allowing loaded trucks conveying fill or other material to ply over the fill area. Even if such a method is permitted, it will be for contractor to demonstrate that the desired/ specified compaction has been obtained. In order that the fill may be reasonably uniform throughout the material should be dumped in place in approximately uniform layers. Traffic over the fill shall then be so routed to compact the area uniformly throughout.

7.11.7 If so specified the rock as obtained from excavation may be used for filling and leveling to indicated grades without further breaking. In such event filling shall be done in layers not exceeding 500 mm approximately. After rock filling to the approximate required level the void in the rocks shall be filled with finer material such as earth, broken stone etc. and area flooded so that be taken to ensure that the finer fill material does not get washed out. Over the layer so filled a 100 mm thick mixed layer of broken material and earth shall be laid and consolidated to the full satisfaction the Engineer-In-charge.

8.0 SAND FILLING:

8.1 At some of the places backfilling may have to be carried with local sand if directed by the Engineer-In-charge. The sand used shall be clean, medium grained and free from impurities. The filled in and sand shall be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition shall be to the contractor's account. The surface of the consolidated sand shall be dressed to required level or slope.

8.2 Construction of floors or other structures on sand fill shall not be started until the Engineer-In-charge has instructed and approved the fill.

9.0 FILL DENSITY:

9.1 The compaction only where so called for in the schedule of quantities/ items shall comply with the specified (proctor/ modified proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor shall demonstrate adequately by field and laboratory tests that the specified density has been obtained.

10.0 MODE OF MEASUREMENT:

10.1 Excavation in all strata's in different components of the schedule of quantities shall be measured net and by levels. Dimensions for the purpose of payment shall be reckoned on the horizontal area of the concrete at the base for foundations of the walls, column, footings, tanks, rafts, or other foundations/ structures to be built multiplied by the mean depth measured from the surface of the original ground level in accordance with drawings or as per actual whichever is minimum.

10.2 In case of excavation exceeding 1.0 meter depth then 3V: 1H in side slopes or as specified in the drawing shall be paid to the contractor. The contractor may make such allowance in his rates to provide for excavation in side slopes keeping in mind the nature of the soil and safety of excavation. Safety of the excavation work shall be the responsibility of the contractor.

10.3 No extra payment shall be paid to the contractor for providing approach ramps to facilitate carrying out the excavation work and transporting the excavated earth at the various levels.

10.4 Reasonable working space not exceeding 600 mm beyond the line of PCC or actual excavation carried out whichever is less for waterproofing of basement structure wherever considered necessary in the opinion of the Engineer-In-charge will be allowed in excavation and considered for payment. However, if concentrating is proposed against the sides of excavation to place the water proofing treatment earlier to casting of foundation member over break in rock up to 225 mm beyond the theoretical fine of water proofing treatment only will be permitted and paid for.

10.5 Over break in hard rock at bottom to the extent of 225 mm in depth or actual whichever is less will be measured and paid for. If, however, the excavation in hard rock at bottom is done more than the required limits the same will have to be made good by filling with concrete of mix 1:3:6 at the contractor's cost. For the rock excavation beyond the required profile over break in rock only will be limited to 225 mm beyond the theoretical line or actual whichever is less.

10.6 In case of rock strata intermixed with soil the excavated rock will be properly stacked as directed by the Engineer-In-charge and the volume of rock calculated on the basis of stack measurement after deducting voids @ 50% of the volume.

10.7 Unless otherwise specified the unit rates quoted for excavation in different types of materials shall also account for the basic class as specified in the item of the work. Only leads beyond the basic lead as specified will be considered as extra lead and paid for at rates quoted in the schedule after deducting the voids as specified in the items.

10.8 The rates for excavation in soft and hard rock shall include carting away the excavated rock to the required lead as indicated in the items of work and properly stacking the same as directed by the Engineer-In-charge.

10.9 The rate to the quoted in hard rock excavation shall also be inclusive of all explosive and additional cost, if any, involved in protective measures as stipulated above in the specifications.

10.10 Backfilling as per specifications in the sides of foundations, columns, footings, structures, walls, tanks, rafts, trenches etc. with selected excavated material will not be paid for separately. It shall be clearly understood that the rate quoted for excavation shall include stacking of excavated material as directed and carting it back and backfilling around the foundations as specified above. Generally the material to be backfilled may be stacked temporarily upto basic lead of 50 meters unless otherwise directed by the Engineer-In-charge.

10.11 Payment for fill inside trenches, plinth or similar filling with selected excavated material will be made only after compaction as specified /directed. Cost of all other operations shall be deemed to have been covered in the rate quoted for excavation. Payment for this work will be made based on the measurement of plinth/ trench dimensions filled. If no compaction is specified/ desired such filling will not be separately paid for. In such a event the fill shall be leveled/ finished to the profiles as directed at no extra cost.

10.12 Filling under floors with approved murrum which may have to be brought from outside sources shall be paid for at rates quoted. The quoted rate shall include all operations such as clearing, excavation, lead and transportation, fill, compaction etc. as specified. Actual quantity of consolidated filling limited to the dimension considered for payment for excavation only shall be measured and paid for in cubic metres.

10.13 Actual quantity of consolidated sand filling shall be measured and paid in cubic metres.

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SPECIFICATION FOR REINFORCED CONCRETE AND ALLIED WORKS

1.0 GENERAL

The quality of materials, method, control of manufacture and transportation of all concrete work in respect of mix whether reinforced or otherwise shall confirm to the applicable portion of these specification.

The Engineer-In-Charge shall have the right to inspect the source of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipments and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-In-Charge's approval shall be obtained prior to starting of concrete work.

2.0 SCOPE

This specification covers the general requirements for concrete to be used on jobs using on-site production facilities including requirements in regard to the quality, quantity, handling, storage of ingredients, proportioning, batching, mixing, and testing of concrete and also requirements in regard to the quality, storage, cutting, bending and fixing of reinforcement in position. This also covers the transportation of concrete from mixer to the place of final deposit and placing, curing, protecting, repairing and finishing of concrete.

3.0 APPLICABLE CODES & SPECIFICATION:

The following specifications, standards and codes are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments, revisions and additional publications. In case of discrepancy between this specification and those referred to herein this specification shall govern.

269	Specification for ordinary, rapid hardening and low heat Portland cement.
IS 383	Specification for coarse & fine aggregate from natural source or concentrate.
IS 456	Code of practice for plain and reinforced concrete.
IS 457	Code of practice for plain and reinforced concrete for dams and other massive structures.
IS 515	Specification for natural and manufactured aggregate for use in mass concrete.
IS 516	Method of test for strength of concrete.
IS 650	Specifications for standard sand for testing of cement.
IS 1199	Method of sampling and analysis of concrete.
IS 1200	Method of measurement of building works.
IS 1791	Specification for batch type concrete mixers.
IS 2386 (Part-I)	Method of test for aggregates for concrete: Particle size and shape.
IS 2386 (Part-II)	Method of test for aggregates for concrete: Estimation of deleterious materials and organic impurities.
IS 2386 (Part-III)	Method of test for aggregates for concrete : Specific gravity, density, voids, absorption and bulking.
IS 2386 (Part-IV)	Method of test for aggregates for concrete: Mechanical properties.
IS 2386 (Part-V)	Method of test for aggregates for concrete: Soundness.
IS 2386 (Part-VI)	Measuring mortar making properties of fine aggregates.
IS 2386 (Part-VII)	Method of test for Alkali aggregates reactivity.

IS 2386 (Part-VIII)	Petro graphic examination of aggregates.
IS 2438	Specification for roller pan mixer.
IS 2505	Specification for immersion type concrete vibrators.
IS 2506	Specification for screed board concrete vibrators.
IS 2514	Specification for concrete vibrating table.
IS 2645	Specification for integral cement water proofing compound.
IS 2722	Specification for portable swing weigh batcher for concrete.
IS 3025	Methods of sampling and test (physical and chemical) for water used in industry.
IS 3366	Specification for pan vibrator.
IS 3370	Code of practice for concrete structures for the storage of liquids: General.
IS 3370	Code of practice for concrete structures for the storage of liquids: Reinforced concrete structure.
IS 3385	Code of practice for measurement of Civil Engineering works.
IS 3414	Code of practice for design and installation of joints in buildings.
IS 3558	Code of practice for use of immersion vibrators for consolidating concrete.
IS 3935	Code of practice for composite construction.
IS 4031	Method of physical test for hydraulic cement.
IS 4656	Specification for form vibrator.
IS 7861	Code of practice for extreme weather concreting (for hot weather concreting).
IS 8112	Specifications for high strength ordinary Portland cement (Grade 43).
IS 10262	Code of practice for design mix.
IS 12269	Specifications for high strength ordinary Portland cement (Grade 53).
IS 13311 (Part-I)	Non-destructive testing of concrete: Method of test for ultrasonic pulse velocity.
IS 13311 (Part-II)	Non-destructive testing of concrete: Method of testing by rebound hammer.

4.0 MATERIALS FOR STANDARD CONCRETE

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement; clean sand, natural coarse aggregate, clean water, ice, an admixture, if specifically called for on drawings or schedule of quantities.

4.1 Cement:

Unless otherwise specified or called for by the Engineer-In-Charge cement shall be ordinary Portland cement / Portland Pozzolana cement in 50 kg bags. The use of bulk cement will be permitted only with the approval of the Engineer-In-Charge. Changing of brand or type of cement within the same structure will not be permitted. In case it is required to change the brand of cement in the same structure, prior permission shall be obtained from the Engineer-In-Charge.

If demanded a certified report attesting to the conformity of the cement to I.S. specifications by the cement manufacturer's chemist shall be furnished to the Engineer-In-Charge.

The contractor will have to make his own arrangements for the storage of adequate quantity of cement. Cement in bulk may be stored in bins or silos, which will provide complete protection from dampness, contamination and minimize cracking and false set. Cement bags shall be stored in dry enclosed shed (storage under tarpaulins will not be permitted), well away from the outer walls and insulated from the floor to avoid contact with moisture from ground and so arranged as to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to use and shall be removed from site. The storage bins and storage arrangements shall be such that there is no dead storage. Not more than 12 bags shall be stacked in any tier. The storage arrangement shall be approved by the Engineer-In-Charge. Consignment of cement shall be stored as received and shall be consumed in the order of their delivery.

Cement held storage for a period of Ninety (90) days or longer shall be tested before use in work. Should at any time the Engineer-In-Charge have reason to consider that any cement is defective, then irrespective of its origin and / or manufacturer's test certificate, such a cement shall be tested immediately at a National Test Laboratory / Departmental Laboratory or such approved laboratory and until the result of such test are found satisfactory, it shall not be used in any work.

4.2 Aggregates:

Aggregate in general designates both fine and coarse inert materials used in the manufacture of concrete. Fine Aggregate is aggregate most of which passes through 4.75 mm I.S. sieve. Coarse Aggregate is aggregate most of which retained on 4.75 mm I.S. sieve.

All fine and coarse aggregate proposed for use in the work shall be subjected to Engineer- In-Charge's approval and after specific materials have been accepted the source of supply of such materials shall not be changed without prior approval of the Engineer-In-Charge.

Aggregates shall consist of natural sand, crushed stone and gravel from source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, and durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and/ or durability of concrete. The grading of aggregate shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the "mixed design" and preliminary test on concrete specified herein after.

4.2.1 Sampling and Testing:

Samples of the aggregates for mixed design and determination of suitability shall be taken under the supervision of the Engineer- In-Charge and delivered to the laboratory, well in advance of the scheduled placing of concrete.

Records of tests, which have been made on proposed aggregates and on concrete made from this source of aggregates, shall be furnished to the Engineer- In-Charge in advance of the work for use in determining the aggregate suitability.

4.2.2 Storage of Aggregates:

All coarse and fine aggregates shall be stacked separately in stock piles in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with the foreign materials and earth during storage and while heaping the materials, shall be avoided. The aggregate must be specified quality not only at the time of receiving at site but more so at the time of loading into mixer. Rakers shall be used for lifting the coarse aggregates from the bins or stock piles. Coarse aggregate shall be piled in layers not exceeding 1.20 metres in height to prevent coning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected material after re-mixing may be accepted, if subsequent tests demonstrate conformity with required gradation.

4.2.3 Specific Gravity:

Aggregate having a specific gravity below 2.60 (saturated surface dry basis) shall not be used without special permission of the Engineer- In-Charge.

4.2.4 Fine Aggregate:

Fine aggregate except as noted above and for other than lightweight concrete shall consist of natural river sand, crushed stone sand or crushed gravel sand stone dust confirming to I.S. 383. The sand shall be clean, sharp, hard, durable, chemically inert and free from dust, vegetable substances, adherent coating, clay, organic matter, alkalis, mica, salt or other deleterious substances which can be injurious to the setting qualities/ strength/ durability of concrete. No creek / sea sand shall be allowed.

Machine made sand will be acceptable provided the constituent rock/ gravel composition is sound, hard, dense, non-organic, uncoated and durable against weathering.

Sand shall be prepared for use by such screening or washing or both as necessary to remove all objectionable foreign matter while separating the sand grains to the required size fractions. Sand with silt content more than 3 % will not be permitted for use unless the same is washed and silt content is brought within 3% by weight.

The percentage of deleterious substances in sand delivered to the mixer shall not exceed the following:

Sl. No.	Substances	Percent by weight Uncrushed : Crushed
1.	Material finer than 75 micron I.S. sieve	3.00% : 15.00%
2.	Shale	1.00% ---

3.	Coal and Lignite	1.00% : 1.00%
4.	Clay lumps	1.00% : 1.00%
5.	Total of all above substances including items 1 to 4 for uncrushed sand and items 3 & 4 for crushed sand.	5.00% : 2.00%

Unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder:

Sl. No.	I.S.Sieve Designation	Percentage passing for			
		Zone - I	Zone - II	Zone - III	Zone - IV
1.	10 mm	100	100	100	100
2.	4.75 mm	90-100	90-100	90-100	95-100
3.	2.36 mm	60-95	75-100	85-100	95-100
4.	1.18 mm	30-70	55-90	75-100	90-100
5.	600 micron	15-34	35-59	60-79	80-100
6.	300 micron	5-20	8-30	12-40	15-50
7.	150 micron	0-10	0-10	0-10	0-15

Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron I.S. sieve by total amount not exceeding 5% (five percent), it shall be regarded as falling within the grading zone. This tolerance shall not be applied to percentage passing the 600-micron I.S. sieve or to percentage passing any other sieve size on the coarser limit of Grading Zone-I or the finer limit of Grading Zone-IV. Fine aggregates confirming to Grading Zone-IV shall not be used unless mix designs and preliminary tests have shown its suitability for producing concrete of specified strength and workability.

The sand shall have a fineness modulus of not less than 2.2 or more than 3.2. The fineness modulus is determined by adding the cumulative percentage retained on the I.S. sieve (4.75 mm, 2.36 mm, 1.18mm, 600 micron, 300 micron and 150 micron) and dividing the sum by 100.

4.2.5 Coarse Aggregate:

Coarse aggregate for concrete except as noted above and for other than lightweight concrete shall confirm to I.S. 383. This shall consist of natural or crushed stone and gravel, and shall be free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkalis, mica, organic matter or other deleterious matter.

The coarse aggregate and fine aggregate shall be tested from time to time as required by the Engineer- In-Charge to ascertain its suitability or use in construction and the charges for testing aggregate shall be born by the contractor as specified herein after.

Crushed rock shall be screened and/or washed for the removal of dirt or dust coating if so demanded by the Engineering- In-Charge.

Coarse aggregates shall be either in single size or graded. In both cases grading shall be within the following limits:

"Table – I"

Sl. No.	I.S. Sieve Designation	Percentage passing for single sized aggregate of nominal size				
		40 mm	20 mm	16 mm	12.5 mm	10 mm
1.	63 mm	100	--	--	--	--
2.	40 mm	85-100	100	--	--	--
3.	20 mm	0-20	85-100	100	--	--
4.	16 mm	--	--	85-100	100	--
5.	12.5 mm	--	--	--	85-100	100
6.	10 mm	0-5	0-20	0-30	0-45	85-100
7.	4.75 mm	--	0-5	0-5	0-10	0-20
8.	2.36 mm	--	--	--	--	0-5

"Table – II"

Sl. No.	I.S. Sieve Designation	Percentage passing for single sized aggregate of nominal size			
		40 mm	20 mm	16 mm	12.5 mm
1.	63 mm	100	--	--	--
2.	40 mm	95-100	100	--	--
3.	20 mm	30-70	95-100	100	100
4.	16 mm	--	--	95-100	--
5.	12.5 mm	--	--	--	90-100
6.	10 mm	10-35	25-55	30-70	40-85
7.	4.75 mm	0-5	0-10	0-10	0-10
8.	2.36 mm	--	--	--	--

The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale if present shall be only in such quantities that will not in the opinion of Engineer-In-Charge affect adversely the strength and / or durability of concrete. The maximum size of coarse aggregate shall be the maximum size specified above but in no case greater than ¼ of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of form. Plums above 160 mm and up to any reasonable size can be used in plain mass concrete work of large dimensions up to a maximum limit of 20% by volume of concrete when specially approved by the Engineer-In-Charge. For heavily reinforced concrete members the nominal maximum size of the aggregate shall be 5 mm less than the minimum clear distance between the main reinforcing bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller. The amount of fine particles occurring in the free state or as loose adherent shall not exceed 1% when determined by laboratory sedimentation tests as per I.S. 2386. After 24 hours immersion in water, a previously dried sample shall not have gained more than 10% of its oven dry weight in air as determined by I.S. 2386.

The percentage of deleterious substances in the coarse aggregate delivered to the mixer shall not exceed the following:

Sl. No.	Substances	Percentage by weight of aggregates Uncrushed : Crushed	
1.	Material finer than 75 micron I.S. sieve	3.00	3.00
2.	Coal and lignite.	1.00	1.00
3.	Clay lumps.	1.00	1.00
4.	Sift fragments.	3.00	--
5.	Total of all above substances.	5.00	5.00

4.3 Water:

Water used for both mixing and curing shall be free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally satisfactory for mixing and curing of concrete. In case of doubt the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in I.S. 456. The sample of water taken for testing shall be typical for the water proposed to be used for concrete, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

Average 28 days compressive strength of at least three 150 mm size concrete cubes prepared with water to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water. The cubes shall be prepared, cured and tested in accordance with the requirements of IS: 516.

The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than + 30 minutes from the initial setting time of control test block prepared with the appropriate test cement and distilled water. The block shall be prepared and tested in accordance with the requirements of IS: 4031 (Part 5).

Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer-In-Charge may refuse to permit its use. As a guide the following concentration represent the maximum permissible values:

To neutralize 100 ml sample of water, using Phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NaOH. The details of test shall be as given in 8.1 of IS: 3025 (Part 22).

To neutralize 100 ml sample of water, using Methyl Orange as an indicator, it should not require more than 25 ml of 0.02 normal H2 SO4 . The details of test shall be as given in 8 of IS: 3025 (Part 23).

The percentage of solids, when tested in accordance with the IS: 3025 shall not exceed the following:

Sl. No.	Substances	Tested as per	Permissible percentage
1.	Organic	IS: 3025 (Part 18)	0.02% (200 mg/litre)
2.	Inorganic	IS: 3025 (Part 18)	0.30% (3000 mg/litre)
3.	Sulphates (as SO3)	IS: 3025 (Part 24)	0.04% (400 mg/litre)
4.	Chlorides (as Cl)	IS: 3025 (Part 32)	0.20% (2000 mg/litre) for concrete not containing embedded steel and 0.05% (500 mg/litre) for reinforced concrete works.
5.	Suspended matter	IS: 3025 (Part 17)	0.20% (2000 mg/litre)

P.H. value of water shall generally be not less than 6.

5.0 DESIGN MIX CONCRETE:

All reinforced concrete in the work shall be "Design Mix Concrete" as defined in IS: 456 considering as 'severe' environment and cost of design mix shall be included in the item rate and no separate payment shall be made on account of this. All "Design Mix Concrete" work to be carried out under these specifications shall be in grades designated as per table below.

Use of mineral admixtures like fly ash, GGBFS, etc. shall not be permitted in the design mix unless otherwise special permission is given by the Engineer-in-Charge. Cement shall be Ordinary Portland Cement – 43 grade or Portland Pozzolana Cement (Fly ash based meeting the 28 day strength requirement of OPC 43 grade cement) only.

Group	Grade Designation	Specified Characteristic Compressive Strength of 150 mm Cube at 28 days in N/mm2
Ordinary Concrete	M - 10	10
	M – 15	15
	M – 20	20
Standard Concrete	M – 25	25
	M – 30	30
	M – 35	35
	M - 40	40
	M – 45	45
	M – 50	50
	M – 55	55
High Strength Concrete	M – 60	60
	M – 65	65
	M – 70	70
	M – 75	75
	M – 80	80

Notes:
The Characteristic strength is defined as the strength of material below which not more than 5% of the test results are expected to fall.

In the designation of a concrete mix, letter 'M' refers to the mix and the number to the specified characteristic compressive strength of 150 mm size cube at 28 days in N/mm2.

The mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than appropriate value given in the table above.

5.1 Mix Design:

This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give works cubes of the characteristic strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be carried out according to the ACI standard designation 'ACI-613' or Design of concrete mixes - Road Research Note No.4, Department of Scientific and Industrial Research U.K. or I.S. 10262.

Since different cements and aggregates of different maximum size, grading, surface texture, shape and other characteristics may produce concretes of different compressive strength for the same free water cement ratio, the relationship between strength and free water cement ratio should preferably be established for the materials actually to be used. In the absence of such data, the preliminary free water cement ratio (by mass) corresponding to the target strength at 28 days may be selected from the relationship shown in Fig.1 of I.S. 10262 at page 7.

Alternately, the preliminary free water cement ratio (by mass) corresponding to the target average strength may be selected from the relationship in Fig. 2 of I.S. 10262 page at 8, using the curve corresponding to the 28 days cement strength to be used for the purpose. Other relevant items to the used with design of mix should strictly confirm to the relevant clauses and appendices of I.S. 10262. The calculated mix proportions shall be checked by means of trial batches. The contractor should refer to the item No.4 at page 12 and the Appendix 'D' (clause No. 4.1) of I.S. 10262 for neat illustration. The contractor may refer Appendix 'C' (clause 3.8) at page 16 of I.S. 10262 for an example illustrating the mix design of M-20. The free water cement ratio selected as above should be checked against the limiting water cement ratio for the requirement of durability and the lower of the two values should be adopted.

Whenever there is a change either in required strength of concrete or water cement ratio or workability or the source of aggregates and/ or cement fresh tests shall be carried out to determine the revised proportion of the mix to suit the altered conditions. While designing mix proportions over wet mixes shall always be avoided.

While fixing the value for water cement ratio for 'Design Mix' assistance may be derived from the standard graph showing the relationship between the 28 days compressive strength of concrete mixes with different water cement ratios and the 7 days compressive strength of cement tested in accordance with I.S. 269 and I.S. 8112.

It will be contractor's sole responsibility to establish the concrete mix designs for different grades of concrete specified in the work consistent with the workability required for nature of work an also taking into consideration the assumed standard deviation which will be expected at site or by establishing the standard deviation based on 30 test results at site for each grade of concrete so as to produce concrete of required strength, durability and surface finish. The materials and proportions used in making the tests to be carried out either at site or under laboratory, conditions shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce the concrete of the required consistency to give such specified strength.

5.2 Standard Deviation:

Standard deviation of concrete of each grade shall be determined separately. When results of sufficient number of tests (at least 30) are not available, then the value of standard deviation given in the table below may be assumed for design mix in the first instance. As soon as the results of the samples are available, actual calculated standard deviation shall be used and the mix designed properly.

Assumed Standard Deviation:

No.	Grade of Concrete	Assumed Standard Deviation in N/mm2
1.	M - 10	3.5
2.	M – 15	
3.	M – 20	4.0
4.	M – 25	
5.	M – 30	5.0
6.	M – 35	
7.	M - 40	
8.	M – 45	
9.	M – 50	

Note: - the above values correspond to the site control having proper storage of cement; weigh batching of all materials; controlled addition of water; regular checking of all materials; aggregate grading and moisture content; and periodical checking of workability and strength. Where there is deviation from the above, the values given in the above table shall be increased by 1 N/mm2.

Standard Deviation Based On Test Results:

The total number of test results required to constitute and acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results as early as possible when a mix is used for the first time.

The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once in a month.

Determination Of Standard Deviation :

Concrete of each grade shall be analyzed separately to determine its standard deviation.

The standard deviation of concrete of given grade shall be calculated using the following formula from the results of individual tests of concrete of that grade obtained as specified for test strength of sample :

Estimated Standard Deviation (S) = $\sqrt{X^2 / (n-1)}$

Where X = Deviation of the individual test strength from the average strength of a sample and

n = Number of sample test results.

When significant changes are made in the proportion of concrete (for example changes in materials used, mix design, equipments or technical control), the standard deviation value shall be separately calculated for such batches of concrete.

5.4 Proportioning:

The proportions which shall be decided by conducting preliminary tests, shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers confirming to I.S. 2722, capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer-In-Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stacked in separate stock piles. The grading of coarse and fine aggregates shall be checked as frequently as possible, as determined by the Engineer-In-Charge, to ensure maintaining of grading in accordance with samples used in preliminary mix design. The material shall be stock piles well in advance of use.

The cement shall be measured by weight for design mix. Every facility should be provided to the Engineer-In-Charge for sampling and inspection of stored cement at site of work.

Only such quantity of water shall be added to the cement and aggregate in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of materials or the collection of excessive free water on the surface of the concrete.

The water cement ratio (W/C) is defined as the weight of water in mix (including the surface moisture of the aggregate) divided by the weight of cement in the mix. The actual water cement ratio to be adopted shall be determined in each instance by the contractor and approved by the Engineer-In-Charge.

The water cement ratio specified for use by the Engineer-In-Charge shall be maintained. The contractor shall determine the water content of the aggregate as frequently as directed by the Engineer-In-Charge as the work progresses and as specified in I.S. 2386 (Part-III) and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer-In-Charge so as to maintain the specified water cement ratio. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

5.5 Consistency and Slump:

Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined the consistency of mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump tests, compacting factor test etc. in accordance with I.S. 1199, shall be conducted from time to time to ensure the maintenance of such consistency.

Workability of Concrete:

The following tabulation gives a range of workability which shall generally be used for various types of construction unless otherwise instructed by the Engineer-In-Charge:

Placing Conditions	Degree of workability	Value of workability
Blinding concrete, shallow sections, pavements using pavers.	Very low	0.75 - 0.80 Compacting factor.
Mass concrete, lightly reinforced sections in slabs, beams, walls, columns, floors, hand placed pavements, canal lining, strip footings.	low	Slump of 25 – 75 mm.
Heavily reinforced sections in slabs, beams, walls, columns, Slip formwork, pumped concrete.	medium	Slump of 50–100 mm. Slump of 75 – 100 mm.
Trench fill, In-situ piling,Tremie concrete.	High Very high	Slump of 100 – 150 mm.

5.6 Batching and Mixing of Concrete:

The material and proportions of concrete ingredients as established by the preliminary tests for the mix design shall be rigidly followed for all concrete works on the project and shall not be changed except when specifically permitted by Engineer-In-Charge.

Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batcher shall be maintained in clean serviceable condition. The accuracy of weigh batcher shall be periodically checked. They shall be set up in level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately unless otherwise stated.

Volume batching will not be permitted. However Engineer-In-Charge may permit volume batching by subsequent conversion of weights of ingredients into their equivalent volumes in respect of their bulk densities only in the case of small and less important pours involving concrete of not more than 0.25 cubic metre on the day when other pours involving weigh batching are not likely to be taken up.

The concrete shall be of strength as stipulated in the respective items. All concrete shall be mixed in mechanically operated batch mixers complying with I.S. 1791 and of Suggested/Recommended make with suitable provision for correctly controlling the water delivered to the drum.

The quantity of water actually entering the drum shall be checked with the reading of the gauge or valve setting when starting a job. The test should be made while the mixer is running.

The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregate. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour for a minimum period of two minutes after all ingredients are in the drum.

The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.

Each time the work stops the mixer shall be cleaned out and when next commencing the mixing the first batch shall have 10% additional cement to allow for sticking in the drum.

6.0 SAMPLING AND TESTING OF CONCRETE:

If the Engineer-In-Charge desires facilities required for sampling materials and concrete in the field shall be provided by the contractor at no extra cost. The following equipments (in serviceable condition) with operator shall be made available at Engineer's request:

No.	Equipments	Requirement
1.	Cast Iron cube moulds of 150 mm size	As required
2.	Slump cone complete set with tamping rod	1 set
3.	Slump cone complete set with tamping rod 10 gm.	1 No.
4.	Laboratory balance of 2 kg. Capacity and sensitivity of 1 gm.	1 No.
5.	I.S. sieves for coarse and fine aggregates	1 set.
6.	A set of measure from 0.1 litre to 5 litres.	1 set.
7.	Electric oven with thermostat up to 120 degree centigrade.	1 No.
8.	Flakiness gauge	1 No.
9.	Elongation index gauge	1 No.
10.	Sedimentation pipette	1 No.
11.	Pyconometer	1 No.
12.	Calibrated glass jar of 1 litre capacity	2 Nos.
13.	Glass flasks and metal containers	As required.
14.	Chemical reagents like Sodium Hydroxide, Tannic Acid, Litmus papers etc.	As required.

The concrete test cubes will be tested at Department's or site laboratory. The contractor shall make all arrangements to cure, store of concrete cubes and transport the same to the laboratory at his own cost as directed by the Engineer-In-Charge.

6.1 Sampling and Strength Test of Concrete:

The samples from fresh concrete shall be taken as per I.S. 1199 and cubes shall be made, cured and tested at 28 days in accordance with I.S. 516.

In order to get a relatively quicker idea of the quality of concrete optional test on beams for modulus of rupture at 72 (+/-)2 hrs. or at 7 days or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose the value given in table below may be taken for general guidance in case of concrete made with ordinary Portland cement. In all cases, the 28 days compressive strength specified shall alone be the criterion for acceptance or rejection of the concrete. If however, from test carried out in particular job over a reasonably long period, it has been established to the satisfaction of the Engineer-In-Charge that a suitable ratio between 28 days compressive strength and the modulus of rupture at 72 (+/-)2 hrs. or 7 days or compressive strength at 7 days may be accepted. The Engineer-In-Charge may suitable relax the frequency of 28 days compressive strength, provided the expected strength values at the specified early age are consistently met.

Optional Test Requirement of Concrete:

No.	Grade of Concrete	Minimum Compressive Strength on 150 mm Cube	Min. Modulus of Rupture By Beam Test at	
			72 (+/-) 2 hrs.	7 days

1.	M - 10	7.00 N/m2	1.20 N/mm2	1.70 N/mm2
2.	M – 15	10.00 N/m2	1.50 N/mm2	2.10 N/mm2
3.	M – 20	13.50 N/m2	1.70 N/mm2	2.40 N/mm2
4.	M – 25	17.00 N/ m2	1.90 N/mm2	2.70 N/mm2
5.	M – 30	20.00 N/ m2	2.10 N/mm2	3.00 N/mm2
6.	M – 35	23.50 N/ m2	2.30 N/mm2	3.20 N/mm2
7.	M - 40	27.00 N/ m2	2.50 N/mm2	3.40 N/mm2

Frequency of Sampling:

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, i.e. the sampling should be spread over the entire period of concreting and cover all mixing units.

The minimum frequency of sampling of concrete of each grade shall be in accordance with the following:

No.	(c) Quantity of concrete	(d) Number of Samples
1.	1.00 to 5.00 m3	One
2.	6.00 to 15.00 m3	Two
3.	16.00 to 30.00 m3	Three
4.	31.00 to 50.00 m3	Four
5.	51.00 m3 and above	Four Plus one additional sample for each additional 50 m3 part thereof.

At least one sample shall be taken from each shift. Where concrete is produced at continuous production unit, such as ready-mixed concrete plant, frequency of sampling may be agreed upon mutually by suppliers and purchasers.

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork or to determine the duration of curing or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in I.S. 9013. The specimen shall be tested as described in I.S. 516.

The test strength of the samples shall be the average of the strength of three specimens. The individual variation should not be more than (+/-) 15 percent of the average.

Slump test shall be carried out as often as demanded by the Engineer-In-Charge and invariably from the same batch of concrete from which the test cubes are made. Slump test shall be done immediately after sampling.

Standard Deviation shall be vide clause '5.3' of this specification.

7.0 ACCEPTANCE CRITERIA:

The concrete shall be deemed to comply with the strength requirement if:

The mean strength determined from any group of four consecutive test results complies with the appropriate limits in col. 2 of table below.

Any individual test result complies with the appropriate limits in col. 3 of table below.

Specified Grade	Mean of the Group of 4 Non-overlapping consecutive test results in N/mm2	Individual Test Results in N/mm2
M 15	> fck + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm2) or, • fck + 3 N/ mm2 , whichever is greater	> fck – 3 N/mm2
M20 or above	• > fck + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm2) or, • fck + 4 N/ mm2 , whichever is greater	> fck – 3 N/mm2

If the concrete is deemed not to comply pursuant to 7.0 above, the structural adequacy of the part affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately. Concrete shall be assessed daily for compliance.

Concrete of each grade shall be liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joints, the reinforcement has been displaced beyond the tolerances specified or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-In-Charge.

8.0 ADMIXTURES:

Admixture may be used in concrete only with the approval of the Engineer-In-Charge based upon evidence that with the passage of time neither the compressive strength nor its durability reduced. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted to be used such as in mass concrete works it shall be dissolved in water and added to the mixing water in an amount not exceed 1.5 percent of the weight of the cement in each batch of concrete. When admixtures are used the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer-in-Charge. The cost of admixtures shall be included in the item rate and no extra amount shall be paid on this account.

Where specified and approved by Engineer-In-Charge neutralized vinsol resin or/ and other approved air entraining agent may be used to procedure the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6-260 air entraining admixture of concrete. The recommended total air content in the concrete is 4% + 1%. The method of measuring air content shall be as per I.S. 1199.

8.1 Retarding Admixtures:

Where specified and approved by the Engineer-In-Charge retarding agents shall be added to the concrete mix in quantities specified by Engineer- In-Charge.

8.2 Water Reducing Admixtures:

Where specified and approved by Engineer- In-Charge water reducing lignosulfonate mixture shall be added in quantities specified by Engineer- In-Charge. The admixtures shall be added in the form of a solution.

8.3 Water Proofing Agent:

Where specified and approved by Engineer-In-Charge chloride and sulphide free waterproofing agent shall be added in the quantities specified by Engineer-In-Charge.

8.4 Other Admixtures:

Engineer-In-Charge may at his discretion instruct contractor to use any other admixture in the concrete.

9.0 INSPECTION AND TESTING OF STRUCTURES:

Immediately after stripping the form work all concrete shall be carefully inspected and any defective work or small defects either removed or made good before the concrete has thoroughly hardened as instructed by the Engineer-In-Charge.

In case of doubt regarding the grade of concrete used either due to poor workmanship or based on results of cube strength tests the contractor may be asked to carry out compressive strength test of concrete on the basis of core test, ultrasonic test and/ or load test.

In case of results of cube strength are observed to be lower than the required designed strength at 28 days as per specifications, ultrasonic test shall be carried out by the digital ultrasonic concrete tester by an approved agency at the cost of the contractor.

In case the ultrasonic test do not satisfy the requirement as above the department will be at liberty to reject the concrete and the contractor has to dismantle and redo the same or carry out such remedial measures as approved by the department at the contractor’s own cost.

The unit rate for concrete shall be all inclusive of making preliminary mix design and test cubes, works cubes, testing them as per specifications, slump test, optional tests etc. However, the department will test the same departmentally the contractor will have to make arrangement for transportation of the cubes to the departmental laboratory.

In case cube tests give unsatisfactory results the contractor should also conduct conclusive tests such as ultrasonic pulse test, core test etc. to prove the suitability of concrete. The cost of the conclusive tests shall have to be borne by the contractor.

If the results of ay test prove unsatisfactory or the structure shows signs of weakness, undue deflection or faulty construction the contractor shall remove and rebuild the member(s) involved or carry out such other remedial measures as may be required by the Engineer-In-Charge. The contractor shall bear the cost of so doing unless the failure of the member(s) to fulfill the test conditions is approved to be solely due to faulty design. The cost of all tests shall be borne by the contractor.

10.0 PREPARATION PRIOR TO CONCRETE PLACEMENT, FINAL INSPECTION AND APPROVAL:

Before the concrete is actually placed in position the insides of formwork shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection especially at bottom of columns and wall forms to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Such openings/ holes shall be later suitably plugged.

The various traders shall be permitted ample time to install drainage and plumbing lines, floor and trench drain, conduits, hangers, anchors, inserts, sleeves, bolts frames and other miscellaneous embedment to be cast in the concrete as indicated on the drawing or as necessary for the proper execution of the work. All such embedment shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

Slots, openings, holes, pockets etc. shall be provided in concrete work in the positions indicated in the drawings or as directed by the Engineer-In-Charge.

Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.

Prior to concrete placement all works shall be inspected and approved bythe Engineer-In-Charge and if found unsatisfactory concrete shall not be poured until all defects have been corrected at contractor’s cost.

Approval of Engineer-In-Charge for any and all materials and work as required herein shall not relieve contractor from his obligations to produce finished concrete in accordance with the drawings and specifications.

Rain or Wash Water:

No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rains shall be entirely removed if there is any sign of cement and sand having been washed away from the concrete mixture.

Before leaving unattended the work shall be covered with tarpaulins immediately after the concrete has been placed and compacted to safe guard against damages, which may be caused by rain.

Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over / around freshly placed concrete suitable drains and sumps shall be provided.

Bonding Mortar:

Immediately before concrete placement begins prepared surfaces except formwork which will come in contact with the concrete to be placed shall be covered with a bonding mortar of the same strength of concrete.

Transportation:

All buckets, containers or conveyers used for transport the concrete shall be mortar tight. All means of conveyance shall be adopted to deliver the concrete of the required consistency and plasticity without segregation or loss of slump whatever method for transportation is employed.

Chute shall not be used for transport of concrete without the written permission of the Engineer-In-Charge and concrete shall not be re-handled before placing.

Contaminated Concrete:

Concrete must be placed in its final position before it become too stiff to work.

On no account water shall be added after the initial mixing.
Concrete which has become stiff or has been contaminated with foreign materials and which has not been placed within half an hour of mixing water with cement shall be rejected and disposed off as directed by the Engineer-In-Charge.

All equipments used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipe lines and other equipments shall be thoroughly cleaned after each period of placement.

11.0 PROCEDURE FOR PLACING OF CONCRETE:

Before any concrete is placed the entire placing programme consisting of equipment, layout, proposed procedures and methods shall be submitted to Engineer-In-Charge for approval if so demanded by the Engineer-In-Charge and no concrete shall be placed until Engineer-In-Charge's approval has been obtained. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials considering the size of the job and placement location.

Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within 30 minutes of leaving the mixer and once compacted, it shall not be disturbed.

In all cases the concrete shall be deposited as nearly as practicable directly in its final position and shall not be re-handled or caused to flow in a manner which may cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible and in narrow forms contractor shall provide suitable drop and Elephant Trunks to confine the movement of concrete. Special care shall be taken where concrete is dropped from a height especially if reinforcement is in the way particularly in columns and thin walls.

Except when otherwise approved by Engineer-In-Charge concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than one metre or handle in a manner which will cause segregation.

The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved:

Concrete placed in restricted forms by borrows, buggies, cars, sort chutes or hand shoveling shall be subjected to the requirement for vertical delivery of limited height to avoid segregation and shall deposited as nearly as practicable in it's final position.

Concreting once started shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 150 mm to 900 mm as directed by the Engineer-In-Charge. These shall be placed as rapidly as practicable to prevent the formation of cold joints or planes of weakness between each succeeding layers within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones into mortar rather than mortar onto stones. Such a condition shall be corrected by redesign of mix or other means as directed by Engineer-In-Charge.

The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

12.0 COMPACTION:

Concrete shall be compacted during placing with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution is to be exercised not to over vibrate the concrete to the point that segregation results.

When placing in layers, which are advancing horizontally as the work progresses great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the successive layers.

The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layers is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come into contact with forms or finished surfaces.

Formation of stone pockets or mortar pondages in corners and against faces of forms shall not be permitted. Should these occur they shall be dug out, reform and refilled to a sufficient depth and shape for thorough bonding as directed by Engineer-In-Charge.

Bleeding or free water on top of concrete being deposited into the forms shall be caused to stop the concrete pour and the condition causing this defect corrected before any further concreting is resumed.

13.0 CONSTRUCTION JOINTS AND KEYS:

Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints as specified therein after. Time laps between the pouring of adjoining units shall be as specified in the drawings or as directed by the Engineer-In-Charge.

If stopping of concreting becomes unavoidable anywhere a properly formed construction joints shall be made where the work is stopped.

Joints shall be either vertical or horizontal unless otherwise shown on drawing. In case of an inclined or curved member the joints shall be at right angles to the axis of the member. Vertical joints in walls shall be kept to a minimum.

Vertical joints shall be formed against a stop board and horizontal joints shall be level and wherever possible arranged so that the joint lines coincide with the architectural features of the finished work.

Batten shall be nailed to the form work to ensure a horizontal line and if directed shall also be used to form a grooved joint. For tank walls and similar work joints shall be formed as per IS 3370.

Concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering.

Horizontal and vertical joints and shear keys shall be located and shall confirm in details to the requirements of the plans unless otherwise directed by the Engineer-In-Charge.

Column Joints:

Column joints shall be formed 75 mm below the lowest soffit of the beam including haunches if any. In flat slab construction the joint shall be 75 mm below the soffit of column capital. At least 2 hours shall elapse after depositing concrete in columns, piers or walls before depositing in beams, girders or slabs supported thereon.

Beam and Slab Joints:

Concrete in beam shall be placed throughout without a joint but if the joint is unavoidable the same shall be vertical and at the centre or within the middle third of the span unless otherwise shown on drawings. Where a beam intersects a girder the joints in the girder shall be offset a distance equal to twice the width of the beam and additional reinforcement provided for shear. The joint shall be vertical throughout the full thickness of the concrete member. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is unavoidably at right angles to the principal reinforcement the joint shall be vertical and at the middle of the span.

Vertical construction joints in water tight construction will not be permitted unless indicated on the drawings. Where a horizontal construction joint is required to resist water pressure special care shall be taken in all phases of its construction to ensure maximum water tightness.

14.0 DOWELS:

Dowels for concrete works not likely to be taken up in the near future shall be wrapped in tar paper and burlap.

15.0 MASS FOUNDATIONS:

Mass foundation shall be poured in lifts not exceeding 1.5 m in height unless otherwise indicated on the drawings or approved by Engineer-In-Charge.

16.0 TREATMENT OF CONSTRUCTION JOINTS ON RESUMING CONCRETING:

A dryer mix shall be used for the top lift of horizontal pours to avoid laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing/ hacking and surface wash.

Just before concreting is resumed the roughened joint surface shall be thoroughly cleaned and loose matter removed and then treated with a thin layer of cement grout of proportion specified by Engineer-In-Charge and worked will into the surface. The new concrete shall be well worked against the prepared face before the grout mortar sets. Special care shall be taken to obtained thorough compaction and to avoid segregation of the concrete along the joint plane.

17.0 CURING, PROTECTING, REPAIRING AND FINISHING:

All concrete shall be cured by keeping it continuously damp for a period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or by ponding of water, continuously saturated coverings of sacking, canvas, hessian (especially on vertical structural members) or other absorbent materials or approved effective curing compounds applied with spraying equipment capable of producing a smooth even textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter.

Certain type of finish or preparation for overlaying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.

Curing With Water:

Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete following a lapse of 10 to 12 hours after laying of concrete in normal weather and in hot weather not more than lapse of 4 hours. Date of casting shall have to be marked, as directed by Engineer-in-charge, on the exposed surfaces of the concrete so as to enable easy monitoring of the curing period.

The curing of horizontal surface exposed to the drying winds shall be however beginning immediately after the concrete has hardened. Water shall be applied to unformed concrete surfaces within one hour after concrete has set. Water shall be applied to formed surface immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

The quality of curing water shall be the same as that used for mixing concrete.

Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliances of hose, sprinklers and spraying devices. Continuous fine moist spraying or sprinkling shall be used unless otherwise specified or approved by the Engineer-In-Charge.

For curing of concrete in pavements, side-walks, floors flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Engineer-In-Charge. Special attention shall be given to edges and corners of the

slab to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water during the curing period.

All equipments and materials required for curing shall be on and ready for use before concrete is placed.

18.0 FINISHING OF CONCRETE:

This specification is intended to cover the treatment of concrete surface for all structures. Areas requiring special finish not covered by this specification shall be clearly indicated on the drawings and special specification shall be furnished.

When specified on the drawings an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded as specified on the drawings and as per I.S. 2571.

The surface shall be compacted and then floated with a wooden float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated.

Floating or trowelling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the concrete finish to absorb moisture or to stiffen the mix.

A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings.

Upon removal of forms all fins and other projections on the surfaces shall be carefully removed, offsets leveled, voids and /or damaged sections immediately saturated with water and repaired by filling with concrete or mortar of the same composition as was used in the concrete.

The finished surfaces shall present a uniform and smooth appearance.

All concrete shall be protected against damage until final acceptance by the Engineer-In-Charge.

19.0 CONCRETE FINISHES:

19.1 Unless otherwise specified concrete finishes shall confirm to the following specifications:

Finish F1, F2 and F3 shall describe formed surfaces.

Finish U1, U2 and U3 shall describe unformed surfaces.

Offsets or fins caused by disposed or misplaced from sheathing, lining or form sections or by defective form lumber shall be referred to as abrupt irregularities.

All other irregularities shall be referred as gradual irregularities. Gradual irregularities shall be measured as deviation from a plane surface with a template 1500 mm long for formed surface and 3000 mm long for unformed surfaces.

19.2 Formed Surfaces:

Finish F1 shall apply to all formed surfaces for which finish F2 and F3 or any other special finish is not specified and shall include filling up all form tie holes.

Finish F2 shall apply to all formed surfaces as shown on the drawings or specified by the Engineer-In-Charge. This shall include filling all form tie holes, repair of gradual irregularities exceeding 6 mm removal of ridges and abrupt irregularities by grinding.

Finish F3 shall apply to all formed surfaces exposed to view or where shown in the drawings or specified by the Engineer-In-Charge. Finish F3 shall include all measures specified for Finish F2 and in addition filling air holes with mortar and treatment of the entire surface with sack rubbed finish. It shall also include clean up of loose and adhering debris. Where a sack rubbed finish is specified the surfaces shall be prepared within two days after removal of the forms.

The surface shall be wetted and allowed to dry slightly before mortar is applied by sack rubbing. The mortar used shall consist of one part of cement to one and half parts of fine sand (minus No.16 mesh) by volume. Only sufficient mixing water to give the mortar a workable consistency shall be used.

The mortar shall then be rubbed over the surface with a fine burlap or linen cloth so as to fill all the surface voids.

The mortar rubbed in the voids shall be allowed to stiffen and solidify after which the whole surface shall be wiped clean so that the surface presents a uniform appearance without air holes, irregularities etc.

Curing of the surface shall be continued for a period of ten days.

19.3 Unformed Surfaces:

Finish U1 shall apply to all unformed surfaces for which the finish U2, U3 or any other special finish is not specified and shall include screeding the surface of the concrete to the required slope and grade.

Unless the drawing specifies a horizontal surface or shows required the slope the top of the narrow surfaces such as stairs, treads, walls, curbs and parapets shall be sloped approximately 10 mm per 300 mm width.

The surfaces to be covered by back fill or concrete sub floors to be covered with concrete topping, terrazzo and similar surfaces shall be smooth screeded and leveled to produce even surface, irregularities not exceeding 6 mm.

Finish U2 shall apply to all unformed surfaces as shown in the drawing or specified by the Engineer-In-Charge and shall include screeding and applying a wood float finish to the surface of the concrete to the required slopes and grade.

Repair of abrupt irregularities unless a roughened texture is specified. Repair of gradual irregularities exceeding 6 mm.

Finish U3 shall apply to unformed surfaces for which a high degree of surface smoothness is required where shown on the drawing or as specified by the Engineer-In-Charge. This shall include screeding, floating and applying a steel trowel finish to the surface of the concrete to the required slopes and grade.

Repair of abrupt irregularities and gradual irregularities exceeding 6 mm, finishing joints and edges of concrete with edging tools.

20.0 MODE OF MEASUREMENTS:

The concrete as actually done shall be measured for payment. Any work done excess over the specified dimensions for the section shown in the drawing or as required by the Engineer-In-Charge shall not be measured for payment.

Dimensions of length, breadth and thickness shall be measured correct to nearest centimeters except for the thickness of slab, which shall be measured to nearest 5 mm.

Areas shall be worked out to nearest 0.01 square metre and the cubic contents of consolidated concrete shall be worked out to nearest 0.001 cubic metres.

For the purpose of measurements and payments for all concrete works I.S. 1200 (Part-II) shall be referred.

21.0 CONTROL JOINT / DUMMY JOINT:

These joints shall be founded at 5 M to 6 M intervals. The width of the joint shall be 8 to 10 mm and the depth shall be 25 mm. The edges shall be rounded with an edging tool.

The joint shall be filled with the joint sealing compound of IS 1834-1961 for hot applied sealing compounds for joints in concrete.

The unit of measurement will be running metre including cost of sealing compound.

22.0 PLAIN CEMENT CONCERTE FOR GENERAL WORK:

For plain cement concrete work, the specifications for materials viz., cement, sand, fine and coarse aggregates and water shall be the same as that specified in reinforced work specification. But the proportion of mix will be nominal and the ratio of fine and coarse aggregate may be slightly adjusted within limits keeping the total volume of aggregates to a given volume cement constant, to suit the sieve analysis of the aggregates. Cement shall on no account be measured by volume, both it shall always be used directly from the bags (i.e., 50 Kg/bag).
The proportion of cement, sand, aggregate for concrete of proportion 1:4:8, 1:3:6, 1:2:4 by volumes shall generally consist of quantities as given below:

Proportions of ingredients	Quantity of materials used per bag of Cement			
	Cement	Sand	Coarse aggregate	Water
1:4:8	1	130 ltrs.	272 ltrs.	39 ltrs.
1:3:6	1	102 ltrs	204 ltrs.	34 ltrs.
1:2:4	1	68 ltrs.	136 ltrs.	30 ltrs.

The quantity of water used shall be such as to produce concrete of consistency required by the particular class or work and shall be decided by the use of slump cone. Sufficient care should be taken to see that no excess quantity of water is used. The final proportion of the aggregates and the quantity of water shall be decided by the Engineer on the basis of test in each case. The slum shall be specified for each class of work and shall in general be as follows:-

Type of Concrete	Mix slump (Millimetres)	Mass
Concrete	50	
Roads and pavements, hand finished	100	
Roads and pavements, machines finished	25	
Floor paving	50	

All plain concrete shall be preferably mixed in a drum type power driven machine with a loading hopper, which will permit the accurate measure of various ingredients. If hand mixing is authorized, it should be done on a watertight platform.

The mixing of each batch in the concrete mixer shall continue for not less than 2 minutes after the materials and water are in the mixer. The volume of mixed materials per batch shall not exceed the manufacturer's rated capacity of the mixer. The mixer shall rotate at a peripheral speed of about 60 metres per minute.

Concrete shall be poured and consolidated in its final position within half an hour of mixing. The re-tempering of concrete, which has partially hardened, that is remixing with or without additional cement, aggregate or water shall not be permitted. Concrete in c.c. 1:2:4 will be required to be vibrated if specified and directed by the Engineer. In case if the thickness of concrete is more than 150 mm in thickness, it may be vibrated if directed by the Engineer.

The concrete shall be cured for 10 days in ordinary weather and 15 days in cold weather. Measurements for the work done shall be exact length, breadth and depth shown or figured on the drawings or as instructed by the Engineer and after the concrete is consolidated. No extra shall be paid for excess quantity resulting from faulty workmanship.

SPECIFICATION FOR FORM WORK

1.0 SCOPE

This specification covers type of form work, moulds and scaffolding required for this job.

General

The formwork shall consists of shores, bracings, side of beams and columns, bottom of slabs, etc. including ties, anchors, hangars, inserts, etc. complete which shall be properly designed and planned for the works.

The formwork shall be so constructed that up and down vertical adjustments can be made smoothly. Wedges may be used at top or bottom of shores, but not at both the ends to facilitate vertical adjustment for dismantling of the formwork.

2.0 APPLICABLE CODES AND SPECIFICATIONS:

The relevant IS specification, standards and codes given below are made a part of this specification. All standards, specifications, code of practices refer to herein shall be the latest edition including all applicable amendments, revisions and additional publications.

IS 303	Plywood for general purpose
IS 1200 (Part V)	Method of Measurement of building and civil engineering work (Form work)
IS 2750	Specification for steel scaffolding
IS 3696	Safety code for scaffolds and ladders
IS 4014 (Part I)	Code of Practice for steel tubular scaffolding
IS 4014 (Part II)	Code of Practice for steel tubular scaffolding
IS 4990	Specification for plywood for concrete shuttering work
ACI 347	Guide to formwork for concrete (American Concrete Institute)

3.0 DESIGN OF FORMWORK:

The design and engineering of the formwork as well as its construction shall be the responsibility of the contractor. If so instructed, the drawings and calculations for the design of the formwork shall be submitted well in advance to the Engineer-in-charge for approval before proceeding with the work at no extra cost to the department. Engineer-In-charge's approval shall not relieve the contractor of the full responsibility for the design and construction of the formwork.

The design shall take into account all the loads vertical as well as lateral that the forms will be carrying including live load and vibration loads.

Depending upon the height of the staging, suitable vertical and horizontal cross bracings shall be provided.

The contractor shall note that no concrete work of floor, beam, slab including roof slab will be permitted unless the staging work is inspected and the approval in writing for its soundness is given to the Engineer-in-charge prior to commencement of concrete work.

4.0 TOLERANCES

Tolerance is a specified permissible variation from lines, grade or dimensions given in the drawings. No tolerance specified for horizontal and vertical building lines or footings shall be considered to permit encroachment beyond the legal boundaries. Unless otherwise specified, following tolerances shall be permitted –

4.1 Tolerance for R.C. Building

Variation from vertical:

No.	Building Members	Tolerances
1.	In the line and surface of columns, piers, walls and buttresses	5 mm per 2.50 M but not more than 25 mm
2.	For exposed corner columns and other conspicuous lines	In any bay or 5 M maximum: (+/-) 5 mm. In 10 M or more: (+/-) 10 mm

Variation from the level or frame the grade indicated in the drawings:

No.	Building Members	Tolerances
1.	In slab soffits, ceilings, beam soffits and staircases	In 2.50 M : (+/-) 5 mm In any bay or 5 M maximum: (+/-) 8 mm. In 10 M or more: (+/-) 15 mm
2.	For exposed lintels, parapets, horizontal grooves and other conspicuous lines	In any bay or 5 M maximum: (+/-) 5 mm. In 10 M or more: (+/-) 10 mm

Variation of the linear building lines from established position in plan and related position of columns, walls and partitions:

No.	Building Members	Tolerances
1.	In any bay or 5 M maximum	(+/-) 5 mm
2.	In 10 M or more	(+/-) 20 mm

No.	Building Members	Tolerances
1.	Variation in the sizes and locations of sleeves, openings in walls and floors except in the case of anchor bolts.	(+/-) 5 mm

No.	Building Members	Tolerances
1.	Variation in cross sectional dimensions of columns and beams	(-) 5 mm and (+) 10 mm.

	and thickness of slabs and walls	

Variation in footings:

No.	Building Members	Tolerances
1.	Variation in dimension in plan	(-) 5 mm and (+) 50 mm.
2.	Misplacement or eccentricity in the direction of misplacement	0.02 times the width of the footing in the direction of the deviation but not more than 50 mm
3.	Reduction in thickness	(+/-) 0.05 times the specified thickness

Variation in steps:

No.	Building Members	Tolerances
1.	In a flight of stairs riser	(+/-) 3 mm
2.	In a flight of stairs tread	(+/-) 5 mm
3.	In consecutive steps riser	(+/-) 1.5 mm
4.	In consecutive steps tread	(+/-) 3 mm

4.2 Tolerances in other Concrete structures:

All structures:

No.	Building Members	Tolerances
1.	Variation of the constructed linear outline from established position in plan	(+/-) 10 mm in 5 M (+/-) 15 mm in 10 M or more
2.	Variation of dimensions to individual structure features from established positions in plan	(+/-) 25 mm in 20 M or more (+/-) 50 mm in buried construction
3.	Variation from plumb, specified batter or curved surfaces of all structures	(+/-) 10 mm in 2.50 M (+/-) 15 mm in 5 M (+/-) 25 mm in 10 M or more (+/-) Twice the above amounts in buried construction
4.	Variation from level or grade indicated on drawings in slabs and beams soffits, horizontal grooves and visible arises	(+/-) 5 mm in 2.50 M (+/-) 10 mm in 7.5 M or more (+/-) Twice the above amounts in buried construction
5.	Variation in cross sectional dimensions of columns, beams, buttresses, piers and similar members	(-) 5 mm and (+) 10 mm
6.	Variation in the thickness of slabs, walls, arch sections and similar members	(-) 5 mm and (+) 10 mm

Footings for columns, piers, walls, buttresses and similar members:

No.	Building Members	Tolerances
1.	Variation in dimension in plan	(-) 10 mm and (+) 50 mm.
2.	Misplacement or eccentricity in the direction of misplacement	0.02 times the width of the footing in the direction of the deviation but not more than 50 mm
3.	Reduction in thickness	(+/-) 0.05 times the specified thickness

Tolerances in other types of structures shall generally conform to those given in clause 2.4 of recommended Practice for Concrete Formwork (ACI 347).

5.0 TYPE OF FORMWORK

Formwork may be of timber, plywood, metal, plastic or concrete. For special finishes the formwork may be lined with plywood, steel sheets, oil tempered hard board, etc. sliding forms and slip forms may be used with the approval of engineer-in-charge

6.0 FORMWORK REQUIREMENTS

Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, waler braces, ties, straps, shores, etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal of forms. Form shall be strong enough to permit the use of immersion vibrators; in special case form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.

Plywood shall be used for exposed concrete surface where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surface, which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Formwork with lining will be permitted.

All new and used form timber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form timber unsatisfactory in any respect shall not be used and if rejected by the Engineer-in-charge shall be removed from the site.

Shores supporting successive stories shall be placed directly over those below or be so designed and placed that the load will be transmitted directly on them. Trussed supports shall be provided for shores that can be secured on adequate foundation.

Form work during any stage of construction showing signs of distortion or disturbed to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings shall be re-positioned and strengthened. Poured concrete affected by faulty formwork shall be removed entirely and the formwork shall be corrected prior to placing new concrete.

Excessive construction camber to compensate for shrinkage settlement etc. that may impair the structural strength of the members will not be permitted.

Forms for substructure concrete may be omitted in the opinion of the Engineer-in-charge the open excavation is firm enough to act as the form. Such excavation shall be slightly larger than that required by drawings to compensate for irregularities in excavation and to ensure the design requirement.

Forms shall be designed and constructed that they can be stripped in order required and their removal do not damage the concrete. Face form work shall provide true vertical and horizontal joints conforming to the architectural features of the structure as to location of joints and be as directed by the Engineer-in-charge.

Where exposed smooth or rubbed concrete finishes are required, the forms shall be constructed with special care so that the desired concrete surfaces could be obtained which require a minimum finish.

7.0 BRACINGS, STRUTS AND PROPS

Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bracings.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slab can be removed without disturbing the beam bottoms.

Re-propping of the beams shall not be done except when the props have to be reinstalled to take care of construction loads anticipated being excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering.

If the shuttering for a column is erected for the full height of the column, one side shall be left open and built upon sections as placing of concrete proceeds or windows may be left for pouring concrete from sides to limit the drop of concrete to one meter or as directed by the engineer-in-charge.

8.0 FORM OIL

Use of the form oil shall not be permitted on the surface that requires painting. If the contractor desires to use form oil on the inside of form work of the other concrete surfaces, a non staining mineral oil or other approved oil ‘CEMOL-35’ of M/s Hindustan Petroleum Co. Ltd. or equivalent may be used provided it is applied before placing of reinforcing steel and embedded parts.

All excess oil on the form surfaces and any oil on metal or other parts to be embedded in the concrete shall be carefully removed. Before treatment with oil forms shall be thoroughly cleared of dried splatter of concrete from placement of previous lift.

9.0 CHAMFERS AND FILLETS:

All corners and angles in the finished structure shall be formed with mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets unless otherwise specified shall be 20 mm x 20 mm. Care shall be exercised to ensure accurate mouldings. The

diagonal face of the moulding shall be planed or surface to the same texture as the forms to which it is attached.

Vertical construction joints on faces which will be exposed at the completion of the work shall be chamfered as above except where not permitted by Engineer-in-charge for structural or hydraulic reasons.

10.0 WALL TIES:

Wall ties passing through the walls shall not be allowed. Also through bolts shall not be permitted. For fixing of formwork alternate arrangements such as coil nuts shall be adopted at the contractor's cost.

11.0 REUSE OF FORMS:

Before reuse all forms shall be thoroughly scraped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary repaired and the inside retreated to prevent adhesion to the satisfaction of Engineer-in-charge. Warped timber shall be resized. Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

12.0 REMOVAL OF FORMS:

Contractor shall record in the drawings or a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.

In no circumstances shall form struck until the concrete reaches a strength of at least twice the stress due to self weight and any construction/erection loading to which the concrete may be subjected at the time of striking of formwork. The strength referred to shall be that of concrete using the same cement and aggregates and admixture, if any, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work.

In normal circumstances where the ambient temperature does not fall below 15o C and where Ordinary Portland Cement is used and adequate curing is done the stripping time is to be followed as specified in IS: 456-2000 (clause 11.3).

Striking shall be done slowly with utmost care to avoid damage to arise and projections and without shock or vibration by gentling easing the wedges. If after removing the formwork it is founds that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

Reinforced temporary openings shall be provided as directed by the Engineer-in-charge to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structure shall be loosened not sooner than 16 hours not later than 24 hours (in case the conditions in 12.3 are satisfied) after the concrete has been deposited. Ties except those required to hold the forms in place may be removed at the same time. Ties withdrawn from walls and grade beams shall be pulled towards the inside face. Cutting ties back from the faces of forms and grade beams will not be permitted. Work damaged due to premature or careless removal of forms, any undulation in exposed concrete surface due to sag / settlement or movement of supports found after removal of shuttering shall be reconstructed or rectified to the satisfaction of the Engineer-in-charge by the contractor at his own risk and cost. Abrupt changes in surface of concrete, mortar fins at formwork

joints shall be made even by chipping, grinding and finishing with cement mortar, curing, etc. as directed by Engineer-in-charge at his own cost.

13.0 MODE OF MEASUREMENT:

The net area of exposed surfaces of concrete members as shown in the drawings coming in contact with form work shall be measured under item of form work in square meter.

The dimensions of the formwork shall be measured correct to a centimeter.

No deductions shall be made from the shuttering for openings/obstructions up to an area of 0.10 m2 and nothing extra shall be paid of forming such opening.

For the purpose of measurements for formwork IS: 1200 (Part V) shall be referred.

14.0 SPECIFICATION FOR STAGING WORK:

The contractor shall note that only steel tubular staging (acrow type or equivalent) shall be used for all RCC beams, slabs, etc. at all floor levels and the same shall be designed by him and the detailed drawings and the design calculations shall be submitted for the approval of Engineer-in-charge at least two months in advance of the scheduled date of its erection at site. Depending upon the height of the staging, suitable vertical and horizontal cross bracings shall be provided. The contractor shall note that no concreting of floor beams, stairs and slabs including roof slab will be permitted unless the staging work is inspected and approval in writing for its soundness by the Engineer-in-charge is given prior to the commencement of concreting.

SPECIFICATIONS FOR STEEL REINFORCEMENT

1.0 GENERAL:

Steel reinforcement bars, if supplied or arranged by the contractor, shall be either plain round mild steel bars grade – I or medium tensile steel bars as per IS: 432 or hot rolled mild steel and medium tensile deformed as per IS: 1139 or Thermo-mechanically treated (TMT) bars - high yield strength deformed bars as per IS: 1786 as shown and specified on the drawings and shall be manufactured by M/s SAIL or TISCO or RINL only and shall be rolled from their own plants and from virgin material. Materials manufactured by their authorized conversion agents and re-rollers shall not be accepted. Documentary evidence of purchasing steel produced from these manufacturers and their manufacturing test certificate shall be submitted. The third party test shall be carried out as directed in line with the relevant Indian standards and cost of which shall be included in the item rate and no separate payment shall be made on account of this.

Wire mesh or fabric shall be in accordance with IS: 1566.

Substitution of reinforcement will not be permitted except upon written approval from Engineer-In-Charge.

2.0 SCOPE:

This specification covers the general requirements for quality, storage, bending and fixing of reinforcement.

APPLICABLE CODES AND SPECIFICATIONS:

The relevant IS specification, standards and codes given below are made a part of this specification. All standards, specifications, code of practices refer to herein shall be the latest edition including all applicable amendments, revisions and additional publications.

IS 226	Specification for steel standard quality
IS 228	Methods for chemical analysis of steels
IS 280	Specifications for mild steel wire for general engineering purpose.
IS 432 (Part 1)	Specification for mild steel and medium tensile steel burn and hard drawn steel wires for concrete requirement. Mild steel and Medium tensile steel bars.
IS 432 (Part 2)	Specification for mild steel and medium tensile steel burn and hard drawn steel wires for concrete requirement. Hard drawn steel wire.
IS 456	Code of practice for construction and design of reinforced concrete.
IS 816	Code of practice for use of metal arc welding for general construction in mild steel
IS 961	Specification for structural steel: high tensile steel Bars.
IS 1566	Hard drawn steel wire fabric for concrete reinforcement
IS 1599	Method of Bend test
IS 1642	General requirements for fire protection.
IS 1785	Cold drawn stress relieved wire (part J)
IS 1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS 2751	Code of practice for welding of MS bars.
IS 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
IS 2751	Code of practice for welding of Bars.
IS 3696	Safety Code of scaffolds and ladders: Part 1 Scaffolds Part 2 Ladders
IS 4014	Code of practice for steel (Part 1 & 2) tubular scaffolding.
IS 4082	Recommendation on stacking and storage of construction materials at site
IS 5525	Recommendation for detailing of reinforcement in RCC work.
IS 9417	Recommendation for welding cold worked steel bars for reinforced concrete construction
IS 10790	Method of sampling of steel for prestressed and reinforced concrete

4.0 STORAGE:

The reinforcement shall not be kept in direct contact with the ground but stacked on top of an arrangement of timber slippers or the like. The reinforcement shall be coated with cement wash before stacking to prevent scale and rust. Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deterioration.

5.0 QUALITY:

All steel shall be of grade-I quality unless specifically permitted by the Engineer-In-Charge. No re-rolled material will be accepted. Contractor shall submit the manufacturer's test certificate for steel.

Random test on steel supplied by the contractor may be performed by owner as per relevant IS. All cost incidentals to such tests shall be at the contractor's expenses. Steel not conforming to the specifications shall be rejected.

All reinforcement shall be clean, free from grease, oil, paint, dirt, loose mill scale, loose rust, dust, bituminous material or any other substance that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated.

Pitted and defective rods shall not be used. All bars shall be rigidly held in position before concreting. No welding of rods to obtain continuity shall be allowed unless approved by the Engineer-in-charge. If welding is approved the work shall be carried out as per IS: 2751, according to best modern practices and as directed by the Engineer-in-charge.

In all cases of important connections, test shall be made to prove that the joints are of the full strength of the bar welded. Special precaution as specified by the Engineer-in-charge shall be taken in the welding of cold work reinforcing bars and bars other tan mild steel.

6.0 LAPS:

Laps and splices for reinforcement shall be as shown on the drawings. Splices and adjacent bars shall be staggered and the location of all splices except those specified on the drawings shall be approved by the Engineer-in charge. The bars shall not be lapped unless the length required exceeds the maximum available length required of bars at site.

7.0 BENDING:

All bars shall be accurately bent according to the size and shape shown on the detail working drawing / bar bending schedule. They shall be gradually bent by machine or approved means.

Reinforcing bars shall not be straightened and re-bend in the manner that will injure the material. Bars containing cracks and splits shall be rejected. They shall be bent cold except bars above 25 mm in diameter which may be bent hot, if specifically approved by Engineer-in-charge.

Bars which depend for their strength on cold working shall not be bent hot. Bars bent hot shall not be heated beyond cherry-red color (not exceeding 645o C) and after bending shall be allowed to cool slowly without quenching.

Bars incorrectly bent shall be used only if the means used for straightening and re-bending is such as shall not in the opinion of the Engineer-in-charge injure the material.

No reinforcement bars shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by the design shall not be used.

8.0 FIXING:

The reinforcement shall accurately be fixed by any approved means and maintained in the correct position as shown in the drawing by use of blocks, spacers and chairs as per IS: 2502 to prevent displacement during placing and compaction of concrete.

Bars intended to be in contact at crossing point shall be securely bound together at all such points with 1.6 mm diameter annealed soft iron wire.

The vertical distance required between successive layers of bars in beams or similar members shall be maintained by provision of mild steel spacer bars at such intervals that the main bar do not perpetually sag between adjacent spacer bars.

9.0 COVER TO REINFORCEMENT:

Unless indicated otherwise on the drawing, clear concrete cover for reinforcement (exclusive of plaster or decorative finish) shall be as per the provisions of IS: 456.

10.0 INSPECTION:

Erected and secured reinforcement shall be inspected and approved by the Engineer-in-charge prior to placement of concrete.

11.0 MODE OF MEASUREMENT:

The actual quantity of reinforcement bars embedded in concrete as specified in the drawing and as approved by the Engineer-in-charge irrespective of the level or height at which the reinforcement bars are placed shall be measured for payment.

The reinforcement bars shall be measured in length nearest to a centimeter for different diameters and their weight shall be calculated based on the standard weights as per Indian Standard.

Wastage, unauthorized overlap and annealed steel binding wires shall not be measured for payment.

Pins, chairs and spacers wherever required shall be provided As directed by the Engineer-in-charge and measured separately and paid for.

The rate for reinforcement item shall include the cost of labour and materials required for all operations described above including transportation, cleaning, straightening, cutting, bending, placing in position and binding of reinforcement bars and wastage, etc.

SPECIFICATION FOR BRICKWORK

1.0 SCOPE

These specifications cover the use of Brick Masonry for the structural purposes.

1.1 GENERAL

Brick shall be table moulded of uniform size, shape and colour must be well burnt so as to give a clear ringing sound when struck. They shall be clean, whole and free from flaws, cracks, stones or lumps of any kind, especially lime. They shall have sharp edges, shapes and even surface and shall be sound & hard to resist compression. They shall be from a source to be approved by the Engineer-in-charge and the quality of the brick should be such that they shall not absorb more than 20% of water by weight after immersion in water for 24 hours and shall have a compressive strength of 3.5 N/mm2 as per IS: 1077-1992.

All bricks shall be thoroughly saturated with water before use. They should be soaked for about 12 hours for this purpose. No broken bricks shall be used except as closers. The course shall be laid flush in mortar and every course shall be thoroughly grouted, joints shall be broken vertically and they shall not exceed 10 mm in thickness. The horizontal joints shall not be more than 10 mm in thickness. The work shall not be raised more than 12 courses per day. It shall be kept constantly wet for at least 10 days and twice a day for a month. Date of laying the brickwork shall have to be marked, as directed by the Engineer-in-charge, on the wall so as to ensure easy monitoring of the curing period.

Before starting the brick masonry, the concrete surfaces e.g., plinth beams, columns, slabs, chajjas, etc. shall be thoroughly hacked and washed to remove all mud, dirt, loose particles, etc. No holes for supporting scaffolding arrangement shall be allowed especially at the junction of concrete surfaces and the brickwork. However, these holes may be allowed elsewhere and are to be made good after the scaffolding is removed in such a manner so as to ensure complete water tightness. When the fresh brickwork to be started on the old brick masonry the surface should be thoroughly cleaned and washed to remove all moss deposit, loose mortar, mud and dirt, etc.

String courses and mouldings shall be set straight and true by projecting brickwork with properly cut and shaped bricks wherever necessary with as fine joints as possible.

The walls shall be carried up regularly in all cases when the nature of the work will admit of it, not leaving any part 1.0 M lower than another, when circumstances render it necessary to carry out on the same section of a building in uneven course. The brick shall be raked back so as to maintain uniform and effectual bond.

In brick arched and other circular work, the brick shall be shaped to have joints indicating correctly to the center from the front to back of walls with thickness not meter than 10 mm. The face brick shall be of uniform colour and with sharp surfaces.

Where pointing or plastering is specified the joints in all brickwork shall be raked out on both the faces of the wall as the work proceeds.

The size of the brick shall be 230 (9”) x 115 (4-1/2”) x 75 mm (3”) (or 190 x 90 x 90 mm). 230 mm (9”) and 115 mm (4-1/2”) thick walls will be built fair on one side only. All walls of greater thickness shall be built without exception with fair face to both sides.

Half brick or 115 mm thick brickwork shall be carried out in panels and with horizontal stiffeners of 115 x 75 mm with two bars of 10 mm diameter and spacers of 6 mm diameter at 900 mm center to center and vertical stiffeners of 115 x 75 mm with two bars of 10 mm diameter and spacers of 6 mm diameter at 2M center to center laid in 1:2:4 concrete properly filled including formwork, consolidation, curing, etc. The RCC work shall not be measured separately but will be included in the brickwork. The MS reinforcement however will be measured separately.

The contractor shall provide all necessary openings doors, windows or such other services and shall embed electrical fittings and fixtures; sleeves supplied by the other agency if required at no extra cost. Also shaping of the bricks for the exhaust fan, circular openings shall also be carried at no extra cost. All these openings shall be closed and gaps to be filled and finished neatly after the installation of all these services at no extra cost.

The rate for brickwork for both 230 mm and 115 mm thick walls shall include all single or double scaffolding, tools and plants, quoins and jambs, hacking, cutting and wastage of bricks for splayed joints, watering, etc. deductions shall be made for all the openings, lintels, sills, columns, etc. The unit for measurement of 230 mm brick masonry and above will be in cubic meter and for 115 mm thick masonry in square meter. The rates for brickwork shall also include the cost of the following –

Making good all holes (also ensuring the water tightness of the holes left out in external walls for supporting the scaffoldings), chases to any depth due to conduit pipes, holdfast, switches, plug box, exhaust fan openings and other openings, etc.

2.0 INDIAN STANDARDS

The provision of the latest Indian Standards listed below form part of these specifications:

IS 1077	Specifications for common burnt clay building bricks
IS 1200	Measurement for Building works
IS 1725	Specifications for solid cement blocks used in general building construction.
IS 1905	Code of practice for structural safety of buildings Masonry walls.
IS 2116	Sand for masonry mortars.
IS 2180	Specification for heavy duty burnt clay building bricks
IS 2185	Specification for concrete masonry units: Hollow and solid concrete blocks.
IS 2212	Code of practice for brick work.
IS 2222	Specification for burnt clay perforated building bricks.
IS 2250	Code of practice for preparation and use of masonry mortar.
IS 2645	Specification for integral waterproofing compound.
IS 2691	Specification for burnt clay facing bricks.
IS 3115	Specification for lime based blocks.
IS 3414	Code of practice for design and installation of joints in buildings.
IS 3466	Specification for masonry cement.
IS 3861	Method of measurement of plinth, carpet and rent able areas of buildings.
IS 3952	Specification for burnt clay hollow blocks for walls and partitions.
IS 4098	Specification for lime-puzzolona mixture
IS 4139	Specification for sand lime bricks
IS 4441	Code of practice for use of silicate type chemical resistant mortars.
IS 4442	Code of practice for use of sulphur type chemical resistant mortars.
IS 5495	Size & shape for fire bricks
IS 8112	Specification for high strength ordinary portland cement
IS 9103	Specification for admixtures for concrete.

Other Indian standards not specifically mentioned here, but pertaining to the use of bricks for structural purposes forms part of these specifications.

3.0 MATERIALS

3.1 Bricks

3.1.1 General

Bricks shall be of regular and uniform size, shape and colour, uniformly well burnt throughout but not over burnt. They shall have plane rectangular faces with parallel sides and sharp straight and right angled edges. They shall be free from cracks or other flaws. They shall have a frog of 10 mm. depth on one of their flat faces.

They shall give a clear metallic ringing sound when struck. They shall show a fine grained, uniform homogeneous and dense texture on fracture and be free from lumps of lime, laminations, cracks, air holes, soluble salts causing efflorescence or other defects which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have any parts under-burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60 cm.

3.1.2 Size of bricks

First class bricks shall be well & truly moulded of uniform shape, size , colour and must be well burnt so as to give a clear ringing sound when struck. They shall not break when thrown on the ground or against other bricks. They shall be clean, whole & free from flaw cracks, stones or un-burnt particles and shall measure 230mm by 112mm by 83mm.

Second class bricks shall be similar to those described above, but may vary more in colour. Twisted or irregular bricks shall not be accepted as second class.

When metric bricks are used they shall comply with I. S: 1077 - 1976.

3.1.3 Absorption

After immersion in water, absorption by weight shall not exceed 20% of the dry weight of the brick when tested according to IS: 1077-1976.

3.1.4 Crushing Strength

The load to crush the brick when dry shall not be less than 50 Kg/sq.cm. and when thoroughly soaked shall not be less than 35 Kg/sq.cm.

3.2 Cement, Fine Aggregate and Water

Refer relevant clauses of these specifications.

3.3 Mortars

Cement and sand shall be mixed in specified proportions given on the drawings. Cement shall be proportioned only by weight, by taking its unit weight as 1440 kg per cubic metre and the sand

shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

The mixing shall be done intimately in a mechanical mixer unless hand-mixing is specifically permitted by the Engineer. If hand mixing is done, the operation shall be carried out on a clean watertight platform and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes. The mortar remaining unused after that period or mortar, which has partially hardened or is otherwise damaged shall not be re-tempered or re-mixed. It shall be destroyed or thrown away.

In case of cement mortar that has stiffened because of evaporation of water the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency, but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

Necessary tests to determine compressive strength of the mortar, for consistency of the mortar and its water retentively shall be carried out in accordance with IS-2250. The frequency of testing shall be one cube for every 2 cubic metre of mortar prepared subject to a minimum of 3 cubes for a day's work.

4.0 CONSTRUCTION

4.1 Soaking of Bricks

Bricks shall be soaked in water for a minimum period of one hour before use so that they will be saturated and will not absorb water from the mortar. When bricks are soaked they shall be removed from the tank sufficiently in advance so that at the time of lying they are skin-dry. Such soaked bricks shall be stacked on a clean place where they are not spoil by dirt, earth, etc,

4.2 Laying of Bricks

All brick work shall be laid in English bond, even and true to line, plumb, level and all joints accurately kept. The bricks used on the face shall be selected whole ones of uniform size and with true rectangular face. Brick shall be laid with frogs up, if any, on a full bed of mortar. When laying, bricks shall be slightly pressed so that the mortar gets into all the surface pores of bricks to ensure proper adhesion. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left.

Before laying bricks in foundation, a layer of not less than 12 mm of mortar shall be spread to make the surface on which the brickwork will be laid even. Immediately thereafter, the first course of bricks shall he laid.

The brickwork shall be built in uniform layers, corners and other advanced work shall be raked back. Brickwork shall be done true to plumb or in specified batter. No part of it, during construction, shall rise more than one meter above the general construction level, to avoid unequal settlement and improper joining. The height of brick works constructed shall not exceed one metre in a day.

Toothing may be done where future extension is contemplated but shall be used as an alternative to raking back.

4.3 Joints

The thickness of joints shall not exceed 10mm and this thickness shall be uniform throughout.

4.4 Joining with existing structure

When fresh masonry is to be placed against existing surfaces of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer so as to affect a good bond with the new work.

4.5 Curing

Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. The top of the masonry work shall be left flooded with water at the close of the day. During hot weather all finished or partly completed work shall be covered or wetted in such manner as will prevent rapid drying of the brick work.

4.6 Scaffolding

The scaffolding shall be sound and strong to withstand all loads likely to come upon it and will be double or single as is warranted for the particular work. The holes, which provide resting space for horizontal members, shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good with 1:4:8 cement concrete.

4.7 Condition of Equipment

All equipment used for mixing or transporting mortar and bricks shall be clean and free from set mortar, dirt or other injurious foreign substances.

4.8 Finishing of Surfaces

For a surface which is to be subsequently plastered or pointed the joints shall be squarely raked out to a depth of 15mm while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

4.9 Weep Holes

In case of abutment retaining walls and wing walls, weep holes as shown on the drawings or directed by the Engineer shall be provided in the masonry to drain moisture from the backfilling Weep holes shall be 8 cm wide, 15 cm high and shall extend through the full width of the masonry with slope of about 1 vertical to 20 horizontal towards the draining face.

The spacing of weep holes shall be as shown on the drawings with the lowest one at about 15cm above the low water level or ground level whichever is higher or as directed by the Engineer.

4.10 Fixtures to be built into Work

All fixtures of whatever nature must be built into the work as it proceeds in the position shown on the plan, specifications or as directed by the Executive Engineer from time to time. All metal

fixtures must be embedded in cement mortar great care being taken to see that no lime mortar is in contact with them.

4.11 Arches

All arches are to be formed on properly framed centres. Bricks in arches should be set with a wooden mallet. The joints which must not exceed 6mm in thickness must radiate truly from the centre. In new work relieving arches shall be turned over all flat arches and lintels of doors, windows and other openings unless otherwise specified.

4.12 Uneven Foundation

In foundations or where due to any other insurmountable cause, part of the masonry starts from a lower level great care must be taken to keep mortar joints as thin as possible and to proceed slowly with the work paying particular attention to the bonding over offsets.

4.13 Bond

Unless otherwise specified the bond used shall be English Bond.

4.14 Excess of bats not to be used

Not bats or cut bricks shall be used in excess of the minimum number required for obtaining the required bond or for obtaining the actual dimensions required.

4.15 Threading

Threading shall be provided on the underside of all string courses, cornices and moulding.

4.16 Recess for beams, joists etc

The ends of beams, girders and roof trusses shall be seated as shown in the drawings, detailed in the specifications or as directed by the Executive Engineer from time to time and the brick work shall be recessed at all such places so as to leave a clear space 0f 38mm round the steel, iron or timber. No deduction shall be made in the brick work measurements for such recesses to compensate for the layout in making them.

4.17 Wooden plugs to be built in as work proceeds

Where shown on the plans or as directed by the Executive Engineer wooden plugs or wooden bricks shall be built in as the work proceeds and no extra rate granted for such work.

5.0 MEASUREMENT FOR PAYMENT

All brick work for 230mm thick or above shall be measured in cubic metres and 115mm thick and below shall be measured in sq. metres. The work of plastering and pointing shall be measured in square metres of the surface treated.

All plain brick work in walls, arches, square columns, bricks on edge and flat floors and flagging in roofs will be measured net.

Rate :- The contract unit rate for brick work shall include the cost of all labour, materials, tools and plant, scaffolding and other expenses incidental to the satisfactory completion of the work as described herein above and as shown on the drawings. The rate for work shall also include:
Dewatering required for completing this item and till the mortar of masonry pointing & plastering is properly set,Watering the masonry, andCleaning the site around the brickwork to restore the area to its original condition.

The rate for work shall also include full compensation for using specially moulded bricks on the face of walls with batter and provision of weep holes.

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SPECIFICATION FOR STRUCTURAL STEEL WORK

1 General

1.1 Scope

This specification, used in conjunction with the contract document, Bill of Quantities and design drawings, establishes the minimum requirements for material, fabrication, galvanisation, assembly, tests / examination, transportation of welded and/or bolted of all types of structural steel works consisting of columns, beams, trusses, trestles, pipe rack, cable rack, monorails, stairs, ladder, hand railing etc. for general construction work of each individual module. This also includes preparation of fabrication drawing based on supplied design drawing.

2 Regulations, Codes and Standards

The work of structural steel shall be in compliance with all applicable state/local laws and regulations.

The following Indian Standard Codes unless otherwise specified herein shall be applicable in all cases. The latest revision of the codes shall be referred to.

IS:800	-	Code of practice for general construction in Steel
IS:2062	-	Weldable structural steel
IS:816	-	Code of practice for use of metal arc welding for general construction in mild steel.
IS:1363	-	Black Hexagonal Bolts, Nuts & Locknuts
IS:9595	-	Recommendation for metal arc welding of carbon manganese steel
IS:1367	-	Technical supply conditions for threaded fastners
IS:8500	-	Weldable structural steel (Medium and High Strength qualities)
IS:3757	-	High strength friction grip bolts
IS:1161	-	Steel tubes for structural purposes.
IS:5369	-	General requirements for plain washers and lock washers.
IS:814	-	Covered electrodes for metal arc welding of Structural (Part - I&II) steel.
IS:5372	-	Taper washers for channels.
IS:5374	-	Taper washers for I - beams

3 Material
Structural Steel

All structural steel shall be of tested quality. The material of all Indian rolled section and plates shall conform to IS 2062 Grade - A.

Wherever the material is procured by the contractor, the contractor shall submit the test certificates conforming to the relevant standards of all steel materials used for fabrication. All

structural steel shall be free from rust, scales, lamination, cracks, fissures and other surface defects.

Carbon steel pipes shall be as per IS:1161 grade YST-25. In case mild steel is available according to latest IS:2062, steel to grade A, B & C will be used as applicable.

Bolts and Nuts

Bolts and nuts shall conform to IS:1363 or IS:1364 as applicable and as shown in the drawing. Unless otherwise specified nuts and bolt heads shall be hexagonal. Property class of nuts and bolts shall be compatible. The contractor shall submit test certificates when called for. Wherever shown in the drawing, high strength friction grip bolts (HSFG bolts) and nuts conform to IS:3757 and IS:6623 respectively shall be used.

Washers

Plain washers shall be made of mild steel conforming to IS:5369 unless otherwise specified. At least one washer shall be supplied for each bolt and in case of special types of bolts more than one washer as needed for the purpose shall be supplied. Helical spring washer conforming to IS:6755 shall be provided for bolts carrying dynamic or fluctuating loads and those in direct tension. Tapered washers conforming to IS:5372 and IS:5374 shall be used for channels and beams respectively. Washers for high strength friction bolts shall conform to IS:6649.

Welding Consumables

Covered electrodes (for metal arc welding of structural steel) shall conform to IS:814. Filler rods & wires for gas welding shall conform to IS:1278.

Base wire electrodes (in submerged arc welding of structural steel) shall conform to IS:7280. The combination of wire and flux shall comply with the requirement of IS:3613.

Filler rods and base electrodes (for gas shield arc welding of structural steel) shall conform to IS:6419.

4 Receipt & Storage of Materials

Each rolled section must be marked for identification and each lot should be accompanied by manufacturer‘s test certificate corresponding to chemical analysis and mechanical characteristics, if steel is supplied by the contractor.

All steel sections shall be checked, sorted out, and arranged according to the grades and qualities in stores as per the instructions of the Engineer-in-charge.

Structural sections and plates etc. with surface defects such as pitting, cracks, laminations etc. shall be rejected if the defects exceed the allowable tolerances specified in relevant standards.

All materials shall be stored properly on skids, above the ground. It shall be kept clean and properly drained. Structural steel shall be so stored and handled that members are not subjected

to excessive stresses and damage. Girders and beams shall be placed upright for storing. Long members shall be supported on closely spaced skids to prevent permanent set due to deflection.

Welding wire and electrodes shall be stored separately by qualities and lots inside a dry and enclosed room in compliance with IS:9595. Electrodes shall be perfectly dry and drawn from an electrode oven, if required.

Checking of quality of bolts of any kind and the storage of the same shall be made conforming to relevant standards.

Each lot of electrodes, bolts, nuts etc. shall be accompanied by manufacturer‘s test certificates.

The CONTRACTOR may use alternative materials as compared to design specifications only with the written approval of the Engineer-in-charge.

Materials for which test certificates are not available or for which test results do not tally with relevant standard specifications, shall not be used and the contractor is liable to remove the same from the work site at his own cost.

5 Fabrication

In and erection drawings shall be prepared by the CONTRACTOR on the basis of ―Approved for Construction‖ design drawings, issued to him. The CONTRACTOR shall submit six copies of fabrication and erection drawings conforming to IS:800 for the approval of the Engineer-in-charge.

Fabrication and erection drawings shall be thoroughly checked and signed by the CONTRACTOR‘S own responsible engineer to ensure accuracy and correctness of the drawings. Unchecked and unsigned drawings shall not be used for the purpose proceeding with the work.
Fabrication and erection drawings (drawn to a scale large enough to convey the information clearly and adequately shall include the following :

Reference to design drawing number (along with revision number, if any) based on which fabrication drawings has been prepared.

Structural layout, elevation and sections (with distinct erection marking of all members). Framing plans, member sizes, orientation and elevations.

Layout and detailing of rain water pipes and gutters showing all necessary level and connections wherever required.

Detailing of shop/field joints, connection, splices, for required strength and erection. Location type, size and dimensions of welds and bolt

Shapes and sizes of edge preparation for welding. Details of shop and field joints / welds

Bill of materials / D.O.D. Lists.

Quality of structural steel, plates etc., welding electrodes, bolts, nuts and washer to be used.

Erection assemblies identifying all transportable parts and sub-assemblies with special erection instructions, if required.

Method of erection and special precautions to be taken during erection as required.

The CONTRACTOR shall however ensure accuracy of the following and shall be solely responsible for the same.

Provision for erection and erection clearance.

Marking of members.

Cut length of members.

Matching of joints and holes

Provision kept in the member for other interconnected members.

Bill of materials / D.O.D. Lists.

Connections, splices and other details not shown on the design drawing shall be suitably designed and shown on the fabrication drawings.

CONTRACTOR shall incorporate all the revisions made in the design drawings during the course of execution of work in his fabrication drawings and resubmit the drawings.

Workmanship for Fabrication

General

Fabrication of structures shall be done strictly as per the ―Approved for construction‖ fabrication drawings and in accordance with IS:800 , IS:9595 and other relevant IS codes and I.S.I. Hand book SP:6(1).

Tolerances for fabrication of steel structure shall be as per IS:7215 Templates

Templates used throughout the work shall be of steel or steel brushed in such cases as may be considered necessary by the Engineer-in-charge. Actual materials should be used as templates for drilling.

Straightening

All material shall be straight and if necessary shall be straightened and/or flattened by pressure unless required to be of curvilinear form and shall be free from twists.

Clearance

The erection clearance for cleated ends of members connecting steel to steel shall not be greater than 2 mm at each end, but where for practical reasons greater clearance is necessary, suitably designed seatings or connections shall be developed.
Shearing, flame cutting and planning

Shearing or flame cutting may be used at the CONTRACTOR'S option. A mechanically controlled cutting torches shall be used for the flame cutting and that the resulting edge shall be reasonably clean and straight. Sheared members shall be free from distortion at sheared edges. For high tensile steel when flame cutting is adopted special care shall be take to remove the burn edges. When gas cutting is adopted, to 5 mm depending upon the thickness of the member. For this purpose cutting allowance shall be provided.

Chipped edges shall be ground to a neat finish and sharp corners and hammered rough faces shall be rounded off. Edge preparation for welding may be done by machine controlled flame cutting with edges free of burrs, clean and straight.

No electric metal are cutting shall be allowed. Unless clean square and true to shape, all frame cut edges shall be planned. Cold sawn ends if reasonably clean and flame cut ends of sections not inferior to sawn ends in appearance need not be planned except for butting ends.

Holing

Holes for rivets and bolts shall be drilled to conform to clause 10 of IS:7215. All holes shall be drilled to the required size or punched 3 mm less in diameter and reamed thereafter to the required size. Thickness of material for punching shall not be greater than 16 mm.

Holes in secondary members like purlins, runners etc. may be punched full size, provided the thickness of materials does not exceed 13 mm.

No holes shall be made by gas cutting process. Allowable variations in holes (out of roundness, eccentricity, plumb line deviation) shall be as per IS:800.

Assembly

All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at both top and bottom without being drawn or caulked. The component parts shall be so assembled that they are neither twisted nor otherwise damaged. Specified cambers, if any, shall be provided.

All parts of welded members shall be held firmly in position by mean of jigs or clamps while welding.

Trial assemblies shall be carried out at the fabrication stage to ensure accuracy of workmanship and these checks shall be witnessed by the Engineer-in-charge.

Bolting

All turned and fitted bolts shall be carefully turned and shall be parallel throughout the barrel. The following limits of tolerance shall be permitted upon the diameter of the barrels of turned bolts and holes which they are to fit.

	Barrel of Bolt	Hole
Low	- 0.13 mm	0.00 mm
High	0.00 mm	+ 0.13 mm

The barrel of each turned bolt shall be of such a length that is in full contact with the work throughout the screwed portion being made at least 1.6 mm less in diameter than the barrel or to suit the next smaller size of the metric screw thread. The barrel portion shall be joined to the thread portion by a 45-degree chamfer within thickness of washer. Unless otherwise specified, faces of heads and nuts bearing on steelwork shall be machined. All such bolts shall be provided with washers having a hole of 1.5 mm larger in diameter than the barrel of bolt and the thickness of not less than 6 mm so that the nut when tightened shall not bear on the unthreaded body of the bolt. In all cases, where the full bearing area of the bolt is to be developed, the threaded portion of the bolt shall not be within the thickness of the parts bolted together. The threaded portion of each bolt shall project through the nut by at least one thread. Tapered washers shall be provided for all heads and nuts bearing on the levelled surface.

Welding

The welding and welded work shall generally conform to IS:816 and IS:9595 unless otherwise specified. As much work as possible shall be welded at shops and the layout and sequence of operations shall be so arranged as to eliminate distortion and shrinkage stresses.

All electrodes shall be kept under dry conditions. Any electrodes damaged by moisture shall not be used unless it is guaranteed by the manufacture that when it is properly dried for used shall have no detrimental effect. Electrodes which have parts of flux coating broken away or otherwise damaged, shall be rejected . Any electrode older than six (6) months from the date of manufacture shall not be used.

The members to be assembled for welding shall be clean and dry on welding edges. Under no circumstances shall wet, greasy rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter, likely to get into the gaps between member to be welded.

The edges shall be prepared as shown in drawings correctly to the shape, size and dimensions with an automatically controlled flame cutting torch and/or by grinding. Wherever, U-groove joint is required, the edges shall be prepared with an automatic flame cutting torch in two phases following a bash out with a gouging pass or by machining. The welding surfaces shall be smooth, uniform and free from fins, tears, notches or any other defect which may adversely affect welding.

Welding Procedure

The welding procedure shall be determined by a CONTRACTOR and approved by the Engineer-in-charge to suit the details of the joints as indicated on the drawings and the position at which welding has to be carried out. Welding procedure shall cover the following :

Type and size of electrodes

Position of welding

Current and arc voltage

Length of run per electrode or (for automatic welding) speed of travel of electrode.

Number of run in multipass welds and arrangement

Preparation of the parts

Welding sequence

Pre or post heating

The welding procedure shall be so arranged that the distortion and shrinkage stresses are reduced to a minimum and that the welds meet the requirements of quality specified.

Any weld found defective shall be cut by using either chipping hammer or gouging torch in such a manner that adjacent material is not injured in any way. The defects must be rectified according to IS:823 and as per the instruction of the Engineer-in-charge.

The welding seams shall be left to cool slowly. The CONTRACTOR shall not be allowed to cool the welds quickly by any other method.

For multipass welding, before welding the following layer the formerly welded layer shall be cleaned metal bright by light chipping and wire brushing.

Fusion faces and surrounding surfaces

Fusion faces and the surrounding surfaces within 50 mm of welds shall be free from dirt, all mill scale, oil, paint or any substance which may affect the quality of welds or impede the quality / progress of welding. The surfaces to be welded shall be free from irregularities.

All mill scale within 50 mm of weld shall be removed either by pickling followed by thorough power wire brushing or by other approved methods before welding.

Edge preparation shall preferably be carried out by shearing, chipping, gas cutting or flame gouging. In general, no special edge preparations will be required for members under 8 mm thick. Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members.

Accuracy of fit-up

Parts to be fillet welded shall be brought into as close contact as possible and the gap due to faulty workmanship or incorrect fit up shall not exceed 1.5 mm. If larger separation occurs at any position, the size of fillet weld shall be increased at such positions by the amount of gap.
Ends of butt welded joints

The ends of butt joint shall be welded so as to provide full throat thickness. This may be done by the use of extension piece, cross runs or other approved means.

Weld face and reinforcement of butt welds

The weld face shall at all places be deposited proud the surface of the parent metal. Where a flush surface is required the surplus metal shall be dressed off.

Testing of butt welds

Butt welded joints are to be radiographically tested by the CONTRACTOR and shall be rectified by the CONTRACTOR if found defective by the Engineer-in-charge.

The minimum leg length of a fillet weld as deposited shall not be less than the specified size. In no case a concave weld profile shall be performed unless it is specially permitted. Whereas concave weld is permitted resultant throat thickness shall be taken care of.

After making each run of welding all slag shall be thoroughly and properly removed and the surface is to be cleaned.

Quality of Welds

The weld metal as deposited including tack welds shall be free from cracks slag inclusion, porosity, cavity and other faults. Proper fusion of the parent metal should be there without undercutting or overlapping at the toes of the weld. The surface of the weld shall have a uniform contour with regular appearance.

Weather conditions

Welding shall not be done under extreme weather conditions which may have an adverse effect and the efficiency of weld might be deteriorated.

Qualification and testing of welders

Welding shall only be carried out by fully trained and experienced welders and approved by the Engineer-in-charge and the CONTRACTOR shall produce evidence to the effect that the welder have satisfactorily complete appropriate tests as described in IS:817. The Engineer-in-charge may at his discretion ask for periodic tests of the welders and/or the welds produced by them. Such tests shall be at the expense of the CONTRACTOR. The CONTRACTOR shall employ a competent superior to ensure the quality of workmanship, materials for welding as laid down in the specification.

Machining of Butting ends, Caps and Bases

Column splices and butt joints of struts and compression members shall be correctly machines and close butt over the whole section depending upon the contact area required for load transmission. In column caps and bases the ends of shaft shall be machined fitted with gussets, ribs etc., so that proper surface contact is achieved. In case any angle, channels are connected to column cap/base the thickness of such angles, channels shall not be reduced by more than 0.8 mm after machining.

Shop Assembly

The steelwork shall be temporarily shop assembled as necessary so that accuracy of fit may be checked before dispatch to site. The parts shall be shop assembled with a sufficient number of parallel drifts to bring and keep th part in place.

Erection Marking

Each fabricated member shall bear an erection mark, which will help to identify the member and its position in respect of the whole structure, to facilitate re-erection at site.

These erection marks shall be according to the markings incorporated in the shop detail and erection drawings.

The members shall be visibly marked with a weather proof light colored paint. For small members those are delivered in bundles or crates, the required marking shall be done on small metal tags securely tied to the bundle while the crates shall be marked directly.

Control in the Fabrication and Assembly of various structures

The Engineer-in-charge or his representative shall have free access at all reasonable times to the

CONTRACTOR'S fabrication shop and shall be afforded all reasonable facilities for satisfying himself that the fabrication being undertaken in accordance with drawings and specifications.

Technical approval of the steel structure in the shop by the Engineer-in-charge is mandatory.

The CONTRACTOR shall not limit the number and kinds of tests, final as well as the intermediate ones, or extra tests requested by the Engineer-in-charge.

The CONTRACTOR shall furnish necessary tool gauges instrument etc. and in addition technical and non-technical personnel for shop tests by Engineer-in-charge.

To ensure good quality of workmanship the CONTRACTOR shall control the fabrication and assembly of structures as per the procedure outlined below :

Steel Structures for Industrial Buildings

The CONTRACTOR shall from his end check the established process and instructions for steelwork. All welds shall be visually examined and measured for external dimensions by appropriate gauges. He shall also conduct selective examination of welds by ultrasonic or drilling methods, X-ray or gamma - ray depending upon the type of joint.

Criteria for tests

The CONTRACTOR shall conduct tests in accordance with the following norms :

Visual examination - 100 % of the welded joints.

Ultrasonic or drilling method - one drill hole for 50 meters of welded joint and not less than 50 mm for each 50 metes of welded joint.

X-ray or Gamma - ray examination - Two percent of the length of weld made by manual or semi- automatic machine and one percent of the weld if made by automatic welding machines (flux welding, shielded arc welding, electroslag automatic welding). However, specified important joints shall be tested beyond these general limits.

Tests

Visual Examination

The CONTRACTOR shall conduct visual examination and measurement of the external dimensions of the weld for all joints. Before examination, area close to weld on both sides of weld for a width not less than 20 mm shall be cleaned of slag and other impurities. Examination shall be done by a magnifying glass which has a magnification power of ten and measuring instrument which an

accuracy of + 0.1 mm or by weld gauges. Also the following checks shall be carried out during visual examination :

Correctness and shape of welding joints.

Incomplete penetration of weld metal.

Burns

Influx of slag

Unwelded craters

Undercuts

Cracks in welded spot and heat affected zones

Porosity in welds

Displacement of welded element

Compression in welded joints as a result of electrode impact while carrying out contact welding.

Mechanical Test

The CONTRACTOR shall carry out various mechanical test to determine weldability, the metal alloyability , nature of break, correct size and type of electrodes, degree of preheating and post heating treatment etc. The type, scope and sample of various mechanical tests shall be determined in agreement with the Engineer-in-charge, attained to satisfy the Engineer-in-charge that the correct type and size of electrode,
pre-heating and post-heating treatment and weldability of different metal are being followed.

X-ray and Gamma-ray Examinations

X-ray and Gamma-ray tests shall be carried out by the CONTRACTOR to determine gas inclusion (blow-holes and hollows), slag inclusion, shallow welds and cracks.

Before conducting the test the weld joints shall be cleaned of slag and scales and visually examined. The welds shall be marked into separate portions depending upon the length to be photographed. The length shall be such as to ensure that there are no distortions and shall reveal and defect correctly. The length shall not be more than 0.75 times the focal distance. The width of the photograph will depend on the width of the welded joint plus 20 mm, on either side of the weld. The cassette with film shall be protected by sheet of lead or equivalent of proper thickness against incidental diffused and secondary radiation.

The direction of the ray with relation to the film shall be specified as follows :

Weld of butt joints without edge slopes and with edge processing shall be examined by a central ray directed at right angles to the weld.

In special cases examination of welds with included rays directed along edge slopes may be permitted by the Engineer-in-charge.

Lap joints shall be examined by directing rays at 45 degrees to the bottom plate. Welds in Tee-joint without edge preparation shall be examined by rays directed at 45 degrees to the bottom place on both the welds. Angle welds in lap and tee joints shall be examined by the rays from opposite direction. Weld in angle joints shall be checked directing ray along with bisector of the angle between the weld elements. Circulate welds of cylindrical and spherical products shall be examined along their full lengths by the ray source located inside the cylinder or sphere near the weld. The cassette with film shall be positioned along the full length of the weld on external surface. The length of the overlapping shall be 10 mm to 15 mm.

Ultrasonic Test

Ultrasonic test shall be conducted by the CONTRACTOR to detect gas inclusion (pores) slag inclusion, shallow welds, cracks, lamination and friability etc. Before starting ultrasonic test the weld joint shall be thoroughly cleaned of slag and other materials. Surface of the basic metal adjacent to the weld joint on both sides shall be mechanically cleaned by a grinder or metal brush to provide contact of the whole ultrasonic probe surface with surface of basic metal. The width of the clean surface shall be as directed by the Engineer-in-charge. The welded joint then shall be covered with a thin coat of transformer oil, turbine or machine oil to ensure acoustic contact. The joints so treated shall be marked and the marks shall be entered into documentation. Subsequent to this ultrasonic tests shall be carried out as directed by the Engineer-in-charge.

Tolerance in workmanship

The permissible tolerance in workmanship shall be as specified in drawings or shall conform to IS:7215.

Inspection and Testing of Fabrication

Unless directed otherwise, inspection shall be made at the place of manufacture prior to dispatch. Should any structure found not to comply with any of the provisions of this specification, it shall be liable for rejection. No structure or part of the structure, once rejected shall be re-submitted for inspection/test, except in cases where the Engineer-in-charge considers the defect as rectifiable.

Defects that may appear during fabrication shall be made good with the consent of and according to the procedure laid down by the Engineer-in-charge. All gauges and templates necessary to satisfy the Engineer-in-charge shall be supplied by the CONTRACTOR. The Engineer-in-charge, may at his discretion, check the test results obtained at the CONTRACTOR‘S works by independent test at the Government test house or elsewhere.

Marking, Packing and Despatch

Each price shall be distinctly marked before delivery in accordance with the marking diagram and shall bear such other marks as will facilitate erection.

All projecting plates or bars and all ends of members at joints shall be stiffened, all straight bars and plates

shall be bundled, all screwed ends and machined surfaces shall be properly packed and all rivets, bolts, nuts, washers and small loose parts shall be packed separately in boxes so as to prevent damage or
distortion during transit.

5.10 Storing and handling of materials

The fabricated materials on receipt at site shall be carefully unloaded, examined for defects, checked and sorted out for each building and stacked securely on skids above level ground , which should be clean and have proper drainage facility.

The CONTRACTOR shall unload the fabricated materials promptly on arrival, otherwise he will be responsible for demurrage charges, if any.

All members having damages like small bends or twists shall not be put in position unless the defects are rectified. Any serious bends or damage shall be reported at once to the Engineer-in-charge by the CONTRACTOR for instructions. The strengthening of bent edges of plates, angles and other shapes shall be done by methods not likely to produce fracture or other injury.

5.11 Setting out

One set of reference axes and one bench mark level shall be furnished to the CONTRACTOR. These shall be used for setting out of structures.

The CONTRACTOR shall assume full responsibility for correct setting out of all steel work and erecting it correctly as per alignment and levels shown in the drawings and plumbing of vertical members.

5.12 Erection

General

The erection of structural steel work shall be carried out in accordance with IS:800 and in conformity with drawings and specifications.

The adequacy of all plant, equipment etc. used for erection shall be to the satisfaction of the Engineer-in-charge.

Scope of Work

For carrying out erection the CONTRACTOR shall provide all construction equipments, tools, tackles, consumables, materials including labour supervision

The CONTRACTOR shall take care of receiving, unloading, checking and moving into storage at site as outlined in general conditions and shall promote attendance to all insurance matters as necessary for all materials arriving at site.

Transporting from site storage, handling, rigging, assembling, bolting, welding and satisfactory erection of all fabricated materials in proper location according to the drawings or as directed by the Engineer-in-charge shall form a part of responsibility of the CONTRACTOR. The CONTRACTOR shall check centre lines, levels of all foundation blocks, line, level, position and plumb of all bolts and pockets. Any defect observed in the foundation shall be brought to the notice of the Engineer-in-charge. The correctness of the foundations before installing the fabricated structures on the foundation pockets.

The CONTRACTOR shall ensure the stability of the structure or part during erection until the final alignment, welding, bolting are carried out. Aligning, lining, leveling, bolting , welding, securely fixing the position shall be done to the satisfaction of the Engineer-in-charge.

Painting shall be done by the CONTRACTOR as per specification including supply of paint.

Supply of all required consumables, construction and erection materials including but not limited to gauges, welding, brazing, gasses and rods, electrodes, oxygen, acetylene, fuel, bolts, nuts and temporary support etc. as required to complete the erection shall be under the scope of the CONTRACTOR.

Erection shall also include the following work :

Removal of bends, kinks, twists etc. for parts damaged in transport and handling

Cutting, grinding, filling, chipping, drilling etc. whatever required for preparation and finishing of site connections.

Re-fabrication of parts damaged beyond repair during transport and handling or wrongly fabricated.

Plug welding and re-drilling of holes which do not register and which can not be reamed for use.

Erection drawings shall be prepared by the CONTRACTOR and shall consist of line diagrams showing every member in position with respective erection mark.
All steelwork shall be erected with the marks in the same relative position as shown on the elevation or plan.

Any discrepancy between the drawings and the specification shall be brought immediately to the notice of the Engineer-in-charge for decision.

5.13 Assembly and Erection

Before starting the erection the CONTRACTOR shall submit to the Engineer-in-charge for his approval the method he proposes to follow and the number and type of equipment and temporary work he proposes to use for the erection. Adequate allowance and provision shall be made for lateral forces and wind loads.

The CONTRACTOR shall plumb and level all steelwork and shall thoroughly braced and Grey the structures during erection to keep them plumb and rigid till completion. Erected parts of the structure shall be stable during all stages of erection and the structural elements should be strong enough to bear the erection load. Specific sequence of erection should be observe.

5.14 Erection Tolerances

Erection tolerances shall be as specified in drawings or shall conform to relevant IS standards.

5.15 Glazing

Unless otherwise specified, side glazing shall be of 6 mm thick rough cast wired glass with hexagonal or square mesh formed of 0.5 mm dia wires or as indicated in the bill of quantities. The materials shall be obtained from approved manufacturer. Glazing shall be fixed in M.S./Aluminium

Tee astragals as shown in the drawings and/or as indicated in the bill of quantities with the polished face on the side exposed to the weather.

All glazing parts shall be securely fixed in their frame and shall be weatherproof. All glazing shall be flashed with the surrounding sheeting. Glass shall be fixed with putty, suitable for structural steelwork, glazing chips, neoprene gaskets etc. as per Indian Standard IS:1038 and IS:1081.

6.0 Electro Forged Grating

Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/ or bolting with MS bolts conforming to property class 4.6 of IS:1367 at all heights as per approved fabrication drawings Structural steel work in built up sections/ framed work, galvanised electro forged gratings, platforms , frames, guard bar and similar works as per IS 800, IS 813, IS 816 & approved fabrication drawings only including supply, transportation, de-rusting, fabricating, erecting, hoisting, fixing in position etc. as required and shall be provided with hot dip Galvanization coating of thickness 80- 90 microns . (All material supply is in contractor's scope)
Note:- Finished size of grating laid shall be measured for the purpose of payment. Pitch of the main flat bars (25x5mm) shall be 33mm and the pitch of the 6mm rod(cross members) shall be 100mm.The outer frame of grating of all sizes shall be 25x5mm FB. The Hot dip galvanized coating shall be of thickness of 80-90 microns.

SPECIFICATIONS FOR PLASTERING WORK

1.0 SCOPE

The work covered under this specification consist of supplying all materials and rendering all types of plaster /pointing finishes strictly in accordance with these specifications and applicable drawings etc.

2.0 INDIAN STANDARDS

Indian Standards to be followed are:

All relevant standards as specified elsewhere in this volume are applicable.

IS 383	Specification for coarse and fine aggregates for natural, sources for concrete.
IS 412	Specifications for expanded metal steel sheets for general purposes
IS 1542	Specifications for sand or plaster
IS 1661	Code of practice for application of cement and cement lime plaster finishes
IS 2402	Code of practice for external rendered finishes
IS 2645	Specifications for integral cement water proofing compound
IS 8112	Specification for 43 grade OPC
SP 27	Handbook of method of measurement of building works.

3.0 MATERIALS

Cement shall be ordinary Portland cement conforming to IS and of grade 43.

Water used for mixing and curing shall be clean, reasonably clear and free from objectionable quantities of silt, oils, alkalis, acids, salts so as not to weaken mortar.

Water tested shall be in accordance with IS 3025. Maximum permissible limits of deleterious materials in water as given in IS 456 are reproduced for ready reference in table 1 of IS 456.

Sand shall conform to IS 1542 specification for sand for plaster. For white or coloured renderings, only quartz or silica sand shall be used. For textured finishes produced by treatment of freshly applied final or finishing coat with a tool coarser, particles used shall be screened through 3.35 mm IS sieve or 2.36 mm IS sieve. For torn texture a slightly larger portion of material coarser than 4.75 mm lS sieve shall be used.

Aggregate shall conform to IS 383.

Integral water proofing compound shall conform to IS 2645 (specification for integral water proofing compound).

GI Chicken mesh of 20 gauge as approved shall be used over junctions of concrete and masonry or two dissimilar materials about 150 mm wide fixed with GI wire nails etc. as directed by the ENGINEER-IN-CHARGE.

4.0 MORTARS

Mortars shall be prepared by mixing fine graded aggregate with cement, the lime or a combination of these in the proportion specified for respective items of 'work as detailed in the BOQ. Mixing of mortars shall be done by mechanical mixers only. Hand mixing may be permitted in specified cases on the written permission of the ENGINEER-IN-CHARGE.

Mortars shall be specified by proportion only and not by strength. Volumetric mixing shall be based on dry volumes of each ingredient. For convenience, measurement shall correspond to volume of one cement bag Le. 0.035 cu m. ; Boxes shall be of size 40 x 35 x 25 cm. These shall be marked as mortar mixing boxes by red paint and shall be used throughout the contract. Hand mixing or mechanical mixing' proportions shall be done with the use of these boxes.

4.1 Cement mortar

Cement mortar shall be prepared by mixing cement and sand in specified proportions. Proportioning shall be carried out as detailed above. Sand shall be added suitably to allow for bulkage if required. Bulkage shall/be determined as specified in IS 2386 Part III. Cement and sand added to mixer - shall be thoroughly mixed and water shall be added to it gradually; After addition of water the mixer shall run for a minimum of 3 minutes. The mortar mixed shall be consumed within 30 minutes of its mixing.

5.0 WORKMANSHIP

Work shall be carried out as per recommendations of code of practices IS 1661 and IS2402.

5.1 Preparation of mortar mix

The material used in preparation of plastering mixes shall be measured by volume using gauge-boxes or by weight. When cement is measured by weight, 1440 kg of material shall be taken equivalent to one cubic meter.

5.2 Mixing

Mixing shall be done mechanically. Each mortar batch shall be used within half an hour. Hand mixing if permitted as special case shall be carried out on a clean, watertight platform. The mixing operation shall be continued with addition of necessary quantity of water until a uniform appearance and consistency of mortar is obtained.

Cement and sand shall be mixed dry in required proportion to obtain a uniform colour and water shall then be added to get the required consistency for the plaster.

5.3 Method of Plastering

Surfaces to be plastered must be clean and free from dust, loose material, oil, grease, mortar droppings, sticking of foreign matter, traces of algae, etc. It is very important to ensure that there should not be any chance of the plaster getting deboned' due to presence of materials harmful for bonding.

Raking out of joints is expected to be carried out along with masonry but it should be checked thoroughly so as to receive good key.

Walls should be sufficiently damp prior to plastering. Water from plastering mortar must not be absorbed by masonry under any condition.

Any unavoidable projections in masonry and concrete surfaces shall be chiseled back. Care shall be taken that surrounding surfaces are not damaged and reinforcement is not exposed.

Thickness of one coat should not be more than 15mm and less than 8 mm for single coat finished plaster.

In case of multi coat plaster, sufficient time shall be allowed for the undercoat to harden (cured, dried and shrunk properly) before subsequent coats are applied.

Undercoats shall be scratched or roughened before they are fully hardened to form' a mechanical key.

The method of application is also important and hence it is recommended that the mix be thrown on the surface rather than stuck with trowel. This increases the adhesion.

Independent double legged scaffolding free of masonry shall be provided. Scaffolding should be rigid, allowing free and safe movement on the platform and it should be at sufficient distance or height from the working areas. Scaffolding with railing gives more confidence to workers and improves the quality of work.

Actual plastering shall be undertaken only on the approval of the ENGINEER-IN-CHARGE. Plaster work should only follow the steps mentioned below:

Surface must be thoroughly cleaned.
Plaster area must be provided with, level dabs or spots allowing working and checking with 2-3 m straight edge. Depth of plaster must not be less than 8 mm at any point.
Required concealing services must be completed and tested.
No further cutting of masonry must be required.

Repairs carried out to masonry or concealing work must be cured and dry.
Surface must be sufficiently damp.
Plaster dabs are checked for plumb and level by the ENGINEER-IN-CHARGE or his representative.
Joints, concealing and repairing areas must be covered with 20 gauge GI chicken mesh as per the ENGINEER-IN-CHARGE's instruction.

Corners, external or internal, shall be finished along with final coat. It is advisable to have rounded corners.

Plaster shall be cured for 14 days by wet curing except in neeru finish plaster. During this period plaster shall be protected from exposure to extremes of temperature and weather.

Plaster shall be leveled and lined by aluminium hollow section, 2-3 m long. (This will give even and leveled surface). There shall not be more than 2 mm difference in level when checked with'3 m straight edge. It is important that enough pressing and beating is done to achieve compact filling of joints and that the area is fully compacted.

Finishing of plaster may be carried out with wooden float (randhas) or trowelled smooth with sheet metal trowels as specified. Care shall be taken to avoid excessive trowelling and overworking of the wooden float.

All corners, internal or external, shall be truly vertical or horizontal. These shall be finished with a proper template to achieve best workmanship for rounding and chamfering as specified or directed.

Plaster shall be cut to correct horizontal or vertical line at the' end of the day or if work requires to be suspended for any reason.

It is advisable to limit the area of plaster to 15 sq m to avoid cracks due to thermal movements of dissimilar material in contact; it is advisable to provide joints treated with groove or any other detail as suggested by the Architect. These joints if not specified shall be treated with 150 mm wide reinforcing chicken mesh (approved by the ENGINEER-IN-CHARGE) fixed over joints by GI nails and the area plastered.

6.0 TYPE OF PLASTER

6.1 12mm thick ordinary cement sand plaster

Single coat cement-sand plaster with cement-sand mix in proportion of 1:4 shall be carried out over the entire area as detailed above. This shall be finished just with wooden float to give the best smooth surface possible. This may be for internal or external areas. Thickness may be from 10 to 15 mm maximum or as specified in the item or drawing.

6.2 18 to 25 mm ordinary cement sand plaster

This is the same as for the 12mm thick single coat plaster except that this shall be carried out in two coats. Maximum thickness of the undercoat shall be 12 mm and balance in the second finishing coat. All operations remain the same and are as detailed in Clause 3.0 of this section.

6.3 Cement Finished Plaster

This shall be carried out in the same manner as in Clause 5.1 and 5.2 of this section for specified thickness in single or double coat. Then it shall be finished uniformly over the entire area with a

paste of neat cement when the plaster has just hardened and finished smooth with a steel trowel. It shall be worked over again to achieve a smooth leveled surface. Quantity of cement applied shall be about 1 kg/sqm.

6.4 Sand Face Plaster

This shall generally be carried out on the outside face and exposed area of masonry work and concrete work. It shall be of minimum 22 mm thickness and shall be in two coats (1st coat 16 mm and 2nd coat 6 mm). The coat shall be CM 1:4 (1 cement and 4 sand) mixed with water-proofing compound 2% by weight of cement and applied as usual and surface shall be keyed.

The second coat shall be applied after 7 to 10 days and shall be of CM 1:4 (1 cement and 4 sand). Mortar shall be mixed with slightly coarse sand. Mix shall be worked over with 3 m gauge or wooden float to achieve an uniform surface.

The surface shall be allowed to harden sufficiently for sponging operation. Sponging shall be done by dipping sponge in cement water and removing fine particles and exposing large sand particles. The movement of sponge shall be such that no patches develop nor excessive materials removed from the surface. There shall not be a difference of more than 7 mm when checked with a 2 m long straight edge.

6.5 Water proof plaster

The water proofing compound shall conform to IS 2645. The water proofing compound shall be mixed with dry cement in the proportion by weight as specified or recommended by the approved manufacturer of water proofing compound. Mixing should be thoroughly well integrated with cement. Addition of water must not allow any slips of mixed cement. The mix used, in general, shall be CM 1:4 (1 Cement: 4 Sand) and the balance application, curing, etc. remains the same as detailed above.

7.0 MEASUREMENT

Plaster work shall be measured in square meter to the second decimal place.

Thickness of plaster shall be the average depth of plaster as specified. But if extra thickness occurs due to bad quality of bricks, stones or blocks or due to bad workmanship, the repairs or extra thickness required to be carried out shall be at the cost of contractor.

Grooves, pattas in continuation of large areas or plaster areas shall be considered as part of the plaster and not measured separately.

Ceiling plaster, including ribbed beam slab shall be measured in square meters.

Beams and columns in continuation of masonry shall be measured in square meter.

Jambs, sills, coves, cornices, etc. shall be a part of plaster and no separate payment shall be made towards these items.

Deduction

Deduction for an opening in plaster shall not be for area less than 0.5 sq m.
In case the opening area is 0.5 sq m to 3.0 sq m, only 50% area shall be deducted from each face.

In case the width of door or window frames is equal to masonry, full area of opening shall be deducted.
In case of openings of area above 3 sqm each deduction shall be made for opening on each face and jambs, soffits, sills shall be measured.

Plaster to ceiling and walls shall be measured separately if specified in the BOQ.

8.0 RATE

Description of item in the BOQ, unless otherwise stated, includes, wherever necessary, conveyance and delivery handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting and fixing in position, straight cutting and waste, return of packings and other incidental charges.

Levels and heights shall be as indicated in the BOQ.

Preparation of surface shall be as approved by the ENGINEER-IN-CHARGE.

Trimming off the projections on masonry shall be included in the price.

Scaffolding and working platform shall be included in the price.

Materials as detailed and as required to complete item as specified shall be included in the price.

Curing of plaster shall be included in the price.

Cleaning of adjacent areas, windows/ door frames, etc. including 0masonry surface in exposed masonry work, shall be included in the price.

Forming grooves for joints between beams/columns and masonry etc. shall be ' included in the price. Any special treatment if detailed shall be measured separately and billed in BOQ.

Providing and fixing chicken mesh at junction of R.C.C., brick work, edges, corners, chiseled and repaired brick work prior to plaster over concealed conduit, etc. shall be as directed by the ENGINEER-IN-CHARGE. It shall be considered as part of item and no separate charge will be payable.

Standard Specification For Floor and Floor Finishes

1 General

Scope

This specification, used in conjunction with the contract document, Bill of Quantities and design drawings establishes the minimum requirements for floor and floor finish work. Reference to other material standards for compliance shall be interpreted as an integral part of this specification.

Any special requirement as shown or noted in the drawings shall be given preference over the provision of this specification.

2 Regulations, Codes and Standards

The flooring work shall be in compliance with all applicable federal, state local laws and regulations.

The following Indian Standard Codes unless otherwise specified herein shall be applicable. In all cases, the latest revisions of the codes shall be referred to :

IS:1443 - Code of practice for laying and finishing of cement concrete flooring tiles
IS:2114 - Code of practice for laying in situ terrazzo floor finish
IS:1077 - Specification for common burnt clay building bricks.
IS:5491 - Code of practice for laying of in-situ granolithic concrete flooring toppings.
IS:1237 - Specification for cement concrete flooring tiles.
IS:4457 - Specification for Ceramic Unglazed Vitreous Acid Resisting Tile.
IS:158 - Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali and heat resisting.
IS:4832 - Specification for chemical resistant mortar.
IS:4441 - Code of practice for use of silicate type chemical resistant mortar.
IS:4442 - Code of practice for use of sulphur type chemical resistant mortar.
IS:383 - Specification for coarse and fine aggregates.
IS:2571 - Code of practice for laying in-situ cement concrete flooring.
IS:4443 - Code of practice for use of resin type chemical resistant mortar.
IS:3461 - Specification for PVC-Asbestos floor tiles.
IS:5318 - Code of practice for laying of flexible PVC sheet and tile flooring.
IS:455 - Specification for Portland slag cement
IS:777 - Specification for glazed earthenware tiles.
IS:269 - Specification for ordinary Portland cement.

3 Materials

Cement

Cement shall conform to IS:269 or IS:455.

Aggregate

The aggregates shall conform to IS:383 and shall be from approved source. Size of coarse aggregate shall be limited to 12 mm unless otherwise specified. Fine aggregate shall be from approved river or pit and also conform to IS:383

Rubble used for packing under floors, foundation etc. shall be hard, durable rock, free from veins, flaws and other defects. The size of the rubble shall be 100 mm – 150 mm unless otherwise specified . The quality of the rubble shall be got approved by the Engineer-in-Charge.

The aggregate used in mosaic flooring shall be marble aggregate of the following types :Calcite, Dolomites, Serpentines, travelines etc. The size of the aggregates shall be as approved in accordance with clause 5.2 of IS:2114 – 1962, marble powder used in the topping shall pass through IS Sieve 30.

Bricks

Bricks shall be class 50 B designation conforming to IS:1077.

Water

Water shall be clean and of potable quality conforming to IS:456.

Dividing Strip

Dividing strip shall be 2 mm thick and shall be of approved material (glass/Aluminium/PVC) and quality.

Colouring Pigment

Pigments, synthetic or otherwise, used for colouring shall have permanent non-fading colour and shall be contain material detrimental to concrete. The pigment shall be approved brand and tint shall be uniform. Pigments used for colouring cement shall conform to IS:2114.

Floor Hardener

It shall be best quality heavy duty metallic hardener – Ironite or approved equivalent or as specified elsewhere.

Terrazzo Tiles

The terrazzo tiles (plain or coloured) shall conform to IS:1237 and shall be of approved colour and size. The type, quality , distribution and sizing of marble chips shall be approved by the Engineer-in-Charge.

Lime

Hydraulic lime shall conform to IS:712

Acid Proof Tiles

Acid proof unglazed ceramic tiles shall be of approved quality and shall conform to IS:4457 and be of different sized like 100 mm x 100 mm, 150 mm x 150 mm etc. with a thickness around 38 to 40 mm or as specified elsewhere.

3.11 Bitumen Primer

Bitumen primer shall conform to IS:158, type II.

3.12 PVC (Vinyl) Tile

All PVC (Vinyl) tiles shall conform to IS:3461 and shall be of Suggested/Recommended make like Bhor, Wonderfloor etc.

3.13 Adhesive

Rubber based adhesive of Suggested/Recommended make and quality shall be used for fixing PVC tiles.Vitreous Tiles

Vitreous tiles shall conform to IS:777 and shall be of approved size and make e.g. Spartek, Johnson and Johnson, Somani etc. Thickness of the tile shall be generally 5 mm – 6 mm unless otherwise specified.

4 Workmanship

General

The CONTRACTOR shall furnish all material, labour, plant and equipments, tools and tackles etc. to complete the work as specified and/or shown in the drawings.

Soling for Sub-grade

All sub-grade shall be laid over the compacted soil.
The sub-grade shall be dressed to correct level and shall be rammed or rolled to proper consolidation.

4.2.1 Brick Flat Single Layer Soling

Bricks shall be placed on a thin cushion of sand on the consolidated sub-grade and the joint shall be broken. Joints shall be fully filled with dry sand and broomed.

4.2.2 Brick Flat Double Layer Soling

The first layer shall be same as that for brick flat single layer soling. The second layer of bricks shall be placed only after completing finishing of the first layer and the joints shall be fully filled with dry sand of approved quality and finally broomed. Both vertical and horizontal joints shall be broken.

4.2.3 Stone Boulder Soling

The sub-grade below the floor slab shall be minimum 230 mm thick stone boulder soling blinded with morrum unless otherwise specified in the drawings. Building paper shall be provided on top of sub-grade before casting the concrete floor slab.

The stone shall be placed absolutely close to each other and in layers only. The crevices between the stones shall be hand packed with stone ballast which shall be hammered into position so as to completely fill up crevices. No stone after packing shall move or tilt in any direction when walked over or pushed with hand. The same soling shall be adequately watered and racked with a power roller and then approved quality of morrum shall be laid over the rolled surface to a thickness of 25 mm and brushed into surface voids, watered and rammed. Spreading of morrum shall be done after obtaining Engineer-in-Charge‘s approval for soling.

Cement concrete flooring, skirting and Dado Granolithic Finish

Workmanship shall generally conform to IS:2571 – Code of practice for laying in situ concrete floors.

4.3.1 Surface Preparation

Before laying in situ concrete floor finish, the surface of the base concrete shall be thoroughly cleaned of loose materials, dirt and laitence by steel wire brushing. If the base concrete has hardened sufficiently the entire surface shall be roughened by chipping or hacking and to be cleaned. The surface then shall be soaked with water for 12 hours before laying the topping.

4.3.2 Laying of Floor

The entire floor where topping is to be laid shall be divided into uniform sized panel not exceeding 20 sq. m. in are with the help of Glass/PVC/Aluminium strip Thickness of the floor shall be 30—50 mm as specified in the drawings. The floor shall be laid in alternate panels. A coat of cement slurry @ 2.75 kg/sq. m. shall be applied so as to get a good bond between the base concrete and the floor finish.

The mix shall be 1 part cement, 2 parts coarse sand and 4 parts graded stone aggregate and shall be prepared by volumes. The mix shall be prepared in a mixer and should be as stiff as possible consistent with workability. The slump of the mix shall not be more than 40 so as to prevent accumulation of excess water or laitence. The concrete shall be placed in position and leveled up and beaten with the wooden hammers until the slurry comes to the surface and all holes are filled up.

It shall then be finished by trowelling or floating. Finishing operation shall start shortly after compacting the concrete and shall be spread over a period of one to six hours depending upon the temperature and atmospheric conditions. The surface shall be trowelled at the regular intervals so as to produce a uniform and hard/surface. The final trowelling shall be done well before the concrete has become too hard but at such a time that sufficient pressure is required to make any impression on the surface. Trowelling with dry cement or with fine aggregate mix on the surface shall not be permitted.

As soon as the surface has hardened, it shall be kept continuously moist for at least fifteen days by impounding water on it.

For skirting and dado, the thickness shall be 15-20 mm and work shall be done on the vertical surfaces. Base layer shall be 12 mm thick P.C.C. 1:2:4 (1 cement, 2 sand; 4 graded stone aggregate of size 12 mm and donw). Then it shall be finished with 6 mm thick plaster with CM 1:1.

4.3.3 Coloured cement concrete flooring

Where coloured finish is indicted, the pigment of approved colour shall be mixed with cement in the proportion of one part of pigment with three parts of cement.

The colouring material and cement shall first be mixed dry and special attention shall be paid to the mixing of colour which should be screened twice with a fine screen and again through fine muslin before use. Colour required for one room shall be mixed in one lot.

IPS Flooring with Floor Hardener Finish

The thickness of the IPS flooring shall be 50 mm and shall be laid in accordance with IS:5491.

The proportion of mix for cement concrete bedding shall be 1 part of cement, 2 parts of sand and 4 parts of granite chippings. The mix for the floor hardener shall be in accordance with the manufacturer‘s specification.

37 mm thick cement concrete bedding shall be laid as described in clause no. 4.3 above.

When granolithic finish is partially dried, approve floor hardener mix shall be applied on the granolithic finish in two or more coats and finished evenly with a trowel . Each coat shall be applied before previous coat dries.

As soon as the surface hardens, it shall be kept continuously moist for at least fifteen days by impounding water on it.

Pre-cast Terrazzo Tile Flooring

Terrazzo tiles can be plain or coloured and their type, quality, distribution and sizing of marble chips shall be approved by the Engineer-in-Charge. All tiles shall conform to IS:1237.

4.5.1 Surface Preparation

4.5.1.1Before commencement of tiling work, all inside walls and ceilings shall be plastered, door frame, windows shall be fixed in place and all heavy work in the room shall be completed.

4.5.1.2The surface of the base concrete shall be thoroughly scrapped, cleaned and washed to remove dirt, loose particles and laitence by scrubbing with a wire brush. The surface shall then be thoroughly cleaned and well wetted but without forming any water pools.

4.5.2 Bedding

Before laying of bed concrete, level pads shall be set up to indicate finished floor level on the clean damp surface of the base concrete and then setting mortar bed of thickness up to 20 mm shall be evenly spread. Proportion of setting mortar shall be cement mortar 1:6 (1 cement; 6 coarse sand) or lime mortar 1:2 (1 lime; 2 sand). Settings beds shall be screeded to a true plane or sloped to drains or leveled as shown.

Before laying the tiles shall be soaked in water for at least 20 minutes and then allowed to dry for about 10 minutes. It is necessary to have tiles damp, but not wet when they are laid.

4.5.3 Fixing and Laying

Workmanship for laying tiles shall conform to IS:1443.

When the bedding mortar acquires sufficient hardness to provide a fairly rigid cushion for the tiles, neat cement slurry of honey like consistency shall be spread @ 4.4 kg. of cement per sq. m. The tiles shall be fixed over this bed one at a time and gently tapped with wooden mallet to proper bedding and in level with the adjoining tiles. The joints shall be perfectly straight and shall not exceed 1.5 mm in width. The top surface of the tiles shall be laid true to plane with levels and/or slopes as indicated on the drawings. After the tiles have been laid, the surplus cement grout that may have come out of the joints, shall be cleaned off and finished with white cement or ordinary cement as specified. In areas adjoining walls, the tiles shall extend about 10 mm inside the plaster,

skirting or dado as the case may be. Half tiles or pieces shall be avoided as far as possible. The day after the tiles have been fixed, the joints shall be refitted with cement paste or grout of the same shade as the colour of the tiles. Before the joints are filled, they shall be cleaned with wire brush or with points of a trowel and any loose cement, dirt or dust in the joints shall be removed.

4.5.4 Curing

4.5.4.1The work shall be kept wet and protected for 7 days before starting the polishing. No one should be allowed to walk on the floor during the first 24 hours after it is laid. The traffic shall be allowed after completion of curing.

4.5.5 Polishing

4.5.5.1Polishing shall commence only after the floor as well as the joints have dried out. The floor shall be polished by machine in three operations by expert trained polishers using carborandum stones of the following grit.

a) For first grinding	:	24 to 60 when the tiles are supplied ungrounded
b) For second grinding	:	120 to 150
c) For final grinding	:	220 to 350

Sufficient quantity of water shall always be continuously used during polishing to prevent scratching. After polishing, the floor shall be thoroughly washed clean and dried. When dry the floor shall be covered with oil free and dry saw dust. Prior to handling over of building, the saw dust shall be removed and floor shall be washed clean with dilute exilic acid solution and dried. Floor shall then be finally polished with wax and machine fitted with hessian felts until the floor shines.

4.5.6 Skirting and dado work

Skirting and dado shall be fixed only after laying the tiles on the floor. Where tiles are to be fixed on walls, the portion of the wall to be tiled shall be left unplastered.

For dado and skirting work, the vertical surface shall be thoroughly cleaned and wetted. Thereafter it shall be evenly and uniformly covered with about 12 mm thick 1:3 cement mortar. For this work the tiles as obtained from the factory shall be of the size required and practically fully polished. The back of each tile to be fixed shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall with a wooden mallet. This shall be done from the bottom of the surface upwards. The joints shall be as close as possible and the work shall be truly vertical and flush. The tiles shall be fixed flush with the plaster or projected as specified by the Engineer-in-Charge. The junction of the plaster and the skirting or dado shall be neatly finished. The joints shall be filled with ordinary cement unless otherwise specified.
Skirting and dado shall be ground and polished just as for floor work but by machine suitable for the purpose. Otherwise skirting and dado may also be polished by hand by rubbing down with suitable polishing stones in three operations evenly and without scratching the surface. It shall then be thoroughly washed clean and dried as specified in clause 4.5.6.

Cast in Situ Terrazzo Flooring

Sample of the terrazzo / mosaic floor shall be approved by the Engineer-in-Charge. Workmanship for laying of cast in situ terrazzo floor shall conform to IS: 2114.

4.6.1 Surface Preparation

Before commencement of mosaic flooring work, all inside walls and ceilings shall be plastered, door frame, windows etc. shall be fixed in place and all heavy work in the room shall be completed.

The surface of the base shall be thoroughly cleaned of dirt, loose particles and laitance by scrubbing with wire brush, light chipping etc. It shall then be thoroughly swept, clean and well wetted down. The floor shall be divided into panels (not exceeding 2.5 sq. m. and the large dimension shall not exceed 2.0 M) by placing and fixing glass/Aluminium strips. The strip shall cover the full depth from base course to the top of the topping layer.

4.6.2 Preparation of Mix

4.6.2.1The terrazzo shall be laid in two layers viz. under layer and topping layer.

4.6.2.2The under layer of mosaic flooring shall be cement concrete of mix 1:2:4 (1 cement; 2 coarse sand ; 4 aggregate). The maximum size of aggregate shall not exceed 10 mm. Thickness of the under layer shall be 30 mm unless otherwise specified.

4.6.2.3The mix of topping shall consist of cement and white cement (in approved proportion) with or without pigments, marble powder, marble aggregate and water. Cement and marble powder shall be mixed dry in the proportion of 3:1 by weight. The proportion of cement shall be inclusive of any pigment added to cement. For every part of cement and marble powder mix, proportion of marble aggregates by volume shall be as follows, depending upon the size of aggregates.

Size of the Marble aggregate Proportion of aggregate to cement and marble powder mix.

For grade 00,0 & 1 1 ¾ parts
(i.e. from 1 mm to 6 mm)

For grade 2 & 3 1 ½ parts
(i.e. from 7 mm to 14 mm)

For grade 4 & 5 1 ¼ parts
(i.e. from 15 mm to 25 mm)

Complete quantities of cement and pigment required for one operation shall be mixed at the beginning of work and stored.

The thickness of terrazzo finish, that is the combined thickness of the under layer and the topping shall not be less than 40 mm. The thickness of the terrazzo topping shall not be less than 10 mm.

The mixing of materials is of utmost importance to obtain an uniform appearance. Mixing shall be carried out in a trough or tub. While mixing the aggregates, care shall be taken not to get the materials into a heap, as this would result in the coarsest chips falling to the edge of the heap and the cement coming to the center at the bottom. The materials shall be kept as far as possible in an

even layer during mixing state, water shall be added in small quantities and materials shall be worked to make the mixture plastic so that the mix shall be capable of being moulded when squeezed in hand without water flowing out. The mix shall be used in the work within half an hour of addition of water.

4.6.3 Laying

The underlayer of cement concrete shall be lid in panels after preparation of surface as explained in clause 4.6.2. The underlayer shall be spread and leveled with a screeding board to leave slightly rough surface for forming key to terrazzo flooring.

Terrazzo topping mix prepared as per clause 4.6.2.3. & 4.6.2.5 shall be laid while the under layer is still plastic but has sufficiently hardened to prevent cement from rising to the surface, which is normally achieved between 18 to 24 hours after under layer is laid. A cement slurry of same colour as the topping shall be brushed on the surface immediately before laying is commenced. The terrazzo mix shall be placed on the screed bed and compacted thoroughly by tamping and trowelled to obtain a level surface. The surface shall then be rammed in order to consolidate the terrazzo, preferably with a piece of smooth marble stone of size 15 cm x 15 cm x 2.5 cm. This may be followed by trowelling. In trowelling pressure rather than rotary action shall be used to achieve a smooth surface.

4.6.4 Curing

4.6.4.1After laying the terrazzo topping, the surface shall be left dry for air curing for a period of 12 to 18 hours depending upon temperature conditions. It shall then be cured by impounding water for a minimum period of seven days.

4.6.5 Grinding and Polishing

Machine grinding can start after seven days of laying the topping. The first grinding shall be done with carborundum stone of 60 grit size. The surface shall then be washed clean and grouted with neat cement grout of cream like consistency. It shall then be allowed to dry for 24 hours and wet cured for 4 days. The second grinding shall be done with 80 grit stone. After another surface grouting and wet curing as mentioned above, the third grinding with carborundum stone of 120 to 150 grit size shall be done. The surface then shall be grouted and wet cured again for four days. The last grinding shall be done with carborundum stone of 320 to 400 grit size and the surface then shall be washed clean and rubbed hard with felt and slightly moistened oxalic acid powder. Five grams of oxalic acid powder shall be used for one square metre of floor surface.

The floor shall be covered with oil free and dry saw dust. Prior to handing over of building to the purchaser, the saw dust shall be removed and the floor shall be washed clean with dilute oxalic acid solution and dried. Floor shall then be finally polished with machine fitted with hessian bobs of felts until the floor shines.

4.6.6 Terrazzo Skirting and dado

4.6.6.1The height of the skirting/dado shall be as per the drawing. The under layer shall be 12-15 mm cement mortar of 1:3 proportion (1 cement, 3 coarse sand) and top 7-10 mm thick layer (shall be of approved marble chips in proportion 1:2 (1 cement, 2 marble chips). The skirting/dado shall be flush with the plaster or projected as specified by the Engineer-in-Charge.

The junction between the skirting / dado andtheplaster shall be finished properly. The skirting/dado shall be hand polished.

Kotah Stone Flooring

Kotah stone can be rough, one side rough and one side polished or both side polished depending upon the nature of work. Stones shall be green in colour and free from natural defects. The quality , size and thickness (30-35 mm) of stone shall be approved by the Engineer-in-Charge.

4.7.1 Surface Preparation

Before commencement of Kotah stone flooring work, all inside walls and ceilings shall be plastered, door frames, windows shall be fixed in place and all heavy work in the room shall be completed.

The surface of the base concrete shall be thoroughly scrapped, cleaned and washed to remove dirt, loose particles and laitence by scrubbing, with a wire brush. The surface shall be thoroughly cleaned and well wetted but without forming any water pool.

4.7.2 Bedding

Before laying of bed concrete, level pads shall be set up to indicate finished floor level on the clean damp surface of the base concrete and then setting mortar bed of thickness approximately 37 mm thick shall be evenly spread. Proportion of setting mortar shall be either lime mortar 1:2 (1 lime; 2 sand) or cement mortar 1:6 (1 cement; 6 coarse sand). Setting beds shall be screeded to a true plane or sloped to drains or leveled as shown.

4.7.3 Laying and Fixing

Before laying the stone slabs over the bed of cement or lime mortar, they shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one in approved pattern keeping in check the line and level of flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded without any void. The joints should not be more than 2 mm thick and should be struck smooth.

4.7.4 Curing

The work shall be kept wet and protected for 7 days before starting the polishing. No one should be allowed to walk on the floor during the first 24 hours after it is laid. The traffic shall be allowed only after completion of curing.

4.7.5 Polishing

Polishing shall commence only after the floor as well as the joints have dried out. The floor shall be polished by machine in three operations by trained polishers using carborundum stones of approved grit sizes and then cleaned with oxalic acid. The CONTRACTOR shall also mop the floor with kerosene and water without any extra cost for at least 2-3 times daily for 7 days.

The other specification for polishing work shall remain same as described in Clause 4.5.6.

4.7.6 Skirting & Dado

The height of the skirting/dado shall be as per the drawing. The stones shall be pre-polished and machine cut and the edges shall be dressed by the fine true, straight and right angles to each other. The stones shall be fixed over cement mortar bed 1:4 (1 cement 4 coarse and). The joints shall be filled with ordinary cement. The joints in flooring shall be continued in the skirting/dado also. The joint between the top of skirting / dado and plaster shall be finished properly. The stones shall be hand and wax polished.

Vitreous Ceramic Tiles in Floor, Skirting and Dado

Ceramic tiles can be glazed, unglazed, coloured and their type, quality and size shall be approved by the Engineer-in-Charge. All tiles shall conform to IS:777.

4.8.1 Surface Preparation

Before commencement of tiling work, all inside walls and ceilings shall be plastered, door frame, windows shall be fixed in place and all heavy work in the room shall be completed.

The surface of the base concrete shall be thoroughly scrapped, cleaned and washed to remove dirt, loose particles, and laitence by scrubbing with a wire brush. The surface shall then be thoroughly and well wetted but without conforming any water pool

4.8.2 Bedding

Before laying of bed concrete or base plaster level pads shall be set up to indicate finished floor level. The tiles shall be submerged in water before laying.

Floor tiles shall be laid on 19 mm thick bedding comprising of cement sand mortar 1:3 (1 cement, 3 coarse sand).

Tiles for skirting and dado shall be fixed on a base of 12 mm thick cement sand mortar 1:3 (1 cement, 3 coarse sand).

4.8.3 Laying

Each tile shall be provided with neat cement slurry @ 3.0 kg/sq. m and glue (Araldite or approved equivalent) on the back side before laying and then shall be fixed to the bedding mortar with a wooden mallet. They shall be laid truly vertical on walls and truly horizontal on floors or to the slopes as directed. They shall be fixed as close as possible to the adjoining one and any difference in the thickness of tiles shall be evened out in the cushioning mortar so that all the tile faces are set in conformity with one another.

The tiles in dado shall be finished in such a way that, only the tile thickness projects over the finished plaster or as specified otherwise. Where full tiles are not possible, the same should be cut or sawn to the required size and their edges rubbed to ensure straight and true joints. Half tiles shall be provided at the corner of the floor or at the corner of walls and at bottom for dado work.

After the tiles are laid extra cement grout shall be removed. The joints shall be cleaned with wire brush and then the joint shall be floated with white or Grey cement as approved by the Engineer-in-Charge. The tiles shall be cured for at least seven days and cleaned.

Acid Resistant Flooring

Acid resistant tiles shall be of approved size, colour and make and conform to IS:4457.

4.9.1 Surface Preparation

Before commencement of tiling work, all inside walls and ceilings shall be plastered, door frame, windows shall be fixed in place and all heavy work in the room shall be completed.

The surface of the base concrete layer shall be thoroughly cleaned to remove dirt, loose particles etc.

4.9.2 Bedding and Laying

Two coats of bitumen primer shall be applied over the base concrete layer. Primer shall be of heavy grade, corrosion resistant and shall conform to IS:158, type 2.

The bitumastic impervious interliner of 12 mm – 15 mm thickness shall be applied over bitumen primer described above. It shall consist of a mixture of straight run bitumen of softening point 145 + 50 C and clean dry coarse quartz power free from lumps. This mixture at a temperature around 180 degree C or above shall be sufficiently plastic to be poured into place and compacted by wooden trowel or by other suitable means to provide a compact, lean tight resilient membrane. The specific gravity of mastic shall be approximately around 2 and penetration at 25 degree C (100 gms/5 mm) shall be above one.

For bedding, laying and jointing K-Silicate cement (two pack self hardening) conforming to IS:4832 part I shall be used. The bedding and jointing shall be at least 6 mm thick.

Furacin cement shall be used for jointing purpose and shall be self hardening (A two pack product conforming to IS:4832 (Part II). In case of hydrofluoric acid service, carbon fillers shall be used. In case of concentrated sulphuric acid having temperature not exceeding 4 degree C sulphur cement conforming to IS:4832 (part III) shall be used.

4.10 PVC (Vinyl) Tiles Floor

PVC tiles flooring shall be approved size, colour, make and shall conform to IS:3461.

4.10.1 Surface Preparation

PVC tiles shall be laid on the leveled finished floor. If there are undulations in the floor, the same shall be made good by screed topping and should be finished with trowel to achieve the finish.

4.10.2 Laying and Fixing

PVC flooring shall be laid after the completion of plastering, painting and other decorative finishing work so as to avoid any accidental damage to the flooring. Prior to laying, the flooring tiles shall be brought to the temperature of the area in which it is to be laid by stacking in a suitable manner within the laying area for a period of 24 hours.

Where air conditioning is installed the flooring shall not be laid on the sub-floor until the conditioning units have been in operation for at least seven days. During this period the

temperature shall neither fall below 20 degree C. There conditions shall be maintained during laying and for 48 hours thereafter.

Before commencing the laying operations, the sub-floor shall be cleaned with a dry cloth. PVC flooring shall not be laid on sub-floor unless it is perfectly dry. The dryness shall be tested in accordance with Appendix A of IS:5318.

The adhesive shall be applied by using a notched trowel to the sub-floor, and to the back side of the PVC tiles. When set sufficiently for laying the adhesive will be taken to the touch but will not mark the fingers. When the adhesive just tack face, the tiles shall be carefully placed in position from one end onwards slowly so that the air will be completely squeezed out between the tile and the background surface (care shall be taken not to slide the tile in position). It is preferable to start laying of tiles from the centre of the area. Care shall be taken to lay the tiles close to each other with minimum gap between the joints. After laying the tile in position it shall be pressed with suitable wooden roller (about 5 kg in weight). Any undulation noticed on the PVC surface shall be rectified by removing and relaying the tiles after thorough cleaning of the underside of the affected tiles. The adhesive applied earlier in such places shall be removed by using proper solvent and the surface shall be cleaned to remove the traces of solvent used.

Any adhesive which may squeeze up between the tiles shall be wiped off with a wet cloth before the adhesive is hardened. If, by chance, the adhesive dries up and removed with a solution of one part of commercial butyle acetate and three parts of turpentine oil.

Wherever, the edge of PVC tiles are exposed it shall be protected with metallic edge strip securely fastened to the sub-floor against damage of the material.

A minimum period of 24 hours shall be given after laying the flooring for developing proper bond of the adhesive. During this period the flooring shall not be put to any service.

SPECIFICATION FOR BLAST CLEANING & PAINTING OF MILD STEEL STRUCTURES

1.0 GENERAL

1.1 These specifications define basic requirements for painting of steel structural sheds, Pump House, tower etc.

1.2 It is deemed that the work shall be carried out by the contractor with the best quality of specified material and workmanship at his own cost.

1.3 Adequate numbers of required tools, brushes, blast material, scaffolding, shot/Blasting equipment, air compressors etc. shall be arranged by the contractor at site.

1.4 During storage and application of paints, the paint manufacturer's instructions shall be strictly followed. Particular attention shall be paid to the following:

1.5 Proper storage avoiding exposure and extreme temperature.

1.6 Specified surface preparation.

1.7 Mixing and thinning.

1.8 Application of paints and the recommended time intervals between consecutive paint coats.

1.9 Two pack paint system will be mixed by mechanical means. The Site Engineer/ Engineer-In-Charge may allow hand mixing of small quantities at his discretion.

2.0 MATERIAL SPECIFICATION

2.1 SHOT/GRIT: The sand/grit used for Blasting shall be free from moisture, impurities salt and shall have a maximum particle size of not more than passing through a 500 micron mesh (IS.)

2.2 BRUSHES: The brushes used in painting shall conform to IS: 384

2.3 PRIMER COAT: The primer used must provide good protection against corrosion and shall leave a tough adherent film which will form a suitable base for the following coats. It shall conform to given specifications.

2.4 FINISH COAT: The finish coats shall conform to given specifications.

2.5 Only superior grade paints of approved make and quality and conforming to given specification shall be used. Contractor shall obtain approval from site engineer in writing before procurement of primer/paint etc. and shall obtain approval from site in sealed and unopened condition for inspection and approval of site engineer/ engineer-in-charge for use of paints at site.

2.6 **GENERAL NOTES**

2.6.1 The blasted surface shall not be kept exposed to atmosphere for more than 24 hours (particularly at night time when humidity %age in atmosphere is more and might spoil the surface prepared).

2.6.2 The first coat of primer shall be applied soon after cleaning and before any visible rusting occurs.

2.6.3 The paint coat shall be smooth and even and shall not show any trace of brush mark. The bands, lettering, etc. shall be carried out as per drawing after the external painting is completed.

3.0 PAINTING

3.1 **SURFACE PREPARATION**

3.1.1 Before Blasting surface shall be cleaned thoroughly leaving it free of all scales, dust, grease, oil coating, moisture and other impurities with the help of brass wire brushes, sand paper, emery paper etc.

3.1.2 Wherever required any weld metal etc. shall be ground off by grinding machine to get smooth polished surface.

3.1.3 Heavy deposits of grease of oily matter if any shall be removed by suitable solvent wash before Blasting is undertaken.

3.2 **BLASTING**

3.2.1 Blast cleaning shall conform to SA 2½ standard as per Swedish Standard SIS 055900-1967 or equivalent i.e., Blast cleaning to near white metal cleanliness, until 95% of each element of surface area is free of all visible residues.

3.2.2 Before Blasting, the surface have to be cleaned thoroughly leaving it free from all scales, dust, grease, oil coating, moisture and other impurities. Any weld metal etc. shall be ground by grinding machine to get a smooth surface. Heavy deposit of greases of oily matter if any shall be removed by solvent wash.

3.2.3 Good quality shot/grit is to be used for blasting of surface

3.2.4 Minimum air supply pressure to be maintained at the delivery nozzle is 7 kg/cm2 (100 psi aprox.) during blasting operation.

3.2.5 The compressor capacity shall be checked to ensure that it is capable of giving the requisite volume of air at specified pressure based on the nozzle size and type employed for Blasting.

3.2.6 The three common sizes of sand blast nozzles for general maintenance painting and air flow requirements are as follows:

Nozzle size	Air flow requirement
¼"	150 cfm
5/16"	240 cfm
5/3"	393 cfm

3.2.7 Compressor capacity for each type of nozzle should be at least 25 to 30% above the rated amount of air required for that size of nozzle.

3.2.8 Compressor should have moisture oil trap. At least 1" internal diameter hose has to be used if the distance from the air compressor to sand blaster is about 50 ft. long or more to avoid excessive pressure drop across the hose.

3.2.9 Blast cleaning shall not be performed where dust can contaminate surfaces undergoing such cleaning or during humid weather conditions (humidity exceeding 85%).

3.2.10 After Blasting, the surface need to be cleaned by dry brush or by dry compressed air (free from moisture and oil) to remove sand, dust or silica deposits.

3.2.11 Irrespective of method of surface preparation, the first coat of primer must be applied on dry surface by airless/conventional spray and as directed by Site Engineer. Delaying the primer application is not advisable beyond 2 hours if weather is dry and humidity level is less than 80% and if primer is applied within 4 hours, there is no need to provide inhibitor wash over the blasted surfaces if it is not possible to apply primer within 4 hours, then application of inhibitor is a must. It is essential to preplan the activities to start the primer application immediately after Blasting.

3.2.12 The surfaces shall be blast cleaned using one of the abrasives, sand or chilled cast iron or malleable iron and steel at pressure of 7 kg/cm2 at appropriate distance and angle depending on nozzle size maintaining constant velocity and pressure. Chilled cast iron, malleable iron and steel shall be in the form of shot or grit of size not greater than 0.555" maximum in case of steel and malleable iron and 0.04 in case of chilled iron".

3.2.13 Blast cleaned surface should be inspected by using magnifier glass or surface profile for anchor patterns. Surface profile in blast cleaning should ideally be 50 to 70 microns (generally 1/3 of the total DFT).

3.2.14 Arrangements for inspection at various stages of work should be made available so that entire blasted area is accessible for inspection.

3.2.15 When carrying out blast cleaning on the structural steel, the work shall always be done in such a manner with respect to the wind direction that the abrasive practices are blown away clear of the steel area.

3.3 **CLEANING**

3.3.1 Abrasives or dirt particles and the other metals shall be removed from the blasted surface by means of clean soft brush or vacuum or compressed air (free from oil and moisture).

4.0 PAINTING SUMMARY:

4.1 PAINTING OF STEEL STRUCTURE: Table 1.

4.2 RE-PAINTING OF MS STRUCTURALS/ PIPES/ PIPE FITTINGS: Table 2

Table - 1

Type	Structural Steel
Surface Preparation	Blast clean to SA 2½
Paint system Recommended	One coat of P1 (75-80μm) + One coat of U1 (120-125 μm) + Two coats of F1 (25 μm *each)*
Thickness of paint system	**230 μm *(Minimum)***

Table – 2

RE-PAINTING FOR PIPELINES/FITTINGS/ MS STRUCTURAL:

- Surface preparation to SSPC SP2
- One coat of Tie coat (200 μm)
- One coat of F1 (50 μm)

TOTAL SYSTEM THICKNESS: 255 μm *(Minimum)*

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5.0 SPECIFICATIONS FOR PAINTS

5.1 PRIMERS

5.1.1 ZINC ETHYL SILICATE PRIMER – (P1)

The zinc ethyl silicate consists of two packs. One pack contains the ethyl silicate binder with suitable solvents. The other pack contains zinc dust with additives. They have to be mixed in suitable proportions before application as recommended by manufacturer.

Colour	:	Gray
Application	:	Spray (airless/air)
Dry film thickness per coat	:	75 microns
Theoretical coverage	:	8 sq.m/litre
Drying time	:	4 hours
Re-coating time	:	10 hours (min.)
% of total metallic zinc in dryfilm	:	85 – 90% by wt.
(As per the ASTM D520 – Spherical size Storage life	:	4 months under sealed conditions

5.1.2 TWO PACK EPOXY POLYAMIDE ZINC PHOSPHATE PRIMER: (P2)

These coatings are corrosion resistant inhibitive primers based on cold cured epoxy – polyamide two pack systems, over which subsequent coatings can be applied

Type of epoxy	:	Condensation product of bisphenol A and Epichlorohydrin with terminal epoxides Groups
Epoxide equivalent	:	450 - 500
Curing agent	:	Polyamide
Volume solids	:	45-50%
Pigment	:	The main pigment shall be a mixture of iron oxide with zinc phosphate. Out of total pigmentation, the minimum quantity of zinc phosphate should be 9% W/W.
Pigment volume concentration	:	40-45%
Application	:	By brush or spray
Dry film thickness / coat	:	75 microns
Spreading rate	:	6 – 7 sq. m / litre
Drying time	:	Surface dry in four hours

Over coating time	:	24-48 hours. This should be very strictly adhered to in order to avoid peeling of subsequent coat.
Storage life	:	12 months under sealed conditions.

5.1.3 REDOXIDE ZINC PHOSPHATE PRIMER (P3)

This primer is based on single pack modified alkyd medium pigmented with a mixture of zinc phosphate and red oxide.

Volume solids: 40 + 2%

Main Pigment: A mixture of zinc phosphate and Red oxide. Out of the total pigmentation, the minimum quantity of zinc phosphate should be 10 %.

Color: Brown

Pigment Volume Concentration: 30-35%

Application: Brush or spray

Dry film thickness per coat: 30-35 μ

Theoretical coverage: 11 – 13 sqm/litre

Drying time: Touch dry- 1 hour

Hard dry- over night

Over coating time: Minimum – over night

Storage life: 6 months under sealed conditions

5.1.4 MASTIC COATING (P4)

This is a two pack high build, modified aluminium epoxy mastic coating possessing self priming properties and good adhesion to even rusted steel or aged paints. The coating is tolerable to under prepared surfaces.

Volume solids	:	90 ± 2
Colour	:	Aluminium
Application	:	by brush air less spray
Dry film thickness / coat	:	175 microns
Theoretical coverage	:	5 sq.m / litre
Overcoat interval	:	24-48 hrs. This should be very strictly adhered to in order to avoid peeling of subsequent coat.
Storage life	:	12 months under sealed conditions

5.1.5 TWO PACK EOPXY – POLYAMIDE MIO UNDERCOAT (U1)

These coatings are high build paints based on cold cured epoxy polyamide system pigmented with chemically inert pigments and extenders formulated to permit application at a DFT higher than 100 microns per coat.

Type of epoxy	:	Condensation product of bisphenol A and epichlorohydrin with terminal epoxides groups.
Epoxide equivalent	:	450 – 500
Curing agent	:	Polyamide
Volume solids	:	55 – 60%
Pigment	:	The main pigment shall be micaceous iron oxide (MIO – about 65% w/w of total pigments.
Pigment volume concentration	:	40-45%
Application	:	By brush or airless spray
Dry film thickness / coat	:	110-120 microns
Spreading rate	:	5 – 5.5 sq.m/l
Drying time	:	Touch dry in 2 hours, hard dry in 48 hours
Overcoating time	:	24-48 hours. This should be very strictly adhered to in order to avoid peeling of subsequent coat.
Storage life	:	12 months under sealed conditions

5.2 FINISH PAINTS

5.2.1 TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT (F1)

Part A and Part B are to be mixed together to form a pigmented polyurethane paint in suitable proportions as recommended by manufacturer.

Part A consists of polyacrylate polyol with appropriate pigments, extenders, solvents and additives. Part B consists of an aliphatic poly isocyanate with appropriate solvents and additives.

Volume solids	:	45%
Main pigment	:	Rutile TiO2 (min.80% w/w on total pigment weight) and extenders with other suitable pigments to get the desired colour
Colour	:	As desired
Pigment volume concentration	:	15-20%
Application	:	Brush or spray
Dry film thickness per coat	:	30-35 microns
Theoretical coverage	:	11-13 sq.m/litre
Drying time	:	Surface dry 1 hr. Full cure 7 days.
Storage life	:	3 months under sealed conditions

5.2.2 COAL TAR EPOXY: (F3)

A high build two component epoxy coal-tar product meant for excellent performance under total / partial / intermittent immersion conditions in salt or fresh water. It is a blend of epoxy and coal-tar pitch in suitable ratios.

Type of epoxy: Condensation product of bisphenol A and epichlorohydrin with terminal epoxides groups.

Curing agent: Polyamide

Volume solids: 80-85%

Application: By brush or airless spray

Dry film thickness / coat: 150-200 microns

Spreading rate (Theoretical): 4 - 5 sq.m/l.

Drying time: Touch dry – overnight dependent on ambient temperature and ventilation. Hard dry – in 48 hours.

Over-coating time: 24-48 hours. This should be very strictly adhered to in order to avoid peeling of subsequent coat.

Storage life: Up to 9 months under sealed Conditions

5.2.3 SYNTHETIC ENAMEL (F4)

A high quality enamel based on synthetic resin vehicle stable weather resistant pigment designed for both protection and decoration.

Volume solids: 38-40%

Application: By brush or conventional spray

Dry film thickness / coat: 25 microns,

Spreading rate (Theoretical): 15 sqm/l.

Drying time: Surface dry - 4 hrs.

Hard dry: in 18 hrs.

Storage life: 12 months under sealed conditions

5.2.4 TWO PACK EPOXY BASED TANK LINER (L1)

These coatings are high build paints based on epoxies and cured with polyamines or modified epoxy-phenolic and cured with amine adduct. They are specially meant as liners to interiors of petroleum tanks formulated to permit application at a DFT of 125 microns per coat.

Volume solids	:	50 – 60%
Pigment volume concentration	:	35 – 40%
Dry film thickness um/coat	:	125 microns
Spreading rate	:	4-5 m2/litre
Storage life	:	12 months under sealed conditions

5.2.5 TIE COAT:

Colour: Aluminium/ any shade

Gloss: Semi gloss

Volume Solids – 80 – 82%

DFT: 150 – 200 microns

Dry time: 7-9 hours

Application: By airless/air spray

Over coating interval: 12-18 hours

PRECAUTIONS TO BE TAKEN DURING PAINTING

Precautions to be taken during application of epoxy and polyurethane paints.

- Do not apply when temperature falls below 10°C or rises above 50°C and when relative humidity rises above 90%. Do not apply during rain, fog or mist.
- Use all the mixed paints within the stipulated pot life period indicated by the manufacturer.

Precautions to be taken during application of Inorganic Zinc Ethyl Silicate Primer

The coating must be fully cured and free from residual solvents before over coating, which normally takes 24 hours but time may be extended if relative humidity is below 80%. While over coating, it is desirable to apply a mist coat first to avoid bubbing problem which appears due to air entrapment.

6. **STORING OF PAINT:** For the storage of paints, special storage space should be set up and handling of paints should be as follows:

i. All paints should be stored in the place with the mark of "NO FIRE (PAINTS STORAGE)". Open flames should be strictly forbidden.

ii. The storage place should be a separate house and distance from other surrounding building must be more than 1.5 m.

iii. In case a part of main building is used for this purpose, the room for storage should be fireproof or anti-fire construction.

iv. The roof of the storage should be covered with fireproofing materials.

v. Each storing room should have extinguishers and sufficient quenching sand. If storing capacity is small, only quenching sand should be provided.

vi. It should be a well-ventilated room free from excessive heat or direct rays of the sun.

vii. All paint should be kept away from dust.

viii. All paint should be stored, sealed tightly and safely.

b. **BURN AWAY OF CLOTH OR OTHER MATERIALS**

i. Paint soaked cloth and other materials may cause spontaneous combustion. So it should be burnt away in the assigned place without storing it in the storing place.

ii. Open air storage should be avoided as direct heat from the sun causes serious deterioration.

iii. Paint in which the pigment has set to a hard mass which cannot be reused by correct mixing should be rejected. Paint which has gelled should be rejected.

c. **INSPECTION**

i. For both primer and finish coat no deviation on dry film-thickness shall be tolerated.

ii. Additional coat of paint shall be provided if reduction in thicknesses is noticed. (At

iii. no extra cost).

iv. Engineer-in-charge and / or his representative shall be the inspecting authority of

v. the work.

d. **SAFETY**

i. All safety regulations and requirements in force, as stipulated in Projects. Site rule shall be strictly adhered to by painting contractor.

ii. Any spillage's of volatiles shall be wiped up immediately, oily or solvent rags shall not be allowed to accumulate anywhere within the job site and shall be kept in closed container before disposing off.

iii. Material shall be stored in a store to be built by contractor and approved by Site Manager for storage of painting material.

7.0 INSPECTION FORMAT DURING PAINT APPLICATION

Surface preparation adopted	
Type of primer used	
Method of application	
Date and time of application	
Whether condition prevailing on the day of application (temp.) humidity, rainy, sunshine)	
DFT measured (24 hour later)	
Method of application	
Date of time of application	
Whether condition on the day of application	
DFT measured	
Type of subsequent paint	
Method of application	
Date and time of application	
Whether condition on the day providing and fixing application.	

8.0 CHECKLIST FOR PAINTING

IndianOil

IOCL Painting Manual, Rev.-1, June 2015

CHECKLIST FOR PAINTING

Location: _____ Equipment No.:_____

Area of Application: _____

Sr No.	Item	Checked & Found Satisfactory (Y/N)	Remarks	Signature & date
1.	Batch test certificates of the paints available at site			
2.	Painting is of correct spec.			
3.	Compressor is of right CFM			
4.	Air receiver and safety valve test certificate			
5.	Humidity is checked & found satisfactory as per the requirement of paint spec.			
6.	Abrasive used is of proper size			
7.	Blasting pressure at the nozzle tip is 7 kg/cm^2.			
8.	Correct size nozzle is used			
9.	Blasted surface is compared to the pictorial standards and profile measured.			
10.	Abrasive is removed from the blasted surface with soft cloth or air before application of primer			
11.	Mixing of the primer is done as per the spec.			
12.	Correct type spraying gun is used for primer application.			
13.	Primer is applied within specified time as per the spec.			
14.	Availability of a digital elcometer			
15.	DFT checked at random			
16.	Application of 2^{nd} coat of primer			
17.	DFT checked			
18.	Application of 1^{st} finish coat			
19.	DFT checked			
20.	Application of 2^{nd} finish coat			
21.	DFT checked			
22.	Overall DFT as per spec.			

9.0 Quality Assurance Plan for PAINTING

IOCL Painting Manual, Rev-1, June 2015

QUALITY ASSURANCE PLAN

Sr. No.	Activities	Ref. Std.	Item to Check	Hold Points	Equipment/ Tool	To be done by	Inspection by	Acceptance Criteria
1	Surface Pre treatment	ISO 8501-3	Weld, Edges, Corners, Holes, Notches, crevices.	Post hot work & Pre surface preparation	Grinder, Hammer, metal file, other tools	IOCL appointed vendor	IOC / Paint Manufacturer's Inspector	As per P3 0f ISO 8501-3, edges round off - 2mm, surface should be free of weld slag, spatter,porosity, undercut other weld defect
2	Raw Material Inspection	As per IOC specification	• Data Sheet • MSDS • Manufacturer's Test Certificate	Pre-Coating Application	1.Visual Inspection 2.Surface Preparation Tools: Solvent, Bresle Test Kit,wire brush tools,coarse emmery paper-40/80(Silicon Carbide) other tools & tackles	Painting Vendor	IOC / Paint Manufacturer's Inspector	As per specification Material to be used as per shelf life. Safety and storage is as per MSDS
3	Safety	As per MSDS	MSDS	Pre-Coating Application	Safety helmet, eye goggles, ear plug, body coverall, hand gloves, safety shoes, full body safety belt, face mask, face protector (washing)	Painting Vendor	IOC	Availability of all safety consumables during paint application. Requirement as per respective locations procedures/ guidelines to be strictly followed. Test certificate of air vessel and safety valve.

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IOCL Painting Manual, Rev-4, June 2015

Sr. No.	Activities	Ref. Std.	Item to Check	Hold Points	Equipment/ Tool	To be done by	Inspection by	Acceptance Criteria
4	Ambient Condition	ASTM E 337	Dry & wet bulb temperature, % Relative Humidity, Dew point Temperature, Surface Temperature	Pre-Coating Application	Surface temperature gauge, hygrometer, Dew point calculator	Painting Vendor	IOC / Paint Manufacturer's Inspector	RH<85%. Substrate temperature then Dew Point Temp by at least 3°C. To be monitored an recorded on hourly basis. Application below 50°C and greater than 10°C only.
5.1	Surface Preparation: 1. Abrasive Blast clean to SA 2½	SIS 0559 00 / ISO 8503	Surface to be blast cleaned to match the Grade of SA 2½ as per SIS 0559 00 / ISO8503 / SSPC SP10/ NACE STANDARD	Pre-Coating Application	Visual & random blast/ anchor profile shall be made on one per ten(10) square meters	Paint Vendor	IOC / Paint Manufacturer's Inspector	The surface profile measurements shall not be less minimum value specified by the paint Manufacturer. **(Silica sand, potentially silica containing material and copper slag not permitted.)**
5.2	Surface preparation: 1.To remove all oil & grease by solvent cleaning. 2.All loose paint, rust scale, blisters are removed by hand tool.3. Heavy scaling prior to be removed by impact tools like hammer followed emery paper & wire brush 4.Surface cleaning to SSPC ST3	SSPC SP1/ SP2 /ST3	1. No oil Grease contamination 2. All loose material should be removed 3. Check adhesion as per ASTM 3359 (Before painting on old Paint)	Pre-Coating Application	Visual	Painting Vendor	IOC / Paint Manufacturer's Inspector	SSPC SP-1(remove excess grease and spray clean with solvent). SSPC SP3/ST3 (Heavy scale removal by Impact tool followed by power tool)

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IOCL Painting Manual, Rev-4, June 2015

Sr. No.	Activities	Ref. Std.	Item to Check	Hold Points	Equipment/ Tool	To be done by	Inspection by	Acceptance Criteria
6	1. Water washing after surface preparation (Refer 5.2) & also before coat application if over coating interval more than seven days or salt level more than acceptable limits. Detergent to be used prior to water wash for complete removal of Algae/ microorganisms. 2. Salt contamination test.	NACE No.5/ SSPC SP12 ISO 8502-9	1. Low pressure water cleaning of the substrate 2. Free from salt contamination. Salt level below 5µgm/cm²	Pre-Coating Application	Extraction of soluble salt and conductometric test – The Bresle method using Bresle Salt Kit.	Painting Vendor	IOC / Paint Manufacturer's Inspector	5µgm/cm². Test frequency to be decided by IOCL/ paint Manufacturer's Inspector based on site condition. Fresh water TDS to be less then 150 ppm.
7	Recording of DFT of the coating prior to application	SSPC – PA2	100 % area to be recorded as per SSPC PA2 frequency	Pre-Coating Application	DFT meter	Painting Vendor	IOC / Paint Manufacturer's Inspector	SSPC PA2
8	X cut Adhesion test	ASTM D3359/ ISO4624	Random checking to be done	Pre- Coating application in case of shop coated & after drying of each coat.	-	Painting Vendor	IOC / Paint Manufacturer's Inspector	5A or 4A (post 7 days curing) if tested as per ASTM D3359. 5 Mpa if tested as per ISO 4624
9	Mixing & Thinning	As Per Data Sheet	Material mix with power stirrer before application	Pre- coating application	Mechanical stirrer/ mixer	Painting Vendor	IOC / Paint Manufacturer's Inspector	Compliance of paint Data Sheet
10	First stripe coat application	As per standard Industry Practice	All weld joints, Edges & pitted area should be striped coated before painting by brush	During coating application.	Epoxy grade brush with long and flat handle	Painting Vendor	IOC / Paint Manufacturer's Inspector	Stripe coat should be visible and checked for all applicable areas.

Developed by M&I, RHQ, New Delhi

SPECIFICATIONS FOR FALL ARRESTOR SYSTEM

1.0. This section intends to provide Technical Specifications & data sheets for the Life Line based Fall Arrestor system to be installed at TLF Gantry, Locker Shed, Calibration Tower, TTD Shed.

2.0. The arrangement of 1 set of Fall Arrestor system for each bay consist of the following:

a. SS Wire rope: Minimum 10 M
b. Shock Ansorber: 1 no
c. Tensioner: 1no
d. Cable Extremity plate: 2 nos
e. Carriage Body: 2 nos
f. Anti-static full safety harness: 2 nos
g. Retractable block: 2 nos

(Note: The items mentioned above shall be provided as minimum for providing fall arrestor system as per the respective items of price schedule. Payment for required structural supports shall be paid under respective items of the price schedule)

3.0. The detailed scope of supply is mentioned under each technical portion of tender document and standard specifications.The scope of supply (includes transportation, packing, forwarding, transit insurance, testing, erection & commissioning, TPI) in brief, as given here below, shall be read in conjunction with the scope of supply under various sections of the tender document.

4.0. necessary tests shall be conducted by the bidder to determine whether the equipment with auxiliaries offered conform to the relevant standards and specifications as listed in this tender. Such tests shall be conducted after arranging the equipment in a manner representative of actual service conditions at the site and the external component and fittings in places which are likely to affect the performance.

5.0. Compliance with this specification will not relieve the bidder of his responsibility for supplying the equipment/item of proper design, material and workmanship to meet the specified operating requirements and also proper workmanship and performance of the facilities under the contract.

A. SS CABLE (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN STANDARDS)

1	Application	Stainless steel cable as horizontal life line system. The user may connect to the cable and work safely. Both ends are terminated by swage less termination technology

B. CABLE EXTRIMITY (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN STANDARDS)

1	Application	Swage less crimping of cable. Swage less crimping to be neat with no loose ends and to be more robust.

C. CARRIAGE BODY (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN **STANDARDS**)

1	Application	The carriage is the connecting device to the horizontal life line system and the user. It is designed to move freely on the life line and cross the intermediates along the length of life line.

D. SHOCK ABSORBER (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN **STANDARDS**)

1	Application	Energy absorber takes the impact force in the event of a fall in the horizontal life line system. Protects the receiving member of the structure. The tension indicator helps giving required tension to the cable in the system. The fall indicator warns of any fall in the system or overloading on the system. It is installed at the starting end of life line

E. UNIVERSAL EXTREMITY PLATE (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN STANDARDS)

1	Application	Extremity - Lifeline end part provides the anchoring of the cable end to the structure. It must withstand the Forces generated in the event of a fall.

F. INTERMEDIATE (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN STANDARDS)

1	Application	Intermediate brackets acts as spans in the system. It allows the carriage to pass through without disconnection of connecting device.

G. TENSION DEVICE WITH SWAGELESS TERMINATION (CONFORMING TO: EN-795 CLASS: C or EQUIVALENT AMERICAN STANDARDS)

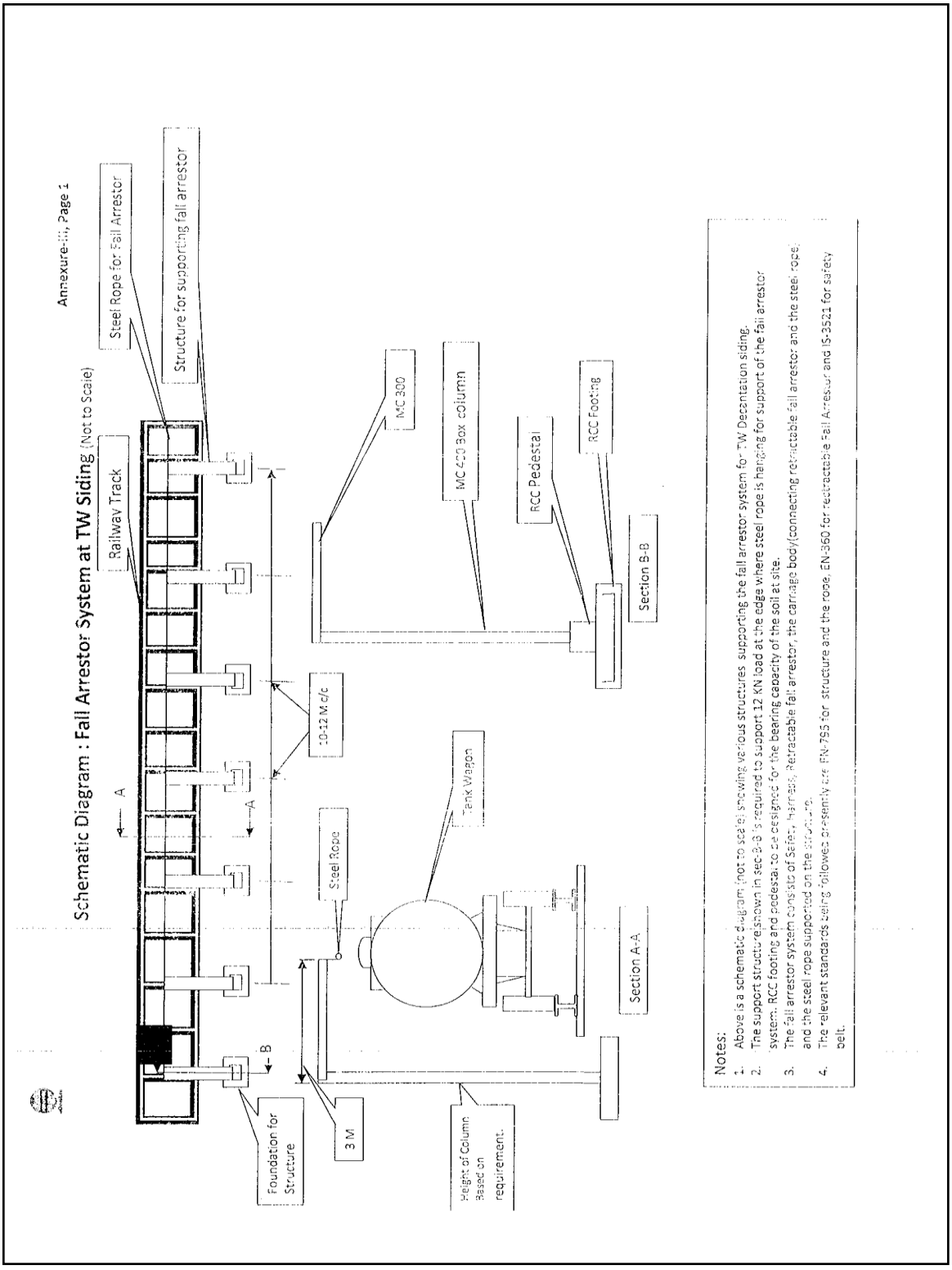
1.	Applications	The tension device is an interconnection piece between the cable and energy absorber with cable length adjustment feature. The tension device has swage less termination to connect the tension.

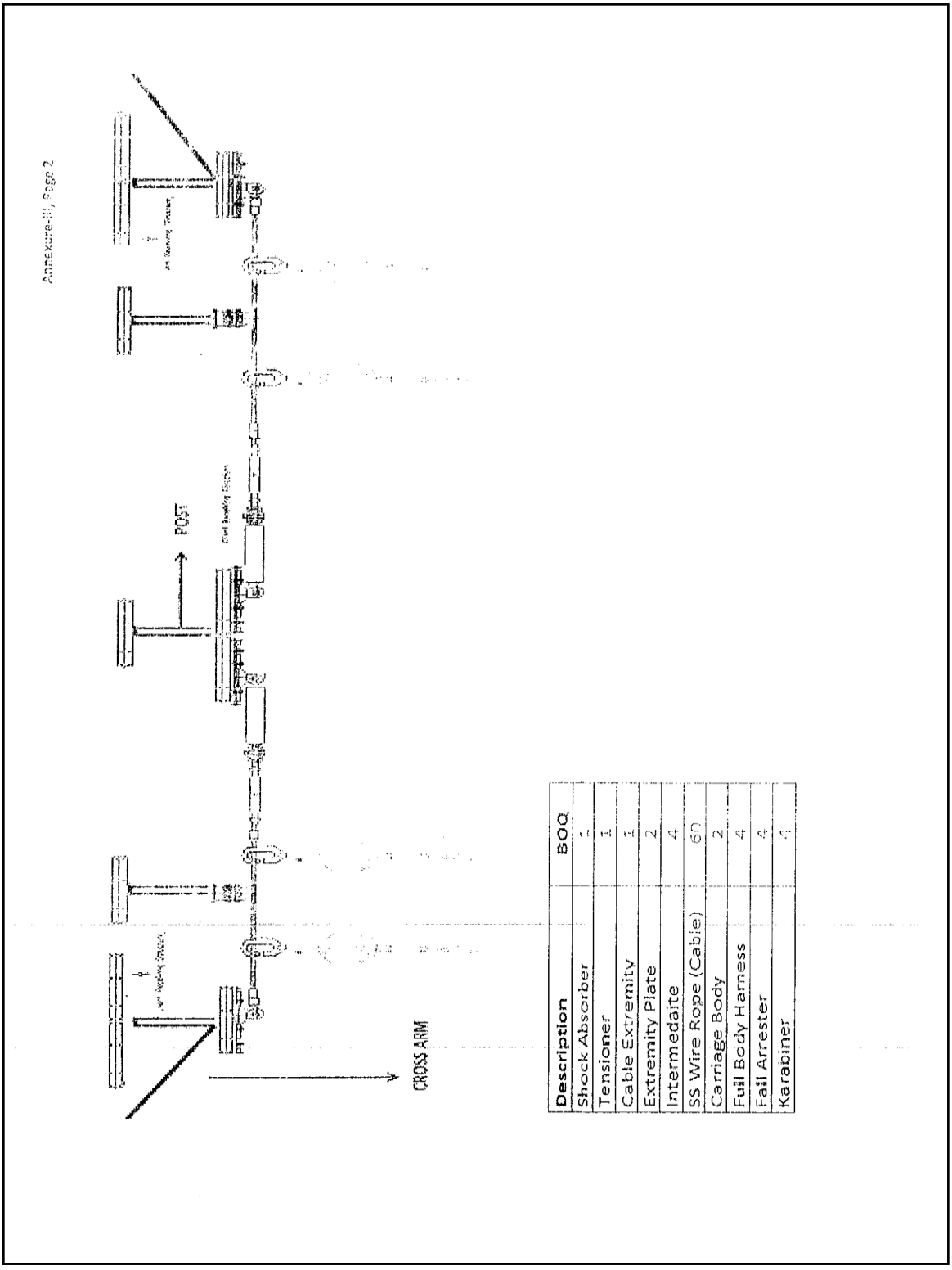
H. RETRACTABLE FALL ARREST BLOCK (CONFORMING TO EN-360 : 2002)

1	Applications	Robust and Durable Plastic Casing made from high impact strength Polymer. Has a Swivel Anchorage eye at one end; and a Swivel Steel Snap Hook at the retractable end.

I. FULL BODY HARNESS (ANTI STATIC) (CONFORMING TO EN 361:2002)

1	Applications	One dorsal attachment D-ring for fall arrest. Two front textile loops used together for fall arrest. Adjustable shoulder & thigh straps. Sit strap Colour of straps bright fluorescent orange thigh strap, green with orange stripes shoulder strap. Has a Tell-Tale indicator to illustrate if the harness has already had a fal.

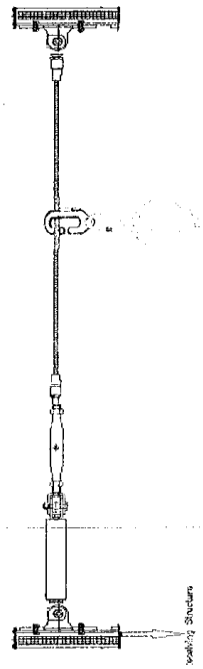

Annexure-III, Page 1
Schematic Diagram : Fall Arrestor System at TW Siding (Not to Scale)
Steel Rope for Fall Arrestor
Structure for supporting fall arrestor
Railway Track
MC 300
MC 450 Box column
RCC Pedestal
RCC Footing
Section B-B
10-12 M c/c
Tank Wagon
Steel Rope
Section A-A
Foundation for Structure
3 M
Height of Column based on requirement.
Notes:
1. Above is a schematic diagram (not to scale) showing various structures supporting the fall arrestor system for TW Decantation siding.
2. The support structure shown in sec-B-B is required to support 12 KN load at the edges where steel rope is hanging for support of the fall arrestor system. RCC footing and pedestal to be designed for the bearing capacity of the soil at site.
3. The fall arrestor system consists of Safety Harness, Retractable fall arrestor, the carriage body(connecting retractable fall arrestor and the steel rope) and the steel rope supported on the structure.
4. The relevant standards being followed are EN-795 for structure and the rope, EN-360 for retractable Fall Arrestor and IS-3521 for safety belt.

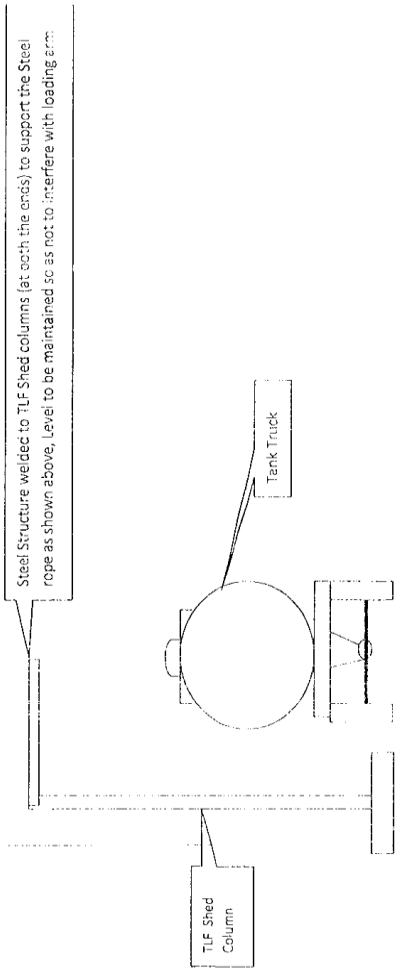


Description	BOQ
Shock Absorber	1
Tensioner	1
Cable Extremity	1
Extremity Plate	2
Intermedaite	4
SS Wire Rope (Cable)	60
Carriage Body	2
Full Body Harness	4
Fall Arrester	4
Karabiner	4

Annexure-IV

Description	BOQ/Line
Extremity Plates	2 nos
Shock Absorber	1 no
Tensioner	1 no
SS Wire Rope	As per size
Cable Extremity	1 no
Carriage	1 no
Fall Arrester	1 no
Full Body harness	1 no





DATA SHEETS FOR FALL ARRESSOR SYSTEM ACCESSORIES

1.0 Main Cable for Horizontal Anchorage Line:

1)	Diameter	:	Min. 8 mm
2)	Material	:	SS 316 meeting the requirements of EN 795 Class C standards or Equivalent American Standard
3)	Construction	:	7 x 19
4)	Cable extremity	:	Swage less termination built in SS 304
5)	Extremity Plate	:	Stainless Steel 304
6)	INTERMEDIATE SUPPORTS	:	SS 304 AT 10 M. ± 2 M.c/c
7)	Tensioner	:	SS 304 with swage less termination of end wire
8)	Shock absorber	:	SS 304 construction to limit impact force in event of Fall to less than 6.5 kN.

2.0 Retractable Fall Arrestor Block:

1)	Casing	:	Reinforced Plastic
2)	Hanging Rope	:	Stainless Steel Wire rope of dia 4.5 mm
3)	Anchorage type	:	Anchorage eye with swivel action
4)	Standard	:	EN 360:2002 or Equivalent American standard
5)	Length of rope	:	To be site specific as per site condition
6)	Connection to main cable	:	Through Aluminium Karabiner connected to the stainless steel carriage shuttle ensuring 100% anchorage at all times.
7)	Carriage body	:	SS 316 with friction free movement

3.0 Anti-static Full Body Adjustable Harness :

Anti static Full body adjustable harness with two front adjustable loops without lanyard, shoulder and thigh strap differentiated by a dual colour scheme, ideally positioned sit strap for extended comfort, two chest attachment textile loops and a dorsal attachment Aluminium D ring for fall arrest, adjustable shoulder and thigh straps conforming to EN 361:2002 complete.

The total fall arrestor system shall be certified to Indian or International Standards for use in potentially explosive atmospheres. All other sub-components, fixtures and fasteners should be in compliance with the respective EN or American standard specified above. The system should be subject to IOCL approved 3rd party inspection agency for confirmation of the specs and tests as per relevant standards.

To ensure correct installation the entire line should be proof loaded at site to a static force of 6 kN.

4.0 QAP, INSPECTION & TESTING:

Vendor shall submit QAPs for each item/ components for approval by IOCL or its TPI agencies. All the materials used in the manufacture of the Retractable stair shall be subjected to examination for testing and approval by IOC/ TPI Agency appointed by IOC prior to and after manufacture. Manufacturer (OEM vendor) shall furnish all necessary information concerning the supply to owner. After completion of manufacture and prior to dispatch, the entire unit shall be subjected to demonstration & acceptance tests for approval by IOC/ TPI Agency appointed by IOC. IOCL/ its TPI Agency reserves the right to witness all the tests as per approved QAP with sufficient advance notice.

5.0 DOCUMENTATION:

Following minimum documentation in 3 sets is to be submitted by the OEM vendor:

a. All material test certificates used for fabrication as per QAP approvals.
b. Inspection Release Notes.
c. Certificate of conformity to required design.
d. As built drawings.

All the certificates shall be approved by IOC/ its TPI Agency for acceptance before dispatch of the retractable stairs.

6.0 WARRANTY:

All the components forming part of the Stair assembly shall be under Warranty for a period of 24 months from the date of supply or 18 months from the date of commissioning whichever is earlier. Further all the components requiring replacement during Warranty shall be guaranteed within the balance Warranty period. This condition does not apply for the components such as fasteners, rubber bumper which are subject to normal wear & tear.

TENTATIVE QUALITY ASSURANCE PLAN FOR CIVIL WORKS

LIST OF MINIMUM EQUIPMENT FOR FIELD TEST LABORATORY

For Building Works

1. Weighing balance

(a) 7 Kg to 10 Kg capacity, semi-self indicating type (accuracy – 10 gm).

(b) 500 gm capacity, semi-self indicating type (accuracy – 1 gm).

(c) Pan balance 5 Kg capacity (accuracy – 10 gm).

2. Ovens electrically operated, thermostatically controlled up to 220^0C (sensitivity-1^0C)
3. Sieves: as per IS:460 1962

(a) IS Sieves 450 mm internal dia of sizes 100 mm, 80 mm, 63 mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75 mm complete with lid and pan.

(b) IS Sieves 200 mm internal dia (brass frame) consisting of 2.36 mm, 1.18 mm, 500 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns with lid and pan.

4. Sieve, shaker capable of 200 mm and 300 mm dia, sieves, manually operated with timings switch assembly.
5. Equipment for slump test slump cone, steel plate, tamping rod, steel scale and scoop.
6. Dial gauges 25 mm travel, 0.01 mm/ division, least count 2 nos.
7. 100 tonne compression testing machine, electric-cum-manually operated.
8. Graduated measuring cylinder 200 ml capacity 3 nos.
9. Enamel trays (for efflorescence test for bricks)

(a) 300 mm X 250 mm X 40 mm 2 nos.

(b) Circular plates of 250 mm dia 4 nos.

For Road & filling Works

1. Weighing balances
   (a) 7 Kg to 10 Kg, capacity semi-self indicating type (accuracy 10 gm)
   (b) 500 gm capacity, semi-self indicating type (accuracy 1 gm)
   (c) Chemical Balance, 100 gm capacity (accuracy 0.1 gm)
   (d) Pan balance 5 kg capacity (accuracy 10 gm)
   (e) Platform scale 300 Kg capacity
2. Ovens – Electrically operated, thermostatically controlled up to 200^0C (sensitivity1^0C)
3. Sieve as per IS:460-1962
   (a) IS Sieve 450 mm of internal dia of sizes 100 mm, 80 mm, 63 mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 1.75 mm complete with lid and pan.
   (b) IS Sieves 200 mm internal dia (brass frame) consisting of 2.36 mm, 1.18 mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns with lid and pan.
4. Sieves Shaker capacity for shaking 200 mm and 300 mm dia, sieves, electrically operated with timer.
5. Dial gauge 25 mm travel 0.01 mm/division.
6. Load Frame 5 tonne capacity electrically operated with speed control.
7. Aggregate impact test, apparatus as per IS:2386 1963 (Part IV)

8. Compaction apparatus (Procter) as per IS:2720 1974 (Part VII)
9. Modified ASIIO compaction apparatus as per IS:2720 1974 (Part III)
10. Stand pouring cylinder with control funnel and type complete as per IS:2720 1974 (Part XXVIII)
11. Sampling tins with rods 100 mm dia X 50 mm height and miscellaneous items like moisture tins etc.
12. Constant temperature bath for accommodating bitumen test specimen electrically operated and thermostatically controlled.
13. Penetrometer with automatic time controller and with adjustable weight accessories and needles as per IS:1203-1958.
14. Laboratory mixer about 0.02 m^3 capacity electrically operated with heating jacket.
15. Distant reading thermometer.
16. Graduated cylinder 1000 ml capacity.

SN	ACTIVITY	REFERENCE	TESTING FREQUENCY	ACCEPTANCE CRITERIA
1.	Soil Compaction In Foundation	Approved Drawing	1 test for every 1000 cu.mtr of fill in site grading	IS:2720Pt-28/IS-10379
2.	Fixing Of Reinforcement As Per Drawing, Specification	Approved Drawing	One no. per size per lot	IS:1786/ PROCEDURE
3.	Fixing Of Inserts, Anchor Bolts & Pipe	Approved Drawing	One no. per size per lot	IS:1239 P-I/IS:2062/ procedure
4.	Back Filling & Levelling	Approved Drawing	1 test for every 1000 cu.mtr of fill in site grading	IS:2720 Pt-28/IS-10379
5.	Misc. Civil Works	Approved Drawing		AS PER SPEC/ PROCEDURE
6.	Painting	Approved Drawing		AS PER SPEC/ PROCEDURE

Note:

- The above mentioned QA/QC plan including List of testing equipment is tentative & minimum requirements for the purpose of tender. During execution if any additional tests are required as per the directions of IOCL and/ or relevant IS codes, successful tenderer has to carry out the same at no extra cost to IOCL.
- Theoretical cement consumption per unit of work shall be as per latest CPWD specifications or as specified in relevant IS codes (latest).

SPECIFIC TESTS ON MATERIALS AND THEIR FREQUENCIES

SN	MATERIAL	TESTS	TESTING METHOD	FREQUENCY OF TESTS
1	Bricks	(a) Visual and dimensional characteristics	IS:1077	As per Table – 1 of IS:1077 given as under: Lot Size (Nos) — Sample size (Nos) — Permissible No of defective Bricks 2001 to 10000 — 20 — 1 10001 to 35000 — 32 — 2 35001 to 50000 — 50 — 3
		(b) Compressive Strength	IS:3495 (Part I)	Lot Size (Nos) — Sample size (Nos) — Permissible No of defective Bricks 2001 to 10000 — 5 — 0 10001 to 35000 — 10 — 0 35001 to 50000 — 15 — 1
		(c) Water Absorption	- do -	- do -
		(d) Efflorescence	- do - (Part II)	- do -
2	Coarse Aggregate (for concrete)	(a) Sieve Analysis	IS:2386 (Part I)	As per Table-3 of IS:2430 Lot size (m^3) — No of Sample Upto 100 — 1

SN	MATERIAL	TESTS	TESTING METHOD	FREQUENCY OF TESTS
				101 to 500 3 501 to 1500 5 1501 to 5001 7
		(b) Flakiness Index		- do - - do -
		(c) Estimation of deleterious materials	IS:2386 (Part II)	- do - - do -
		(d) Organic impurities	- do -	- do - - do -
		(e) Specific gravity and water absorption	- do - (Part III)	- do - - do -
3	Fine Aggregate (for concrete)	(a) Sieve analysis	IS:2386 (Part I)	As per Table-3 of IS:2430 Lot size (m^3) No of Sample Upto 100 1 101 to 500 3 501 to 1500 5 1501 to 5001 7
		(b) Test for clay silt & impurities	- do - (Part I)	
		(c) Specific gravity and water absorption	- do - (Part Ill)	
		(d) Test for organic impurities	- do - (Part I)	
		(e) Moisture Content	- do -	- do -
4	Cement	(a) Setting time	IS:4031 - do -	Once for each consignment of 50 MT or part thereof.
		(b) Soundness	- do -	- do -
		(c) Compressive strength	- do -	- do -
		(d) Fineness	- do -	- do -
5	Structural concrete	(a) Compressive strength	IS:516	Quantity of concrete No of Sample

SN	MATERIAL	TESTS	TESTING METHOD	FREQUENCY OF TESTS
				(in m^3) 1 - 5 1 6 - 15 2 16 - 30 3 31 - 50 4 51 and above 4 plus one addl sample for each additional 50 m3 or Part thereof
				- do -
		(b) Slump/ compaction factor for workability	- do -	
6	Structural steel sections	(a) Tensile strength	IS:1608/ IS:1663/ IS:1894	One test for every 25 tonnes of steel or part thereof
		(b) Bend test	IS:1403/ IS:1599/ IS:2329	One test for every 10 tonnes of steel or part thereof
		(c) Impact test	IS:1403/ IS:1599/ IS:1500	- do -
		(d) Hardness test	- do -	- do -
7	Flooring tiles PCC/ terrazzo	(a) Flatness, perpendicularity, thickness of wearing layer	IS:1237	18 tiles from each source of supply
		(b) Water absorption	- do -	
		(c) Wet transverse strength	- do -	6 tiles out of 18 randomly selected tiles
		(d) Resistance to wear	- do -	- do -

SN	MATERIAL	TESTS	TESTING METHOD	FREQUENCY OF TESTS
				- do -
8	Water for construction purpose	(a) Test for acidity and alkalinity (PH Value) (b) Test for solid contents	IS:456 - do -	Once at the stage of approval of source of water - do -
9	Aggregate of all sizes for WBM, BM, AC, PMC etc. for road and pavement	(a) Impact (b) Crushing value (c) Los Angeles abrasion value (d) Flakiness (e) Water absorption (f) Specific gravity (g) Density	IS:2386 (Pt-IV) IS:2386 (Pt-IV) IS:2386 (Pt-IV) IS:2386 (Pt-II) IS:2386 (Pt-III) IS:2386 (Pt-III) IS:2386 (Pt-III)	1 test per 100 M^3 1 test per source - do - 1 test per 100 M^3 - do - 1 test per source - do -

Note :

1. The tests mentioned above are to be conducted on receipt of materials at site.
2. Requirements of tests to be conducted by manufactures ex-factory for certain materials like cement, steel, tiles, pipes, manufactured or fabricated items, paints, bitumen's products, pre-laminated boards, electrical and mechanical equipments etc. shall be as per the relevant IS code provisions. For ensuring required quality in materials, these tests shall be carried out. Accepting Officer may decide to accept the manufacturers test certificate(s), call for third party test or decide to have these tests in presence of his representative.

3. Where factory manufactured or fabricated materials are to be used, the approved sources may be decided based on proven past track/ IS embossed/ ISI certified/ conforming to IS specifications.

SPECIFIC TESTS ON WORKMANSHIP

<table>
<tr><th>SN</th><th>MATERIAL</th><th>TESTS</th><th>TESTING METHOD</th><th>FREQUENCY OF TESTS</th></tr>
<tr><td>1</td><td>Structural concrete (M-15 grade and above) Random sampling shall be carried out to cover all mixing units</td><td>(a) Slump test or compacting factor or Vee-Bee time

(b) Compressive strength

(c) Non Distractive Test (NDT) (where required)</td><td>IS:109

IS:516

IS:13911</td><td>Minimum frequency of sampling of concrete of each grade shall be as under:<table><tr><th>Qty (cum)</th><th>Sample (No)</th></tr><tr><td>1-5</td><td>1</td></tr><tr><td>6-15</td><td>2</td></tr><tr><td>16-30</td><td>3</td></tr><tr><td>31-50</td><td>4</td></tr><tr><td>> 51</td><td>4 + 1 sample for every 50 cum</td></tr></table>
As required</td></tr>
<tr><td>2</td><td>Structural steel work for hangars and industrial sheds</td><td>(a) Test for sample weld
(i) Tensile test
(ii) Bend test
(iii) Impact test
(iv) Load test

(b) Test for workmanship of welds in structure
(i) X-ray
(ii) Ultrasonic</td><td>IS:821

IS:821</td><td>One for each test

Frequency and extent of tests shall be as per IS provisions</td></tr>
</table>

SN	MATERIAL	TESTS	TESTING METHOD	FREQUENCY OF TESTS
		(iii) Magnetic particle (iv) Liquid (v) Penetration		
4	Plumbing (a) Soil pipes (b) Drain & sewers (c) Sanitary appliances	Smoke test under a pressure of 2.5 m head of water smoke test under a pressure of 4.5 m head Water test/ Smoke test		1 test for 15 min before embedding As required before embedding in soil/ concrete As required

PREAMBLE TO SCHEDULE OF RATES FOR CIVIL WORK

GENERAL

1.01 The plans have been evolved tentatively based on information available with Owner / Consultant but the dimensions and details etc. are liable to changes. The Tenderers shall not be entitled to claim any higher rate or compensation on this account. The tender drawings are intended mainly to give an indication of the probable type of construction. The successful Tenderers will, however, be required to execute the work as per detailed approved drawings issued to them from time to time. Steel structures can be changed to R.C.C. or vice versa. Owner reserves the right to add / delete any of the building works mentioned in the N.I.T., during the currency of the contract.

1.02 The Tenderers shall note that the quantities of the different Items, as given in the "Schedule of Rates" are tentative based on tentative tender drawings and are subject to variation and they shall not be entitled to claim any higher rate or compensation on this account. Owner / Consultant reserves the right to change / modify the size and type of sections at any time. Owner / Consultant does not guarantee work under each item of the Schedule of Quantities.

1.03 The Tenderers shall be fully responsible for the correct setting out and execution of the work in accordance with approved drawings which will be supplied to them progressively. All tools, tackles, construction equipments etc., required for the successful execution / construction of the complete work, shall be responsibility of the Tenderers.

1.04 The quantities given in the "Schedule of Rates" are approximate and are given only for the guidance for quoting rates. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. Unless otherwise specified, measurements of quantities shall be taken as per Indian Standards IS: 1200.

1.05 The rates to be inserted in the "Schedule of Rates" are to be inclusive of the value of the work described under several items including all costs and expenses which may be required for the construction of the work described together with all taxes except service tax, general risks, liabilities and obligations such as temporary buildings / hutments, fencing,

watching, lighting, insurance, labour regulations, indemnity, maintenance and the like. The prices shall be inclusive of all labours, materials, tools, plants, equipment, hoists, tackles, scaffoldings, the sundries, etc., as may be necessary for the completion of the work in all respects.

1.06 No work shall be undertaken at site until detailed approved drawings have been issued by the Owner / Consultant in writing. Subsequent revision in the drawings which become necessary shall be incorporated and revised drawings issued to the Contractor who shall execute the work as per the latest revised drawings. Nothing extra will be paid on this account and no claim whatsoever will be entertained on this account. The Owner / Consultant reserves to themselves the right to modify / revise / alter etc. in any drawing supplied to the Contractor.

1.07 Any fabrication / construction done before final approval of the drawings shall be the Contractor's responsibility.

1.08 In case of any discrepancy between the description of items given in the "Schedule of Rates" and Specifications, drawings and other documents, the decision of the Owner / Consultant in writing shall be final, binding and conclusive for the purpose of this contract.

1.09 The term "Design and drawings" mentioned in the description of Items in the "Schedule of Rates" means the detailed approved design drawings marked "Good for Construction".

1.10 The work "As described", "As shown", "As directed" or "As approved", "As mentioned" in the description of Items shall mean as directed in design or detailed drawings and as directed by the Engineer-in-Charge.

1.11 The Owner shall furnish the Contractor with only reference points of the job site and a level bench mark, and the Contractor shall at his own cost and initiative, set out the works to the satisfaction of the Engineer-in-Charge but shall solely be responsible for the accuracy of such setting up not withstanding satisfaction as aforesaid of the Engineer-in-Charge or any other assistance rendered by the Engineer-in-Charge for the purpose.

1.12 The Contractor shall provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and the like and shall take all precautions necessary to prevent their removal or disturbance, and shall be responsible for the consequence of such removal or disturbance and for their efficient and timely reinstatement. The Contractor shall also be responsible for the maintenance of all survey marks, boundary marks, distance marks and centre line marks, whether existing or supplied / fixed by the Contractor.

1.13 Before commencing the work, the Contractor shall at his own cost and initiative provide all necessary references, level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme for fixing bench marks acceptable to the Engineer-in-Charge. The centre of longitudinal or face line and cross line shall be marked by means of small masonry pillars. Each pillar shall have distinct mark at the center to enable a theodolite/ Total Station to be set over it. No work shall be started until all these points are approved by the Engineer-in-Charge in writing.
But such approval shall not relieve the Contractor of any of his responsibilities in respect of the adequacy or accuracy, thereof. The Contractor shall also provide all labour, material and other facilities necessary for the proper checking of layout and inspection of the points during construction.

1.14 Pillars bearing geodetic marks located at the site / unit of works under construction should be protected and fenced by the Contractor.

1.15 On completion of works, the Contractor must submit to the Engineer-in-Charge the geodetic documents according to which the work was carried out.

1.16 The Contractor shall be exclusively responsible for the provision and maintenance of horizontal and vertical alignments and levels and for the correctness of every part of the work in accordance there with and shall at his own cost rectify any errors or imperfections therein.

1.17 The Contractor shall at all times during the progress and continuance of the works be responsible for and effectively maintain and uphold in good, substantial, sound and perfect condition of all / and every part of works and shall make good from time to time and at all times as often as the Engineer-in-Charge shall require any damage or defect that may during the above period arise in or be any way connected with works.

1.18 The portion which is under HOLD shown in the approved drawing or the portion which would be brought under HOLD during execution on account of coordinating different activities of other working agencies shall be taken up by the Contractor to execution only after the said HOLD is withdrawn. The Contractor on this account shall not be entitled to claim for any compensation.

1.19 The Contractor shall maintain adequate drainage facilities at the work site at all times during the execution of the work.

1.20 No compensation shall be made by the Owner / Consultant for any damage done by rain or traffic during the execution of the work.

1.21 The Contractor shall afford all reasonable facilities such as scaffolding etc., and cooperation to the various other agencies and Contractors, for services not included in this contract, who may be working on the site simultaneously so that entire work can proceed smooothly and simultaneously to a successful completion. The Tenderer must take all the aforesaid factors into consideration while quoting his rates. Nothing extra shall be paid on any ground out of or relating to the aforesaid factors.

1.22 For details of works, materials and workmanship, attention is invited to the "Schedule of Rates", Scope Drawings, Special Conditions of Contract, Materials and Job Specifications, this section, etc. and the Tenderers must quote the rates keeping in full view the requirement of the said documents.

1.23 Except otherwise clearly stated, CPWD/HO Civil Specifications with Correction Slips (latest) shall be followed in all Civil, Structural and other allied Works and in absence of CPWD Specifications for any work, relevant Indian Standard codes of practices (latest) shall be followed. Where there are no Specifications available for any work either in HO Civil/CPWD Specifications or in IS Codes of practices, the work shall be carried out as per the direction of Engineer-in-Charge.

1.24 The following notations have been used throughout the "Schedule of Rates" and Materials and job Specifications:

1.	Cu.M	Cubic Metre
2.	Sq.M	Square Metre

3.	m.	Metre
4.	mm	Millimeter
5.	Cm. / Cms.	Centimeter / Centimeters
6.	No. / Nos.	Number / Numbers
7.	Tonne / Te.	Metric Tonne
8.	Kg.	Kilogram
9.	RCC	Reinforced Cement Concrete
10.	PCC	Plain Cement Concrete

1.25 The quoted rates shall be applicable for all heights, depths etc. except otherwise clearly stated in the description of items and nothing extra shall be paid to the contractor on this account.

1.26 Description of items and mode of measurement for payment indicated herein shall override those given elsewhere if these are at variance.

1.27 Any materials / accessories / fittings etc. which may not be specifically mentioned in the description of items but which are normally used or necessary are to be provided by the contractor without any extra cost to Owner / Consultant and the work must be completed in all respects.

2.00 MATERIALS

2.01 The supply / procurement of all materials, required for the job, shall be the responsibility of the Contractor unless otherwise stated in the "Schedule of Rates" and elsewhere in the tender documents. The quality of the materials procured by the Contractor shall be subject to the approval of Engineer-in-Charge or his authorized representative before the materials are allowed to be used in the works. All the materials to be procured by the Contractor shall be in conformity with the HO Civil/CPWD Specifications with correction slips (latest) and in absence of which as laid down in the relevant Indian Standard Codes of practices (latest).

2.02 Transport of all materials shall be the Contractor's responsibility and it shall be at their own risk and cost.

2.03 The Engineer-in-Charge shall determine the suitability of materials to be used on the job and the Contractor shall get all materials approved by the Engineer-in-Charge. Any material procured and brought to site by the Contractor, found not to conform to the specifications and does not meet the approval of the Engineer-in-Charge, for use, will be rejected, and the Contractor shall remove and dispose off the same at his own cost and he shall not have any claim for compensation in this regard.

3.00 TESTS

3.01 According to the nature and importance of works, Owner / Consultant will demand the conduct of tests on concrete and other building materials etc., in which case the Contractor shall get the same done at his own cost in a laboratory to be approved by the Owner / Consultant.

3.02 Providing and operating necessary measurements and testing devices, materials and consumables are included in the scope of work and the rates quoted shall be deemed to include the cost of such tests which are required to ensure achievement of specified quality of work.

4.00 EXECUTION OF WORK

4.01 EARTH WORK

a. The prices for all excavations shall include for removing and clearing away all shrubs, bushes, roots etc.

b. The prices for all excavations shall also include for all leveling and ramming foundation beds, trimming of sides and bottom, grading to proper level as required.

c. Removal and carrying shall include for all loading, unloading and handling as may be necessary and also all necessary means of transport (Mechanical or animal or manual) as required.

d. The prices are also to include removal of water caused by rain, seepage, spring due to water table or any other cause, either by pumping or by bailing, that may accumulate in the trenches, foundations, pits, etc. It is likely that the subsoil water may encounter during excavation. The Contractor shall be responsible to remove all water accumulated in trenches, foundations, pits, etc. due to subsoil seepage, rainwater or from any other sources. For the above reasons, if the Contractor is required to install some special type of dewatering system, the same shall be arranged by the Contractor at his own cost and nothing extra shall be payable. The Contractor shall be fully responsible for removal of all water from the working area including necessary shoring and strutting, etc., wherever required, in order to maintain safe working condition and good engineering practice at his own cost and nothing extra shall be paid on this account.

e. Where excavations are made in excess of the depth required the Contractor shall, at his own expenses, fill up to the desired level with lean concrete of nominal mix. 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size).

f. In case of hard / dense soil, the last 150 mm depth of such depth specified in the drawing or decided by the Owner shall be excavated just prior to the laying of plain cement concrete bed.

g. For payment of Earthwork in foundations / pits / trenches, etc., the excavation in earthwork volume shall be calculated by multiplying the base area as per the dimensions of mat (lean) concrete indicated in the drawing for different foundations by the specified depth of excavation considering vertical cut up to the bottom of mat concrete level from ground level. Extra excavation carried out by the Contractor with sloping sides or with larger base area or with extra deepening of trenches / pits / foundations, etc. for working convenience shall not be measured and paid for.

Nothing extra shall be paid for sorting / screening of the excavated materials to obtain good earth for filling.

h. Nothing extra shall be paid on account of any lead/ lift for disposal of excavated materials.

i. Proper precautions shall be taken during the excavations to prevent any damage to the existing structures, pipes, sewer lines etc. If such damage occurs, it shall be rectified by the Contractor at his own expense.

4.02 **PLAIN AND REINFORCED CEMENT CONCRETE WORKS**

a. The prices for concrete beds and slabs are to include for laying on any type of subgrade, laying to falls or camber and for preparing surface to receive concrete.

b. All concrete surfaces shall be finished to a fair face to give smooth and even surfaces and nothing extra shall be paid on this account.

c. The prices are to include leaving pockets, cutouts and holes and to provide wooden boxes or any other suitable arrangement in R.C.C for providing pockets for bolts as per approved working drawings and nothing extra shall be paid on this account.

d. All pockets / holes are to be properly covered by suitable means, so that dirt, rain water etc., should not enter the pockets / holes etc. No deduction in R.C.C quantity shall be made for pockets and nothing extra shall be paid for providing pockets as mentioned in para 5.02c above.

e. For measurement of openings in plain concrete / R.C.C work, refer clause No. 4.13 of IS: 1200 (Part-3).

f. Threads of bolts etc., which have already been fixed in the pockets, are to be greased and properly covered with gunny bags or polythene sheet to protect it from damage from all sources and nothing extra shall be paid on this account.

g. The prices shall include for all rebating, throating, chamfering, weathering, moulding etc. to accord with the details shown in the approved working drawings.

h. Nothing extra shall be paid for any intricate work for foundation of equipments and machinery (Static / Dynamic) in R.C.C walls and other superstructure work or in concreting in small and thin sections in P.C.C or R.C.C work.

i. The prices for concrete are to include for hoisting and / or lowering to any heights and / or depth required and in any type of form work, packing around reinforcement wherever required and finishing the surfaces to fair and even surfaces.

j. The prices shall include for working up or hacking of concrete surface for providing keys for further concrete work and shall also include all plane, rebated or grooved construction and other joints.

k. All reinforced cement concrete used shall be of controlled concrete with designed mix and weigh batched conforming to IS : 456 unless otherwise specified. In all concrete and R.C.C work, graded coarse aggregate shall be used. The design mixes of concrete of different grades shall be established at the beginning of the work considering the required workability. However, if batching plant facility is not available, only nominal mix concrete is permissible.

l. Concrete admixtures for workability, if necessary, may be used in R.C.C., if decided by the Engineer-in-Charge. No extra payment for material or mixing etc. shall be made on this account.

m. Machine and equipment foundations shall mean all foundations including pedestals of vessels, towers, pumps, compressors, motors or any other equipment or machinery (both static and dynamic), pipe supports etc., and / or the like.

n. The prices shall include applying cement slurry on reinforced cement concrete surfaces, keys of construction joints etc. @ 2.75 Kg/Sq.m of surface area of receiving cement concrete including roughening and proper cleaning etc., complete as directed by Engineer-in-Charge.

o. The prices shall include for performing water tightness for all water retaining R.C.C structure as stipulated in IS: 3370 (Part-I), wherever specified in the drawing.

p. Cement to be used for plain & reinforced cement concrete and other works shall be of Ordinary Portland Cement conforming to IS : 269/ PPC unless otherwise stated in the "Schedule of Rates" and elsewhere in this Section of NIT.

q. Any concrete having honeycomb is not acceptable and shall be rejected and redone at contractor's cost.

4.03 **REINFORCEMENT AND EMBEDMENTS**

a. Wastage in cutting will not be paid for. Steel actually fixed in position only will be paid by the linear measurement including hooks and laps. Lapping of bars will be allowed only where the required bar length exceeds the standard lengths available. All other laps provided, unless otherwise specified in the drawings, shall not be measured and paid for. Weight of binding wire shall not be measured for payment.

b. Bars shall be issued in lengths and in forms as available in the stores. Nothing extra shall be paid for decoiling and straightening of the bars.

c. Reinforcement are to be tack welded in addition to binding by 18 S.W.G annealed wire wherever necessary to improve efficiency of the joint. Bars of 28 mm diameter and above shall be provided with stitch weld in addition to binding with 18 SWG annealed wire and nothing extra shall be paid for stitch welding. Welding of mild steel plain and deformed reinforcements shall conform to IS: 2751, 'Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction'.

d. The Contractor shall prepare the bar bending schedule for all reinforced cement concrete work as per the approved / "good for construction" drawings furnished by the Owner / Consultant and nothing extra shall be paid on this account.

4.04 SHUTTERING

a. The prices for shuttering shall include for providing splayed edges, notching, chamfering, allowances for overlaps and passing at angles, battens, strutting bolting, wedging, easing, striking and removing.

b. The concrete work should have ply wood / steel shuttering as not to require any plastering, after striking out the shuttering. Any concrete having honeycomb is not acceptable and is liable to be rejected and redone at Contractor's cost.

c. The prices are also to include for all necessary supports, struts, braces, etc., dressing with shuttering compound and / or other approved method to prevent adhesion between concrete and form work and all raking for circular cutting and waste.

d. The prices shall also include for all labour and materials necessary for providing form work at all heights and depths and including striking, dismantling the form work assembly etc.

after the necessary stripping period of concreting is over and also making all the joints in shuttering fully leak-proof providing low density polythene sheets / bitumen paper.

e. The prices shall also include for forming detailed design required for the form work and / or all other sundry labour.

f. All shuttering shall be either plywood or steel shuttering to produce plain, smooth and even surfaces, which will thus be integrally finished. If any impressions of the shuttering joints are noticed after the striking of the shuttering, the same should be treated by rubbing with Carborundum stones and nothing extra shall be paid on this account.

g. In case of dowel bars projecting out from R.C.C works such as columns, beams etc. nothing extra shall be paid for any special provision like making holes that may be required to be left in the form work.

4.05 MASONRY WORKS

The prices for brick work shall include the following:
Fair face of brick work with selected brick with class designation 75 or as specified in the description of relevant Items in the "Schedule of Rates" from the lot.
Raking out joints for plastering and pointing done as separate process of finishing joints, flush as the work proceeds.
All rough and / or fair cutting and waste unless specifically stated otherwise.
Plumbing to angles.
Providing holes left or formed for fixing pipes etc.
Forming reveals to the jambs, where fair cutting on exposed face is not involved.
All masonry work shall be done using mortar with coarse sand.

4.06 STRUCTURAL STEEL WORK

a. The weight of structural steel work for the sake of payment shall be calculated by linear measurements and unit weight taken from the relevant IS codes based on approved fabrication drawings assuming all members to be cut square without making any deduction for bolts, bevel ends or edges, beveling of plates. Gusset plates shall be paid for minimum rectangle enveloping their actual periphery.

b. Welds, black-bolts, high tensile bolts, nuts, plain and tapered washers etc. shall not be measured and paid for. Rate for the structural steel work shall be deemed to include the same. Nothing extra shall be paid on this account.

c. Nothing extra shall be paid over the unit rates for structural members to be built up by butt or fillet welding as indicated in the approved fabrication drawings or as per the instruction of Engineer-in-Charge, from either:

i. Plates.
ii. Two or more rolled steel sections.
iii. One or more rolled steel sections and plates.

d. Nothing extra shall be paid over the unit rates for sealing the joints of box sections made out of channels or joists by continuous butt welding.

e. All paints and primers specified in various Items in the "Schedule of Rates" shall be best quality of approved brand and manufacturer such as M/s. Asian Paints, M/s. Berger Paints (India) Ltd., M/s. Johnson & Nicholson and / or other equivalent paint approved by the Engineer-in-Charge.

f. On box / compound sections, the painting shall be done before fabrication on all those surfaces which become inaccessible after fabrication.

g. Prior approval of the Engineer-in-Charge shall have to be obtained for changing the sections due to non-availability of certain sections and using built-up sections / compound sections and nothing extra shall be paid on this account.

h. The word "Fabrication" wherever used for the description of work herein shall include: Straightening, cutting, notching, beveling, drilling or cutting holes, necessary welding, fastening, etc. to prepare the structural member as per fabrication drawings.

I. The word "Erection" wherever used for description of work shall include: Hoisting, putting in position at all required heights, aligning and fixing with necessary welding, bolting and / or other fasteners, as per approved drawings and technical specifications with all safety standards.

j. Preparation of "AS-BUILT" construction drawings incorporating all approved changes at site shall be in Contractor's scope of work and it shall be considered included in relevant Items of the "Schedule of Rates".

k. For sand blasting / painting by the specialized agency other than indicated in the NIT, if proposed by the Contractor, the same shall be got approved from the Engineer-in-Charge at site.

l. The Contractor shall prepare design of joints and detailed fabrication and erection drawings in sequence of erection on the basis of detailed design drawings supplied by the Owner / Consultant from time to time. Nothing shall be paid extra on this account. The above fabrication drawings must show clearly all shop and site joints and connection with erection marks on each loose parts.

m. The Contractor shall submit his design calculations for the design of joints. All joints shall be designed for full strength of the members or otherwise as indicated in the design drawings.

n. The design calculations of joints and fabrication drawings will be checked and approved by the Owner / Consultant as per mutually agreed time schedule and the Contractor should strictly adhere to these approved drawings and specifications. Fabrication work shall be taken up only with the approved fabrication drawings.

4.07 FINISHING WORKS

a. The prices shall include for work at any height / depth and for all necessary scaffolding etc. as required.

b. The prices shall include for providing and laying of materials for all the Items of plaster and also raking to form key for plaster and for all work in narrow width, formed angles, chamfered external angles and for making good the faces.

4.08 MISCELLANEOUS

a. The Contractor may have to splice shorter length of structural steel members to obtain required length at site. If extra pieces of materials are required for splicing (say for lap jointing) then the same will be measured and paid for in the relevant structural steel items and nothing extra on any other account shall be paid to the Contractor for such splicing.

b. The Contractor should note that steel wedges, packing plates, shim plates, etc. used by them for leveling and alignment of structural members are to be considered erection devices and these should be taken out after proper alignment is over to the satisfaction of Engineer-in-Charge. Such erection devices shall neither be measured nor paid for.

SPECIFICATION FOR QUALITY ASSURANCE SYSTEM REQUIREMENTS FROM CONTRACTOR

1.0 INTRODUCTION

This specification establishes the quality assurance requirements to be met by contractors and vendors.

In case of any conflict between this specification and other provisions of the Contract/Purchase Order, the same shall be brought to the notice of IOCL/EPMC, at the stage of bidding and shall be resolved with IOCL/EPMC, prior to the placement of order.

2.0 DEFINITION

2.1 BIDDER

For the purpose of this specification, the word "Bidder" means the person(s), firm, company or organization who is under the process of being contracted by IOCL/EPMC for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

2.2 CORRECTION

Action is to be taken to eliminate the detected non-conformity.

Refers to repair, rework or adjustment and relates to the disposition of an existing non-conformity

2.3 CORRECTIVE ACTION

Action is to be taken to eliminate the causes of an existing non-conformity, defect or other undesirable situation in order to prevent recurrence.

2.4 PREVENTIVE ACTION

Action taken to eliminate the causes of potential nonconformity, defect or other undesirable situation in order to prevent occurrence

2.5 PROCESS

Set of inter-related resources and activities which transform inputs into outputs.

2.6 SPECIAL PROCESS

Processes requiring pre-qualification of their process capability.

3.0 SCOPE OF WORK BY CONTRACTOR

3.1 PRIOR TO AWARD OF CONTRACT

3.1.1 The bidder shall understand scope of work, drawings, specifications and standards etc., attached to the tender/enquiry document, before he makes an offer.

3.1.2 The bidder shall submit milestone chart showing the time required for each milestone activities along with over all time period required to complete the entire scope of work.

3.1.3 The bidder shall develop and submit manpower and resource deployment chart.

3.1.4 The bidder shall submit, along with bid, a manual or equivalent document describing/indicating/addressing various control /check points for the purpose of quality assurance and the responsibilities of various functions responsible for quality assurance.

3.2 AFTER THE AWARD OF CONTRACT

The bidder shall submit the schedule for submission of following documents in the kick-off meeting or within two week of the placement of order, whichever is earlier.

Quality plan for all activities, required to be done by the bidder, to accomplish offered scope of work
Inspection and test plans, covering various control aspects.
Job procedures as required by IOCL/EPMC.

Various documents submitted by the bidder shall be finalized in consultation with IOCL/EPMC. Here it shall be presumed that once a bidder has made an offer, he has understood the requirements given in this specification and agrees to comply with them in totality unless otherwise categorically so indicated during pre-award stage through agreed deviation/exception request. All quality assurance documents shall be reviewed by concerned IOCL/EPMC functional groups and the bidder shall be required to incorporate all comments within the framework of this specification at this stage of the contract. It is also obligatory on the bidder that he obtains approval on every quality assurance document, before he starts using a particular document for delivery of contracted scope of work. Participation of IOCL/EPMC in review /approval of quality plan/QA documents does not absolve the contractor of the contractual obligations towards specified and intended use of the product (or service) provided by him under the contract.

3.3 DURING JOB EXECUTION

3.3.1 During job execution, the bidder shall fully comply with all quality documents submitted and finalized/agreed against the requirements of this specification. Approval of IOCL/EPMC on all these documents shall be sought before start of work.

3.3.2 Bidder shall produce sufficient quality records on controlled/agreed forms such that requirements given in this specification are objectively demonstrable.

3.3.3 Bidder shall facilitate IOCL/EPMC during quality/technical audits at his work/sites.

3.3.4 Bidder shall discharge all responsibilities towards enforcement of this specification on all his sub-contractors for any part of the scope which is sub-contracted.

4.0 QUALITY ASSURANCE SYSTEM REQUIREMENTS

4.1.1 The bidder shall nominate an overall in-charge of the contract titled as “Project Manager” for the scope work of agreed contract. The name of this person shall be duly intimated to EPMC, including all subsequent changes, if any. EPMC shall correspond only with the project manager of the bidder on all matters of the project. The project manager of the bidder shall be responsible for co-ordination and management of activities with bidder’s organization and all sub-vendors appointed by the bidder.

4.1.2 After award of work the bidder may review augmentation of manpower and resources deployment charts (submitted earlier), detail it out, if so consented by IOCL/EPMC and resubmit the same as “Issued for implementation”

4.2 The bidder shall plan the contract scope of work on quality plan format such that that no major variation is expected during delivery of contract scope of work. This quality plan shall be assumed to be detailing bidder's understanding and planning for the contract /offered scope of work. The bidder shall plan the type of resources including various work methodology which he agrees to utilize for delivery of contact scope of work.

4.3 The bidder is required to review the contract at all appropriate stages to evaluate his capabilities with respect to timely and quality completion of all activities pertaining to contracted scope of work and shall report to IOCL/EPMC of constraints, if any.

4.4 The design activities, if any, performed during delivery of contract scope of work shall be so controlled that the output is reliable enough. It is expected that during development of design, the bidder shall take resource to detailed checking, inter departmental reviews and documented verification methods.

4.5 For all documents which the bidder is likely to utilize for delivery of contract scope of work, a system must exist which assure that latest/required version(s) of the document(s) is available at all location/point of use.

4.6 In case the bidder decides to sub-contract any part/full of the contract scope of work (without prejudice to main contract condition), the bidder shall:

Evaluate the technical and financial capabilities and past performance of the sub contractor(s) and their product and/or services before awarding them with the sub-contracted scope of work. Selection of a sub-contractor should meet IOCL/EPMC approval in documented form.
Requirement of this specification shall be enforced on sub-contracted agency also. The bidder shall choose sub-contractor based on their capability to meet requirements of this specification also.

NOTE
It may so happen that, in a given situation, a sub-contractor may not have a system meeting the requirements of this specification. In all such eventualities, bidder may lend his system to sub-contractor for the contract such that sub-contractor effectively meets the requirements of this specification. In all such cases IOCL/EPMC shall be duly informed.

4.7 Bidder shall establish adequate methodology such that materials supplied by the Owner/EPMC shall be adequately preserved, handled and made use of for the purpose for which they are provided.

4.8 All output delivered against contract scope work shall be suitably identified in such a manner that either through identification or some other means, sufficient traceability is maintained which permits effective resolution of any problem reported in the outputs.

4.9 Critical activities shall be identified and the bidder is required to have documented methodologies which he is going to utilized for carrying out such activities under the contract scope of work. Wherever it is difficult to fully inspect or verify the output for special process, bidder shall prequalify the performers and methodologies.

4.10 All inspections carried out by the bidder's surveillance/inspection staff shall be in conformity to qualify plans and /or inspection and test plans. All inspection results shall be duly documented on controlled/agreed forms such that results can be co-related to specific product that was inspected/ tested.

4.11 All inspection, measuring and test equipments (IMTEs) shall be duly calibrated as per National/International standards/codes and only, calibrated and certified IMTEs shall be utilized for delivery of contract scope of work.

4.12 All out puts or products delivered against contract scope of work shall be duly marked such that their inspection status is clearly evident during all stages/period of contract.

4.13 All non-conformities (NCs) found by the contractor's inspection/surveillance staff shall be duly recorded, including their disposal action. The deficiencies observed during stage of the product shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the bidder for all repetitive NCs, including deficiencies.

4.14 All deficiencies noticed by IOCL/EPMC/TPIA representative(s) shall be recorded on a controlled form (format No. 11C1A10-QA-001-F2). Such deficiencies shall be analyzed by a bidder and effective and appropriate correction, corrective and preventive action shall be implemented. Bidder shall intimate IOCL/EPMC/TPIA of all such corrective and preventive action implemented by him.

4.15 Bidder shall establish appropriate methodologies for safe and effective handling, storage, preservation of various materials/inputs encountered during delivery of contract scope of work.

4.16 Bidder shall prepare sufficient records for various processes carried out by him for delivery of contract scope of work such that requirements of this specification are objectively demonstrable. In case IOCL/EPMC/TPIA finds that enough objective evidence/recording is not available for any particular process, bidder shall be obliged to make additional records so as to provide sufficient objective evidence. The decision of IOCL/EPMC/TPIA shall be final and binding on such issues.

4.17 The bidder shall arrange internal quality audits at quarterly intervals, to independently assess the conformance by various performers to the requirements of this specification. The findings of such assessment shall be duly recorded and a copy shall be sent to IOCL/EPMC for review.

4.18 For all special processes, bidder shall deploy only qualified performers. Wherever IOCL/EPMC observes any deficiency, the bidder shall arrange the adequate training to the performer(s) before any further delivery of work.

NOTE:

The Bidder ensures that the filled up Format (No: 11C1A10-QA-001-F2) conforms to minimum requirements on Quality Plan / Quality Assurance, specified by Consultant on Drawings / standards / specifications / write-ups.

The Bidder confirms that document is issued for information / approval of IOCL/EPMC or for implementation.

Format For Quality Plan (No: 11C1A10-QA-001-F1)

<table>
<tr><td colspan="2">Job No. and description : No.:

Issued to : Date :</td></tr>
<tr><td colspan="2">Location of work :

Name of work :</td></tr>
<tr><td>Details of Observations(Deficiency)</td><td>Recommended Course of Action</td></tr>
<tr><td rowspan="2"></td><td></td></tr>
<tr><td>Time Allowed for Correction :</td></tr>
<tr><td colspan="2">Issued by :_____
Name and signature of EPMC’s Engineer</td></tr>
<tr><td colspan="2">Corrective Action taken report by contractor/vendor :

Date : Name and Signature</td></tr>
<tr><td colspan="2">Distribution(before resolution) :

Project Manager(Owner), Project Manager(EEPMC), TPIA Inspection(HO,RPO)/RCM</td></tr>
<tr><td colspan="2">Verification of resolution by Consultant :

Date : Name and Signature</td></tr>
<tr><td colspan="2">Distribution after Resolution :

Project Manager(Owner), Project Manager(EPMC), TPIA Inspection(HO,RPO)/RCM</td></tr>
</table>

Format For Observation on Quality Aspect (No: 11C1A10-QA-001-F2)

PO/Contract Ref.:	Audit Function	Owner's/ PMC's review/audit requirement	
		Audit Scope	
	Inspection Functions	Type of (Approval) Surveillance	
		Testing And Inspection Code	
		Sampling Plan	
Project Name :	Performing Functions	Reviewer/ Approver	
		Checker	
		Performer	
Bidder's Quality Plan	General	Code of Conformance	
		Procedure No.	
		Activity Description	

List of suggested/ recommended makes/ brands

S/N	ITEM	RECOMMENDED MAKES/ VENDORS
1	CEMENT	ACC,AMBUJA,ULTRATECH, BIRLA,DALMIA, TOP CEM, COROMANDEL KING, JK CEMENT,STAR
2	STEEL STRUCTURALS	SAIL, VIZAG STEEL (RINL) ,TATA , JINDAL , ESSAR
3	WATER PROOFING COMPOUND	FOSROC, PIDILITE, CICO, IMPERMO, ACURON, ROFF, DR FIXIT.
3	Concrete floor hardner	FOSROC, DR FIXIT,CICO
4	PAINTS	ASIAN, BERGER, BOMBAY PAINTS, GOODLAS NEROLAC, JENSON NICHOLSON.
5	DISTEMPERS/CEMENT BASED PAINTS	ASIAN, BERGER, SNOWCEM, SUPERCEM, JANATACEM, SUPER SNOWCEM.
6	REINFORCEMENT STEEL	SAIL,TATA, KAMDHENU,BALMUKUND,TISCO,ESSAR,JINDAL
7	BITUMEN	LOCALLY AVAILABLE AND SUBJECT TO APPROVAL OF SITE ENGINEER
8	BRICKS	
9	SAND	
10	STONE, MORUM	

FORM OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

1. In consideration of the Indian Oil Corporation Limited (hereinafter called 'The Corporation') having agreed to accept from_____ (name of the Bidder) (hereinafter called `the said Bidder') Earnest money in the form of Bank Guarantee, under the terms and conditions of tender No._____dated _____ in connection with _____ (mention the details of the tender) (hereinafter called "the said tender"), for the due observance by the said Bidder of the stipulation to keep the offer open for acceptance for a period of _____ days from the date of the opening of the tender and other stipulations of the tender we, _____(indicate the name of the bank) hereinafter referred to as 'the Bank' at the request of _____(mention the name of the Bidder) do hereby undertake to pay on demand to the Indian Oil Corporation Limited an amount not exceeding Rs. _____ in the event of the said Bidder having incurred forfeiture of earnest money as aforesaid or for the breach of any of the terms or conditions or the stipulations of the said tender and/ or the contract if awarded including but not limited to non performance of the contract caused due to revision in price/ pricing basis after close of the pricing part of the tender under an order of the Indian Oil Corporation limited.

2. We_____(indicate the name of the bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Indian Oil Corporation Limited stating that the amount claimed is due by way of forfeiture of earnest money or any loss or damage caused to or suffered or would be caused to or suffered by the Indian Oil Corporation Limited by reason of breach by the said Bidder any of the terms or conditions or stipulations 3contained in the said tender or by reason of the Bidder's failure to perform the stipulations of the said tender. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

3. We _____(indicate the name of the bank) undertake to pay to the Indian Oil Corporation Limited any money so demanded notwithstanding any dispute or disputes raised by the Bidder in any suit or proceeding pending before any court or Tribunal or arbitrator relating thereto our liability under this present being absolute and unequivocal. The payment so made by the bank under this bond shall be a valid discharge of our liability for payment there under and the Bidder shall have no claim against us for making such payment.

4. We _____(indicate the name of the bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the terms, conditions or stipulation of the said tender and that it shall continue to be enforceable till all the dues of the Indian Oil Corporation Limited under or by virtue of the said tender/ contract have been fully paid and its claims satisfied or discharged or till Indian Oil Corporation Limited certifies that the terms and conditions of the said tender have been fully and properly carried out by the said tender and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before _____ we shall be discharged from all liability under this guarantee thereafter.

5. We_____(indicate the name of the bank) further agree with the Indian Oil Corporation Limited that the Indian Oil Corporation Limited shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said tender or to extend time of performance by the said Bidder from time to time or to postpone for any time or from time to time any of the powers exercisable by the Indian Oil Corporation Limited against the said Bidder and to forbear or enforce any of the terms and conditions relating to the said tender and shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Bidder

or for any forbearance, act or omission on the part of Indian Oil Corporation Limited or any indulgence by the Indian Oil Corporation Limited to the said Bidder or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provisions have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the bank or the Bidder.

7. We, _____(indicate the name of the bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Indian Oil Corporation Limited in writing.

Dated the ___ day of ____ 20__

For _____

(indicate the name of bank)

Place :

Date :

BANK GUARANTEE PROFORMA IN LIEU OF SECURITY DEPOSIT

1. In consideration of the Indian Oil Corporation Limited having its Registered Office at _____ (hereinafter called "The Corporation") having agreed to exempt _____ (hereinafter called "The said Contractor(s) / Supplier(s) / -Seller(s)") from the demand under the terms and conditions of an Agreement dated _____ made between _____ and _____ for _____ (hereinafter called "The said Agreement"), of Security Deposit for the due fulfillment by the said Contractor(s) / Supplier(s) / - Seller(s) of the terms and conditions contained in the said Agreement, on production of a Bank Guarantee for Rs. _____ (Rupees _____ only), we _____ (hereinafter referred to as "The Bank" at the request of _____ Contractor(s) /Supplier(s) / - Seller(s) do hereby undertake to pay to the Corporation an amount not exceeding Rs. _____ against any loss or damage caused to or suffered or would be caused to or suffered by the Corporation by reason of any breach by the said Contractor(s) /Supplier(s) / - Seller(s), of any of the terms or conditions contained in the said Agreement.

2. We _____ (indicate the name of the bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Corporation stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Corporation by reason of breach by the said Contractor(s) / Supplier(s) / - Seller(s) of any of the terms or conditions contained in the said Agreement or by reason of the Contractor(s) / Supplier(s) ' failure to perform the said Agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____

3. we undertake to pay to the Corporation any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) / - Seller(s) in any suit or proceeding pending before any court or Tribunal or Arbitrator relating thereto our liability under this present being absolute and unequivocal.

   The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) / Supplier(s) / - Seller(s) shall have no claim against us for making such payment.

4. we, _____ further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Corporation under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till _____ office / department at _____ certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) / Supplier(s) / - Seller(s) and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before _____ we shall be discharged from all liability under this guarantee thereafter.

5. We, _____(indicate the name of Bank) further agree with the corporation that the corporation shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) / Supplier(s) / - Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the corporation against the said Contractor(s) / Supplier(s) / - Seller(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) / Supplier(s) / - Seller(s) or forbearance, act or omission on the part of the corporation or any indulgence by the corporation to the said Contractor(s) / Supplier(s) / -

Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provisions have affect of so relieving us.

6. This guarantee will not be discharged due to change in the constitution of the Bank or the Contractor(s) / Supplier(s) / - Seller(s).
7. We, _____(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the corporation in writing.

Dated the _____day of _____ 20__

For _____

(indicate the name of Bank)

PLACE….

DATE……

PROFORMA OF BANK GUARANTEE

(FOR ADVANCE)

(On non-judicial paper of appropriate value)

To

Indian Oil Corporation Ltd.

(Marketing Division)

……

……..

Dear Sirs,

1. In consideration of the Indian Oil Corporation Ltd (Marketing Division) having its Registered Office at Mumbai (hereinafter called "The Corporation" which expression shall include its successors and assigns) has awarded M/s _____ (hereinafter called "The Contractor" which expression shall include its successors and assigns) the work of designing, manufacturing, fabricating, supply, installation, testing & commissioning of (name of the work) _____ in terms of a contract as constituted by Purchase Order No._____ dated _____ issued by the Corporation to the Contractor (hereinafter called "The Contract" which expression include any formal contract entered in to between the Corporation & the Contractor in super session of the said Purchase Order and/or all the amendments and/or modifications of the Purchase Order).

   AND WHEREAS the Corporation has agreed to advance to the Contractor, at his request, a sum of _____(Rupees _____ only) (hereinafter called "the said Advance" to the Contractor as financial assistance under the Contract on the condition, inter-alia, that the said Advance together with interest thereon at the rate of ___% (percent) per annum on the amount of the said Advance for the time being outstanding shall without prejudice to any other mode of recovery available to the Corporation be recoverable by the Corporation by deduction from the gross accepted amount of any Running Account Bills and the Final Bill of the Contractor commencing from the first Running Account Bill of the Contractor, and meanwhile, the said Advance shall be secured by by a Bank Guarantee the details of which are mentioned below.

2. We _____ (indicate the name of the bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Corporation stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Corporation by reason of breach by the said Contractor(s) / Supplier(s) / - Seller(s) of any of the terms or conditions contained in the said Agreement or by reason of the Contractor(s) / Supplier(s) ' failure to perform the said Agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding ` _____

3. We undertake to pay to the Corporation any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) / - Seller(s) in any suit or proceeding pending before any court or Tribunal or Arbitrator relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) / Supplier(s) / - Seller(s) shall have no claim against us for making such payment.

4. We, _____ further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Corporation under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till _____ office / department at _____ certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) / Supplier(s) / - Seller(s) and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before _____ we shall be discharged from all liability under this guarantee thereafter.

5. We, _____(indicate the name of Bank) further agree with the corporation that the corporation shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) / Supplier(s) / - Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the corporation against the said Contractor(s) / Supplier(s) / - Seller(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) / Supplier(s) / - Seller(s) or forbearance, act or omission on the part of the corporation or any indulgence by the corporation to the said Contractor(s) / Supplier(s) / - Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provisions have affect of so relieving us.

6. This guarantee will not be discharged due to change in the constitution of the Bank or the Contractor(s) / Supplier(s) / - Seller(s).

7. We, _____(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the corporation in writing.

Place:

Date:

Yours faithfully

For _____

Signature _____

Name & Designation_____

Name of the Branch _____

NOTE

1. This Guarantee/Undertaking is not to be witnessed.
2. This Guarantee is required to be stamped as an agreement according to the stamp duty act.
3. This Guarantee is required to be sent by Vendor’s Bankers directly to the Corporation

PROFORMA OF BANK GUARANTEE

(FOR COMPOSITE BG AGAINST ADVANCE & SECURITY DEPOSIT)

(On non-judicial paper of appropriate value)

To

Indian Oil Corporation Ltd.

(Marketing Division) ……

……..

Dear Sirs,

1. In consideration of the Indian Oil Corporation Ltd (Marketing Division) having its Registered Office at Mumbai (hereinafter called "The Corporation" which expression shall include its successors and assigns) has awarded M/s _____ (hereinafter called "The Contractor" which expression shall include its successors and assigns) the work of designing, manufacturing, fabricating, supply, installation, testing & commissioning of (name of the work) _____ in terms of a contract as constituted by Purchase Order No._____ dated _____ issued by the Corporation to the Contractor (hereinafter called "The Contract" which expression include any formal contract entered in to between the Corporation & the Contractor in super session of the said Purchase Order and/or all the amendments and/or modifications of the Purchase Order).

   AND WHEREAS the Corporation has agreed to advance to the Contractor, at his request, a sum of _____(Rupees _____ only) (hereinafter called "the said Advance" to the Contractor as financial assistance under the Contract on the condition, inter-alia, that the said Advance together with interest thereon at the rate of ___% (percent) per annum on the amount of the said Advance for the time being outstanding shall without prejudice to any other mode of recovery available to the Corporation be recoverable by the Corporation by deduction from the gross accepted amount of any Running Account Bills and the Final Bill of the Contractor commencing from the first Running Account Bill of the Contractor, and meanwhile, the said Advance shall be secured by by a Bank Guarantee the details of which are mentioned below.

2. We _____ (indicate the name of the bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Corporation stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Corporation by reason of breach by the said

Contractor(s) / Supplier(s) / - Seller(s) of any of the terms or conditions contained in the said Agreement or by reason of the Contractor(s) / Supplier(s) ' failure to perform the said Agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding ` _____

3. We undertake to pay to the Corporation any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) / - Seller(s) in any suit or proceeding pending before any court or Tribunal or Arbitrator relating thereto our liability under this present being absolute and unequivocal.

   The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) / Supplier(s) / - Seller(s) shall have no claim against us for making such payment.

4. We, _____ further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Corporation under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till _____ office / department at _____ certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) / Supplier(s) / - Seller(s) and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before _____ we shall be discharged from all liability under this guarantee thereafter.

5. We, _____(indicate the name of Bank) further agree with the corporation that the corporation shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) / Supplier(s) / - Seller(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the corporation against the said Contractor(s) / Supplier(s) / - Seller(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) / Supplier(s) / - Seller(s) or forbearance, act or omission on the part of the corporation or any indulgence by the corporation to the said Contractor(s) / Supplier(s) / - Seller(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provisions have affect of so relieving us.

6. This guarantee will not be discharged due to change in the constitution of the Bank or the Contractor(s) / Supplier(s) / - Seller(s).

7. We, _____(indicate the name of Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the corporation in writing.

Place:

Date:

Yours faithfully

For _____

Signature _____

Name & Designation_____

Name of the Branch _____

NOTE

1. This Guarantee/Undertaking is not to be witnessed.
2. This Guarantee is required to be stamped as an agreement according to the stamp duty act.
3. This Guarantee is required to be sent by Vendor's Bankers directly to the Corporation.

INDEMNITY BOND FOR LOST DEPOSIT RECEIPT

WHEREAS DEPOSIT RECEIPT NO …….. DATED …… for Rs. ……(Rupees in words) issued by Indian Oil Corporation Limited in favour of the undersigned on Earnest Money Deposit for due fulfillment of our obligations under the Tender No …….. in respect of …….. has been misled or lost by us and the same is not traceable in spite of due and diligent search made by us for the same AND WHEREAS Indian Oil Corporation Limited have at our request and entreaty agreed to refund to us the amount covered by the said DEPOSIT RECEIPT on our executing these presents in the manner hereinafter appearing NOW KNOW HE AND THESE PRESENTS WITNESS that we, the undersigned (name and address ……) for ourselves and our heirs, executors and administrators and our successors and assigns do hereby agree convenent and undertake to Indian Oil Corporation Limited and its successors and assigns to fully and effectively indemnify and keep Indian Oil Corporation Limited and its, successors and assigns fully and effectively indemnified against all claims , actions and demands, losses and damages and cost charges and expenses respectively and that they and their successors and assigns might suffer and be put to by reason of refunding to us the undersigned sum covered by the said DEPOSIT RECEIPT and we, our heirs, executors and administrators and our successors and assigns hereby record having agreed to reimburse Indian Oil Corporation Limited, the amount of all claims, losses, damages costs charges and expenses suffered by them in the premises aforesaid.

IN WITNESS THEREOF we the undersigned have here note unto and subscribed our signature the day and year first therein above written.

Signature of the Executor.

Witness:

1. Name and Address :

2.

FORM OF CONTRACT

(On Rs. 100/- Non-Judicial Stamp Paper)
(To be executed on award of the work)

THIS CONTRACT made at **Mumbai** this _____ day of _____ 201 BETWEEN INDIAN OIL CORPORATION LTD., a Government of India Undertaking registered in India under the Indian Companies Act 1956, having its registered office at G-9, Ali Yavar Jung Marg, Bandra (East), Bombay- 400 051 and the Headquarters at G-9, Ali Yavar Jung Marg, Bandra (East), Bombay- 400 051 Mumbai (hereinafter referred to as the "OWNER" which expression shall include its successors and assigns) of the One Part; AND _____ carrying on business in sole proprietorship/ carrying on business in partnership under the name and style of _____ a Company registered in India under the Indian Companies Act, 1913/ 1956 having its registered office at _____ (hereinafter referred to/ as collectively referred to as the "CONTRACTOR" which expression shall include his/ their/ its executors, administrators, representatives and permitted assigns/ successors and permitted assign) of the other part:

WHEREAS

The OWNER desires to have executed the work of _____ more specifically mentioned and described in the contract documents (hereinafter called the 'work' which expression shall include all amendments therein and/ or modifications thereof) and has accepted the tender of the CONTRACTOR for the said work.

NOW, THEREFORE THIS CONTRACT WITNESSETH as follows:

ARTICLE – 1

Contract Documents

1.1 The following documents shall constitute the Contract documents, namely

(a) This contract;

(b) Tender documents as defined in the General Instructions to Tenderers;

(c) Letter of Acceptance of Tender along with Fax/ Telegram of Intent.

1.2 A copy of each of the Tender Documents is annexed hereto and the said copies have been collectively marked Annexure 'A' while a copy of the letter of Acceptance of Tender along with annexures thereto and a copy of Fax/Telegram of Intent dated _____ are annexed hereto and said copies have been collectively marked as Annexure 'B".

ARTICLE – 2

Work to Be Performed

2.1 The CONTRACTOR shall perform the work upon the terms and conditions and within the item specified in the Contract documents.

ARTICLE – 3

Compensation

3.1 Subject to and upon the terms and conditions contained in the Contract documents, the OWNER shall pay CONTRACTOR compensation as specified in the Contract documents upon the satisfactory completion of the work and/ or otherwise as may be specified in the Contract documents.

ARTICLE – 4

Jurisdiction

4.1 Notwithstanding any other court or courts having jurisdiction to decide the question(s) forming the subject matter of the reference if the same had been the subject matter of a suit, any and all actions and proceedings arising out of or relative to the contract (including any arbitration in terms thereof) shall lie only in the court of competent civil jurisdiction in this behalf at _____ (where this Contract has been signed on behalf of the OWNER) and only the said Court(s) shall have jurisdiction to entertain and try any such action(s) and/ or proceeding(s) to the exclusion of all other Courts.

ARTICLE – 5

Entire Contract

5.1 The Contract documents mentioned in Article - I hereof embody the entire Contract between the parties hereto, and the parties declare that in entering into this Contract they do not rely upon any previous representation, whether express or implied and whether written or oral, or any inducement, understanding or agreements of any kind not included within the Contract documents and all prior negotiations, representations, contacts and/ or agreements and understandings relative to the work are hereby cancelled.

ARTICLE – 6

Notices

6.1 Subject to any provisions in the Contract documents to the contrary, any notice, order or communication sought to be served by the CONTRACTOR on the OWNER with reference to the Contract shall be deemed to have been sufficiently served upon the OWNER (notwithstanding any enabling provisions under any law to the contrary) only if delivered by hand or by Registered Acknowledgment Due Post to the Engineer in- Charge as defined in the General Conditions of Contract.

6.2 Without prejudice to any other mode of service provided for in the Contract Documents or otherwise available to the OWNER, any notice, order or other communication sought to be served by the OWNER on the CONTRACTOR with reference to the Contract, shall be deemed to have been sufficiently served if delivered by hand or through Registered Post Acknowledgement Due to the principal office of the CONTRACTOR at _____ or to the CONTRACTOR's representatives as referred to in the General Conditions of Contract forming part of the Contract Documents.

ARTICLE-7

Waiver

7.1 No failure or delay by the OWNER in enforcing any right or remedy of the OWNER in terms of the Contract or any obligation or liability of the CONTRACTOR in terms thereof shall be deemed to be a waiver of such right, remedy, obligation or liability, as the case may be, by the OWNER and notwithstanding such failure or delay, the OWNER shall be entitled at any time to enforce such right, remedy, obligation or liability, as the case may be.

ARTICLE-8
Non-Assignability

The Contract and benefits and obligations thereof shall be strictly personal to the CONTRACTOR and shall not on any account be assignable or transferable by the CONTRACTOR.
IN WITNESS WHEREOF the parties hereto have executed this Contract in duplicate the place, day and year first above written

SIGNED AND DELIVERED for and on behalf of INDIAN OIL CORPORATION LTD.

by.....

in the presence of
1.
2.

SIGNED AND DELIVERED for and on behalf of

..... (CONTRACTOR)

by .....

(this day of _____ 20___)

in the presence of
1.
2.

(Strike off which is not applicable)

PAYMENT TO VENDORS THROUGH ELECTRONIC MODE

Payment system to Vendors through Electronic Modes such as EFT, RTGS etc has been introduced by the Corporation. For availing this facility, a consent letter from the Vendor as also the Bank Account details of the Vendor is required.

Bidders are requested to submit their Consent Letter as per the format given below along with the enclosures as required:-

Dated:

To,

M/s Indian Oil Corporation Ltd.

Address

Dear Sir,

With reference to your advise, we hereby agree to accept the payment of our bills through "RTGS/NEFT/Electronic Mode".

The desired bank account details are given below:

1.	Vendor Code allotted by IOCL in SAP	
2.	Name of Beneficiary (i.e. IOCL Vendor)	
3.	Name of the Beneficiary's Bank	
4.	Address of the Beneficiary's Bank Branch	
5.	Contact details of Branch with STD Code	
6.	Beneficiary's Bank Account No. (as per cheque copy)	
7.	Beneficiary's Account Type (SB/CC/CA)	
8.	Beneficiary's Bank IFSC Code (11 Digit)	
9.	Mobile No of Beneficiary (One Number only)	
10.	E-Mail Id of Beneficiary (One Mail Id only)	

A blank cancelled cheque leaf relating to the above bank account is enclosed for verifying the accuracy of the bank account details.

I hereby declare that the particulars given above are correct and complete. I agree to receive transactional SMS / E-Mail Alerts from IOCL with regard to my bill payments.

(Signature of Account Holder)

Seal of the Vendor

Encl.: Cancelled Cheque

**** We hereby confirm that the above bank account details of beneficiary are correct in all respects and the account of Beneficiary (IOCL vendor) is maintained at our bank branch.

(Name of Bank & Branch)

Authorized Signatory

**** Verification required only in case vendors name is not printed/appearing on the cancelled cheque leaf being submitted to IOCL office.

PROFORMA OF TENDER NOT TEMPERED

(TO BE SUBMITTED ON LETTER HEAD OF BIDDER DULY SIGNED)

Note: Copy to be uploaded along with tender and original to be submitted during documents verification.

Subject: Tender No: _____ due on _____.

I/We _____ (Name of Bidder), hereby declare that:

- I/We have not tampered or modified the subject tender document in any manner and before uploading, same has been cross-checked with documents hosted on your e-portal https://iocletenders.gov.in. In case, if same is found to be tampered/modified, I/We understand that my/our tender will be summarily rejected and EMD/SD may be forfeited and I am/We are liable to be banned from doing business with and/or prosecuted.

- I/We, hereby confirm that if any discrepancy observed in the submitted tender even at a future date, I/We will abide by all the terms and conditions as per all the documents hosted including Addendums/Changes/Corrigendum, on your e-portal related with subject tender. I/We further assure that we agree to all the decisions confirmed in Pre-Bid Conference of the subject tender.

Tenderer's Signature & Seal
Date:
Place:

Witness:
1) Name & Address: _____
_____
_____

2) Name & Address: _____
_____
_____

Bidder to classify without fail the nature of supply being executed by him as works contract, or services or goods along with the Service Accounting Code/HSN & GST Rate (%) in the last two columns of the table given below respectively. Bidders are required to fill Service Accounting Code/HSN & GST Rate (%) in the technical bid. Filling of Service Accounting Code/HSN & GST Rate (%) in the technical bid is mandatory and non-submission of the same is liable for rejection of their bid.

SL.NO.	Description of item	QTY	UNIT	Service Accounting Code/HSN	GST Rate (%)
PART I	CIVIL WORKS				
	A - EARTHWORK				
	a) The prices for all excavations are to include for removing and clearing away all shrubs, bushes, roots etc.				
	b) The prices are also to include for all leveling and ramming foundation beds, trimming of sides and bottom grading to proper level as required.				
	c) Removal and carrying shall include for all loading, unloading and handling as may be necessary and also all necessary means of transport (Mechanical or manual as required).				
	d) The prices are also to include removal of water accumulated due to subsoil seepage, rains or from any kind of sources, either by pumping or by bailing or by any suitable method like well point dewatering etc. if reqd. No extra payment shall be made for dewatering. This also includes for draining out the pumped water to nearby available drainage system.				
	e) Normally payment of earth work shall be made according to the sizes of PCC for trenches/ pits as contemplated in the working drawings. Extra due to widening or deepening of trenches / pits shall not be paid for except for the cases where water / acid proofing would be accepted as per working drawings in such case the mode of measurement shall be as per IS : 1200				
	f) Nothing extra shall be paid for sorting /screening of excavated materials to obtain good earth for filling.				
	g) Nothing extra shall be paid on account of any lift for disposal of excavated materials, the prices includes for all excavation at any depth.				

	h) Where excavation are made in excess of the depth required, the contractor shall at his own expense fill up to the desired level with lean concrete of mix 1:5:10 (1 Cement: 5 Coarse sand: 10 Graded stone aggregate 40 mm nominal size				
	i) Rate shall include Royalty, Taxes, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account.				
	j) Soft / loose soil also includes filled up earth / moorum.				
	k) The filling for earth / morrum or sand shall be done in layers not exceeding 20 cm in thickness (consolidated) with by Suitable means to achieve 90% dry density at Optimum Moisture Content corresponding to standard Proctor test & vibro compactor in confined spaces.				
1	**Earth work in excavation** by mechanical means (Hydraulic excavator) / manual means over areas including Back Filling (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidation each deposited layer by ramming and watering and disposal of excavated earth within and outside site to unobjectionable place, disposed earth to be levelled and neatly dressed. For all Lift and Lead. All kinds of soil including ordinary rock.	8640.00	Cu.M		
2	**Filling available excavated earth** (excluding rock) under floors in layers not exceeding 20cm in depth, consolidation each deposited layer by ramming and watering, within premises for all Lift and Lead	2152.00	Cu.M		
3	Earth work in supply & filling for all works with **good quality borrowed earth**, free from vegetation, organic matters, boulders with all leads and lifts including cost of transportation, loading/ unloading, breaking clods, watering etc, complete as per directions of Engineer - in- Charge.The measurement shall be made on the basis of calculated compacted volume of earth, based on the contour surveys of level on site before filling and spot level after filling to be taken jointly with contractor after execution of work.	5.00	Cu.M		

4	Supplying and **filling local sand** within the grading zone III of fine aggregates as per IS Code in plinth, under floors, underground tanks, foundations, tank pads, etc. in layers not exceeding 20cm in depth, each deposited layer to be compacted by ramming watering and dressing complete as per technical specifications/ drawings.	510.00	Cu.M		
	B. CONCRETE WORK/ REINFORCED CONCRETE WORK				
	a) The prices for concrete in beds and slabs are to include for laying on any type of sub grade, laying to falls, or cambers and for preparing surfaces to receive concrete.				
	b) All concrete surfaces shall be finished to a fair face to give a smooth and even surface. Nothing extra shall be paid on this account.				
	c) The prices are to include leaving pockets, cut outs and holes and to provide wooden boxes or any other suitable arrangements in RCC for bolt holes in slab, beams, walls, foundation of equipments etc. as per approved working drawing. (Nothing extra shall be paid on this account).				
	d) No deduction in RCC quantity shall be made for pockets and nothing extra shall be paid for providing pockets as mentioned in para 'C' above.				
	e) Measurement of opening in concrete work/RCC work: For measurement of openings in concrete work / RCC works, shall be as per IS: 1200 Part-III.				
	f) All pocket holes are to be properly covered by suitable means so that dirt, rain water etc. etc., should not enter the pockets/holes etc. (Nothing extra shall be paid on this account.)				
	g) Threads of bolts etc. which have already been fixed in the pockets are to be greased and polythene sheet properly covered with gunny bags to protect it from damages from all sources. (Nothing extra shall be paid on this account.)				
	h) The prices shall include for all rebating, trotting, chamfering weathering, molding etc. to accord with the details shown on the approved working drawings				

	i) Nothing extra shall be paid for any intricate concrete work for foundations of equipments and machinery (dynamic/static), RCC wall and other superstructure works or any delay in concreting in small and thin sections in PCC or RCC works.				
	j) The prices for concrete are to include for hoisting and / or lowering to any height and/or depth required and in any type of form work, packing around reinforcement where required and finishing the surfaces, to fair and even surface.				
	k) The prices shall include working up or hacking of concrete surface for providing keys for further concrete work and shall also include all plane, rebated or grooved constructional and other joints.				
	l) The design mixes of all controlled concrete of various grades shall be established by the contractor on the basis of weigh batching, at the beginning of work. In all concrete / RCC work graded coarse aggregate shall be used. Any concrete work with honey comb shall be rejected and the work has to be redone by the contractor at his own cost.				
	m) Concrete admixtures for workability if necessary, may be used in RCC if decided by Engineer-in-charge. No extra payment for mixing etc, shall be made on this account.				
	n) Machine and equipment foundations shall mean all foundations including pedestals of vessels, towers, pumps, compressor motors, or any other equipment or machinery (both static and dynamic), pipe supports, etc. and the like.				
	o) The prices are also to include the removal of water caused by rains/seepage etc. either pumping or by bailing out or by special means like well point dewatering etc. that may accumulate in the trenches and foundation pits etc.				
	p) The prices are to include the supply of cement by the contractor.				
	q) Anti shrinkage compound used in grouting shall be paid separately.				
	r) Desired design mix shall be got approved from Engineer-in charge before commence of casting.				

	s) The source of supply for sand and stone chips shall be approved by IOCL.				
	t) Approved brand of 43 grade cement shall be used for preparing design mix & cement shall be tested as per relevant IS Codes. Cement supply shall be in contractor's scope.				
	Following additional points to be noted for Batch Mix Concrete(BMC)				
	a) BMC shall be setup within the plant premises as Directed by Engineer-in-charge.				
	b) Nothing extra should be paid for establishing and removal, after compliting of Job of such plant.				
	c) It shall be ensured that shuttering done by contractor shall be adequate to withstand pumping pressure.				
	d) Any loss of material shall be contractor's responsibility.				
	e) Desired design mix shall be got approved from Engineer-in charge before Casting.				
	g) Approved brand shall be used for preparing BMC & Cement shall be tested as per relevant IS Codes. Cement supply shall be in contractor's scope.				
	a) Cement brand to be used: i) Ultratech Cement ii) J.K. Cement iii) Coromandal King iv) Birla Cement ACC v) Ambuja Cement vi) Dalmia Cement vii) Top Cement				
	B1. PLAIN CEMENT CONCRETE				
	Providing and laying cement concrete in foundation, footings and base for columns/walls , below product pipeline , FH line including proportioning, mixing in mechanical mixer, laying vibration by means of mechanical vibrators, curing etc. complete including the cost of shuttering:-				
1	Concrete of mix 1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size)	404.00	Cu.M		

2	Concrete of mix 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) and finishing with 6mm thk cement mortar 1:4 below product pipeline and FH line.	502.00	Cu.M		
3	Concrete of mix 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) skid concrete on roof	5.00	Cu.M		
4	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement :3 coarse sand : 6graded stone aggregate 20mm nominal size) over 75mm bed by dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top smooth.	5.00	SQM		
	B2. REINFORCED CEMENT CONCRETE				
	IN FOUNDATION & PLINTH:				
1	Providing and laying in position, machine batched, machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement as per approved design mix, including pumping of concrete to site of laying and cost of centering, shuttering but excluding the reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete,improve workability without impairing strength and durability as per direction of Engineer-in-charge. Note :- Cement content considered in this item is @410 kg/cum. a. Batch mixing plant of capacity to be approved by Site Engineer for the works to be installed by the Contractor at site along with required NOCs from concerned Authorities. Alternately, Contractor shall also be permitted to use RMC (if available) at no extra cost to IOC & after obtaining prior approval from Engineer In-Charge. b. For small quantities (up to 5 cum per day), mixing & placing of concrete using mechanical mixer shall be permitted with the prior approval of IOC. c. Hacking of exposed surface of green concrete (wherever applicable) as Key to plaster shall be done at no extra cost to IOC.	1467.00	Cu.M		

	IN SUPERSTRUCTURE:				
2	Providing and laying in position, machine batched, machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, including floors. Floors are to be cast in the panel of max 3meter x 3meter including integral smooth finish and painting side surfaces with two coats of bitumen paint of approved quality, complete in all respects as per direction of Engineer-in-Charge, using cement as per approved design mix, including pumping of concrete to site of laying and cost of centering, shuttering but excluding the reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete,improve workability without impairing strength and durability as per direction of Engineer-in-charge.Note :- Cement content considered in this item is @410 kg/cum.a. Batch mixing plant of capacity to be approved by Site Engineer for the works to be installed by the Contractor at site along with required NOCs from concerned Authorities. Alternately, Contractor shall also be permitted to use RMC (if available) at no extra cost to IOC & after obtaining prior approval from Engineer In-Charge.b. For small quantities (up to 5 cum per day), mixing & placing of concrete using mechanical mixer shall be permitted with the prior approval of IOC.c. Hacking of exposed surface of green concrete (wherever applicable) as Key to plaster shall be done at no extra cost to IOC.	146.00	Cu.M		
3	Providing grouting in pockets with cement concrete 1: 1: 2 (1 cement: 1 coarse sand: 2 coarse aggregate 10 mm nominal gauge) with approved anti shrinkage compound as per manufacturer's specifications (payment for anti shrinkage compound shall be made separately) with necessary finishing etc all complete as per directions of Engineer –in- Charge.	2.00	Cu.M		
4	Providing grouting under base plates with cement mortar 1:1 (1 cement : 1 coarse sand) with anti shrinkage compound for which payment shall be made separately with necessary finishing etc all complete as per directions of Engineer –in- Charge.	2.00	Cu.M		

5	Providing, hoisting and fixing up to floor five level precast reinforced cement concrete in drain/ sump covers including setting in cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering and finishing with neat cement punning on exposed surfaces but excluding the cost of reinforcement with concrete of 1:2:4) (using stone aggregate 12.5mm nominal size)	20.00	Cu.M		
	B3. REINFORCEMENT & EMBEDMENTS				
	a) Wastage in cutting will not be paid for. Only steel actually fixed in position will be paid by the linear measurement i/c hooks, chairs, dowels and laps. Only authorized hooks and laps approved in bar bending schedule shall be paid. Lapping of bars will be allowed only where the required bar length exceeds the standard lengths available. All other laps provided unless otherwise specified in the drawings shall not be measured and paid for. Weight of binding wire shall not be measured for payment. The prices are to include for the supply of all Reinforcement & Embedment at site by the Contractor.				
	b) Reinforcement are to be tack welded in addition to binding by 18 SWG annealed wire wherever necessary to impart fixity. Bars of 28 mm dia & above shall also be provided with stitch weld in additions to binding with annealed iron wire and nothing extra will be paid for stitch welding. Stitch welding shall be done as per IS specifications. No extra claim shall be entertained on this account.				
	c) Rebars to be used: i) TISCO ii) SAIL iii) RINL(VIZAG STEEL) iv) ESSAR v) JINDAL STEEL AND POWER vi) KAMDHENU				
	Supplying, cutting, bending, hoisting, placing in position with proper precast concrete block cover and binding with 18 SWG annealed wire, high yield strength deformed bars as per IS: 1786 for all R.C.C works including all necessary handling at all heights and depths complete in all respects and as per direction of the Engineer-in-Charge.				

1	Thermo Mechanically Treated Bars Fe-500 grade or better ,Conforming to IS1786	198.00	Te.		
2	Supplying and fixing MS foundation bolts with necessary GI nuts and sizes, all conforming to relevant Indian Standards/approved drawing	6000.00	kg		
	C. STRUCTURAL STEEL				
1	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/or bolting with MS bolts conforming to property class 4.6 of I.S:1367 at all height as per approved fabrication drawings of all types of structural steel work in rolled steel joints, channels, angles, tees, flats, plates, lattice members built up / compound sections in columns, portals, girders, beams, bracings, trusses, purlins, rafters, staircase, steps, walkway, cat ladder with cages, toe plates, side walling, trestles, Conveyor gantries , cheqquered plate etc.including gusset plates, anchor plates, hand rail (40 NB , 32 NB & 25 NB pipe) etc., including site and shop fasteners, riveting, bolting, welding at shop or work site at all heights etc. MS structural Steel in channels, angles, flats, conforming to IS-2062 of various sizes (ISMC 100 / 75x75x8 L / 50x50x6 L/ 50x6 flat/ 6 mm thick sheet/ Any other sizes of Structural steel members . & including applying approved coats of primers and paint as per Technical specification.Complete as per drawing and direction of Owner / Consultant. (All material supply is in contractor's scope including paints).Providing and applying Anticorrosive treatment to structural steel surface as per below specifications.a) Surface preparation by shot blasting conforming to SA 2.5 b) Primer coat of INORGANIC ZINC ETHYL SILICATE, one coat of 75 – 80 micron DFTc) Intermediate coat of TWO PACK EPOXY-POLYAMIDE MIO UNDERCOAT, one coat of 120 – 125 micron DFTd) Final coats of TWO PACK ALIPHATIC POLYURETHANE, two coats of 25 micron DFT Total DFT shall be 230micron.Primer & paint shall be of approved make as specified by IOCL.Payment will be on the basis of weight of structural steel provided.	273.00	Te.		

2	Providing & fixing of MS tubes (Square /round) , square rods of approved size, welding etc. to steel gates , fencing at all other places as required including mech cleaning of the structures and painting the same as per specifications of approved colour and shade as per site direction. Providing and applying Anticorrosive treatment to structural steel surface as per below specifications. a) Surface preparation by shot/grid blasting conforming to SA 2.5 b) Primer coat of INORGANIC ZINC ETHYL SILICATE, one coat of 75 – 80 micron DFT c) Intermediate coat of TWO PACK EPOXY-POLYAMIDE MIO UNDERCOAT, one coat of 120 – 125 micron DFT d) Final coats of TWO PACK ALIPHATIC POLYURETHANE, two coats of 25 micron DFT Total DFT shall be 230micron.Primer & paint shall be of approved make as specified by IOCL.	10.00	Te.		
3	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/ or bolting with MS bolts conforming to property class 4.6 of IS:1367 at all heights as per approved fabrication drawings Structural steel work in built up sections/ framed work in galvanised electro forged gratings, platforms , frames, guard bar gratings and similar works as per IS 800, IS 813, IS 816 & approved fabrication drawings only including supply, transportation, de-rusting, fabricating, erecting, hoisting, fixing in position etc. as required and shall be provided with hot dip Galvanization coating of thickness 80-90 microns . (All material supply is in contractor's scope including paints)	113.00	Te.		
	D. FINISHING				
	a) The prices are to include for work at any height / depth and for all necessary scaffolding etc. as required.				

	b) The prices shall also include for making to form key for plaster and for all work in narrow width formed angles, chamfered external angles and for making good the faces.				
	c) Plastering shall be measured in sq. metre area of the surface to be plastered, as per IS: 1200 (Part XII). The rate shall include erecting and removal of scaffolding all labour, all materials, equipment, plants, tools and all incidental expenses to complete plastering, pointing, rubbing out joints, cleaning, wetting, filling with cement mortar, troweling etc. and making of drip moulds, grooves, vattas, bands etc. including curing.				
	d) The prices are to include the supply of cement at site by the contractor.				
	e) Water proofing compound in proportion recommended by manufactures shall be used in all Plaster works for which no separate payment will be done.				
	f) Sand used for plastering shall be from approved sources.				
	Providing and laying cement plaster on surfaces with Coarse sand including curing etc.				
1	12 mm Cement plaster of mix1:4 (1 cement: 4 coarse sand)	1700.00	Sq.M		
2	20 mm Cement plaster of mix1:4 (1 cement: 4 coarse sand) Providing and applying 20 MM thick cement plaster to all external surfaces and at all levels in two coats with base coat of 12 mm thick in CM 1:5 & finish coat of 8 mm thick in CM 1:3 including finishing the surface to uniform rough texture (sponge finish) by applying neat coat of cement including staging, curing etc complete as per technical specifications and site directions complete. Note: a) Hacking of RCC surfaces shall be done when the concrete is green in order to provide key to plaster. b) Plastering shall be done using 1 Kg of water proofing compound to every bag of cement used. c) For existing plaster surface , the key to be made by hacking of existing plaster	3800.00	Sq.M		

	surface at no extra cost. d)The above cost includes the rates for making grooves, Plaster Band, Elevation Plaster Treatment & Etc in any shape & size in plaster or as directed by EIC.				
	E .BRICK WORK				
	All brick work shall be with class designation 50 as per CPWD Specification unless otherwise mentionedAutoclaved aerated concrete (AAC) blocks of class designation 45-50 can also be used with the approval of Site In-charge.				
1	Brick work with Class Designation 50 bricks in Cement mortar 1:4(1 cement : 4 coarse sand) in superstructure ABVOE PLINTH & UP TO FLOOR V LEVEL	323.00	Cu.M		
	F.FLOORS & BASES				
	a) The prices for hard core are to include for all labour in laying to slopes or camber, hand packing, edges of haunches forming splayed edges, watering and rolling and ramming wherever required to solid compaction etc.				
	b) The prices are to include for works at all levels/depths				
1	Supply and Laying hard core under floors and footing including watering, ramming, Bliding, and well consolidating with broken stone aggregates 90mm to 40mm in layers of maximum compacted thickness of 100mm including filling the voids with smaller stone chip and with bliding materials fine river sand.(Payment shall be made of finished compacted thickness of hard core)	1802.00	Cu.M		
2	**Cement concrete coping** Providing & laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments,pillars,posts,struts, buttresses,string or lacing courses, parapets,coping, bed blocks, anchor blocks, plain window sills, fillets etc. UP TO FLOOR V LEVEL excluding the cost of centering, shuttering and finishing : PCC 1 Cement:2 Coarse Sand:4 Graded Stone Aggregate 40mm	120.00	Sq.M		
	G. MISCELLANEOUS				

1	Demolishing cement concrete manually/ by mechanical means including disposal of material outside premises at unobjectionable and as per direction of Engineer -in - charge.				
	1:3:6 or richer mix	1.00	Cu.M		
	1:4:8 or leaner mix	1.00	Cu.M		
2	Dismantling of RCC ringwall of dismantled tanks (500 mm thick approx.)	148.00	Cu.M		
3	Demolishing Brick work manually/mechanical means including stacking of serviceable material & disposal of unserviceable material outside site at unobjectionable place & as/direction of Engineer-in-charge.	225.00	Cu.M		
4	Extra for cutting reinforcement bars manually/ by mechanical means in R.C.C. or R.B. work (Payment shall be made on the cross sectional area of R.C.C. or R.B. work) as per direction of Engineer-in-charge.	140.00	SqM		
5	Providing and fixing NECO or equivalent make CI cover with frame including finishing etc. complete with all labours, materials, tools, tackles.	1.00	EACH		
6	Providing & laying 80mm thick factory made Pre-cast cement concrete interlocking paver block of M 40 grade made by block making machine with strong vibratory compaction & of approved size and design/ shape/ shade and manufacturers and as per IOCL's specifications. The paver block will have peripheral chamfer,with average crushing strength more than 40 N/Sq.mm as/ BS6717 Part -1(1986), maximum water absorption of 2% after 10 minutes and 5% after 24 hrs. as per BS 1881, maximum dimensional deviations of +/- 2mm on length & width and +/- 3mm on on thickness. The job includes supplying & laying a layer of 50mm thick clean course sand on thoroughly compacted sub-base below the paver blocks, cutting the paver blocks wherever required with hydraulic splitter, filling in the joints at the edges of paver blocks with sand,compacting with machine vibrator to required line and level, etc. complete.(Payment for provision of edge restraints shall be made	800.00	Sq.M		

	separately);- Grey or Coloured 80mm thick paver blocks				
7	Chequerred precast cement concrete tiles 22 mm thick in footpath & courtyard jointed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and cleaning etc. complete on 20 mm thick bed of cement mortar 1:4 (1 cement: 4 coarse sand). TILES OF DARK SHADE USING ORDINARY CEMENT	6850.00	Sq.M		
	Structural steel work in 6 mm thick chequered plate including cutting, hoisting, fixing in position and including mechanical cleaning of the structures & painting as per enclosed specifications of approved colour and shade as per enclosed specifications & as per site direction. Note: Quantity of stiffener angle in the under surface of chquered plate shall be paid separately under MS structural steel work item	50.00	Sq.M		
8	Providing and fixing concertina coil fencing with punched tape concertina coil 600mm dia 10metre openable length(total length 90m having 50 nos. rounds per 6 metre length, over compound wall of any height with angle iron 'X' shaped placed 2.4 m or 3.00 m apart and with 9 horizontal R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal including necessary bolts or G.I. barbed wire tied to angle iron all complete as per direction of Engineer-in-charge with reinforced barbed tape (RBT)/ Spring core(2.5mm thick)wire of high tensile strength of 165 kg/sq.mm with tape (0.52 mm thick) and weight 43.478gm/metre. (cost of M.S. angle, C.C.blocks,shall be paid separately)	1300.00	RM		
9	Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50mm including strengthening with 2mm dia GI wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge using hot dipped galvanised wire of 4mm dia (The rate for civil works for excavation, brick masonry, PCC shall be paid separately)	1950.00	SqM		

10	Supply and fabrication, Installation/laying of B-class G.I Pipes conforming to IS:1039 for cable Protection Buried in Concrete/PCC/Brick work or Under Earth including cutting to size, Threading, Bending etc. of following sizes:				
	75 Dia G.I. Pipes	15.00	RM		
	100 Dia G.I. Pipes	200.00	RM		
11	Design, supply of horizontal lifeline with accessories for Fall arrestor system of 56 BTPN T/Ws covered shed loading/unloading Railway Gantrylines, each railway Gantry line divided in 14 blocks each block having 4BTPN T/Ws and for each block two persons fall carriage/fall arrestorsystem to be provide. Item includes required nos. Shock absorber (SS 304 to limit impact force in event of fall to less than 6.5 KN), App. 720m Steel wire rope (minimum 8 mm dia of SS 316), 28 nos. Retractable fallarrestor (with SS wire rope of 4.5 mm dia & length as required at site),28 no. Carriage body (SS 316 with friction free movement), required nos.Tensioner (SS 304 with swageless termination of end wire), Extremityplates, Cable extremity (if required), 28 no. Anti static Full bodyadjustable harness & any other material to complete the job. Fallarrestor system shall be provided as required at the location. Items shall be provided in line with the material specifications . The above requirement is typical and vendor shall provide any additional items required for efficient working of the system at no extra cost to IOCL.The rates mentioned are inclusive of all Installation, testing,commissioning & customization of Fall arrestor system with Safety harness, complete. For ensuring correct installation, horizontal lifeline shall be proof loaded at site to a static force of 6 KN by the vendor. Work shall be done at site with all required safety precautionsas per OISD/IOCL with required daily work permit only.Rate inclusive of all materal transportation, packging, forwarding, loading, unloading,insurance charges, labour, tools, equipment, double stage structuralscaffolding etc.,	1.00	Set		

12	Providing and fixing with clamps i/c cutting chases and making good the wall etc. concealed or embeded under floors unplasticised Rigid PVC soil and waste pipes (Prince or equivalent) conforming to IS:13592 Type B including fitting conforming to IS:14735 such as, but not limited to, all type of bends, tees, Ys with or without door, couplers, unions, reducers, acess/socket plug, busings, gully, floor, nahni trap with jali,etc, as required, all necessary accessaries required for making it water tight. This includes jointing of pipes & fittings with one step solvent cement and testing of joints complete as per direction of Engineer-in-Charge, Single socketed pipes.				
	75 mm dia nominal bore	30.00	Mtrs		
13	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete : Light Duty				
	Pipe 300 mm. dia.	20.00	Mtrs		
	Pipe 600 mm. dia.	20.00	Mtrs		
	Pipe 900 mm. dia.	20.00	Mtrs		
14	Providing and fixing 18mm thick gang saw cut mirror polished premoulded and prepolished) machine cut for kitchen platforms, vanity counters,sills,facias,Pump Island & similar locations of required size of shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) with joints treated with white cement mixed with matching pigment,epoxy touch ups, including rubbing,curing moulding & polishing to edge to give high gloss finish etc. complete at all levels. Granite of any colour and shade Area of slab over 0.50 sqm.	100.00	SqM		
15	Providing edge moulding to 18mm thick marble stone counters, Vanities etc. including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge Granite work	100.00	Mtrs		

16	40mm Thick Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand:4 stone aggregate of 20mm nominal size) finished with a floating cement coat of neat including cement slurry, but excluding the cost of nosing of steps etc. complete.	200.00	SqM		
17	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement:3 coarse sand) including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm) including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment) (Precast C.C. kerb stone shall be approved by Engineer-in-charge.	50.00	CUM		
18	Shifting of materials within site / loading / Unloadng of material like MS plates , pipes, valves etc. from trailor/trucks etc. with suitable capacity of hydra or cranes and stacking of the same inside the IOCL site premises (anywhere within the IOCL premises) as per direction of Site Engineer.The payment will be done on theoritical weight basis of material unloaded.	850.00	MT		
19	Finishing walls with Acrylic Smooth exterior paint of required shade with Two or more coat applied @ 1.67 ltr/10 sqm over & including base coat of water proofing cement paint applied @ 2.20kg/10 sqm.	30360.00	SqM		
20	Painting **road surface marking** with adequate no. of coats to give uniform finish with ready mixed road marking paint conforming to IS : 164, on Concrete / bituminous surface in white/yellow shade including cleaning the surface of all dirt, scales, oil, grease and foreign material etc. complete. New work (2 coats).	2000.00	SQM		

21	Providing and applying 2.5mm thick **road marking strips (retro-reflective)** of specified shade/ colour using hot thermoplastic material by fully/ semi automatic thermoplastic paint applicator machine fitted with profile shoe, glass beads dispenser, propane tank heater and profile shoe heater, driven by experienced operator on road surface including cost of material, labour ,T&P, cleaning the road surface of all dirt, seals, oil, grease and foreign material etc. complete as per direction of EIC and accordance with applicable specifications.	300.00	SQM		
	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) , foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 120x90 cm and 150 cm deep including C.I. cover with frame (heavy duty) 560 mm internal diameter, total weight of cover and frame to be not less than 208 kg (weight of cover 108 kg and weight of frame 100 kg) : With common burnt clay bricks of class designation 50	5.00	Each		
	Constructing brick masonry chamber for underground **C.I. inspection chamber** and bends with 75 class designation bricks in cement mortar 1:4 (1 cement : 4 coarse sand) C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg), foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design : Inside dimensions 600x 850 mm and 150 cm deep for pipe line with three or more	5.00	Each		

	inlets :With common burnt clay bricks of class designation 50				
	Supplying, filling, spreading & levelling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	1000.00	CuM		
22	**Z- SIGNAGE**				
a	**Aluminum Composite Panel (ACP) Display Board** Supply and erection of retro reflective sign (Bi-lingual) Display Board made out of 4mm thick Aluminum composite panel (ACP) one face covered fully with HIP grade retro reflective sheeting of TIMEX or equivalent make, and HIP grade retro reflective vinyl radium film message and graphic. The work shall include all the allied items (MS structural sections or pipes of proper dia including applying a priming coat of approved steel primer and two coats of synthetic enamel paint of approved colour and make, consumables, civil works etc.) required for fixing and erection of sign boards at all necessary locations as per site conditions and under approval of EIC. Background color shall be white for external plant signage and metallic for building signage and font size of minimum 25mm and as appropriate as per the approval and direction of EIC.	500.00	SQM		
b	**Brass Display Board (Replacable)** Supply and installation of 1mm thick brass plates satin polish with 15 mm vinyl letter.	5.00	SQM		
c	**Aluminium Display Board** Supply and installation of Proprint Aluminium 0.2 mm thick direct print with UV ink,letter size depending on signage.	30.00	SQM		

d	**Inaugaration Signage** Supply and installation of 20 mm thk. Granite –Black slab (size: 1200mm x 1200mm) to be embossed with letters/names as per client, cladded on the wall at main gate.	5.00	SQM		
e	**Steel Display Board (Replacable)** Supply and installation of 1mm thick steel plates with detailed dimensions as mentioned in sheet with 15 mm vinyl letter.	5.00	SQM		
f	Supply and installation of **Wind Sock** with cloth made out of Red and White colour strips 2ft. dia and 6ft. long from fluorescent parachute cloth with extra nylon rope, including G.I. pipe stand made out of 1" dia. 4ft. long with portable round ring 2ft. dia. with ball bearing system.	5.00	EACH		
	TOTAL (Part I)				
PART II	**FURNITURE**				
	Supply of Following Godrej Office Furniture or Equivalent. The rates are inclusive of all taxes and duties, freight and other charges.				
1	Supply of Godrej make Table Model Name : 'Lead', Appearance/Colour: Oak white (Size 2055 W x1800 x 750 (ht)). Or latest Equivalent make	1.00	Each		
2	Supply of Godrej make Table Model Name : 'Trident Senior', Appearance/Colour: Mapple + Wenge (Size 1804 W x 750 D x 750 H). Or latest Equivalent make	6.00	Each		
3	Supply of Godrej make Table Model Name : 'Wish modular', Appearance/Colour: As approved (Size Tentative - 1200 x 600 x 750). Or latest Equivalent make	6.00	Each		

4	Supply of Godrej make Table Model Name : 'Trident Junior', Appearance/Colour: Mapple + Wenge (Size 1500 W x 750 D x 743 H). Or latest Equivalent make	3.00	Each		
5	Supply of Godrej make Table Model Name : 'Café pod with SS top', Appearance/Colour: SS (Size 800 W x 800 D x 742 H). Or latest Equivalent make	10.00	Each		
6	Supply of Godrej make Table Model Name : 'T-8', Appearance/Colour: MS body + wooden top (Size 1200 x 600). Or latest Equivalent make	5.00	Each		
7	Supply of Godrej make Centre Table Model Name : 'Alice', Appearance/Colour: Walnut (Size 1000 W x 650 D x 450 H). Or latest Equivalent make	4.00	Each		
8	Supply of Godrej make Conference table Model Name : 'Senate conference table', Appearance/Colour: As approved as addon extension of existing table. (Size 1360 x710). Or latest Equivalent make	1.00	Each		
9	Supply of Godrej make Chair for Senate Conference Table, Appearance/Colour: Gallop mesh. Or latest Equivalent make	30.00	Each		
10	Supply of Godrej make Chair Model Name : 'Monarch/ La sede - High back', Appearance/Colour: Black. Or latest Equivalent make	2.00	Each		
11	Supply of Godrej make Chair Model Name : 'Monarch/ La sede - Mid back', Appearance/Colour: Black. Or latest Equivalent make	8.00	Each		

12	Supply of Godrej make Chair Model Name : 'CH7B', Appearance/Colour: Cushon chair with arm rest. Or latest Equivalent make	6.00	Each		
13	Supply of Godrej make Chair w/o arm Model Name : 'Staq', Appearance/Colour: Wooden finish, beige . Or latest Equivalent make	40.00	Each		
14	Supply of Godrej make Visitor Chair Model Name : 'Kareena Mid Back', Appearance/Colour: Black. Or latest Equivalent make	36.00	Each		
15	Supply of Godrej make Sofa set Model Name : 'Novara / PARTO PLUS ', Appearance/Colour: Beige (Size 3 seater - 1900 W x 830 D x760 H). Or latest Equivalent make	1.00	Each		
16	Supply of Godrej make Sofa set Model Name : 'Novara/ PARTO PLUS ', Appearance/Colour: Beige (Size 2 seater - 1440 W x 830 D x 760 H). Or latest Equivalent make	1.00	Each		
17	Supply of Godrej make Sofa set Model Name : 'Novara /PARTO PLUS ', Appearance/Colour: Beige (Size 1 seater - 930 W x 830 D x 760 H). Or latest Equivalent make	1.00	Each		
18	Supply of Godrej make Sofa set Model Name : 'Midas', Appearance/Colour: Sea green (Size 3 seater). Or latest Equivalent make	3.00	Each		
19	Supply of Godrej make Sofa set Model Name : 'Midas', Appearance/Colour: Sea green (Size 2 seater). Or latest Equivalent make	3.00	Each		

20	Supply of Godrej make Sofa set Model Name : 'Midas', Appearance/Colour: Sea green (Size 1 seater). Or latest Equivalent make	3.00	Each		
21	Supply of Godrej make Back unit Model Name : 'Tambour door unit', Appearance/Colour: Bond white with white shutter (Size 1200 W x 470 D x 690 H). Or latest Equivalent make	4.00	Each		
22	Supply of Godrej make Back unit Model Name : 'Tambour door unit', Appearance/Colour: Bond white with white shutter (Size 1200 W x 470 D x 1169 H). Or latest Equivalent make	1.00	Each		
23	Supply of Godrej make Back unit Model Name : 'Trident Back unit', Appearance/Colour: Wenge (Size 1804 W x 450 D x 750 H). Or latest Equivalent make	7.00	Each		
24	Supply of Godrej make Locker (base unit) Model Name : '6 door PLU', Appearance/Colour: Bone White /Shell grey (Size 1830 x 380 x 450). Or latest Equivalent make	11.00	Each		
25	Supply of Godrej make Locker (addl unit) Model Name : '6 door PLU', Appearance/Colour: Bone White /Shell grey (Size 1830 x 380 x 450). Or latest Equivalent make	5.00	Each		
26	Supply of Godrej make Storwel Plain Model Name :Storwel Plain - 4SH Colour: Bone White (Size 1981 H x 916 W x 486 D). Or latest Equivalent make	5.00	Each		
27	Supply of Godrej make Minor Plain Model Name :Storwel Plain - 2SH Colour: Bone White (Size 1270 H x 765 W x 440 D). Or latest Equivalent make	4.00	Each		
	TOTAL (Part II)				

PART III	**ELECTRICAL WORKS**				
A	**SUPPLY OF FOLLOWING ITEMS**				
1.0	**LIGHTING SUB DISTRIBUTION BOARD (Make: CONTROLS & SWITCHEAR CO LTD./ ELECMECH CORPORATION/ HAVELLS INDIA LTD/ INDO ASIAN FUSEGEAR LTD/ INTRELEC/ LEGRAND)**				
1.1	**Lighting Sub Distribution Board (LSDB) :**Supply of 415V,3 phase 4 wire 50 Hz, 63 A, Lighting Sub Distribution Board (LSDB) comprising of 1 no. 63A 4P MCB incomer feeder and 06 nos. 415V, 16A , 4 pole RCBO outgoing feeders as per Single Line Diagram shown in Drg. no. PC00088-0807 REV. 0. The lighting sub distribution boards shall have double door arrangement, fabricated out of 2.5 mm thick cold rolled sheet steel and shall be suitable for mounting on wall/structure. These shall have dust and vermin proof construction & suitable for outdoor installation, the enclosure shall conform to IPW-55 as per IS: 13947. Suitable canopy made out of 2 mm thick Aluminum sheet shall be supplied along with the board. The LSDB shall be provided with Heavy duty double compression type Aluminum cable glands with suitable PVC shroud, suitable for incoming and outgoing cables of size 3.5x50sq.mm (Al) XLPE, FRLS cables with separate terminal blocks, required lugs, earthing terminals, etc. The enclosure after suitable pre-treatment shall be painted with two coats of anti rust paint followed by two coats or anticorrosive paint. The finishing shade shall be light grey shade no.631 as per IS: 5. Routine test as per IS/ IEC shall be carried out on the LSDB and same shall be provided with the equipment.	1	Nos.		
2.0	**LIGHTING FIXTURES & ACCESSORIES**				

	Supply of Weather proof Lighting Fixtures & Accessories (All Lighting fixtures shall be provided with required no. of double compression nickel plated brass cable glands and stopping plug. (MAKE : RENOSOLA MODEL NO.RLF200AF0101/02 OR EQUIVALENT MODEL OF BAJAJ/ CGL/ PHILIPS/SURYA/ WIPRO)				
2.1	Supply of specially designed flood light luminaries 350W LED lamps on CCTV pole.The cost shall include supply and providing 3C x 2.5 mm^2 unarmoured copper cable from the junction box fixed on top of the lighting pole to each lighting fixtures including terminations with suitable glands with suitable PVC shrouds, Lugs etc all complete.	45	Nos.		
3.0	**JUNCTION BOXES (FLP & NON-FLP) -** Make: BALIGA LIGHTING EQUIPMENT PVT.LTD/ FCG FLAMEPROOF CONTROL GEARS PVT LTD.(FORMERLY CEAG FLAMEPROOF)/ FCG POWER INDUSTRIES LTD/ FLAMEPROOF EQUIPMENTS PVT LTD/ FLEXPRO ELECTRICALS PVT LTD/ GOVAN INDUSTRIES(INDIA) PVT LTD/PROMPT ENGINEERING WORKS/ SUDHIR SWITCHGEARS PVT LTD				
3.2	**Flameproof 16A, 240V, Ph-N, 3-way Junction boxes;** Junction boxes with terminals block with additional earthing terminals and end clamps etc. including 3 Nos. Ex'd' double compression stainless steel cable glands with PVC shrouds suitable for 3x2.5 sq. mm (cu.) XLPE, FRLS cables,	45	Nos.		
3.3	**Flameproof 16A, 415V, Ph-N, 6-way Junction boxes;** Junction boxes with terminals block with additional earthing terminals and end clamps etc. including 3 Nos. Ex'd' double compression stainless steel cable glands with PVC shrouds suitable for 2nos.-3.5x50sq.mm (Al) and 4 nos- 3x2.5 sq. mm (cu.) XLPE, FRLS cables, 2mm thick Alu canopy shall be provided.	6	Nos.		

4.0	**SUPPLY OF LT CABLES AS PER IS:IS: 7098 Part (I)Make** CABLE CORPN. OF INDIA/ CORDS CABLE INDUSTRIES LTD/ FINOLEX CABLES LTD/ HAVELLS INDIA LTD/ KEC INTERNATIONAL LTD (FORMERLY RPG CABLES LTD)/ KEI INDUSTRIES LIMITED/ RAVIN CABLES LTD/ TORRENT CABLES LTD/ UNIVERSAL CABLES LTD				
	1.1KV armoured XLPE, FRLS Power Cable of following size:-				
4.1	3.5x50 sq.mm. (AL)	3500	Mtrs		
4.2	3x2.5 sq.mm. (CU)	4500	Mtrs		
5.0	**Supply of G.I. ladder type Cable Tray 100x30x2mm thick runners, Rungs at 300mm spacing, Min.2400mm length along with required Coupler Plate with stainless Hard-ware ,Hold on clamps With stainless Hard- ware , Horizontal /Vertical - Inside / Outside bends etc. suitable for following G.I. Cable Tray and Tray cover. G.I. tray, cover and accessories shall have zinc coating of 800 gm/sq. metre applied by hot dip galvanising process. Galvanising shall be uniform, adherent, smooth and free from defects. Make: 1) GLOBE ELECTRICAL INDUSTRIES/ INDIANA ENGG WORKS PVT LTD/ JAMNA METAL COMPANY/ KANADE ANAND UDYOG PVT LTD/MAHESHWARI ELECTRICAL MFRS. (P) LTD/ METALITE INDUSTRIES/PAREKH ENGINEERING COMPANY/PREMIER POWER PRODUCTS (CALCUTTA) PVT LTD/RUKMINI ELECTRICAL & COMPONENTS PVT LTD/SADHANA ENGINEERING CORPORATION/ SLOTCO STEEL PRODUCTS PVT LTD/ SREE ATREYA ENTERPRISES/ STEALITE ENGG CO.**				
5.1	300 wide G.I. ladder type cable tray - 2mm thick	3300	Mtrs.		
5.2	2mm Thick Cover for 300 wide G.I. ladder type cable tray	3300	Mtrs.		
6.0	**GI CABLE PROTECTION PIPES**				

	Supply of Class-B Galvanized Iron (G.I. pipes) conforming to IS-1239 complete with accessories (bends, reducers, couplers etc.) of following sizes:-				
6.1	50 mm NB	100	Mtrs		
6.2	150 mm NB GI Pipe (B class)	50	Mtrs		
7.0	**EARTHING & LIGHTNING**				
	Supply of following Hot dip Galvanized earthing and lightning protection materials conforming to IS & drg. specifications.(Galvanisation is 910 gms/sq. mtr.)				
7.1	**Earth Pit:** Supply of hot dip GI earth electrode 3.8 m long 100 dia NB heavy duty as per IS 1239 complete with all parts including required S.S. hardware for earth pit (equipment earthing, Neutral earthing and for lightning protection) and required test link for checking earth connectivity.as per enclosed Drawing No. PDS :E 610 & Earthing GI accessories as per Drawing No. PDS:E 611 (2 Sheets). Earth electrodes shall be hot dip galvanised after drilling / welding.	2	Nos.		
	Hot Dip Galvanized G.I. earth strips, PVC insulated Cu/Al cable of following sizes for earthing and lightning protection:-				
7.2	50 mm x 6 mm GI Strip	200	Mtrs		
7.3	35 mm x 6 mm GI Strip	50	Mtrs		
7.4	1Cx16 mm2 PVC (Al) cable Green colour	50	Mtrs		
7.5	Hot dip galvanized GI earth bus bar of size 390 x 50 x 12 thick with fixing materials as per Drg. No.- PDS:E 615 (10 holes)	7	Nos.		
B	**INSTALLATION, TESTING & COMMISSIONING OF FOLLOWING ITEMS: -**				

1.0	Receiving from store, transporting to erection site excluding cable glanding & power/ control cable termination but including verification of bill of materials, handling, arrangement of transport vehicle, loading/unloading equipment & accessories etc., supply & fixing of base frame by welding on insert plate/angle embedded in foundation OR on frame works/supports grouted or welded to walls/columns/structures, (Supply cost for base frame shall be included in steel fabrication item & fixing cost shall be included in this item), checking of complete bill of materials , placing on base frame OR frame works/supports, assembly of shipping section, interconnection of busbars, interpanel wiring, drilling of gland plates as per required holes for cable entries, plugging of all unused entries and other holes in the boards/panels to make the same dust and vermin proof, making good of wall/columns broken or chipped by cement plastering, checking internal connection for tightness & proper wiring, carrying out minor modification on wiring, fixing of panels with base frame OR frame works/supports by welding/bolting including supply of GI hardwares, fixing of canopy for outdoor DB's, touch up painting work as required, testing & commissioning of following AUXILIARY BOARDS together with all accessories, all works, labour and materials complete as per drawings & documents, specifications, codes & standards & instructions/ directions of ENGINEER IN CHARGE.				
1.1	**Lighting Sub Distribution Board (To be located in substation) :** Installation of 415V,3 phase 4 wire 50 Hz, 63 A, LDB , comprising of 1 no. 63A 4P MCB incomer feeder and 06 nos. 415V, 3Ph-N, 16A , 4 pole RCBO outgoing feeders as per Drg. no. PC00088-0807 REV. 0. Double compression, cable glands with PVC shrouds and required lugs shall be supplied along with LDB.	1	Set		
2.0	**LIGHTING FIXTURES**				

	Receiving from store, transporting to erection site including handling, arrangement of transport vehicle, unpacking, inspection, checking of internal wiring, fixing copper conductor, cabling / circuit wiring between LTG SUB DB to (JB/control gear box wherever applied) to fixtures, painting of circuit nos., wherever required, supply & fixing pipes/GI chains, supply & fixing neoprene/rubber/PVC bushes at fixtures and JBs, erection in position on brick/RCC walls OR on RCC/steel columns/roofs/structures/cable trays OR on poles, cable glanding & termination, crimping of lugs & connections at fixtures/ control gears, supply of all erection materials including supply of necessary GI hardware, GI clamps, GI brackets, civil masonry materials, testing of following types of LIGHTING FIXTURES with all their parts & accessories etc.,including fixing of lamps, all work, labour and materials complete as per drawings and documents, specifications, codes & standards and instructions / directions of ENGINEER IN CHARGE.				
	Installation of Weather proof Lighting Fixtures & Accessories				
2.1	Installation of specially designed flood light luminaries 350W LED lamps on CCTV pole.The cost shall include supply and providing 3C x 2.5 mm^2 unarmoured copper cable from the junction box fixed on top of the lighting pole to each lighting fixtures including terminations with suitable glands with suitable PVC shrouds, Lugs etc all complete.	54	Nos.		
3.0	**MISCELLANEOUS WALL / STRUCTURE MOUNTED ITEMS**				

	Receiving from store, transporting to erection site excluding cable glanding & power / control cable termination but including handling, arrangement of transport vehicle, unpacking, inspection, levelling, alignment, fixing in position by bolting, grouting, etc., closing of unused cable entries with threaded plug provided, supply of all necessary hard wares as required, testing & commissioning of following MISCELLANEOUS WALL / STRUCTURE MOUNTED ITEMS on MS structures / MS pedestals / concrete columns / concrete or brick walls etc. like FLP Local control stations, FLP Switches, FLP Switch sockets, Ex 'd' Junction boxes, Industrial / Weather proof LCS, switches, Switch socket, Junction boxes etc. together with all accessories, all work, labour and materials complete as per drawings & documents, specifications, codes & standards and instructions / directions of ENGINEER IN CHARGE.				
	JUNCTION BOXES				
3.1	**Flameproof 16A, 240V, Ph-N, 3-way Junction boxes;** Junction boxes with terminals block with additional earthing terminals and end clamps etc. including 3 Nos. Ex'd' double compression stainless steel cable glands with PVC shrouds suitable for 3x2.5 sq. mm (cu.) XLPE, FRLS cables,	54	Nos.		
3.2	**Flameproof 16A, 415V, Ph-N, 6-way Junction boxes;** Junction boxes with terminals block with additional earthing terminals and end clamps etc. including 3 Nos. Ex'd' double compression stainless steel cable glands with PVC shrouds suitable for 2nos.-3.5x50sq.mm (Al) and 4 nos- 3x2.5 sq. mm (cu.) XLPE, FRLS cables, 2mm thick Alu canopy shall be provided.	54	Nos.		
4.0	**CABLE LAYING**				

	CABLE LAYING ON OVER HEAD RACK / IN RCC TRENCH /GI PROTECTION PIPE: Horizontal and Vertical Laying of FRLS , XLPE/ PVC cables of following sizes and particulars on already installed cable racks, in trenches; in floor slits; in G.I. conduit (including chipping of floor wherever required), cable trays, cable risers, supports, hangers, saddles etc.; Sealing of wall openings and pipe sleeves ,sand filling after cable laying etc.; Including handling, transportation from owner's store/storage yard to installation site of cables/cable drums; unpacking , inspection; cable dressing; fixing of cable clamps in vertical and if necessary, in horizontal runs; fixing of cable identification tags (At every 10 Mtr. interval all along the length); testing before and after laying; installation of Aluminum cable clamps and cable tags, GI saddles and GI saddle bars , GI bolts, nuts and washer screws etc.; Actual site measurement shall be taken before cutting the cable from drum to avoid cable joint / waste. Balance cables shall be neatly re-rolled and length mentioned on the drums and send to ware house; all work, labour and materials complete as per drawings, specifications, codes and standards and directions of Engineer-in-Charge. Bidder shall note that approximately 10mtr. power and control cable for motor/LCS at each terminating end shall be laid in GI cable protection pipe. Vendor shall quote the cable laying rate considering the same.				
	1.1KV armoured XLPE, FRLS Power Cable of following size:-				
4.1	3.5x50 sq.mm. (AL)	3500	Mtrs		
4.2	3x2.5 sq.mm. (CU)	4500	Mtrs		
5.0	**CABLE TERMINATIONS & GLANDING**				

	Cable termination, connections and testing of 11 kV (UE) /1.1kV grade, Al. OR Cu. conductor, XLPE insulated, GI strip armoured, FRLS POWER / CONTROL / LIGHTING CABLES of following sizes and particulars including drilling / tapping of gland plate for cable entry, fixing of cable glands & terminals supplied loose at equipment end but excluding supply of cable glands. Cable termination also includes supply of lugs with stripping of insulation, taping, soldering OR crimping of tinned Cu. / Al. (as required), sockets OR lugs to conductors, connection of leads to equipment terminals etc., ferruling, supply of GI nuts, bolts, washer, screws, insulating tapes, compounds, solders, fluxes, ferrules etc. Closing of unused cable entries to make the equipment dust, moisture & vermin proof, testing of cables before & after terminations for IR values, all work, labour and materials complete as per drawings, specifications, codes & standards and instructions / directions of ENGINEER IN CHARGE.				
	Cable termination for 1.1 kV grade, XLPE insulated, FRLS POWER CABLES termination of following sizes: -				
5.1	3.5c X 50 sq. mm (Al)	16	Nos.		
6.0	**INSTALLATION OF G.I. LADDER TYPE CABLE TRAY AS PER ENCLOSED DRAWINGS AND SPECIFICATION.**				
	Installation of Pre-Fabricated G.I. cable tray with accessories like: Coupler Plates,Hold on Clamps , bends etc. and supporting arrangement. The work includes transportation from owners store to erection site, unpacking, inspection; checking, Erection in position on supports, fixing, supply of all erection materials Including necessary hardware. All work, labour and materials complete as per drawings, specifications, codes and standards and directions of Engineer-in-Charge.				
6.1	300 wide G.I. ladder type cable tray - 2mm thick	3300	Mtrs.		
6.2	2mm Thick GI Cover for 300 wide G.I. ladder type cable tray	3300	Mtrs.		

7.0	**GI CABLE PROTECTION PIPES (GI)**				
	Fabrication & installation / laying of following medium grade GI pipes for cable protection on wall / floor / steel structure / RCC column / foundation etc. fixed on steel, concrete or similar structure, laid in trenches, buried in concrete or brick work or under earth including handling, transportation to erection site, inspection, cutting to size, threading, bending etc., chipping or breaking concrete floors / concrete cable trenches / columns / walls & making good the same by cement plastering etc., supply & fixing of GI clamps, supports, GI nuts, bolts, washers, sockets, spacers, plugs, couplers, reducers, bushings, civil masonry materials, all work labour & materials complete as per drawings, specifications and instructions / directions of ENGINEER IN CHARGE.				
7.1	50 mm NB GI Pipe (B class)	225	Mtrs.		
7.2	150 mm NB GI Pipe (B class)	100	Mtrs.		
8.0	**EARTHING / LIGHTNING PROTECTION**				
8.1	Installation & testing of 100 NB, 3.8 M. long G.I. pipe Earth Electrode in Earth pit (for equipment earthing,Neutral earthing and for lightning protection) as per Drawing Nos.PDS: E 601 (3 sheets),PDS: E 602 (1sheet),PDS: E 603 (6sheets),PDS:E 604 (Sheet 1 of 1),PDS:E 605 (2 Sheets),PDS:E 610(Sheet 1of 1) and PDS:E 611(2 Sheets) Including handling ,Transportation to Erection site , **Excavation** of Earth pit in all types of soil ,back filling of pit with common salt, charcoal / coke and loose Earth after Installation of Electrode there in, removal of surplus Earth away from Erection site, consolidation of loose Earth on back filled pit, making of bricks work, Inspection chamber on back filled pit and cover of RCC ,there of complete with lifting hook, fixing & connecting inside the chamber of G.I. Earth bracket and other accessories of the Earth Electrode, painting of Earth pit No. and Earthing symbol on the cover, supply of salt, charcoal /coke, bricks, sand, cement, stone chips, reinforcement	2	Nos.		

	rods, lifting hook, necessary stainless steel hardware, paints etc.(Excluding supply of G.I.Earth Electrode & its accessories),all works, labour & materials complete as per Drawings, specifications, code & standards and direction of consultant/owner.Bidder shall note that the excavation may be for hard or soft soil and rate is inclusive of excavation of Earth pit.				
	Installation and testing of GI earth strip / laying of earthing cable of following sizes as per PDS :E 603 (6 Sheets) PDS:E 606 (2 Sheets) enclosed in ready made concrete trenches or in floor slits, on cable racks/ risers/ trays , on brick / concrete wall , on RCC/steel columns , on RCC/steel towers and vessels, under concrete floors, or paved areas, across pipe joints and valves, directly buried under ground at depth of 500 mm, including handling, transportation to erection site , bending, straightening, cutting to size, welding together of earth strips in overlapping manner, chipping in concrete floors/ paved areas for laying the earth strips under floors/ paved areas and making good by cement plastering concrete after laying of the strips ; clamping and supporting of earth strips laid above ground, connecting the strips/ wire at both ends to equipment or to earth bus / earth plates or to GI brackets fixed inside earthpit chamber, by bolting etc., Hessian tapes, all necessary GI hardware, GI clamps, civil masonry materials, etc. all work, labour as per specifications, codes and standards and directions of owner/consultant. Note: Rate of excavation and back filling of GI strip/earthing cable is excluded.				
	Hot Dip Galvanized G.I. earth strips, PVC insulated Cu/Al cable of following sizes for earthing and lightning protection:-				
8.2	50 mm x 6 mm GI Strip	200	Mtrs		
8.3	35 mm x 6 mm GI Strip	50	Mtrs		
8.4	1Cx16 mm2 PVC (Al) cable Green colour	50	Mtrs		

8.5	Installation of GI Earth Bus bars (size: 390x50 x12mm thick) as per PDS:E 615 (Sheet 1 of 1) Including handling, transportation, drilling of necessary holes/enlargement existing holes as required; all associated work for fixing the Bus bars in position e.g. cutting, levelling, aligning, chipping, grouting, welding bolting etc.; making good of broken/chipped portion on walls /columns by cement plastering. supply of all necessary hardware (GI), paints, civil masonry materials etc. all work, labour complete as per drawings, specifications, codes and standards and directios of consultant /owner.	7	Nos.		