

NHPC LIMITED
(A GOVT. OF INDIA NAVRATNA ENTERPRISE)



BID DOCUMENT
(DOMESTIC COMPETITIVE BIDDING – OPEN TENDER)
THROUGH E-TENDERING WITH E – REVERSE AUCTION
FOR

EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh



Tender ID: 2025_NHPC_849250_1

CONTRACTS (CIVIL) DIVISION

REGD. OFFICE: NHPC OFFICE COMPLEX, SECTOR-33, FARIDABAD – 121003

CIN: L40101HR1975GOI032564

TABLE OF CONTENTS

Tender Document for EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh

Section	Description	Page
Section -I	Notice Inviting E-Tenders	5-12
Section -II	Instructions to Bidders (ITB), Bidding data, IFB	13-50
Section -III	Letter of Tender Form, Qualification Information, Form of declaration,	51-94
Section -IV	General Conditions of Contract and Schedules	95-165
Section -V	Forms	166-191
Section -VI	Special Conditions of Contract	192-194
Section -VII	Schedule of Quantities and Prices	195-196
Section -VIII	Technical Specifications & Safety Manual	197-358
Section -IX	Drawings	359-368

SECTION-I

NOTICE INVITING E-TENDER



NHPC Office Complex,
Sector-33, Faridabad-121003

NOTICE INVITING TENDER

(Domestic Competitive Bidding)

(E-tendering)

Tender ID: 2025_NHPC_849250_1

- Online bids are invited through **Domestic Competitive Bidding in Single Stage -Two Part Bidding** Basis {i.e. Part-I (Cover-I): Technical- Bid and Part-II (Cover-II): Financial Bid} with e-Reverse Auction (e-RA) by NHPC Ltd. on behalf of Bundelkhand Saur Urja Limited (A Joint Venture of NHPC Ltd. and Uttar Pradesh New and Renewable Energy Development Agency i.e. UPNEDA herein after referred to as employer/owner) from eligible Bidders for **“EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh”**.

A. Brief details of the tender:		
Sl. No.	Item	Description
i)	Mode of tendering	e-Procurement System Cover-I: Online Techno-Commercial Bid Cover-II: Price Bid
ii)	Tender ID No.	2025_NHPC_849250_1
iii)	Tender reference No.	NH/CCW/CC-I/CO-367/BSUL /PR/JSP/2024-25/383
iv)	Cost of bid document	Rs.5,000/- (Rupees Five thousand only) in the form of demand draft from a Nationalized / Scheduled bank in favour of NHPC Ltd. Payable at Faridabad.
v)	Bid Security (EMD)	Rs. 34,92,000/- (Rupees Thirty Four Lakhs Ninety Two Thousands only) in the form of DD/BG/Insurance Surety Bond as per clause no.

		14 of ITB
vi)	Period of Bid Validity	120 days from the last date of submission of online Bids.
vii)	Estimated Cost	Rs. 17.46 Crore (including Taxes)
viii)	Completion Period	350 Days from the date of issue of Notification of Award
ix)	Tender inviting Authority	General Manager (Civil Contracts-I) Room No. 218, 2nd Floor, Jyoti Sadan, NHPC OFFICE COMPLEX, Sector-33, Faridabad-121003, Haryana, India Tele No :+91 (129) 2270596 Email: contcivil1-co@nhpc.nic.in
B. Critical dates of tender:		
S. No.	Particulars	Date & Time
x)	Publishing Date & Time	14.02.2025 (18:30 Hrs)
xi)	Document Download Start Date & Time	14.02.2025 (18:30 Hrs)
xii)	Bid Submission Start Date & Time	14.02.2025 (18:30 Hrs)
xiii)	Online Bid Submission Closing Date & Time	08.03.2025 (17:30 Hrs)
xiv)	Last Date of Offline submission (Date, Time and Address)	10.03. 2025 (upto 17:00 Hrs) <u>Address :</u> General Manager (Civil Contracts-I) Room No.218, 2nd Floor, Jyoti Sadan, NHPC OFFICE COMPLEX, Sector-33, Faridabad-121003, Haryana, India Tele No :+91 (129) 2270596 Email: contcivil1-co@nhpc.nic.in
xv)	Opening: Date, Time & Venue of Online/ Offline Bid (Technical Bid (Part-I) submission	11.03.2025(15:00 Hrs) <u>Venue :</u> General Manager (Civil Contracts-I) Room No.218, 2nd Floor, Jyoti Sadan, NHPC OFFICE COMPLEX, Sector-33, Faridabad-121003, Haryana, India Tele No :+91 (129) 2270596 Email: contcivil1-co@nhpc.nic.in
xvi)	Price Bid Opening (Part-II) – Financial Bid	Venue, Date & time to be intimated later to the bidders whose Techno-commercial Bids will be found responsive

xvii)	Date & Time of Start of e-Reverse Auction	Shall be intimated separately by NHPC

- 1.1 Complete Bid Document /Tender Document can be viewed and down loaded from Central Public Procurement (CPP) Portal <https://eprocure.gov.in/eprocure/app>. The site can also be viewed through e-procurement corner of NHPC website **www.nhpcindia.com** and CPP Portal. Any Bidder who wishes to quote for this Tender can download the Tender Document from aforesaid portal after online Bidder registration for e-tendering.

2. Eligible Bidders

2.1 This Invitation for Bid is open to:

- The bidders who are incorporated legal entity and are legally and financially autonomous and operate under commercial law of their respective jurisdiction.
- All bidders meeting the Qualification criteria as defined in clause 3.
- Bidder shall be Class-I Local Supplier under Public Procurement (Preference to Make in India), Order-2017 issued by the Department of Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry vide No. P-45021/2/2017-PP (BE-II) dated 16.09.2020 or as amended from time to time. Bidders shall submit undertaking/self-certificate regarding Local content in the format provided. Bidder shall also give details of the location(s) at which the local value addition is made.

Public Procurement (Preferences to Make in India) Policy (including its latest modifications/amendments) as may be prevailing on the date of Price Bid Opening shall be applicable against this tender. Bidders are requested to go through the Public Procurement (Preferences to Make in India) policy available on concerned ministry website.

- Bidder shall comply with the provisions of “Restrictions under Rule 144(xi) of the General financial Rules (GFRs) 2017” issued by Department of Expenditure, Ministry of Finance dated 23.07.2020 and subsequent amendments.
- 2.2 Bidders shall not be under declaration of ineligibility for banning / delisting / blacklisting / debarment from business on the ground mentioned in para 6 of Guidelines on Banning of Business dealings (Annexure-A) to Integrity Pact at the time of submitting the bid and shall intimate immediately of any such banning / delisting / blacklisting / debarring after submission of bid till award of tender. Self-Declaration in this regard is to be submitted as per the enclosed proforma (Form-6, Section-III).
- 2.3 The Bidders whose contract(s) have been terminated due to unsatisfactory performance by employer in past, shall not be allowed to participate in the bidding process till completion of the ineligibility period.
- 2.4 To improve transparency and fairness in the tendering process the Employer is implementing Integrity Pact.

The Integrity Pact, signed by all the prospective Bidders and the Employer, shall commit the persons/officials of both the parties, not to exercise any corrupt/ fraudulent/collusive/coercive practices in the Tendering process and also during implementation of the Contract. Only those Bidders who have entered into Integrity Pact with the Employer shall be eligible to participate in the bidding process.

All Applicants shall enter into an Integrity Pact (to be executed on plain paper) with the Employer at the time of submission of their Bids. The Integrity Pact digitally signed / signed on behalf of the Employer shall be as per Form-7 Section-III. The Integrity Pact shall be downloaded, printed and signed by the Applicant and to be submitted online.

Successful bidder shall submit duly executed Integrity pact on Non-Judicial Stamp paper of appropriate value prior to signing of Contract Agreement.

To oversee the compliance of obligation under the Integrity Pact, **Dr. Vinod Aggarwal** , **Sh. Prabhash Singh** and **Shri Upendra Malik** have been appointed as Independent External Monitor (IEM) by the Employer. The Contact address of IEMs are as under:

Dr. Vinod Aggarwal, B-103, Sarvodaya Enclave, 2 nd Floor, New Delhi-110017, e-mail: arsv50@gmail.com	Sh. Prabhash Singh, E7M702, Housing Board Colony, Arera Colony, Bhopal Madhya Pradesh-462016, e-mail: srgmhrbpl@gmail.com	Shri Upendra Malik, B-108, NSG Society, Plot-2, Pocket-6, Builders Area, Greater Noida- 201315 (UP) Email: upendra.malik@gmail.com

3. **Qualification of the Bidder**

3.1 All bidders shall include the following information and documents with their bids in, Qualification Information unless otherwise stated in the ITB:

- a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder. Additional information as sought in the Form-1 General Information, Section-III shall be provided;
- b) work experience to demonstrate meeting the criteria stipulated in clause 3.2 A (b) shall be provided in Form -3 work experiences record, Section-III. The work experience shown shall be supported with certificate(s) from the Engineer-in-charge/Project head of the concerned work. In case of experience certificates produced by the contractors for having executed works for Private Organizations, TDS Certificates / Form 26AS / Annual Information Statement (AIS) shall also be produced along with experience certificate.
- c) Information on financial criteria stipulated in clause 3.2A (a) shall be furnished in Form -4, Annual construction turnover, Section-III. Copy of affidavit/Certificate of CA mentioning

Annual construction Turnover of last 3 (three) years. Printed Annual reports or financial statements of the Bidder, such as balance sheet, profit and loss statements and auditor's reports as the case may be for the past three years shall be submitted to ascertain bidder's meeting the financial criteria. The CA Certificate should have the Unique Document Identification Number (UDIN) as per Gazette Notification No. 1-CA(7)/192/2019 dated 02.08.2019.

- d) the proposed methodology (Schedule- G in separate sheets) and programme of construction (in Schedule- E), as per technical specifications and within the stipulated period of completion.

3.2 A To qualify for award of the Contract, each bidder should have:

- a) Achieved in any one year in last three year a minimum Annual construction turnover of at least equivalent to the estimated cost of works for which bid has been invited.
- b) Satisfactorily completed, in last seven years ending on last day of month previous to one in which applications are invited, at least one similar work costing not less than the amount equal to 80% of the estimated cost of work or two similar works costing not less than the amount equal to 50% of estimated cost of work or three similar works not less than the amount equal to 40% of the estimated cost of works.

For arriving at the cost of similar work, the value of work executed shall be brought to current costing level by enhancing the actual value of work at simple rate of seven percent (7%) per annum, calculated from the date of completion to the date of bid opening.

Similar Works means: Construction of Buildings or Multistorey Hostels or Township Development or RCC Bunkers or Barracks or RCC Bridges or Overhead RCC Water tanks or Switch Yards (132KV or higher capacity) or RCC Sewage treatment Plants or RCC Water treatment Plants.

3.2 B Each bidder must also submit with their Bid:

- i) Copies of PAN, GST Registration No., EPF Registration No. and ESIC Registration No. (as applicable).
- ii) A declaration that the information furnished with the bid documents is correct in all respects in form-5, form of declaration, Section-III.
- iii) Such other certificates if any as defined in the ITB.

3.2 C To qualify for Contract for which bids are invited in the Notice Inviting Tender, the bidder must demonstrate having work experience, financial capability and resources sufficient to meet the aggregate of the qualifying criteria. Failure to produce the certificates and documents in clauses 3.1 and 3.2(A) & (B) shall make the bid non-responsive.

3.2 D JVs or any other arrangement other than sole bidder is not allowed. Experience and resources of proposed sub-contractor, if any shall not be taken into account in determining the bidder's compliance with the qualifying criteria. However, experience of bidder as sub- contractor approved by Project developer shall be considered. Experience of bidders as member of Consortium/Joint Venture shall be considered as per distribution of work against the member of the Consortium/Joint Venture. In case where distribution of Consortium/JV members is not specified in Consortium/JV agreement then the experience credential shall be considered for all members of JV with minimum 35% participation share.

3.2 E All Startups (whether MSEs or otherwise) registered for similar nature of work falling within the definition as per Gazette notification- GSR 127(E) dated 19.02.2019 or as amended from time to time are exempted from meeting the qualification criteria in respect of Prior Experience-Prior Turnover as per para 3.2 A subject to their meeting the quality and technical specification. However, the Employer reserves the right to deny such exemptions to Startups in case of circumstances like procurement of items related to public safety, health, critical security operations and equipment, etc.

3.2 F **Insolvency**

The Bidder against whom an application for initiating corporate insolvency resolution process has been admitted by the Adjudicating Authority under the Insolvency and Bankruptcy code 2016 or as amended from time to time shall not be eligible for bidding. The same shall also be applicable to the bidder company who has taken unconditional technical and/or financial support from their Parent/ Holding Company, against whom an application for initiating corporate insolvency resolution process has been admitted by the Adjudicating Authority under the Insolvency and Bankruptcy Code 2016, or as amended from time to time (IBC 2016 hereafter).

In case, bidder in respect of whom any application for initiating corporate insolvency resolution process was not admitted at the time of submission of bid but subsequently during the period of evaluation of bids or any time before the work is awarded, any such application is admitted by the Adjudicating Authority under the IBC 2016, the bidder shall be considered as ineligible and his bid shall be rejected.

An undertaking that “no insolvency proceedings is admitted by the Adjudicating Authority against bidder under the IBC 2016” shall be submitted on letter head duly signed by the authorized representative of bidder.

Further, the bidder after submitting the bid till the time of award of work, shall inform NHPC regarding any admission of application for corporate insolvency resolution process by the Adjudicating Authority under the IBC 2016 against bidder and any suppression of such fact shall render the bidder liable for rejection of his bid and banning of business dealing as per terms and conditions of the Bid Document.

3.3 **Disqualification:**

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- (i). made misleading or false representations in the forms, statements, affidavits, declarations and attachments submitted in proof of the qualification requirements; and/or,
- (ii). participated in the previous bidding for the same work & found L-1 and had quoted abnormally high or low bid prices and could not furnish rational justification for it to the Employer,
- (iii). The Bidders whose contract(s) have been terminated due to unsatisfactory performance by employer in past, shall not be allowed to participate in the bidding process till completion of the ineligibility period. In such case the bid shall be considered as non responsive.

4.0 Time for Completion

The successful bidder shall complete the entire work within the time specified at SI no. -1, to be reckoned from the date of issue of Letter of Acceptance issued by the Employer.

- 5.0** Tenders must be accompanied by the Earnest Money of the amount specified for the work in the table.

6.0 Deleted

7.0 Bid submission

- i) Online Bid Submission – Technical Bid (Cover-I) (Refer Section- II i.e. ITB) and Price Bid (Cover-II) electronic format) complete in all respect must be uploaded at the aforesaid portal before the specified date & time as per SI. No. 1.
- ii) Offline Bid Submission (Refer Section- II i.e ITB) complete in all respect must be delivered in sealed envelopes to the address, up to the specified date & time as per SI. No. 1

In the event of the specified date or amendment if any for the submission of bids being declared a holiday for the Employer, the hard copy of the documents will be received up to the specified time on the next working day. Similarly, in the event of the specified date or amendment if any for the opening of bids being declared a holiday for the Employer, the opening shall be carried out at the specified time on the next working day. However, the date and time for online submission of the Bids shall continue to be the date and time specified or amendment if any.

- 8.0** The currency for the Bid shall be Indian Rupee only.

- 9.0** Bids shall be valid for a period as mentioned in SI no. 1 after the deadline for Bid submission. If any Bidder withdraws his Bid before the said period or makes any modification in his Bid, the Earnest Money deposit of the Bidder shall be forfeited. Prior to the expiry of bid validity period, Employer may request Bidders to extend the Bid validity period. The request and the response shall be made in writing. An extension of the bid validity period will not entitle a Bidder to modify its Bid. In case

Bidder fails to extend the bid validity upon employer's request, the corresponding Bid shall be rejected as being non-responsive.

- 10.0** The Techno-commercial Bid shall be opened online at venue date & time as per Sl. No.-1. the time and date of opening of Financial Bid of bidders qualified the technical bid shall be communicated through portal at later date after evaluations of technical bids. The Employer/Tender inviting Authority at his discretion may open Technical and Financial Bid simultaneously and evaluate the Bid completely.
- 11.0** The Employer may impose certain restrictions on the foreign companies participating in any form and their employees in view of the National Security, in the Project situated in the sensitive region and border areas. The Employer shall obtain clearance of Govt. of India regarding security implications prior to qualification of such company. Further, bidders from countries which share land border with India shall comply with Department of Expenditure, Ministry of Finance, GoI, OM No. F.No. 6/18/2019/PPD dt. 23.07.2020 & 24.07.2020.
- 12.0** Any corrigendum, subsequent amendments and / or extension of date, if any, for submission of Bids shall be posted on the portal <https://eprocure.gov.in/eprocure/app>. Bidder(s) are advised to visit the portal regularly before the deadline for submission of Bids.
- 13.0** The employer reserves the right to accept or reject any Bid and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidder(s). However, the Bidder(s) who wish to seek reasons for such decision of cancellation/rejection shall be informed of the same by Employer unless its disclosure reasonably could be expected to affect the sovereignty and integrity of India, the security, strategic, scientific or economic interest of the state or lead to incitement of an offence.
- 14.0** In case of any difference between wordings of English and Hindi, version of 'Notice Inviting Tender', English version shall prevail.

(For & on behalf of NHPC Ltd.)

**General Manager (Civil Contracts-I)
Room No. 218, 2nd Floor, Jyoti Sadan,
NHPC OFFICE COMPLEX,
Sector-33, Faridabad-121003, Haryana, India
Tele No :+91 (129) 2270596
Email: contcivil1-co@nhpc.nic.in**

SECTION II

INSTRUCTIONS TO BIDDERS (ITB), BIDDING DATA

AND

INFORMATION FOR BIDDERS (IFB)

Section II: Bidding Data and Instructions to Bidders

Bidding Data

Instructions to Bidders

Clause	A. General	16	Deadline for Submission of Bids
1	Scope of Bid	17	Late Bids
2	Eligible Bidders	18	Modification and withdrawal of Bids
3	Qualification of the Bidder	E. Bid Opening and Evaluation	
4	Cost of Bidding	19	Bid Opening
5	Site Visit	20	Process to be Confidential
	B. Bidding Documents and Evaluation	21	Examination of bids and Determination of Responsiveness
6	Content of Bidding Documents	22	Evaluation and Comparison of Bids
7	Clarification of Bidding Documents and Pre Bid Meeting	23	Preference for Domestic Bidders
8	Amendment to Bidding Documents	F. Award of Contract	
	C. Preparation of Bids	24	Award Criteria
9	Language of Bid	25	Employer's Right to Accept any Bid And to Reject any or all Bids
10	Bid Prices	26	Notification of Award and Signing of Agreement
11	Currencies of Bid and Payment	27	Performance Security Deposit
12	Bid Validity	28	Advances
13	Earnest Money	29	Corrupt or Fraudulent Practices
14	Alternative Proposals by Bidders	30	General
	D. Submission of Bids		
15	Submission of Bids		

Bidding Data

Sl. No.	Ref. Clause	Description	Particulars
1	1	Name of Work:	EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh
2	2.4	Name of IEM	1. Dr. Vinod Aggarwal, 2. Sh. Prabhash Singh, 3. Sh. Upendra Malik
3	12	Bid Validity	120 Days
4	13	Earnest Money Deposit:	Rs. 34,92,000/- (Rupees Thirty Four Lakhs Ninety Two Thousands only) in the form of DD/BG/Insurance Surety Bond.
5	16	Deadline for online Submission of Bids :	08.03.2025 (17:30 Hrs)
6	16	Deadline for offline submissions of Bids:	10.03.2025 (17:00 Hrs)
7	19	Time and Date for opening Technical Bid/Bids:	11.03.2025 (15:00 Hrs)
8	19	Time and Date of opening Financial Bid/Bids:	Shall be intimated separately to Bidders whose Bid found to be Technically responsive.
9	22	Time and Date of e-RA	Shall be intimated separately after activity at S.No. 8
10	26	Copies of Agreement to be provided by Contractor free of Charge	Original- three(two for employer and one for contractor) True copies: 10 (Ten)

Section-II

Instructions to Bidders (ITB)

A. General

1. Scope of Bid

- 1.1** Online bids are invited through **Domestic Competitive Bidding in Single Stage -Two Part Bidding** Basis {i.e. Part-I (Cover-I): Technical- Bid and Part-II (Cover-II): Financial Bid} with e-Reverse Auction (e-RA) by NHPC Ltd. on behalf of Bundelkhand Saur Urja Limited (A Joint Venture of NHPC Ltd. and Uttar Pradesh New and Renewable Energy Development Agency i.e. UPNEDA herein after referred to as employer/owner) from eligible Bidders for **“EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh”**

The bid will be received, opened and evaluated online in electronic form through NHPC's E-tendering portal i.e. <http://eprocure.gov.in/eprocure/app> [Link to reach at site is also available at NHPC website i.e., www.nhpcindia.com →e-Procurement→Govt. e-Procurement System of NIC (GePNIC) under Central Public Procurement Portal (CPPP)].

After e-tendering, e-Reverse Auction (e-RA) shall be conducted at application service provider's portal. Bid shall be prepared and submitted in accordance with instructions contained in this Section.

This section of the bidding document provides the information necessary for Bidders to prepare online responsive bids, in accordance with the requirements of the Employer. It also provides information on online bid submission, opening, evaluation, e-Reverse Auction and Contract award.

- 1.2** The successful Bidder will be required to complete the Works in the Time allowed for Completion specified in the **Schedule D** in accordance with Conditions of Contract.
- 1.3** Throughout these documents, the terms “bid” and “tender” and their derivatives (bidder/tenderer, bid/tender, bidding/tendering, etc.) are synonymous.

2. Eligible Bidders

- 2.1** This Invitation for Bid is open to:

- a) The bidders who are incorporated legal entity may only participate in the bidding process if they are legally and financially autonomous and operate under commercial law of their respective jurisdiction.
- b) All bidders meeting the Qualification criteria as defined in clause3.
- c) Bidder shall be Class-I Local Supplier under Public Procurement (Preference to Make in India), Order-2017 issued by the Department of Promotion of Industry and

Internal Trade (DPIIT), Ministry of Commerce and Industry vide No. P-45021/2/2017-PP (BE-II) dated 16.09.2020 or as amended from time to time. Bidders shall submit self-certification that the item offered meets the local content requirement for 'Class-I local supplier in the format provided under Tender Form-11.

Public Procurement (Preferences to Make in India) Policy (including its latest modifications/amendments) as may be prevailing on the date of Price Bid Opening shall be applicable against this tender. Bidders are requested to go through the Public Procurement (Preferences to Make in India) policy available on concerned ministry website.

- d) Bidder shall comply with the provisions of “Restrictions under Rule 144(xi) of the General financial Rules (GFRs) 2017” issued by Department of Expenditure, Ministry of Finance dated 23.07.2020 and subsequent amendments.

2.2 Bidders shall not be under declaration of ineligibility for banning / delisting / blacklisting / debarment from business on the grounds mentioned in para 6 of Guidelines on Banning of Business dealings (Annexure-A) to Integrity Pact at the time of submitting the bid and shall intimate immediately of any such banning / delisting / blacklisting / debarring after submission of bid till award of tender. Self-Declaration in this regard is to be submitted as per the enclosed proforma (Form-6-, Section-III).

2.3 the Bidders whose contract(s) have been terminated due to unsatisfactory performance by employer in the past, shall not be allowed to participate in the bidding process till completion of the ineligibility period

2.4 To improve transparency and fairness in the tendering process the Employer is implementing Integrity Pact.

The Integrity Pact, signed by all the prospective Bidders and the Employer, shall commit the persons/officials of both the parties, not to exercise any corrupt/ fraudulent/collusive/coercive practices in the Tendering process and also during implementation of the Contract. All Applicants shall enter into an Integrity Pact (to be executed on plain paper) with the Employer at the time of submission of their Bids. Only those Bidders who have entered into Integrity Pact with the Employer shall be eligible to participate in the bidding process. Entering into Integrity Pact as per Performa provided in the Section Forms & Procedure is a basic qualifying requirement.

The Integrity Pact digitally signed / signed on behalf of the Employer is provided as Form-7 Section-III. The Integrity Pact shall be downloaded, printed and signed by the Applicant and to be submitted online.

Successful bidder shall submit duly executed Integrity pact on Non-Judicial Stamp paper of appropriate value prior to signing of Contract Agreement.

To oversee the compliance of obligation under the Integrity Pact, **Dr. Vinod Aggarwal, Sh. Prabhash Singh and Sh. Upendra Malik** have been appointed as Independent External Monitor (IEMs) by the Employer. The Contact address of IEMs are as under:

1. Dr. Vinod Aggarwal, B-103, Sarvodaya Enclave, 2nd Floor, New Delhi-110017, e-mail: arsv50@gmail.com	2. Sh. Prabhash Singh, E7M702, Housing Board Colony, Arera Colony, Bhopal Madhya Pradesh-462016, e-mail: srgmhrbpl@gmail.com	Shri Upendra Malik, B-108, NSG Society, Plot-2, Pocket-6, Builders Area, Greater Noida- 201315 (UP) Email: upendra.malik@gmail.com

3. Qualification of the Bidder

3.1 All bidders shall include the following information and documents with their bids in, Qualification Information unless otherwise stated in the ITB:

- copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder. Additional information as sought in the Form-1 General Information, Section-III shall be provided;
- work experience to demonstrate meeting the criteria stipulated in NIT shall be provided in Form -3 work experiences record, Section-III. Any work experience (not specified in Form-3) claimed afterwards during clarification shall not be considered for evaluation. The work experience shown shall be supported with certificate(s) from the Engineer-in-charge/Project head of the concerned work;
- Information on financial criteria stipulated in NIT shall be furnished in Form -4, Annual construction turnover, Section-III. Copy of affidavit/Certificate of CA mentioning Financial Turnover of last 3 (three) years. Printed Annual reports or financial statements of the Bidder, such as balance sheet, profit and loss statements and auditor's reports as the case may be for the past three years shall be submitted to ascertain bidder's meeting the financial criteria.
- the proposed methodology ((Schedule- G in separate sheets) and programme of construction (in Schedule- E), as per technical specifications and within the stipulated period of completion.

3.2 For Qualification criteria refer Clause 3.2A to 3.2 F of NIT.

3.3 Disqualification:

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements, affidavits, declarations and attachments submitted in proof of the qualification requirements; and/or,

- (ii). participated in the previous bidding for the same work & found L-1 and had quoted abnormally high or low bid prices and could not furnish rational justification for it to the Employer,
- (iii). The Bidders whose contract(s) have been terminated due to unsatisfactory performance by employer in past, shall not be allowed to participate in the bidding process till completion of the ineligibility period. In such case the bid shall be considered as non responsive.

4. Cost of Bidding

The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will, in no case, be responsible or liable for those costs, regardless of the outcome of the Bidding process.

5. Site Visit

5.1 The tenderers, in their own interest, should inspect and examine the site and its surroundings and satisfy themselves, before submitting their tender, in respect of the site conditions including but not restricted to the following which may influence or affect the work or cost thereof under the Contract:

- a) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by them in connection with the works;
- b) Requirement and availability of land and other facilities for their enabling works, colonies, stores and workshops etc.;
- c) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained therefrom;
- d) Source and extent of availability of suitable materials including water, etc. and labour (skilled and un- skilled), required for work and Laws and Regulations governing their use and employment;
- e) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work;
- f) The limit and extent of surface and sub-surface water to be encountered during the performance of the work and the requirement of drainage and pumping;
- g) The type of equipment and facilities needed, preliminary to, for and in the performance of the work; and
- h) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

5.2 The tenderers should note that information, if any, in regard to the site and local conditions, in these tender documents, except for the material agreed to be supplied by the Employer, has been given merely to assist the tenderers and is not warranted to be complete.

5.3 The tenderers should note and bear in mind that the Employer shall bear no responsibility for the lack of acquaintance of the site and other conditions or any information relating thereto, on their part. The consequences of the lack of any knowledge, as aforesaid, on the part of the tenderers

shall be at their risk and cost and no charges or claims whatsoever consequent upon the lack of any information, knowledge or understanding shall be entertained or payable by the Employer.

5.4 The Bidders should note and bear in mind that the cost of visiting the site shall be at the Bidder's own expenses. The confirmation of the site visit by the bidder shall be submitted as per **Schedule H**.

5.5 Contact detail for site visit and related queries:

- (i) Sh. Rajesh Kumar,
-CEO, BSUL, Mob.9350270238,
Address: Office at TC-43/V, Vibhuti Khand, Gomti Nagar,
Lucknow, Uttar Pradesh.
- (ii) Sh. Sanjeev Balyan,
DGM (M), BSUL, Mob.8130203048,
Address: Office at TC-43/V, Vibhuti Khand, Gomti Nagar,
Lucknow, Uttar Pradesh.

B. Bidding Documents and Evaluation

6. Content of Bidding Documents

6.1 The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 8 of ITB.

Section I	Notice Inviting E-Tender
Section II	Instructions to Bidders(ITB), Bidding Data and Information for Bidders(IFB)
Section III	Tender Form, Form of declaration and Qualification Information
Section IV	General Conditions of Contract (GCC) and Schedules
Section V	Forms
Section VI	Special Conditions of Contract(SCC)
Section VII	Schedule of Quantities and Prices
Section VIII	Technical Specifications (TS) and Safety Manual
Section IX	Drawings

6.2 The bidder is expected to examine carefully all instructions, Forms, Schedules of Quantities and Price, qualification information and other schedules, General and Special conditions of contract, specifications, and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. Pursuant to clause 21 hereof, bids, which are not substantially responsive to the requirements of the Bid Documents, shall be rejected.

7. Deleted

8. Amendment to Bidding Documents

- 8.1 Before the deadline for submission of bids, the Employer may for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the bidding documents by issuing addenda.
- 8.2 In case the Schedule of Quantities and Price (Schedule–A) is revised through corrigendum/addendum, in such a case submission of revised financial bid will become mandatory, and the financial bid submitted earlier (i.e before corrigendum) will become invalid.
- 8.3 Any addendum/corrigenda issued prior to submission of bids would be put up on the CPP portal <https://eprocure.gov.in/eprocure/app> as well as NHPC website www.nhpcindia.com. Any addenda/corrigenda/clarifications thus issued shall be part of the bidding documents. The prospective bidders have to check aforesaid portal for any amendment/corrigenda/clarifications periodically and before submission of their bids. All prospective bidders are presumed to have examined all amendments/corrigenda/clarifications published on the website and have submitted their bids accordingly.
- 8.4 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend, as necessary, the deadline for submission of bids, in accordance with Clause 16 of ITB.

C. Preparation of Bids

9. Language of Bid

All documents relating to the Bid shall be in English language.

10. Bid Prices

- 10.1 The Contract shall be for the whole Works, as described in Clause 1 of ITB, based on the Schedule of Quantities and Prices submitted by the Bidder.
- 10.2 Unless otherwise specified in the Technical Specifications, Bidders shall quote for the entire Facilities on a “single responsibility” basis such that the total bid price covers all the Contractor’s obligations mentioned in or to be reasonably inferred from the bidding documents in respect of design, Engineering including procurement, delivery, construction, installation and completion of the Facilities. This includes all requirements under the Contractor’s responsibilities for commissioning of the Facilities and, where so required by the bidding documents, the acquisition of all permits, approvals and licenses, etc.; training services and such other items and services as may be specified in the bidding documents, all in accordance with the requirements of the General and Special Conditions of Contract.
- 10.3 All duties, taxes, royalties and other levies payable by the Contractor under the Contract, or for any other cause, as applicable 28 days prior to deadline for submission of Bid, shall be included in the rates, prices, and total Bid price submitted by the Bidder. All applicable taxes / duties including GST as applicable and assessed 28 days prior to bid submission date on the Employer shall also be included in the final bid prices, which shall be deducted from the Contractor and deposited to the concerned authority by the Employer. Employer will not entertain any claim whatsoever on this account.

All the bidders should ensure that they are GST compliant and their quoted tax structure /rates are as per GST Law. As per the GST Act the bid must show the GST Tax Rates and GST Amount explicitly.. The bidder has to declare the applicable/considered GST Tax structure in 'Letter of Tender Form' (Form-2)

GST has been implemented by the Government w.e.f. 01.07.2017. The Contractor, except for the supplies for the categories mentioned at Section 9(3) of GST Act, shall submit GSTIN and shall quote his prices in accordance with GST provisions after considering the benefit of Input Tax Credit etc.

10.4 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules or BOQ.

11. Currencies of Bid

The rates and the prices shall be quoted by the bidder entirely in Indian Rupees.

12. Bid Validity

12.1 Bids shall remain valid for a period as mention in NIT/Bidding data, after the deadline date for online bid submission specified in Clause 16 of ITB or amendment thereof.

12.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request the bidders to extend the period of validity for a specified additional period. The request and the bidders' response shall be made in writing or by e-mail. A bidder may refuse the request without forfeiting his Earnest Money. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his earnest money for a period of the extension, and in compliance with Clause 14 of ITB in all respects.

13. Earnest Money Deposit (EMD)

13.1 The Bidder shall furnish, as part of the Bid, Earnest Money, for the amount specified in the NIT/Bidding data either in the form of Demand draft in favour of 'NHPC Ltd' payable at place mentioned in NIT/Bidding data or irrevocable Bank Guarantee valid for a period of 90 days beyond the validity period of the bid issued by any Indian Nationalised Bank/Scheduled Commercial Bank in the prescribed format (Forms of Bank Guarantees) or irrevocable Insurance Surety Bond valid for a period of 90 days beyond the validity period of the bid issued by any Indian Insurance Company registered under Insurance Act 1938 or as amended from time to time and approved by the Insurance Regulatory Development Authority of India (IRDAI) in the prescribed format (Form of Insurance Surety Bond). Earnest Money if submitted by the Bidder in the form of Bank Guarantee / Insurance Surety Bond, the original Bank Guarantee / Insurance Surety Bond shall be submitted along with the bid. However, the issuing Bank / Insurance Company shall submit an unstamped duplicate copy of Bank Guarantees / Insurance Surety Bond directly by registered post (A.D.) to the Employer (authority inviting tenders) with a forwarding letter.

However, in case Earnest Money has been submitted by the bidder in the form of Demand draft, the information relating to particulars of the bidders bank shall be submitted by the bidder along with the bid in the ECS Form at Section-V. The Earnest Money of unsuccessful bidders shall be remitted by the Employer in the above account through ECS mode, the Earnest Money submitted

in the shape of Bank Guarantee / Insurance Surety Bond shall be returned in original by speed post.

13.2 Any bid not accompanied by an acceptable Earnest Money shall be rejected by the Employer as non-responsive. However, the bidders recognized as Startup for the works covered under the tender by the Department of Industrial Policy & Promotion (DIPP) are exempted from furnishing the Bid Security /Earnest Money Deposit, such bidders shall require to submit notarised copy of valid certificate of recognition for the works covered under the tender issued by the DIPP.

13.3 The Earnest Money of bidders who are not qualified for opening of price bid shall be returned within 15 days after such notification. The Earnest Money of unsuccessful bidders will be returned within 15 days of opening of price bids.

13.4 The Earnest Money of the successful Bidder will be discharged when the Bidder has signed the Agreement and furnished the required Performance Security Deposit.

13.5 The Earnest Money may be forfeited:

- a) if the Bidder withdraw or modify/revise the bid in the interval between the Bid submission deadline and the expiration of the Bid validity period ; or
- b) if the Bidder adopts corrupt or fraudulent or collusive or coercive practice(s) or defaults under Integrity Pact: or
- c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
 - i. sign the Agreement; and/or
 - ii. Furnish the required Performance Security Deposit.

13.6 Interest or any other charges, whatsoever, will not be payable by the Employer on the Earnest Money Deposit.

13.7 Bidder shall communicate the following bank details of NHPC to the issuing Bank for online confirmation of Bank Guarantee to be submitted in terms of this clause:

Name of the beneficiary: NHPC Limited

Account No: 10813608692

IFSC Code: SBIN0017313

Credit Bank: State Bank Of India

Account Type: CURRENT

Branch: CAG-II New Delhi (17313)

Address of the Bank : 5th Floor, Redfort Capital, Parsvnath Towers, Bhai Veer Singh Marg, Gole Market, New Delhi-110 001

Bidder is required to submit the SFMS receipt issued by the bank along with its bid for BG Confirmation.

14. Alternative Proposals by Bidders

Bidder(s) shall submit offers that comply with the requirements of the bidding documents, including the Schedule of Quantities and Price, and the basic technical design as indicated in the drawings and specifications. Further, failure to furnish all information required by the Bid

Document or submission of incomplete offers, conditional Bid and proposals containing deviations from the Bid Document shall be rejected as non-responsive.

D. Submission of Bids

15. Submission of Bids

The Bid shall be prepared and submitted in two parts as stated hereunder. Submission of the bids by any other means shall not be accepted by the Employer in any circumstances. The start date of submission of bids and the deadline for submission of bids is indicated in Bidding Data/NIT.

The bidder shall ensure that all uploaded documents/offline documents of bid shall be duly signed along with seal of the authorized person of the bidder having valid power of attorney.

15.1 Online Submission:

15.1.1 Cover –I: This shall be named “Technical Bid”. No bid price related information shall be mentioned in the Technical Bid. Techno-commercial Bid shall comprise;

- i). Dully filed Letter of Tender (Form- 2) (without indicating the quoted price)
- ii). Scanned copy of DD towards cost of bidding document as mentioned in NIT
- iii). Scanned copy of DD/Bank Guarantee / Insurance Surety Bond towards Earnest Money Deposit (EMD) / notarised copy of valid registration certificate from DIPP Certificate **as per ITB Clause 13.**
- iv). Duly filled General Information (Form-1), and Scanned copies of original documents defining the constitution or legal status, Memorandum of Understanding/ Articles of Association, place of registration, and principal place of business; notarised power of attorney of the signatory of the Bid to commit the Bidder with authority of the executant to execute the same;
- v). Duly filled Form of Declaration (Form-5)
- vi). Duly filled Declaration of Ineligibility (Form- 6)
- vii). Scanned copy of PAN No.
- viii). Scanned copy of GST Registration No.
- ix). Scanned copy of EPF Registration No. & ESIC Registration No..... (as applicable).
- x). Detail(s) of Work Experience (Duly filled in Form -3) supported with scanned copies of documentary evidence.
- xi). Scanned copies of Annual Construction Turnover in (Duly filled in Form–4) (Copy of affidavit/Certificate of CA mentioning Annual Construction Turnover of last 3 (three) years, Printed Annual reports or financial statements of the Bidder, such as balance sheet, profit and loss statements and auditor's reports as the case may be for the past three years.)
- xii). The proposed methodology (in separate sheets), Schedule E, G & H.
- xiii). Scanned copy of duly signed Integrity Pact as per Clause 2.4 of ITB
- xiv). Form-11 Certificate of Local Content in accordance to Public Procurement (Preference to Make in India) Order 2017
- xv). Form-12 Declaration on Compliance under Rule 144(xi) of GFR-2017.
- xvi). Such other certificates/documents as defined in the ITB.

The Employer reserves the right to request the bidder for submission of original documents in respect of any of the online submissions defined above

15.1.2 Cover-II: It shall be named “Financial Bid or Price Bid” and shall comprise of Schedule of Quantities and Prices (Schedule A).

Financial Bid shall be submitted in Electronic Form on the portal by the date & time as specified in NIT. Submission of the “Financial Bid” by any other means shall not be accepted by the Employer in any circumstances. In case, if any cell is left blank and no rate is quoted against any of the item(s) by the bidder, rate of such item(s) shall be treated as "0" (Zero) and considered included in the cost of the Bid and no separate claim whatsoever will be entertained on this account.

15.1.3 Submission of revised financial bid will be mandatory, in case the same is desired by Employer through corrigendum/addenda. In such a case the financial bid submitted earlier will become invalid.

15.2 Offline Submission:

Bidder shall be submit the hard copy(ies) of documents as mention at sub para 15.2.1 in (one) sealed envelope, which must be either delivered by hand or by registered mail, and submitted by the date and time as specified in NIT/Bidding data. The envelope received late or after the prescribed due date and time will not be entertained. NHPC will not be responsible for any postal delay.

15.2.1 The sealed Envelope containing hard copy of documents shall be marked as “Hard copy(ies) of documents” for Tender ID : 2025_NHPC_849250_1

- i). i) DD /banker’s cheque payable at “Faridabad” (in original) towards cost of bidding document as mentioned in NIT.
- ii). DD/BG/ Insurance Surety Bond (in original) towards Bid Security as mentioned in Clause No. 13 of ITB.
- iii). Power of Attorney along with a copy of the Board resolution. In case of a General Power of Attorney, a true copy of the POA shall be duly notarized by Notary and in case of a specific Power of Attorney, the original POA. If a proprietary firm is bidding and proprietor of the firm is signing the bid, notarized copy of ownership of firm shall be submitted.
- iv). Duly signed Integrity Pact along with its annexures as per Clause 33 of ITB
- v). Such other certificates/documents as defined in the ITB.

15.3 Out of offline documents, DD towards cost of bid document and DD/BG/ Insurance Surety Bond towards Bid Security must be strictly as per Bid conditions and if any discrepancy is found between the hard copies of the above documents and scanned copy of the same uploaded online, then the Bid uploaded on the portal shall not be considered at all any further. However, Employer may ask for additional documents / clarifications on the other documents submitted online.

16. Deadline for Submission of Bids

- 16.1 Complete Bids must be uploaded at the portal, and hard copy(ies) of the document as mentioned in Clause 15.2 of ITB must be submitted at the address specified, by the date and time as stipulated in the Bidding Data/NIT.

In the event of the specified date for the submission of bids being declared a holiday for the NHPC Ltd., the hard copy(ies) of the documents will be received up to the specified time on the next working day. However, the date and time for online submission of the Bids shall continue to be the date and time specified in the Bidding Data/NIT or any amendment for the same.

- 16.2 The Employer may, in the exceptional circumstances and at its discretion, extend the deadline for submission of bids by issuing an amendment in accordance with Clause 8 of ITB, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.
- 16.3 E-procurement portal permits only one person having Digital Signature Certificate (DSC) and registration etc. at the portal. It will be deemed that the legally authorized signatories of the Bidder having DSC has carried out bidding process through portal.
- 16.4 Any alteration/ modification in the Bid or additional information supplied subsequently to the Bid after period of bid submission, unless the same has been expressly sought for by the Employer, shall be disregarded.

17. Late Bids

Online submission of the bid will not be permitted on the portal after expiry of submission time and the bidder shall not be permitted to submit the same by any other mode. Similarly hard copies of the Off line documents, if received by the Employer after the deadline for submission of Bids prescribed in Bidding Data/NIT, then it will be considered as 'Late Bid' notwithstanding the fact that the bidder has uploaded the bid online within the stipulated deadline. In such a case, the uploaded online bid on the portal shall be considered as non-responsive and shall not be processed further.

18.0 Modification and Withdrawal of Bid

- 18.1 After submission of the bid the contractor can re-submit revised bid any number of times but before stipulated deadline for submission of bid.
- 18.2 In case Employer desired through amendment/corrigendum to submit revised financial bid then it shall be mandatory to submit revised financial bid. In such case the bid submitted before amendment/corrigendum shall become invalid.
- 18.3 The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
- 18.4 No Bid shall be withdrawn or modified/revised after Bid submission deadline. Withdrawal or modification of a Bid after Bid Submission deadline will result in the Bidder's forfeiture of its Bid security and further their Bid shall be considered non-responsive.

E. Bid Opening and Evaluation

19. Bid Opening

19.1 The Employer/ Authority inviting Tender will open the bids received (except those received late) in the presence of the bidders / bidder's representatives who choose to attend at the time, date and place specified in the Bidding Data/NIT. The Bidders/ Bidder's representatives who are present shall sign a register evidencing their attendance. Bidder(s) can also view Bid opening online on the CPP portal <https://eprocure.gov.in/eprocure/app> at their end.

In the event of the specified date for the opening of bids being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day.

19.2 Online Cover-I i. e Technical Bids shall be opened first.

19.3 Cover-I i. e Technical Bids shall be evaluated for establishing eligibility of the bidder as per clause 2 & 3 as well as techno-commercially responsiveness as per Clause 21 of ITB, and a list will be drawn up of the responsive bids whose financial bids are eligible for consideration.

19.4 The Cover-II i.e. Financial Bid of only of those Bidder(s), who are found to be meeting the eligibility criteria as well as techno-commercially responsive for the subject Works shall be opened thereafter. The date of opening of the Financial Bid shall be notified separately to all the eligible & techno-commercial responsive Bidder. The Financial Bid shall be opened online in presence of Bidder's representatives who wish to be present at the notified time and place. Bidder(s) can also view Bid opening online on the CPP portal <https://eprocure.gov.in/eprocure/app> at their end.

19.5 The Financial Bids of Bidder(s), who are not considered eligible and techno commercial responsive, shall not be opened and will be Archived' unopened. The decision of the Employer will be final and binding in this regard.

19.6 The Employer/Tender inviting Authority at his discretion may open Technical and Financial Bid simultaneously and evaluate the Bid completely.

20. Process to be Confidential

Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidder(s) or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any attempt by a Bidder to influence the Employer's processing of bids or award decisions may result in the rejection of his Bid

21. Examination of Bids and Determination of Responsiveness

21.1 During the detailed evaluation of "Technical Bids", the Employer will determine whether each Bid:

- (a) meets the eligibility criteria defined in Clauses 2 and 3;
- (b) has been properly signed;
- (c) is accompanied by the required securities; and

(d) is substantially responsive to the requirements of the bidding documents. During the detailed evaluation of the “Financial Bids”, the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced Schedule of Quantities and Prices, Technical Specifications and Drawings.

21.2 A substantially responsive “Bid” is one which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one:

- (a) which affects in any substantial way the scope, quality, or performance of the Works;
- (b) which limits in any substantial way, the Employer’s rights or the Bidder’s obligations under the Contract; or
- (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids or
- (d) which is inconsistent with the bidding documents,.

21.3 If a “Bid” is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

21.4 During techno-commercial Bid evaluation, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. The request for clarification and response shall be in writing or e-mail or through the portal, however, no change in the price or substance of the Bid shall be sought, offered or permitted. Reply shall be submitted by Bidder within a stated reasonable period of time. If Bidder does not provide clarifications of the information requested by the date and time set in the Employer’s request for clarification, its Bids may be rejected.

22. Evaluation and Comparison of Bids

22.1 The Employer will evaluate and compare the Cover II i.e Financial Bid of bidders whose bids are determined to be substantially techno-commercially responsive in accordance with Clause 21 of ITB.

22.2 To assist in the examination, evaluation, and comparison of bids, the Employer may, at its discretion, ask any bidder for clarification of its Bid, including breakdowns of unit rates. The request for clarification and the response shall be through letter/e-mail but no change in the price or substance of the bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetical errors discovered by the Employer in the evaluation of the Bids in accordance with Sub-Clause 21.4 of ITB.

22.3 e-Reverse Auction (e-RA) (if applicable)

22.3.1 e-RA shall be followed after e-tender only if number of eligible bidders at price bid stage are at least 2 (two). Following Procedure shall be followed for e-RA:

- a. If the discovered price is upto 105% of the estimated cost, no e-RA will be conducted.
- b. If the discovered price is above the price mentioned in (a) above, then following procedure of e-RA shall be followed:

- In case the number of eligible Bidders is 3 or less than 3, then e-RA shall be conducted among all the bidders.
- In case the number of eligible Bidders are 4, then e-RA shall be conducted among the bidders except H1.
- In case the number of eligible Bidders are more than 4, then the bidders quoting higher rates shall be eliminated as per below formula, and e-RA shall be conducted among the remaining bidders:

Numbers of eliminated bidders = $(n-3) \times 0.5$ where n = total bidders

(In case “Numbers of eliminated bidders” is a fraction, it shall be rounded off to lower whole number.)

22.3.2 In case of e-Reverse Auction, the procedure of e-RA shall be as hereunder:-

- i) Conditions of conducting e-RA after e-tendering (enclosed as Appendix-I)
- ii) Business Rule for e-RA (enclosed as Appendix-II)
- iii) Process Compliance form (enclosed as Appendix-III)
- iv) Price Confirmation form for e-RA (enclosed as Appendix-IV)

23. 1 Public Procurement (Preference to Make in India), Order 2017:

Bidder shall be Class-I Local Supplier under Public Procurement (Preference to Make in India), Order-2017 issued by the Department of Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry vide No. P-45021/2/2017-PP (BE-II) dated 16.09.2020 or as amended from time to time.

Definition of Make in India:

A) Definitions

Local content: means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all custom duties) as a proportion of the total value, in percent.

Class-I local supplier : means a supplier or service provider, whose Goods/ Services /Works offered for procurement, meets the minimum local content as prescribed for “Class-I local supplier” under this order.

For procurement of Goods / Services / Works, irrespective of purchase value where there is sufficient local capacity and local competition, only Class-I local supplier shall be eligible to bid.

Minimum local content: Nodal ministry/department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as Class-I local supplier / Class-II local supplier / Non local supplier. For the items, for which Nodal ministry/department has not prescribed higher minimum local content notification under the order, it shall be 50% and 20% for Class-I local supplier / Class-II local supplier respectively.

B) Verification of local content:

- a) The 'Class-I local supplier' at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'. They shall also give details of the location(s) at which the local value addition is made.
- b) In cases of procurement for a value in excess of INR 10.00 Crores, the 'Class-I local supplier'/ 'Class-II local supplier' shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.
- c) False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law. A supplier who has been debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities.

23.2 Restrictions under Rule 144(xi) of the General financial Rules (GFRs) 2017:

- i. Any Bidder from a country which shares a land border with India will be eligible to bid in this tender only if bidder is registered with the Competent Authority {i.e Registration Committee constituted by the Department of Promotion of Industry and Internal Trade(DPIIT), Govt. of India }. However, the said requirement of registration will not apply to bidders/sub-contractors from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects. Bidders may apprise themselves of the updated lists of such countries available in the website of the Ministry of External Affairs (23.07.2020, order (PP no.2).
- ii. Such registration should be valid for the entire period of bid validity or any extension thereof. However, in case the validity period of registration is less than bid validity period, the Bidder shall be required to submit the extension of the validity period of registration before the opening of price bids. (point 13, 23.07.2020, Order(PP no.1)
- iii. Further the successful bidder shall not be allowed to sub-contract works to any “Subcontractor” from a country which shares a land border with India unless such Subcontractor is registered with the competent Authority {Registration Committee constituted by the Dept of Promotion of Industry and Internal Trade (DPIIT), Govt. of India}. (point 11, 23.07.2020, Order(PP no.1)

- iv. A bidder is permitted to procure raw material, components, sub-assemblies, etc. from the vendors of countries sharing a land border with India without getting registered with the Competent Authority, i.e. Registration Committee constituted by DPIIT, as it is not regarded as “sub contracting” (circular 12.03.2021)
- v. However, in case a bidder proposes to supply finished goods procured directly/indirectly from the vendors of the countries sharing land border with India, such vendors will be required to get registered with the Competent Authority, i.e. Registration Committee constituted by DPIIT. circular 12.03.2021)
- vi. Bidders have to submit certificate in accordance with Application **Form 12** (as per applicability). If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for termination and further legal action in accordance with law.
- vii. “Bidder” for the purpose of above referred order (including the term 'tenderer', 'consultant', 'vendor' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies) , every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.
- viii. Bidders from a country which shares a land border with India” mentioned in para above means; (point 8, 23.07.2020, Order (PP no.1):
 - a. An entity incorporated, established or registered in such a country; or
 - b. A subsidiary of an entity incorporated, established or registered in such a country; or
 - c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d. An entity whose beneficial owner is situated in such a country; or
 - e. An Indian (or other) agent of such an entity; or
 - f. A natural person who is a citizen of such a country; or
 - g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

- ix. The bidder shall comply with all the term and condition of the OM issued by the Department of Expenditure, Ministry of Finance, Govt. of India vide F. No 6/18/2019-PPD dated 23.07.2020 & 24.07.2020 read with its amendments thereof.

F. Award of Contract

24. Award Criteria

Subject to Clause 26 of ITB, the Employer will award the Contract to the Bidder who has offered the lowest evaluated Bid price after e tendering and / or e-Reverse Auction (as the case may be), provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause 2 & 3 of ITB; (b) determined substantive responsive and (c) who has offered the lowest Evaluated Bid Price pursuant to Clause 22.

25. Employer's Right to accept any Bid or Reject any or all Bids

Notwithstanding Clause 24 above, the Employer reserves the right to accept or reject any bid, and to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected bidder or bidders. However, the Bidder(s) who wish to seek reasons for such decision of cancellation/ rejection shall be informed of the same by Employer unless its disclosure reasonably could be expected to affect the sovereignty and integrity of India, the security, strategic, scientific or economic interest of the state or lead to incitement of an offence.

26. Notification of Award and Signing of Agreement.

26.1 The bidder whose bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period through the "Letter of Acceptance", which will state the sum that the Employer will pay to the Contractor in consideration of the execution, completion by the Contractor as prescribed by the Contract.

26.2. The notification of award will constitute the formation of the Contract until the Formal Agreement is signed pursuant to clause 26.3 of ITB and further subject only to the furnishing of a performance security deposit in accordance with the provisions of Clause 27 of ITB. After notifying the successful bidders that its bid has been accepted, the Employer will prepare the Contract Agreement incorporating all the correspondence exchanged between the parties, which have a bearing on the Contract.

Within 28 days of receipt of notice of readiness of the Contract Agreement by the Employer, the Employer and the successful bidder shall sign the Contract Agreement after submission of Performance Security in terms of ITB Clause 27.

26.3. The Agreement will incorporate all agreements between the Employer and the successful bidder. It will be signed by the Employer and the successful bidder after the performance security deposit is furnished. Till signing of Contract Agreement between the Employer and successful bidder, provision under Clause 55.2 'Arbitration' of GCC shall not be applicable.

26.4 The Contract shall be signed in three originals (two for employer and one for contractor). The language of the contract shall be English.

26.5 The Contractor shall furnish free of charge nos. of true copies of the Contract to the Employer as mentioned in Bidding Data.

27. Performance Security Deposit

27.1 Within 28 (twenty eight) days after issue of the Letter of Acceptance, the successful bidder shall deliver to the Employer Performance Security in accordance with Clause 3 of General Conditions of Contract valid till 90 days beyond the end of Defect Liability Period. The performance security shall not be released till liquidated damages, if any, is pending for recovery. If the contractor does not submit the performance security within the stipulated period due to any valid reason, Tender Inviting Authority may grant time extension for submission of performance security based on the request of contractor.

In case, the contractor does not submit performance security without a valid reason, the Employer shall impose simple interest @12% per annum on the full amount of applicable performance security (alongwith applicable taxes, if any) for the period of delay in submission of performance security. The interest on delayed period shall be calculated on pro rata basis for number of delayed days.

The interest accrued shall be payable by the Contractor within 14 days from the date of intimation by Tender Inviting Authority in form of Bank Demand Draft/ Banker Cheque in favour of 'BSUL', otherwise the same shall be recovered from any payment due or become due against bills / any other amount lying with NHPC/BSUL.

The delayed submission of Performance Security by the Contractor shall be recorded in substantial completion and final completion certificates. Further, no claim for extension of time for completion period or any other type of claim on account of delayed submission of performance security shall be entertained.

27.2 If contractor fails to submit the Performance Security within 45 days (for the contracts having time for completion - upto 12 months) or 60-days (for the contracts having time for completion - more than 12 months) from the date of issue of Letter of Award (LOA), then following actions shall be taken against such Contractor:

- i) Award shall summarily be terminated
- ii) EMD/ Bid security shall be forfeited.
- iii) The bidder shall be debarred / banned to participate in the business dealings with NHPC/BSUL for a period of one year.
- iv) The name of the Contractor shall be hosted on the NHPC/BSUL website etc. as per existing norms of NHPC /BSUL/ Govt. of India.
- v) Such defaulted contractor shall not be eligible to participate in the bidding process of re-tender of this work.

27.3 Bidder shall communicate the following bank details of .BSUL to the issuing Bank for online confirmation of Bank Guarantee to be submitted in terms of this Clause:

Name of the beneficiary Bundelkhand Saur Urja Ltd

Account No.: 34786481845

IFSC Code: SBIN0000125

Address of the Bank: SBI Main Branch, Tarawali Kothi, Motimahal Marg, Hazratganj, Lucknow, UP- 226001

Bidder is required to submit the SFMS receipt issued by the bank along with its bid for BG Confirmation.

28. Advances

The Employer will provide Mobilization Advance and Advance for procurement of new equipment as provided in General Conditions of Contract.

29 Corrupt or Fraudulent or Collusive or Coercive Practices

29.1 The Employer requires the bidders/contractors under this contract observe the highest standard of ethics during the procurement and execution of this contract. In pursuance of this policy, the Employer:

(a) defines, for the purpose of these provisions, the terms set forth below as follows:

- (i) **“corrupt practice”** means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution; and
 - (ii) **“fraudulent practice”** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to be detriment of the Employer, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
 - (iii) **“collusive practices”** means a scheme or arrangement between two or more Bidders with or without the knowledge of the Borrower, designed to establish Bid prices at artificial, non- competitive levels;
 - (iv) **“coercive practice”** means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in a procurement process, or affect the execution of a contract.
 - (v) **“Integrity Pact”** means an agreement signed between the Contractor and the Employer committing the persons/officials of both the parties, not to exercise any corrupt influence on any aspect of the Tender/Contract.
- (b) An agreement called Integrity Pact between the prospective Bidders and the Employer shall be signed committing the persons/officials of both the parties, not to exercise any corrupt influence on any aspect of the Tender/Contract. The Independent External Monitor(s) (IEM) appointed by the Employer shall oversee the compliance of obligation under the Integrity Pact.
- (c) A Bid may be rejected by the Employer if it is determined at any stage that the respective Bidder has engaged in corrupt or fraudulent or collusive or coercive

practices or defaulted commitments under Integrity Pact in competing for or in executing the contract in question and his Bid Security shall be forfeited. The Contractor shall not be entitled for any compensation whatsoever under this clause.

- (d) The Employer will declare a Bidder ineligible for a stated period of time to award a contract/contracts as per Guidelines on Banning of Business Dealings if he at any time determines that the Bidder has engaged in corrupt or fraudulent or collusive or coercive practices in competing for, or in executing, the contract.
- (e) The documents/information submitted by Contractor may be verified by the officials of the Employer for its authenticity at any time and the Contractor shall provide all facilities/co-operation in this regard. If it is found that any of the documents/information submitted by the Contractor is not genuine, the Employer shall have full rights to cancel his Bid, forfeit the bid security and terminate the Contract, if awarded.

30.0 PERMANENT ACCOUNT NUMBER (PAN) AND GSTIN

The Bidder shall furnish to the Employer his Permanent Account Number issued by the Income Tax Authorities in India and Goods and Services Tax Identification number issued by the concerned Authorities in India. No payment shall be made to the Contractor unless he submits his Permanent Account Number (PAN) and Goods and Services Tax Identification number (GSTIN).

31.0 General

No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor/contractor's employee for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. The bid shall become invalid and/or contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.

Bidder shall also intimate the names of persons who are working with him in any capacity who are near relatives to any official of the Employer. Any breach of this condition by the bidder/contractor would render him liable to be removed from this contract. An undertaking in this regard shall be submitted by the bidder in its letter head as per format placed at **Form-9**.

E- TENDERING INFORMATION

REGISTRATION:

- (i) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal by using the “Online Bidder Enrollment” option available on the home page. **Enrolment on the CPP Portal is free of charge.**
- (ii) During enrolment/ registration, the bidders should provide the correct/ true information including valid email-id & mobile no. All the correspondence shall be made directly with the contractors/ bidders through email-id provided.
- (iii) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- (iv) For e-tendering possession of valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) is mandatory which can be obtained from SIFY/ nCode/ eMudra or any Certifying Authority recognized by CCA India on eToken/ SmartCard.
- (v) Upon enrolment on CPP Portal for e-tendering, the bidders shall register their valid Digital Signature Certificate with their profile.
- (vi) Only one valid DSC should be registered by a bidder. Bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse and should ensure safety of the same.
- (vii) Bidders can then log into the site through the secured login by entering their user ID/ password and the password of the DSC/ eToken.

Searching for Tender documents:

- a) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.
- b) Once the bidders have selected the tenders they are interested in, they may download the required documents/ tender schedules. These tenders can be moved to the respective ‘My Tenders’ folder. This would enable the CPP Portal to intimate the bidders through SMS/ e-mail in case there is any corrigendum issued to the tender document.
- c) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification/ help from the Helpdesk.

Preparation for submission of Bid:

Technical Bid and Price Bid to be submitted on-line at <https://eprocure.gov.in/eprocure/app>.

- (i) For preparation of bid Bidders shall search the tender from published tender list available on site and download the complete tender document and should take into account corrigendum if any published before submitting their bids.

After selecting the tender document same shall be moved to the 'My favourite' folder of bidders account from where bidder can view all the details of the tender document.

- (ii) Bidder shall go through the tender document carefully to understand the documents required to be submitted as part of the bid. Bidders shall note the number of covers in which the bid documents have to be submitted, the number of documents – including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- (iii) Any pre-bid clarifications if required, then same may be obtained online through the tender site, or through the contact details given in the tender document.
- (iv) Bidders should get ready in advance the bid documents in the required format (PDF/xls/rar/dwf/jpg formats) to be submitted as indicated in the tender document/schedule. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
- (v) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, Annual Reports, Auditor Certificates etc.) has been provided to the bidders. Bidders can use "My Space" or "Other Important Documents" area available to them to upload such documents. These documents may be directly submitted from the "My Space" or "Other Important Documents" area as per tender requirements while submitting the bid, and need not be uploaded again and again. This will lead to reduction in the time required for bid submission process.

SUBMISSION OF BIDS:

Two-Part Bid procedure shall be adopted for submission and evaluation of the bids. The Bidder shall accordingly prepare and submit the bids containing the required documents up to the date and time given in NIT. The bidder shall prepare the bid and submit the bid in following manner:

- i) Bidder should log into the site well in advance for bid submission so that he/ she upload the bid in time i.e. on or before the bid submission time.
- ii) Bidder should prepare the Tender Fee and EMD as per the instructions specified in the NIT/ tender document. The details of the DD/BC/BG/ others physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.
- iii) While submitting the bids online, the bidder shall read the terms & conditions (of CPP portal) and accepts the same in order to proceed further to submit their bid.
- iv) Bidders shall select the payment option as offline to pay the Tender Fee/ EMD and enter details of the DD/BC/BG/others.

- v) Bidder shall digitally sign and upload the required bid documents one by one as indicated in the tender document.
- vi) Bidders shall note that the very act of using DSC for downloading the tender document and uploading their offers is deemed to be a confirmation that they have read all sections and pages of the tender document without any exception and have understood the complete tender document and are clear about the requirements of the tender document.
- vii) Bidder shall note that each document to be uploaded for the tender should be less than 2 MB. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document. For the file size of less than 1 MB, the transaction uploading time will be very fast.
- viii) **If price quotes are required in XLS format, utmost care shall be taken for uploading Schedule of quantities & Prices and any change/ modification of the price schedule shall render it unfit for bidding.**

Bidders shall download the Bill of Quantities, in XLS format and save it without changing the name of the file. Bidder shall quote their rate in figures in the appropriate cells, thereafter save and upload the file in financial bid cover (Price bid) only. If the template of Bill of Quantities file is found to be modified/corrupted in the eventuality by the bidder, the bid will be rejected and further dealt as per provision of clause no 14.0 of ITB including forfeiture of EMD.

The bidders are cautioned that uploading of financial bid elsewhere i.e. other than in cover 2 will result in rejection of the tender.

- ix) Bidders shall submit their bids through online e-tendering system to the Tender Inviting Authority (TIA) well before the bid submission end date & time (as per Server System Clock). **The TIA will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders at the eleventh hour.**
- x) After the bid submission (i.e. after Clicking “Freeze Bid Submission” in the portal), the bidders shall **take print out of system generated acknowledgement** number, and keep it as a record of evidence for online submission of bid, which will also act as an entry pass to participate in the bid opening.
- xi) Bidders should follow the server time being displayed on bidder’s dashboard at the top of the tender site, which shall be considered valid for all actions of requesting, bid submission, bid opening etc., in the e-tender system.
- xii) All the documents being submitted by the bidders would be encrypted using PKI (Public Key Infrastructure) encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology.

ASSISTANCE TO BIDDERS:

- xiii) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.

- xiv) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24X7 CPP Portal Helpdesk No.0120-4200462, 0120-4001002, 0120-4001005, 0120-6277787, E-mail:support-eproc [at]nic[dot]in..

Toll Free Number 1800-3070-2232. Mobile Nos. 91-7878007972 and 91-7878007973.

Appendix-I

CI 22.3.2

Conditions for conducting e-RA

- 1) e-RA shall be implemented at Application Service Provider's Portal intimated by NHPC.
- 2) e-RA shall be followed after e-tender as per provision of ITB.
- 3) The Start Bid Price for Reverse Auction shall be the L1 Bidder's total evaluated Bid Price (including taxes & duties etc.) as per ITB Clause 22. The bidder shall modify their Bid Price in the decremented slab in terms of 0.1% or its multiples.
- 4) e-RA will be done on total evaluated Bid Price and the unit rates of the winning bidder quoted in e-tender shall be reduced on pro-rata basis to match with the e-RA bid price.
- 5) In cases where no bidder accepts to quote lower than the Base Price (Start Bid Price), e- RA is to be treated as failed and in such cases, tender shall be evaluated based on already opened e-tender.
- 6) After e-Reverse Auction and evaluating the lowest bid, the award shall be processed as per bid conditions.
- 7) In case of failure of e-RA process for any reasons, e-tender results will be processed for award. Further, NHPC shall reserve the right to call the L1* bidder for further process/negotiation/cancel the e-reverse auction process/ re-tender at any time.

*L1= Lowest Evaluated Bidder after e-tendering and/or e-Reverse Auction (as the case may be)

Appendix-II

Business Rules for e-Reverse Auction

1. e-RA shall be implemented at Application Service Provider Portal intimated by NHPC. NHPC has made arrangements with a Service Provider, who will be NHPC's authorized Service Provider for e-Reverse Auction. Please go through the guidelines given below and submit your acceptance to the same.
2. Bidders who are found technically and commercially acceptable, after e-tender are eligible to participate in e-RA. The intimation of schedule date & time to conduct e-RA shall be sent to eligible bidders in advance. e-Reverse Auction (e-RA) shall be conducted by the service provider on scheduled date and time. Eligible bidders shall participate from their own offices/ place of their choice. Internet connectivity shall be ensured by the respective bidders themselves. Designated officials i.e., Tender Inviting Authority of NHPC shall have access to portal and shall witness e-RA process.

The Service Provider (for e-RA) shall arrange to demonstrate/ train (if not trained earlier) bidders' nominated person(s), without any cost. They will also explain all the Rules related to e-Reverse Auction/Business Rules Document to be adopted along with training manual. The Application Service Provider (ASP) shall arrange to demonstrate/ train (if not trained earlier) bidders' nominated person(s) through ONLINE training by ppts /Audio Visual file without any cost. These training materials are available on the portal all the time whenever bidders access the portal for such purposes. If bidders require any explanation in regard to the Rules related to e-Reverse Auction/ Business Rules Document to be adopted along with bid manual, the same shall be explained to the bidder through any means of communication i.e. telephonic/email.

For addressing any queries relating to the process of e-RA, the name and contact number of NHPC Authorized Service Provider for e-Reverse Auction shall be intimated in due course of time.

Any queries relating to the process of e-RA or in general, Tender Inviting Authority may be contacted.

3. Before start of e-RA process, NHPC will provide the template calculation sheet (Excel Sheet) which will help bidders to arrive at "modified Bid Price" for the total scope as per BOQ.

Rank of the bidders would be displayed as per the "modified Bid Price" i.e., including Taxes and Duties as per the provisions of the Bidding Document.

4. The start bid price (SBP) for e-Reverse Auction shall be lowest bidder's total evaluated

bid price after e-tender (including taxes & duties) arrived as per relevant ITB Clause defined in Appendix-I of ITB.

5. **Procedure of e-Reverse Auctioning:**

Dynamic Template Bidding (Rank Disclosed)

- i) In ‘Dynamic Template Bidding (Rank Disclosed)’, bidders shall enter the Lump sum price in line with Clause 4 above for the total scope for subject Package. The value of decrement must be in decremented slab of minimum 0.1% and its multiple in terms of lowest bidder’s total evaluated bid price after e-tender (SBP).
 - ii) In the “Dynamic Bidding” tie bid is not allowed on lowest price at e-RA Portal, i.e. if any higher price ranked vendor places bid equal to lowest price in e- reverse auction, their bid will be rejected. The bidder is required to click on “Rejected” to know the reason of bid rejection. In that case, the bidder will have to instantly reduce their price within **10 minutes** to submit lower quoted price otherwise the price will be considered as higher bid or rejected bid (system does not support tie bids in this type of auction).
 - iii) The modified bid prices received under e-RA shall be evaluated on the basis of evaluation method specified in the bidding document and the final evaluated prices thus obtained shall be used for comparison of bids.
6. Within one (1) hour after conclusion of e-RA, Successful bidder shall furnish confirmation of final price quoted in Reverse Auction in line with price schedule (already available with them), to NHPC, duly signed and stamped (without any new condition other than those already agreed before start of Reverse Auction) (Appendix-IV). In case, there is any variation between the final price quoted in Reverse Auction and the signed document received after Auction, the first i.e. Closing Price in Auction will be taken final offered price by the bidder. However, the detailed break-up of final prices as per price formats with pro rata reduction in unit rates (excluding fixed rate items and abnormally low rated items) without increase in unit rates of any items, shall be submitted by the successful bidder matching with the final price quoted during e-RA within 3 days from the date of conclusion of e-RA.
7. Auction shall be for a period of **60 minutes**. The bidding continues with an auto extension of **15 min** time if any Bidder quotes a further lower price within final 15 minutes of specified closing time of auction.

In final countdown and auto extension time, the lowest price at e-RA Portal would be visible to all the vendors who have placed valid bids. However, real identity of the bidder would not be disclosed during entire e-reverse auction process. The bidding could continue even after the final run till the time there are no changes in prices within aforesaid final **15 minutes**.

8. During Auction, if no bid is received within the specified time, NHPC, at its discretion, may decide to close the reverse auction process and proceed with results of e-tendering.
9. Each Bidder shall be assigned **Unique User Name & Password** by the service provider (for eRA). Bidders are advised to change the Password and edit the information in the Registration Page after the receipt of initial Password from the service provider (for e-RA) to ensure confidentiality. All bids made from the Login ID given to the bidder will be deemed to have been made by the bidder.
10. Bidders shall be able to view the following on their screens along with the necessary fields during the auction.
 - a) Rank of the respective bidder@
 - b) Bid Placed by the respective bidder.

@ Price of Lowest bidders at e-RA Portal will be displayed in the last 15 minutes and in auto extension time

11. Consequent upon completion of e-Reverse Auction, NHPC's/BSUL's decision on award of contract shall be final and binding on all the bidders.
12. NHPC/BSUL shall be at liberty to call the*L1 bidder for further process/ negotiation/ cancel the e- Reverse auction process/ re-tender at any time, without assigning any reason thereof.
13. NHPC/ Service Provider shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause.
14. NHPC along with Service Provider can decide to reschedule or cancel any Auction; the bidders shall be informed accordingly.
15. The bidder shall not involve himself or any of his representatives in price manipulation of any kind directly or indirectly by communicating with other bidders. The bidder shall also not divulge either his bid or any other exclusive details of NHPC to any other party. If it has come to notice of NHPC/Service Provider that bidders have colluded while submitting price in e-RA, the same be dealt as per provision of Integrity Pact.
- 16. Other terms and conditions shall be as per the bidding documents.**

*L1= Lowest Evaluated Bidder after e-tendering and/or e-Reverse Auction (as the case may be)

Appendix-III

Process Compliance Form for e-Reverse Auction

(Bidders are required to submit this on their Company's Letter Head and sign & stamp)

To,

[Employer's Name & Address]

Sub: Agreement to the Process related Terms and Conditions

Dear Sir,

This has reference to the Terms & Conditions for the e-Reverse Auction mentioned in the Business Rules for “_____ (Name of Work)” with Tender Specification No.: _____ and Tender ID.

This letter is to confirm that:

1. The undersigned is authorized representative* of the Company.
2. We have studied the e-Reverse Auction Terms & Conditions and the Business Rules governing the e-Reverse Auction as mentioned in your letter and confirm our agreement to them.
3. We also confirm that we shall take the training on the auction tool and shall understand the functionality of the same thoroughly, before start of e-RA.
4. We also confirm that we will submit price confirmation within an hour of conclusion of e-Reverse Auction through the Company email ID. However, break up of our final offered price in e-Reverse Auction as per NHPC's Price format and as per Conditions of e-RA shall be submitted within three working days. We also confirm that we will not increase unit rate of any item submitted in our bids.

We hereby confirm that we will honor the Bids placed by us during the auction process.

With regards,

**Signature with company
seal Name –**

Bidder /Company / Organization – Designation
within Company / Organization – Address of
Company / Organization –

**Person having power of attorney for the subject package*

Format for submitting Price Confirmation for e-Reverse Auction

(To be submitted on Company Letter Head duly signed and stamped within 1 Hrs.)

REF No.

Date:.....

To,

[Employer's Name & Address]

Contact Person:

E-mail:

Re: Price Confirmation for the e-Reverse Auction of.....

Auction Notice Dated:

For Procurement of :.....[...Name of work].

For M/s NHPC LIMITED: Tender Specification No.:_____and Tender ID. _____

Reference above, we hereby confirm that we have given our final offer in the e-Reverse Auction System as per the template, which is attached herewith duly signed and stamped from our end.

Signature:

Name:

Designation:

Seal of the Bidder / Company:

Personnel Capabilities

Qualification and Experience of Key personnel

Sr. No.	Key personnel position	Qualification	Experience

INFORMATION OF BIDDERS (IFB)

(JALAUN SOLAR PARK-1200MW)

Information for Bidders

Introduction

Jalaun Solar Park of 1200 MW capacity is envisioned by Bundelkhand Saur Urja Limited (BSUL). The 1200 MW Solar Park is envisaged to assist in meeting MNRE solar target of 450GW of RE capacity by 2030. The proposed 1200 MW Solar Park is planned to be developed in multiple locations within Jalaun district, Uttar Pradesh. Each location will undergo separate development processes. A total land area of 6049 acres approximately has been identified for the establishment of the Solar Park. This land allocation is deemed sufficient for the development of the 1200 MW capacity of the Jalaun Solar Park, along with the necessary infrastructure. The power evacuation strategy comprises both internal pooling and external evacuation arrangements. Internal pooling involves accumulating power at 33kV, which is then stepped up to 400kV. Location Madhogarh encompasses two land parcels where internal pooling occurs before being evacuated to PGCIL S/S at 400kV. In Orai, an additional 300 MW will be internally pooled alongside power from Madhogarh, as LILO configuration. Subsequently, the total 1200 MW is evacuated through a 400kV Single circuit line in Double circuit tower and linked to the 765kV /400kV substation of PGCIL at Orai.

Project Locations:

Project Location and Approach Roads

The proposed project is divided into 2 land parcel, location 1 as Tehsil Orai, Dist. Jalaun and location 2 as Tehsil Madhogarh, Dist. Jalaun. The geographical coordinates of location 1 and location 2 are 25°50'03.5"N, 79°14'50.9"E and 26°23'27.8"N, 79°11'30.6"E respectively. The site has good accessibility & location 1 is approximately 32 Km from Orai Town (District HQ Jalaun Dist.) and 40 km from Jalaun, UP, whereas, location 2 is approximately 63 Km from Orai Town (District HQ Jalaun Dist.) and 41 km from Jalaun, UP. The location 1 and location 2 can be accessed through NH 27 which is approx. 8 km from location 1 and approx. 70km from location 2. Also, location 2 can be accesses through State Highway SH 70 which lies at an approx. distance of 25 km.

The project site is located into two distinct locations, Madhogarh location in Tehsil Madhogarh, and Orai location in Tehsil Orai, both in Dist. Jalaun, Uttar Pradesh. Madhogarh location consists of two (02) different land parcels and Orai location consist of single land parcel.

Solar Park Location and Land Ownership

Approach

The overall objective of setting up the Solar Park in the district of Jalaun in the State of Uttar Pradesh is to promote the development of the solar power projects for electricity generation. The overall aim is to install a capacity of a round 1200 MW in the Solar Park. It is proposed that one or more blocks of land identified in the solar park will be allocated to different project developers in order to have a concentrated zone for solar development. Approx. 6049.6 acres of the land is to be procured on long term lease basis by M/s BSUL from revenue land department and various Private land owners in Jalaun district of the State of Uttar Pradesh.

The Jalaun district encompasses a geographical area of 4544 sq.km. It forms the northern most part of the trans-Yamuna tract of the state. The area is bounded in the north by Yamuna river, in the south by Betwa

river and its western boundary follows Phuja river. The eastern border is shared with Hamirpur district. The area lies between Latitude 26° 26' to 25° 45' North and Longitude 79° 57' to 78° 00' East, falling in the survey of India Toposheet No. 54 N and O. Administratively it has been divided into 4 Tehsils with its district headquarter at Orai.

Road Connectivity: The location 1 of the solar park is at a distance of approx. 8 km from National Highway NH 27 and location 2 is at a distance of approx. 25 km from **State highway 70**. The location 1 and location 2 land parcels are well connected to Government roads. Approximately **10 m wide bitumen access road of 133 m length** is envisaged from the existing Government Road to location 1 and **10 m wide bitumen access road of 1 km length** is envisaged from the existing Government roads to location 2 land parcels.

GPS coordinates of Land

The geographical co-ordinates of location 1 are 25°50'03.5"N, 79°14'50.9"E and that of location 2 are 26°23'27.8"N, 79°11'30.6"E.

Proximity

Rail Connectivity: The location 1 is around 30 km and location 2 is around 62 km from Orai railway station.

Airport Connectivity: The location 1 is around 152 km and location 2 is around 145 km from Kanpur airport.

Nearest Major City: The location 1 is around 32 km and location 2 is around 63 km from Orai city.

Table -A	
LOCATION	
(A) State	Uttar Pradesh
(B) District	Jalaun
(C) Tehsil	Orai & Madhogarh
(D) Site	Gram Samuh Amrod & Gram Samuh Mai Mai & Patrahi
E) Geographical Coordinates Latitude Longitude	location 1 are 25°50'03.5"N, 79°14'50.9"E and that of location 2 are 26°23'27.8"N, 79°11'30.6"E.
(F) Distance Headquarter from District	30 Kms from Orai and 35 Kms from Jalaun town
(G) Nearest Major Towns	Orai
(H) Access by Road	The location 1 of the solar park is at a distance of approx. 8 km from National Highway NH 27 and location 2 is at a distance of approx. 25 km from State highway 70. The location 1 and location 2 land parcels are well connected to Government roads. Approximately 10 m wide bitumen access road of 133 m length is envisaged from the existing Government Road to location 1 and 10 m wide bitumen access road of 1 km length is envisaged

	from the existing Government roads to location 2 land parcels.
(I) Access by Rail	The location 1 is around 30 km and location 2 is around 62 km from Orai railway station.
(J) Access by Air	The location 1 is around 152 km and location 2 is around 145 km from Kanpur airport.
(K) Nearest Sea port	-
(L) Elevation above MSL,m	129 -143 mtrs
(M) Land Characteristics	Alluvial soil , sand mix
(N) Land Available	Location-1 2993 (Orai) Acre, Location-2 (Madhogarh) 2608 Acre, Location-1 (Patrahi) ~2000 Acre
METEOROLOGICAL FEATURES	
Max. Ambient Air Temp, °C	50°C
Min. Ambient Air Temp, °C	10°C
Annual average Rainfall, mm	871.5 mm per year
Rainfall Period, months	July to September
Mean Relative humidity	96%
TECHNICAL FEATURES	
Plant Capacity (MW)	1200MW
Solar module type	SPV
Net Minimum exportable power at 132 kV to nearest grid substation	-
MU for first year	-
Capacity Utilization Factor	-
Power evacuation	-
Plant Commissioning Date	-
Irradiation details considered	-

SECTION-III

- **LETTER OF TENDER FORM,**
- **QUALIFICATION INFORMATION,**
- **FORM OF DECLARATION,**

SECTION III

TABLE OF CONTENTS

Letter of Tender Form	
Form-2	Letter of Tender Form
Qualification Information	
Form-1	General Information
Form-3	Work Experience Record
Form-4	Annual Construction Turnover
Form of Declaration	
Form-5	Form of Declaration
Form-6	Declaration of Ineligibility
Form-7	Form of Integrity Pact
Form-8	Form for Declaration of Start-up
Form-9	Undertaking regarding near relative to official of the Employer
Form-10	Certificate of Insolvency
Form-11	Certificate of Local Content
Form-12	Declaration regarding Compliance of restrictions under Rule 144(xi) of GFR-2017 regarding procurement from bidders from a country or countries sharing Land Border with India.
Form-13	Checklist for Bidders

FORM – 1

General Information

Bidders are requested to complete the information

1.	Name of firm	Corporate Identity No. (CIN):.....		
2.	Head office address	Country:		
	Principal Place of Business:			
3.	Telephone Mobile No.Email	Contact Person(s) Name Title/Position		
4.	Place of incorporation / registration Date			
5.	Legal status of firm Field of specialty in business			
6.	Whether Start-up (for the works covered under the tender) :		YES	NO
7.	Number of present permanent employees:			
		Detail	Civil Engineers	Other Engrs
		Nos.		Non Engineering
8.	Quality assurance system in head office	Certified by:		
9.	Agent or representative in INDIA Name Address Telephone	(if exists) Fax & Email		

10	Authorization of Person(s) signing the bid on behalf of the Bidder a) Full Name: b) Designation: c) Signing as: ☐ A sole proprietorship firm: The person signing the bid is the sole proprietor/ constituted attorney of the sole proprietor, ☐ A partnership firm: The person signing the bid is duly authorised being a partner to do so, under the partnership agreement or the general power of attorney, ☐ A company: The person signing the bid is the constituted attorney by a resolution passed by the Board of Directors or in pursuance of the Authority conferred by Memorandum of Association. ☐ A Society: The person signing the bid is the constituted attorney. <i>Documents to be submitted: Registration Certificate/ Memorandum of Association/ Partnership Agreement/ Power of Attorney/ Board Resolution</i>
11	Following documents w.r.t. legal status of the firm / company shall be furnished by the bidder: I. In case of Sole Proprietorship Concern: i. The full name of an individual proprietor, his/her parentage, documentary proof of his/her age, permanent address and present postal address/ contact details. ii. A deed of declaration by the Proprietor, that no other individual or company has any share in the concern. II. In case of Partnership Firm: i. Certified photocopy of the Partnership Deed, with upto date amendments (if any). ii. Registration certificate issued by the Registrar of Companies concerned, if any. iii. In case of change in the constitution of the firm due to retirement or death or addition of an incoming partner, photocopy of Deed of Dissolution, fresh registration Certificate and the fresh / extant Partnership Deed, as applicable. III. In case of Private Limited Companies: i. Certified to be true and upto date amended copy of Memorandum and Articles of Association of the Company. ii. Certificate of incorporation of the Company.

IV. In case of Public Limited Companies and Statutory Corporations:

- i. Certified to be true copy of Memorandum and Articles of Association of the Company and/or the relevant Statute/Act.
- ii. Certificate of Incorporation of the company - In case of public limited Co. only.
- iii. Certificate of Commencement of Business - In case of public limited Co. only.

Date

Signature

FORM-2

Letter of Tender Form

To

The-----,

NHPC Ltd.,

-----,

1. We have read and examined the following tender documents relating to “EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh”
 - i.
 - a) Agreement form
 - b) Notice Inviting Tender
 - c) Information and Instructions to Tenderers
 - d) Tender Forms, Form of Declaration and Qualification information
 - e) General Conditions of Contract and Schedules A, B, C, D, E, G& H
 - f) Forms
 - g) Special Conditions of Contract
 - h) Safety Manual
 - ii. Technical Specifications
 - iii. Drawings.
 - iv. Amendment issued in pursuance to Clause No. 8 of ITB.
2. We hereby tender for execution of the work referred to in the documents mentioned in paragraph one above upon the terms and conditions contained or referred to in the aforesaid documents and in accordance in all respects with the specifications, designs, drawings and other details given herein and at the rates contained in Schedule-A and within the period(s) of completion as given in Schedule-D and subject to such terms and conditions as stipulated in the Bid Document.
3. We agree to keep this tender open for acceptance for 120 days from the last date of online bid submission thereof and also agree not to make any modifications in its terms and conditions on our own accord.
4. A sum of Rs----- (Rupees-----only) is hereby enclosed in form of Demand Draft/Bank Guarantee from a Nationalised or Scheduled Bank of India as

Earnest Money. We agree that if we fail to keep the validity of tender open, as aforesaid, or make any modification in the terms and conditions of our tender on our own accord or fail to furnish the prescribed performance guarantee within prescribed period, after the acceptance of our tender, that Employer shall without prejudice to any other right or remedy available in law be at liberty to forfeit the said earnest money absolutely. Further, we agree if we fail to commence the execution of the works as provided in the Bid Documents referred to in paragraph-1 above that Employer shall without prejudice to any other right or remedy available in law be at liberty to forfeit the said performance guarantee absolutely/EMD.

Should this tender be accepted, we agree to abide by and fulfil all the terms and conditions and provisions of the above mentioned tender documents.

We certify that the Tender submitted by us is strictly in accordance with the terms, conditions, specifications etc. as contained in Tender Documents, referred to in paragraph-1 above, and it does not contain any deviations to the aforesaid documents. It is further certified that information furnished in the Tender submitted by us is correct to the best of our knowledge and belief.

5. We hereby also declare that any of the firm/Company participating in this Tender have not been declared ineligible at the time of submitting the bid under Para-6 of Guidelines on Banning of Business Dealings, declaration in this regard is placed at Form-.....
6. We also certify that the bidder is a(Class-I / Class-II / non-local supplier) supplier under Make in India Order-2017 or as amended from time to time, Undertaking in this regard is enclosed at Form-11.
7. We also certify that the bidder is not ineligible under the reasons mentioned at Para 3.3 of NIT.
8. We hereby declare the GST Tax structure considered (applicable and assessed 28days prior to bid submission date) in our bid for the present work.

(Signature of person duly authorised to sign the Tender on behalf of the Bidder along with seal of company)

Name_____

Designation_____

Signature_____

Name of Company_____

Date:_____

Witness:

Name &

Signature_____

Address:_____

Date:_____

FORM –3

(Ref. NIT Clause-3.1(b))

Work Experience Record

Name of Bidder: _____

Sl. No.	Name of Project	Name & Address of Project Developer	Description of Work & Contract no.	Value of Work	Date of Award/	Date of Start of work	Date of completion of work	Remarks
1								
2								
3								
4								
5								

Note: Copies of Work experience certificates from appropriate authority of project Developer with regard to above to be submitted by bidder.

Any addition work experience claimed after the bid submission shall not be considered during bid evaluation.

FORM –4

(Ref. NIT Clause-3.1(c))

Annual Construction Turnover

Name of Bidder: _____

<i>Fiscal Year</i>	<i>Turnover (unit)</i>
1.	
2.	
3.	

Fiscal year begins on in each calendar year.

Date

Signature

NB: To please attach detailed data sheet wherever possible.

FORM – 5

(Ref. NIT Clause-2.1)

FORM OF DECLARATION

M/s-----**(name of Tenderer)** having its registered office at -----
----- (hereinafter referred to as `the Tenderer') having carefully studied all the Tender documents, specifications, drawings, etc. pertaining to the Work for “-----
-----**(name of the Work)**”, the local and site conditions and having undertaken to execute the said works.

It is declared without any reservation whatsoever that:

- 1) the submitted Techno-Commercial/Price Bid proposals are without any deviations and are strictly in conformity with the documents issued by the Employer,
- 2) in case any deviations are noticed which might have crept inadvertently, that such deviations without reservation of any kind are automatically deemed to have been withdrawn by us,
- 3) we are familiar with all the requirements of the Contract and has not been influenced by any statement or promise of any person of the Employer,
- 4) we are experienced and competent Bidder to perform the Contract to the satisfaction of Employer and are familiar with all general and special laws, acts, ordinances, rules and regulations of the Municipalities, District, State and Central Government of India that may affect the work, its performance or personnels employed therein,
- 5) we hereby authorize the Employer to seek reference from our bankers for its financial position and undertake to abide by all labour welfare legislations, and
- 6) we confirm that the provisions Start up India Initiative of GoI, ...are applicable to us. Any change in the status of the organization occurring during the currency of the contract shall be informed to Employer.

The above statement submitted by us is true and correct to our best knowledge.

For and on behalf of the Tenderer

Dated:

FORM – 6

(Ref. NIT Clause-2.2)

FORM OF DECLARATION OF INELIGIBILITY UNDERTAKING

I/ We, M/s(Name of Bidder) hereby certify that I/we are not under the declaration of ineligibility for banning / delisting / blacklisting / debarment from business on the grounds mentioned in para 6 of Guidelines on banning of Business dealings (Annex-A) to Integrity Pact, ITB Clause 2 of Tender Document at the time of submitting the bid and shall intimate immediately of any such banning / delisting / blacklisting / debarring after submission of bid till award of tender.

(Seal & Signature of the Bidder)

Form- 7

(To be executed on plain paper at the time of submission of bid/ and on Non-judicial stamp paper of appropriate value by successful Bidder (Contractor) prior to signing of Contract Agreement)

(Format of Integrity Pact)

PRE CONTRACT INTEGRITY PACT

Between

NHPC Limited, a company incorporated under the Companies Act 1956 and having its registered office at NHPC Office Complex, Sector-33, Faridabad-121003 (Haryana), hereinafter referred to as "The Employer" which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns of the **First Part**.

And

M/s _____, a company/ firm/ individual (status of the company) and having its registered office at represented by Shri _____, hereinafter referred to as "The Bidder/Contractor" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns of the **Second Part**.

WHEREAS the Employer proposes to procure under laid down organizational procedures, contract/s for _____(Name of the work/ goods/ services) and the Bidder/Contractor is willing to offer against NIT No.

WHEREAS the Bidder/Contractor is a private company / public company/Government undertaking/partnership/consortium/joint venture constituted in accordance with the relevant law in the matter and the Employer is a Public Sector Enterprise.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

Enabling the Employer to obtain the desired said (work/ goods/ services) at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling the Bidder(s)/Contractor(s) to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the Employer will commit to prevent corruption, in any form, by its officials by following transparent procedures.



1.0 Commitments of the Employer

- 1.1 The Employer undertakes that no official of the Employer, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the Bidder/Contractor, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.
- 1.2. The Employer will, during the pre-contract stage, treat all the Bidders/Contractors alike, and will provide to all the Bidders/Contractors the same information and will not provide any such information to any particular Bidder/Contractor which could afford an advantage to that particular Bidder/Contractor in comparison to other Bidders/Contractors.
- 1.3. All the officials of the Employer will report to the appropriate Authority any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

- 2.0 In case any such preceding misconduct on the part of such official(s) is reported by the Bidder to the Employer with full and verifiable facts and the same is prima facie found to be correct by the Employer, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the Employer or Independent External Monitor and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the Employer the proceedings under the contract would not be stalled.

3.0 Commitments of the Bidder(s)/Contractor(s)

The Bidder(s)/Contractor(s) commits themselves to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit themselves to observe the following principles during participation in the tender process and during contract execution:-

- 3.1. The Bidder(s)/Contractor(s) will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.
- 3.2 The Bidder/Contractor further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift consideration, reward, favour, any material or immaterial

benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with Employer for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with Employer.

- 3.3 The Bidder(s)/Contractor(s) shall disclose the name and address of agents and representatives and Indian Bidder(s)/Contractor(s) shall disclose their foreign principals or associates.
- 3.4 The Bidder(s)/Contractor(s) shall, when presenting their bid, disclose any /all payments made, is committed to or intends to make to agents, brokers or any other intermediaries, in connection with this bid/award of the contract
- 3.5 Deleted.
- 3.6 The Bidder, either while presenting their bid or during pre-contract negotiations or before signing the contract, shall disclose any payments made, is committed to or intends to make to officials of the Employer or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.
- 3.7 The Bidder/Contractor will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 3.8 The Bidder/Contractor will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 3.9 The Bidder/Contractor shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the Employer as part of the business relationship, regarding plans, technical proposals and business details, including information contained in electronic data carrier. The Bidder/Contractor also undertakes to exercise due and adequate care lest any such information is divulged.
- 3.10 The Bidder(s)/Contractor(s) commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.
- 3.11 The Bidder(s)/Contractor(s) shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.



- 3.12 If the Bidder/Contractor or any employee of the Bidder/Contractor or any person acting on behalf of the Bidder/Contractor, either directly or indirectly, is a relative of any of the officers of the Employer, or alternatively, if any relative of an officer of the Employer has financial interest/stake in the Bidder(s)/Contractor(s) firm(excluding Public Ltd. Company listed on Stock Exchange), the same shall be disclosed by the Bidder/Contractor at the time of filling of tender.

The term 'relative' for this purpose would be as defined in Section 2(77) of the Companies Act 2013.

- 3.13 The Bidder(s)/Contractor(s) shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the Employer.
- 3.14 The representative of the Bidders/Contractors signing Integrity Pact shall not approach the Courts while representing the matters to IEMs and he/she will wait their decision in the matter.
- 3.15 In case of Sub-Contracting, the bidder shall take the responsibility of the adoption of Integrity Pact by the Sub-Contractor.

4.0 Previous Transgression

- 4.1 The Bidder(s)/Contractor(s) declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect on any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India.

5.0 Earnest Money (Security Deposit)

The provision regarding Earnest Money/Security Deposit as detailed in the Notice Inviting Tender (NIT) and Instruction to Bidders (ITB) section of the Bid Document is to be referred.

6.0 Sanctions for Violations

- 6.1 Any breach of the aforesaid provisions, before award or during execution by the Bidder/Contractor or any one employed by it or acting on its behalf such as to put their reliability or credibility in question shall entitle the Employer to take action as per the procedure mentioned in the "Guidelines on Banning of Business Dealings" attached as **Annexure-A** and initiate all or any one of the following actions, wherever required:-
- (i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the Bidder/Contractor. However, the proceedings with the other Bidder(s)/Contractor(s) would continue.

- (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is Signed) shall stand forfeited either fully or partially, as decided by the Employer and the Employer shall not be required to assign any reason thereof.
- (iii) To immediately cancel the contract, if already signed, without giving any compensation to the Contractor. The Bidder/Contractor shall be liable to pay compensation for any loss or damage to the Employer resulting from such cancellation/rescission and the Employer shall be entitled to deduct the amount so payable from the money(s) due to the Bidder/Contractor.
- (iv) Deleted.
- (v) To encash the Bank guarantee, in order to recover the dues if any by the Employer, along with interest as per the provision of contract.
- (vi) Deleted .
- (vii) To debar the Bidder/Contractor from participating in future bidding processes of NHPC Ltd., as per provisions of "Guidelines on Banning of Business Dealings" of NHPC Ltd. (Annexure-A), which may be further extended at the discretion of the Employer.
- (viii) To recover all sums paid in violation of this Pact by Bidder(s)/Contractor(s) to any middleman or agent or broker with a view to securing the contract.
- (ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the Employer with the Bidder/ Contractor, the same shall not be opened/operated.
- (x) Forfeiture of Performance Security in case of a decision by the Employer to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.2 The Employer will be entitled to take all or any of the actions mentioned at para 6.1 (i) to (x) of this Pact also on the Commission by the Bidder/Contractor or any one employed by it or acting on its behalf (whether with or without the knowledge of the Bidder/Contractor), of an offence as defined in Chapter IX of the Indian Penal Code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of the Employer to the effect that a breach of the provisions of this Pact has been committed by the Bidder/Contractor shall be final and conclusive on the Bidder/Contractor. However, the Bidder/Contractor can approach the Independent External Monitor(s) appointed for the purposes of this Pact.

7.0 Independent External Monitor(s)

7.1 The Employer has appointed Independent External Monitors (hereinafter referred to as monitors) for this Pact after approval by the Central Vigilance Commission.

7.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

- 7.3 The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently. The Monitors report to CMD, NHPC.
- 7.4 Both the parties accept that the Monitors have the right to access all the Contract documents relating to the project/procurement, including minutes of meetings, whenever required. The right to access records should only be limited to the extent absolutely necessary to investigate the issue related to the subject tender/contract.
- 7.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he / she will so inform CMD, NHPC and request NHPC Ltd. to discontinue or take corrective action, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- 7.6 The Bidder(s)/Contractor(s) accepts that the Monitor has the right to access without restriction, to all Project documentation of the Employer including that provided by the Bidder/Contractor. The Bidder/Contractor will also grant the Monitor, upon his / her request and demonstration of a valid interest, unrestricted and unconditional access to their project documentation. The same is applicable to Subcontractor(s). The Monitor shall be under contractual obligation to treat the information and documents of the Bidder/Contractor/Subcontractor(s) with confidentiality. The Monitor has also signed declaration on 'Non-Disclosure Agreement' and of 'Absence of Conflict of Interest'. In case of any conflict of interest arising at an later date, the IEM shall inform CMD, NHPC and recuse himself / herself from that case.
- 7.7 The Employer will provide to the Monitor sufficient information about all meetings among the parties related to the project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings as and when required.
- 7.9 The Monitor will submit a written report to the CMD, NHPC Ltd., within 8 to 10 weeks from the date of reference or intimation to him by the Employer/Bidder and should the occasion arise, submit proposals for correcting problematic situations.
- 7.10 The word 'Monitor' would include both singular and plural.



8.0 Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the Employer or its agencies shall be entitled to examine all the documents including the Books of Accounts of the Bidder/Contractor and the Bidder/Contractor shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

9.0 Law and Place of Jurisdiction

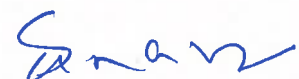
This Pact is subject to Indian Law. The place of performance and jurisdiction is the Registered Office of the Employer, i.e. Faridabad (Haryana). The arbitration clause provided in the tender document/contract shall not be applicable for any issue/dispute arising under Integrity Pact.

10.0 Other Legal Actions

- 10.1 The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.
- 10.2 Changes and supplements as well as termination notice need to be made in writing.
- 10.3 If the Contractor is a partnership or a consortium or a joint venture, this pact must be signed by all partners of the consortium/joint venture.

11.0 Validity

- 11.1 The validity of this Integrity Pact shall be from date of its signing and expires for the Contractor 12 months after the last payment under the contract, and for all other Bidders 6 months after the contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from business dealings.
- 11.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intention.
- 11.3 Issues like Warranty / Guarantee etc. shall be outside the purview of IEMs.
- 11.4 In the event of any contradiction between Integrity Pact and its Annexure, the clause in the Integrity Pact will prevail.



For & On behalf of the Employer



(Office Seal)

Place Farridabad

Date 14/02/25

Witness1. (Rajiv Kumar Singh)
Sr. Manager (E)

(Name and address)

2. 3rd Floor, 1st Floor, 2nd Floor (Bldg. 1)

(Name and address)

For & On behalf of the Bidder / Contractor

(Office Seal)

Place-----

Date-----

Witness1. _____

(Name and address)

2. _____

(Name and address)

Guidelines on Banning Business Dealings**1. Introduction**

NHPC Limited (NHPC) deals with Agencies viz. parties/ contractors/ suppliers/ bidders, who are expected to adopt ethics of highest standards and a very high degree of integrity, commitments and sincerity towards the work undertaken. It is not in the interest of NHPC to deal with Agencies who commit deception, fraud or other misconduct in the tendering process and/or during execution of work undertaken. NHPC is committed for timely completion of the Projects within the awarded value without compromising on quality.

- 1.2 Since banning of business dealings involves civil consequences for an Agency concerned, it is incumbent that adequate opportunity of hearing is provided and the explanation, if tendered, is considered before passing any order in this regard keeping in view the facts and circumstances of the case.

2.0 Scope

- 2.1 NHPC reserves its rights to remove from list of approved suppliers / contractors (if such list exists) or to Suspend/Ban Business Dealings if any Agency has been found to be non / poor performing or have committed misconduct or fraud or anything unethical or any of its action(s) which falls into any such grounds as laid down in this policy.
- 2.2 The procedure of (i) Removal of Agency from the List of approved suppliers / contractors; (ii) Suspension and (iii) Banning of Business Dealing with Agencies, has been laid down in these guidelines.
- 2.3 These guidelines shall apply to all the units of NHPC.
- 2.4 These guidelines shall not be applicable in Joint Venture, Subsidiary Companies of NHPC unless they are assignees, successors or executor.
- 2.5 The suspension/banning except suspension/banning under Integrity Pact shall be with prospective effect, i.e. future business dealings.

3.0 Definitions

In these Guidelines, unless the context otherwise requires:

- i) **"Agency /Party / Contractor / Supplier / Bidders/Vendors"** shall mean and include a public limited company or a private limited company, a joint Venture, Consortium, HUF, a firm whether registered or not, an individual, cooperative society or an association or a group of persons engaged in any commerce, trade, industry, etc. "Party / Contractor/ Supplier / Bidder/Vendor" in the context of these guidelines is indicated as 'Agency'.
- ii) **"Unit"** shall mean the Corporate Office, Project/ Power Station/ Regional Office/ Liaison Office or any other office of NHPC.

iii) **"Competent Authority" and 'Appellate Authority' shall mean the following:**

a) For works awarded/under Tendering from corporate office (falling in the competency of CMD /Board of Directors)

- Competent Authority: CMD
- Appellate Authority : Board of Directors

b) For works awarded/under Tendering from Corporate Office/Projects/ Power Stations/ Regional Offices/Liaison Offices (falling in the competency of Director /Executive Director)

- Competent Authority: Concerned Director/Executive Director as the case may be
- Appellate Authority: CMD /Concerned Director as the case may be

c) For works awarded/under Tendering from Corporate Office / Regional Offices / Projects/ Power Stations/ Liaison Offices (falling in the competency of CGM and below)

- Competent Authority in case of works awarded/under Tendering from Corporate Office/Regional office shall be CGM or GM of the concerned division as the case may be.
- Competent Authority: Head of the Unit not below the rank of General Manager
- Appellate Authority: Next higher authority

iv) **"Investigating Committee"** shall mean a Committee appointed by Competent Authority to conduct investigation.

4.0 Initiation of Suspension /Banning

Action for Suspension / Banning Business Dealings with any Agency shall be initiated by the department responsible for invitation of Bids/Engineer-in-charge after noticing the irregularities or misconduct on the part of Agency concerned. Besides the concerned department, Vigilance Department of each Unit/ Corporate Vigilance may also be competent to initiate such action.

5.0 Suspension of Business Dealings.

- 5.1 If the conduct of any Agency dealing with NHPC is under investigation, the Competent Authority may consider whether the allegations (under investigation) are of a serious nature and whether pending investigation, it would be advisable to continue business dealing with the Agency. If the Competent Authority, decides that it would not be in the interest to continue business dealings pending investigation, it may suspend business dealings with the Agency. The order of suspension would operate for a period not more than six months and may be communicated to the Agency as also to the Investigating Committee. The Investigating Committee may ensure that their investigation is completed and whole process of final order is over within such period. However if the investigations are not completed within six months ,the investigation committee shall put up the proposal to the competent authority for approval of extension of time maximum up to further three months with in which the committee shall conclude the proceedings .
- 5.2 The order of suspension shall be effective throughout NHPC in case of work falling in the Competency of CMD/ Board of Directors/Directors, in case of work falling in the competency of Executive Director suspension shall be effective throughout Region /Corporate office (in case the works awarded/under Tendering from Corporate office) .In case of work falling in the competency of HOP or below suspension shall be effective throughout the Project/Power Station and attached liaison offices/units and in case of work falling under the competency of CGM and below at Corporate office suspension shall be effective at Corporate office. During the period of suspension, no business dealing shall be held with the Agency.
- 5.3 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.
- 5.4 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension.
- 5.5 The format for intimation of suspension of business dealing is placed at **Appendix– I**

6.0 Ground on which Banning of Business Dealings can be initiated

- 6.1 If the security consideration, including questions of loyalty of the Agency to NHPC so warrants;
- 6.2 If the director /owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises, during the last five years;
- 6.3 If the Agency has resorted to Corrupt, Fraudulent, Collusive, Coercive practices including misrepresentation of facts and violation of the any provisions of the Integrity Pact provided in the Contract.
- 6.4 If the Agency uses intimidation / threatening or brings undue outside pressure on NHPC or its official for acceptance / performances of the job under the contract;



- 6.5 If the Agency misuses the premises or facilities of NHPC, forcefully occupies or damages the NHPC's properties including land, water resources, forests / trees or tampers with documents/records etc.
- 6.6 If the Agency does not fulfil the obligations as required under the Contract and Violates terms & conditions of the contract which has serious affect for continuation of the Contract.
- 6.7 If the work awarded to the agency has been terminated by NHPC due to poor performance of the contract in the preceding 5 years.
- 6.8 If the Central Vigilance Commission, Central Bureau of Investigation or any other Central Government investigation Agency recommends such a course in respect of a case under investigation or improper conduct on agency's part in matters relating to the Company (NHPC) or even otherwise;
- 6.9 On any other ground upon which business dealings with the Agency is not in the public interest.
- 6.10 If business dealings with the Agency have been banned by the Ministry of Power, Government of India OR any PSU/ any other authority under the MOP if intimated to NHPC or available on MOP Website, the business dealing with such agencies shall be banned with immediate effect for future business dealing except banning under Integrity Pact without any further investigation.

(Note: The examples given above are only illustrative and not exhaustive. The Competent Authority may decide to ban business dealing for any good and sufficient reason).

7.0 Procedure for Banning of Business Dealings

- 7.1 An Investigating Committee shall be constituted by the authority competent to Ban the dealing comprising members from Engineering/Indenting department (convener), Finance, Law and Contract. The level of the committee members shall be CGM and above for works falling in the competency of CMD/Board of Directors, General Manager and above for the works falling in the competency of Director/ Executive Director and DGM/SM with at least one member of the level of General Manager for works falling in the competency of CGM and below.
- 7.2 The order of Banning of Business Dealings shall be effective throughout the NHPC. During the period of Banning of Business Dealings, no Business Dealing shall be held with the Agency.
- 7.3 The functions of Investigating Committee in each Unit to be appointed by the competent authority in line with para 3 (iii) shall, inter-alia include:

- a) To study the report of the department responsible for invitation of bids and decide if a prima-facie case for banning exists, if not, send back the case to the Competent Authority.
- b) To recommend for issue of show-cause notice (after vetting by legal deptt.) to the Agency by the concerned department as per clause 7.4 "Show Cause Notice".
- c) To examine the reply to show-cause notice and call the Agency for personal hearing, if required.
- d) To submit final recommendations to the Competent Authority for banning or otherwise including the period for which the ban would be operative considering the implications for NHPC on account of the act/omission on the part of the agency, intention of the agency as established from the circumstances of the case etc.

7.4 Show Cause Notice

Once the proposal for issuance of Show Cause Notice is approved by the Competent Authority, a 'Show Cause Notice' (as per format at **Appendix-II** of these guidelines) shall be issued to the delinquent Agency by the Competent Authority or by a person authorized by the Competent Authority for the said purpose. The Agency shall be asked to submit the reply to the Show Cause Notice within 15 days of its issuance. Further, the Agency shall be given an opportunity for Oral hearing to present its case in person, if it so desires, and the date for Oral Hearing shall necessarily be indicated in the Show Cause Notice.

The purpose of issuing the Show Cause Notice is only that the Agency concerned shall be given an opportunity to explain their stand before any action is taken. The grounds on which action is proposed to be taken shall be disclosed to the Agency inviting representation and after considering that representation, orders may be passed. Such orders require only the satisfaction of the authority that passed the final orders.

If the Agency requests for inspection of any relevant document in possession of NHPC, necessary facility for inspection of documents may be provided.

During the conductance of oral hearing, only the regular duly authorized employees of Agency will be permitted to represent the Agency and no outsider shall be allowed to represent the Agency on its behalf.

Reply to the Show Cause Notice given by the Agency and their submissions in oral hearing, if any, will be processed by the Committee for obtaining final decision of the Competent Authority in the matter.

In case, no reply to Show Cause Notice is received from the Agency within stipulated time, further reminder shall be given with further period of 10 days thereafter if no reply is received action for processing ex-parte against the concerned Agency shall be initiated.

7.5 Speaking Order

The speaking order (reasoned order) for banning the business dealing with the Agency shall be issued by the Competent Authority or by a person authorized for the said purpose.

Smaw

The decision regarding banning of business dealings taken after the issue of a Show Cause Notice and consideration of representation, if any, in reply thereto, shall be communicated to the Agency concerned along with a reasoned order. The fact that the representation has been considered shall invariably be mentioned in the communication. Also the fact that if no reply was received to the Show Cause Notice shall invariably be indicated in the final communication to the Agency. The format for intimation of banning of business dealing is placed at **Appendix- III**.

7.6 Period of banning

In case banning is processed for violation of provisions of Integrity pact or due to corrupt or fraudulent practices, the Competent Authority shall decide on the period of banning on case to case basis depending on the gravity of the case and considering the implications for NHPC on account of the act/omission on the part of the Agency, intention of the Agency as established from the circumstances of the case etc. The period of banning shall not be less than 6 months and shall not exceed 2 years and in case termination of contract due to poor performance the period of banning shall be for 5 years. For contracts awarded to JV/Consortium, a constituent of the JV shall be permitted to participate in the bidding process if it has not been banned on grounds of its role and responsibility in the tendering process for which the Joint Venture has been banned in Past. In case if the Joint Venture which has been banned does not indicate the roles and responsibility of individual Partner(s) then, the partner of the banned Joint Venture shall only be allowed to participate in the bidding process if its participation share is less than 35%.

In case the information/documents submitted by Agency in competing for the tender found to be false/forged then NHPC, without prejudice to any other rights or remedies it may possess, shall recover from Agency the cost incurred in carrying out physical assessment for establishing veracity of such information/documents. In case Agency refuses to reimburse such cost to NHPC then banning period of Agency shall be extended by another one year.

7.7 Effect of Banning

As far as possible, the existing ongoing contract(s) with the Agency may continue unless the Competent Authority, having regard to the circumstances of the case, decides otherwise, keeping in view contractual and legal issues which may arise thereof. In case the existing Contracts are allowed to continue, the suspension/Banning of Business Dealing along with default of the Contractor shall be recorded in the experience certificate issued for the work.

The Agency, (after issue of the order of banning of business dealings) would not be allowed to participate in any future tender enquiry and if the Agency has already participated in tender process as stand-alone OR constituent of joint venture and the price bids are not opened, his techno-commercial bid will be rejected and price bid will be returned unopened. However, where the price bids of Agency have been opened prior to order of banning, bids of Agency shall not be rejected and tendering process shall be continued unless Competent Authority having regard to the circumstances of the case decides otherwise keeping in view the Contractual, Legal issues which may arise thereafter. However, in case the suspension /Banning is due to default of an Agency for the provisions

under Integrity Pact and the Agency happens to be Lowest Bidder (L1), the tendering process shall be annulled and fresh tenders shall be invited.

During the Suspension/ Banning period, if it is found at any stage that Agency has participated in tender enquiry under a different name then such Agency would immediately be debarred from the tender/contract and its Bid Security/Performance Security would be forfeited. Payment, if any, made shall also be recovered.

After Suspension/ Banning order, the Suspended/ Banned Agency shall not be allowed to participate as Sub-Vendor/Sub-Contractor in the tenders.

Further, if the Suspended/ Banned agency is an approved Sub-Vendor under any Contract for such equipment/component/service, the Main Contractor shall not be permitted to place work order/Purchase order/Contract on the Suspended/ Banned agency as a Sub-Vendor /Sub-Contractor after the date of Suspension/ Banning even though the name of the party has been approved as a Sub-Vendor /Sub-Contractor earlier.

There would be no bar on procuring the spares and awarding Contracts towards Annual Maintenance (AMC)/ O&M/ Repair works on Agencies pertaining to the packages for which they have been banned provided the Equipment has been supplied by such Agency.

Banning of business dealing shall not be applicable to the Subsidiary Company of the Banned agency provided subsidiary company has not participated on the strength of the Banned agency. However, in case of a default by a Sub-Contractor, the banning shall be applicable to the Sub-Contractor as well as the Lead Partner of the concerned JV or the Sole bidder as the case may be.

7.8 Hosting at NHPC website

The concerned unit shall forward the name and details of the Agency (ies) banned along with period and reasons of banning to IT&C Division of Corporate Office for displaying the same on the NHPC website.

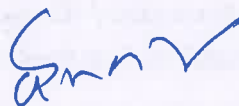
8.0 Appeal against the Decision of the Competent Authority.

The Agency may file an appeal against the order of the Competent Authority banning of business dealing before Appellate Authority. Such an appeal shall be preferred within 30 (Thirty) Days from the date of receipt of the order of banning of business dealing. Appellate Authority would consider the appeal if convinced may constitute another committee for further investigation. The investigation Committee constituted by the Appellate Authority shall study the report of the previous investigating committee and reply submitted by the Agency while filing its case for appeal and call the Agency for personal hearing, if requested by the Agency. Based on the recommendation of the committee Appellate Authority shall pass appropriate Speaking (Reasoned) order in line with Sub-Para 7.5 above which shall be communicated to the Agency as well as the Competent Authority (as per format enclosed as **Appendix-IV** with these guidelines).



9.0 Circulation of the names of Agencies with whom Business Dealings have been banned

The name of the concerned banned agency shall also be shared with MOP and other PSU in the sector and all the units of NHPC. The provisions of this policy supersede and will have overriding effect on all earlier guidelines, procedures & system issued for the similar purpose.



(Format for Intimation of Suspension of business dealing)

BY REGD. POST/SPEED POST/COURIER

No.....

Date.....

To

M/s

Attn.: Shri

Sub: Intimation of Suspension of Business Dealings

Dear Sir,

Whereas the work of was awarded to your firm vide letter of award no ...dt..... amounting to Rs. OR In response to NHPC NIT (e-tender / physical tender) no dt. you have submitted your bid . (strike out whichever is not applicable)

Whereas the conduct of your firm in respect of the following is under investigation:

Brief of the default

"Whereas the Competent Authority prima facie considered the allegations (under investigation) are of a serious nature and decided pending investigation, it is not in the interest of the corporation to continue business dealing with your firm

This order shall have the following effects:

- (i) Further business dealings with your firm is Suspended within Region/Project/Unit/wide NHPC. The order of Suspension is effective with immediate effect and would operate for a period of six months or till the investigation is completed and whole process of final order is over within such period. However, if investigations are not completed in six months' time, the Competent Authority may extend the period of Suspension
- (ii) During the period of Suspension, no business dealing shall be held with your firm. No enquiry / bid / tender shall be issued to your firm nor will the bids submitted by your firm be entertained.



- (iii) In cases where tenders have already been issued to you and price bids are yet to be opened, the Price Bid submitted by you shall not be opened and BG/EMD, if any, submitted by you shall be returned.
- (iv) In cases where tenders have already been issued to you and Price Bids have already been opened, the tendering process shall be continued.
- (v) In case of ongoing contracts between you & NHPC, (including cases where contract has already been awarded before the issue of Suspension order) you will be required to continue with the execution and perform as per terms of the contract.

(vi)(a) In case the Firm is in Joint Venture the following would also be applicable:

i) Participation of Agency in Joint Venture

Tenders in which your firm has been proposed as Joint Venture Partner by any of the bidders and price bids have been opened prior to Suspension of your firm in such cases the tendering process shall not be annulled on this ground and the Agency shall be permitted to continue as Partner in the Joint Venture for such bidding. However where event of Price Bid opening has not taken place prior to Suspension/Banning of Agency then in such case Agency shall not be permitted to participate as Partner in the Joint Venture.

ii) Banning of joint Venture:

As the Joint Venture is Banned, your firm intends to bid as Partner(s) of Joint Venture in bidding process then it shall be permitted to participate in the bidding process if it has not been Banned on grounds of its role and responsibility in the tendering process for which the Joint Venture has been Banned in Past. In case if the Joint Venture which has been Banned does not indicate the roles and responsibility of individual Partner(s) then, the partner of the Banned Joint Venture shall only be allowed to participate in the bidding process if its participation share is less than 35%.

- (b) Your firm shall not be allowed to participate as Sub-Vendor/Sub-Contractor in the tenders.

Further if your firm is an approved Sub-vendor under any Contract for such equipment/component/service, the Main Contractor shall not be permitted to place work order/Purchase order/Contract on your agency as a Sub-Vendor/Sub-Contractor after the date of Suspension/ Banning even though the name of the party has been approved as a Sub-Vendor/Sub-Contractor earlier.

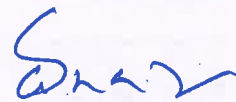
- (c) There would be no bar on procuring the spares and awarding Contracts towards Annual Maintenance (AMC)/ O&M/ Repair works on Agencies pertaining to the packages for which they have been Banned provided the Equipment has been supplied by such Agency.
- (d) Banning of business dealing shall not be applicable to the Subsidiary company of the Banned agency provided subsidiary company has not participated on the strength of the Banned agency.

On expiry of the above period of Suspension/Banning, you may approach..... (Indicate the concerned procurement department), with request for revocation of the order mentioning inter-alia the steps taken by you to avoid recurrence of misconduct which has led to Suspension.

Yours faithfully,

For & On behalf of NHPC.

Note: Strike out whichever is not applicable



(Format of Show Cause Notice)

BY REGD. POST/SPEED POST/COURIER

No.....

Date.....

To

M/s

.....

Attn.: Shri

Sub: Show Cause Notice

Ref :

Dear Sir,

You are hereby required to Show Cause in writing within 15 days from the date hereof why Business Dealing with your firm should not be banned / your firm is placed in the Banning List (as the case may be) and be debarred from entering into any contracts with NHPC for the following reasons:

(Give Reasons)

Your reply (if any) should be supported by documents and documentary evidence which you wish to rely in support of your reply. In case you desire to present your case in person to NHPC, a personal hearing shall be conducted on ----- at ----- Hours for which prior intimation be furnished to this office. Should you fail to reply to this Show Cause Notice within the time and manner aforesaid, it will be presumed that you have nothing to say and we shall proceed accordingly.

Your reply, if any, and the documents / documentary evidence given in support shall be taken into consideration prior to arriving at a decision.

Yours faithfully,

For & On behalf of NHPC.



(Format for Intimation of Banning of Business Dealing)

BY REGD. POST/SPEED POST/COURIER

No.....

Date.....

To

M/s

Attn.: Shri

Sub: Intimation of Suspension of Business Dealings

Dear Sir,

Whereas the work of was awarded to your firm vide letter of award no ...dtd..... amounting to Rs. OR In response to NHPC NIT (e-tender / physical tender) no dt. you have submitted your bid .(strike whichever is not applicable)

Whereas the Competent Authority had prima facie considered the allegations as detailed below are of a serious nature and decided to conduct investigation.

“ Brief of the Default may be mentioned”

Whereas show cause notice vide no ... dtd.....was served upon you. (whereas in spite of the opportunity given to you, you failed to submit the reply to the show cause notice within the time period mentioned there upon or further extended period, if any). Whereas you submitted the reply along with documents vide your letter no. _____dt. _____and presented your case in the personal hearing dated (if any) . After considering the allegations made in the show cause notice, your reply to the show cause notice documents/documentary evidence in support thereof and personal hearing dated(if any), it has been decided to Ban the Business Dealing with you and you are hereby debarred from entering into contracts with NHPC.

(In order to make the Intimation of Banning of Business Dealing Speaking Order (reasoned order), the issue of a Show Cause Notice and consideration of representation in reply to show cause notice , opportunity of personal hearing, if any, shall be communicated to the Agency concerned along with a reasoned order. The order for Banning should also contain the reasons with detailed justification for conclusion of decision to Ban the Agency. Also the fact that if no reply to the Show Cause Notice was received or request for personal hearing was not made shall invariably be indicated in the communication to the Agency. The above order shall mention the grounds considering violation of any provision of Integrity Pact, any ground mentioned in Guidelines of Banning of Business Dealings, default by the agency under fraudulent practice / or any unethical practice and/or violation of any provision of Tender/Contract Condition having serious implications.)

This order shall have the following effects:



- i) Further business dealings with your firm is banned with immediate effect . The order of Banning would operate for a period of years/month Competent Authority may extend the period of Banning.
- ii) During the period of Banning, no Business Dealing shall be held with your firm. No Enquiry / Bid / Tender shall be issued to your firm nor will the bids submitted by your firm be entertained.
- iii) In cases where tenders have already been issued to you and Price Bids are yet to be opened, the Price Bid submitted by you shall not be opened and BG/EMD, if any, submitted by you shall be returned.
- iv) In cases where tenders have already been issued to you and price bids have already been opened, the Tendering Process shall be continued.
- (v) In case of ongoing contracts between you & NHPC, (including cases where contract has already been awarded before the issue of Banning order) you will be required to continue with the execution and perform as per terms of the contract.
- (vi) (a) In case the Firm is in Joint Venture the following would also be applicable:

i) Participation of Agency in Joint Venture

Tenders in which your firm has been proposed as Joint Venture Partner by any of the bidders and price bids have been opened prior to Banning of your firm in such cases the tendering process shall not be annulled on this ground and the Agency shall be permitted to continue as Partner in the Joint Venture for such bidding. However where event of price bid opening has not taken place prior to Banning of Agency then in such case Agency shall not be permitted to participate as Partner in the Joint Venture.

ii) Banning of joint Venture:

As the Joint Venture is banned, your firm intends to bid as Partner(s) of Joint Venture in bidding process then it shall be permitted to participate in the bidding process if it has not been banned on grounds of its role and responsibility in the tendering process for which the Joint Venture has been banned in Past. In case if the Joint Venture which has been banned does not indicate the roles and responsibility of individual Partner(s) then, the partner of the banned Joint Venture shall only be allowed to participate in the bidding process if its participation share is less than 35%.

- (b) Your firm shall not be allowed to participate as Sub-Vendor/Sub-Contractor in the tenders.

Further if your firm is an approved Sub-vendor under any Contract for such equipment/component/service, the Main Contractor shall not be permitted to place work Order/Purchase Order/Contract on your agency as a Sub-Vendor/Sub-Contractor after the date of Banning even though the name of the party has been approved as a Sub-Vendor/Sub-Contractor earlier.

- (c) There would be no bar on procuring the spares and awarding Contracts towards Annual Maintenance (AMC)/ O&M/ Repair works on Agencies pertaining to the packages for which they have been banned provided the Equipment has been supplied by such Agency.

- (d) Banning of Business Dealing shall not be applicable to the Subsidiary company of the Banned Agency provided subsidiary company has not participated on the strength of the Banned Agency. However, in case of a default by a Sub-Contractor, the banning shall be applicable to the Sub-Contractor as well as the Lead Partner of the concerned JV or the Sole bidder as the case may be.

On expiry of the above period of Banning, you may approach..... (Indicate the concerned procurement department), with request for revocation of the order mentioning inter-alia the steps taken by you to avoid recurrence of misconduct which has led to Banning.

Further if you desire to appeal against this order you may do so within 30 days from the date of issue of this order to the appellate authority as here under:

Appellate Authority :

Designation:

Address:.....

Ph . no.

e-mail :

Yours faithfully,

For & On behalf of NHPC.

Note: Strikeout whichever is not applicable



Appendix –IV

(Format for communication of Appellate Decision on Suspension/Banning Order)

BY REGD. POST/SPEED POST/COURIER

No.....

Date.....

To

M/s

Attn.: Shri

Sub: Suspension Banning of Business Dealings - Intimation of decision of Appellate Authority

Ref: 1. Order dated Placing M/s on Suspension/Banning List by NHPC;

2. Your Appeal reference Dt.....

Dear Sir,

This has reference to the order dt..... placing you on Suspension/Banning List and your appeal petition reference dt.... on the same.

After considering the findings of the Original Authority in order and submissions made by you in your appeal , and the documents/documentary evidences available on record, it has been decided finally that :

- * There is no infirmity in the order of the Original Authority, and the allegations stand substantiated and the Suspension/Banning for the period of years/month from the date of order, as ordered by the original Authority is upheld,
- * Considering your submissions, the order of Suspension/Banning passed by the original authority is upheld , but with a reduction in period of Suspension/Banning for years/months from the date of order of original authority;
- * Considering your submissions and the evidence available on record, there is enough justification to annul the order of the original authority.

(*** Incorporate any one of the above as applicable

##In order to make the Communication of Appellate Authority on Banning of Business Dealing Speaking Order (reasoned order), the fact that the representation of the agency has been considered and reference of grounds brought forward by the Agency in his defense and if any opportunity of personal hearing has been given to the Agency as a part of principle of natural justice shall invariably be mentioned in the communication, The order for Banning should also contain the reasons with detailed justification for conclusion of decision to Ban the Agency. Also the fact that if no sufficient ground has been furnished shall invariably be indicated in the final communication to the Agency. In case the option for Banning of Agency or reduction of Time Period for Banning of Agency is exercised then the above order shall mention the grounds considering violation of any provision of Integrity Pact, any ground mentioned in Guidelines of Banning of Business Dealings, default by the agency under fraudulent or any unethical practices and/or violation of any provision of Tender/Contract Condition having serious implications.)

Yours faithfully,

For & On behalf of NHPC.



FORM -8

(Ref. NIT Clause-3.2(E))

DECLARATION REGARDING APPLICABILITY OF START UPS UNDER START UP INDIA INITIATIVE

To,
Name & Address of the Employer

Subject: Declaration as regard to applicability of Startup India Initiatives

Startup India Initiative has been introduced by the Government of India and their revised definition has been notified in the Gazette notification-G.S.R. 127(E) dated 19.02.2019 . In this notification an entity shall be considered as a startup:-

- a) If it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India; and
- b) up to ten years from the date of its incorporation/ registration; and
- c) if its turnover for any of the financial years since incorporation/ registration has not exceeded Rupees 100 crores; and
- d) if it is working towards innovation, development or improvement of products or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation.

Provided that any such entity formed by splitting up or reconstruction of a business already in existence shall not be considered a “startup”.

As such, it is requested to provide the confirmation as regard to applicability of Startup India Initiative to your firm by submitting the declaration/undertaking by _____ (last date of bid submission).

-----Sd--

**(Authorized Representative of
Concerned Contract & Procurement Division)**

Declaration/Undertaking

- A) I/We confirm that the provisions of Startup India Initiatives are:
- [] Applicable to us and our organization falls under the definition of Startups for the tendered work.
- [] Not Applicable to us and our organization does not fall under the definition of Startups for the tendered work.
- Please (tick) the appropriate box [] and attach documents / certificates, as applicable.

B) I/We also undertake to inform the change in this status as aforesaid during the currency of the contract, if any.

(Authorized Representative of Firm)

Form-9

Undertaking regarding near relative to any official of the Employer

(To be submitted on letter head)

I / We (Name of bidder) confirms that following persons are near relatives to the officials of the Employer working with our firm / company:

Sr. No.	Name and Designation of Employee of Bidder	Name and designation of near relative working with Employer	Relation
1			
2			
3			

(Authorised Representative of Bidder)

Name

Designation

Form-10

(Ref. NIT Clause no 3.2(F))

DECLARATION REGARDING INSOLVENCY PROCEEDINGS UNDER INSOLVENCY AND BANKRUPTCY CODE 2016

Subject: In respect of Domestic Competitive Bidding for(name of work).

It is declared that “no insolvency proceeding is admitted by the Adjudicating Authority against (name of the bidder) under the IBC 2016”.

Further, it is declared that after submitting the bid till the time of award of work, ... (name of the bidder) shall inform NHPC regarding any admission of application for corporate insolvency resolution process by the Adjudicating Authority under the IBC 2016 against (Name of the bidder) and any suppression of such fact shall render the (name of the bidder) liable for rejection of our bid and banning of business dealing as per terms and conditions of Guidelines of banning of business dealings under Integrity Pact.

(To be submitted on letter head duly signed by the authorized representative of the Bidder)

.....
.....
.....
.....
.....
.....

Form-11

(Ref. NIT Clause-2.1(c))

(To be submitted by the bidder on the Companies Letter head duly signed by the authorised signatory)

(Format for Self-declaration for Local Content in accordance with Public Procurement (Preference To Make In India) Order 2017 and as amended from time to time)

We ,M/s_____ (name of Bidder) having registered office at _____ (Address of the Company) confirm that , we have examined the **Make In India** provisions circulated by Government of India, Ministry of Commerce and Industry , Department for Promotion of Industry and Internal trade (DPIIT), vide order no. P-45021/2/2017-PP(BE-II) dated 04.06.2020 , MoP order No. 11/05/2018-Coord. dated 28.07.2020, MoP order no. 11/05/2018-Coord dated 17.09.2020 and MoP order no. A-1/2021-FSC/Part-5 dated 16.11.2021 and its amendment thereof related to “Local content”, “Class-I local supplier”, “Class-II local supplier” & “Local content percentage” and other provision mentioned therein Further, we also acknowledge that in case, it has been found that the declaration against local content percentage given by us is false then action can be initiated against us as per Govt. Guidelines under Make in India issued from time to time.

Name of the bidder	Country of origin	(% of local content to be mentioned by bidder)

Further we declare that cyber security/safety of the equipment/ process to be supplied / services to be rendered as safe to connect.

Note:

1. The responsibility of e-waste and its recycling/disposal shall be the responsibility of the registered e-waste handlers/Manufacturers/Suppliers. The list of registered e-waste handlers/Manufacturers/Suppliers for the corresponding items is to be given by the contractor.
2. All the items/components shall be supplied in compliance to cyber security policies/guidelines 2021 issued by CEA and any amendments thereof. The applicable security standards already specified in the contract.

3. Further, all bidders shall keep on visiting website of department for promotion of Industry and Internet Trade (DPIIT), Ministry of Commerce & Industry i.e. <https://dpiit.gov.in> to get updated/latest information regarding public procurement (Preference to Make in India) Order 2017.

()

Signature of Authorised Signatory of Company

Note:

In case of Procurement for a value in excess of Rs.10 crores, the Class-I local supplier/Class-II Local supplier' shall be required to provide a certificate from the statutory auditors or cost auditors of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

Form-12

(Ref. ITB Clause no. 23.2)

Declaration regarding Compliance of restrictions under Rule 144(xi) of GFR-2017 regarding procurement from bidders from a country or countries sharing Land Border with India.

I/We (name of bidder) have read the clause no. of NIT regarding restrictions on procurement from a bidder of a country which shares a land border with India ; I hereby certify that this bidder is not from such a country and is eligible to be considered.

I/we (name of bidder) have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]

I/we (name of bidder) have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I/we certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]

Evidence of valid registration by the Competent Authority is hereby attached.

(Strikeout whichever is not applicable)

Duly authorized to sign bid for and on behalf of

.....

.....

[name & address of Bidder and seal of company]

Form-13

Checklist for Bidders

(To be submitted as part of Technical bid)

(on Company Letter-head)

Bidder's Name _____

[Address and Contact Details]

Bidder's Reference No. _____ Date.....

Tender Document No. Tend No./ xxxx; Tender Title:

Note to Bidders: This check-list is merely to help the bidders to prepare their bids, it does not over-ride or modify the requirement of the tender. Bidders must do their own due diligence also.

Sr. No.	Documents submitted, duly filled, signed	Yes/ No/ NA
1.	Form 1 : General Information	
2.	Form 2 : Letter of Tender Form	
3.	Form 3 : Work Experience Record	
4	Form-4 : Annual Construction Turnover	
5	Form-5 : Form of Declaration	
6	Form-6 : Declaration of Ineligibility	
7	Form-7 : Form of Integrity Pact duly signed	
8	Form-8 : Form for Declaration of Start-up	
9	Form-9 Undertaking regarding near relative to official of the Employer	
10	Form-10 : Certificate of Insolvency	
11	Form-11 : self-Certificate of Local Content under Make in India policy, or from auditors/ cost accountant in case of Tenders above estimated cost Rs 10 Crore	
12	Form-12 : Declaration regarding Compliance of restrictions under Rule 144(xi) of GFR-2017 regarding procurement from bidders from a country or countries sharing Land Border with India.	
13	Bid Security	
14	Power of Attorney (if applicable)	
15	Price Schedule (BOQ) Excel Sheet downloaded from the Portal and filled and uploaded	
16	Any other requirements, if stipulated in NIT/ ITB; or if considered relevant by the Bidder	
17	Form 13: This Checklist	

.....

(Signature with date)

.....

(Name and designation)

Duly authorized to sign bid for and on behalf of.....

[name & address of Bidder and seal of company]

SECTION -IV

GENERAL CONDITIONS OF CONTRACT (GCC) AND SCHEDULES

GENERAL CONDITIONS OF CONTRACT

CONTENT

CLAUSE	DESCRIPTION
1.0	DEFINITIONS
2.0	INTERPRETATIONS
3.0	SECURITY DEPOSIT FOR PERFORMANCE
4.0	REFUND OF SECURITY DEPOSIT
5.0	SUFFICIENCY OF TENDER
6.0	CONTRACT DOCUMENTS
7.0	BREAKDOWN OF LUMP SUM ITEMS
8.0	DUTIES AND POWERS OF ENGINEER-IN-CHARGE'S REPRESENTATIVE
9.0	ASSIGNMENT AND SUB-LETTING
10.0	FACILITIES TO OTHER CONTRACTORS
11.0	CHANGES IN CONSTITUTION
12.0	POSSESSION AND USE OF SITE
13.0	ADVANCES AND RECOVERY THEREOF
14.0	COMMENCEMENT OF WORK
15.0	WORKS TO BE CARRIED OUT IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS AND ORDERS, ETC.
16.0	SETTING OUT THE WORKS
17.0	URGENT WORKS
18.0	DEVIATIONS
19.0	CONTRACTOR'S SUPERVISION
20.0	INSTRUCTIONS AND NOTICES
21.0	CONSTRUCTION EQUIPMENT
22.0	PATENT RIGHTS
23.0	MATERIALS

24.0	POWER SUPPLY
25.0	SUPPLY OF WATER
26.0	WATCHING AND LIGHTING
27.0	WORK DURING NIGHT OR ON SUNDAYS AND HOLIDAYS
28.0	SITE DRAINAGE, PROTECTION OF TREES AND PREVENTION OF NUISANCE
29.0	LABOUR
30.0	REMOVAL OF CONTRACTOR'S MEN
31.0	MATERIALS OBTAINED FROM EXCAVATION AND TREASURE, TROVE, FOSSILS ETC
32.0	FORCE MAJEURE
33.0	LIABILITY FOR DAMAGE, DEFECTS OR IMPERFECTIONS AND RECTIFICATIONS THEREOF
34.0	CONTRACTOR'S LIABILITY AND INSURANCE
35.0	SUSPENSION OF WORKS
36.0	FORECLOSURE OF CONTRACT IN FULL OR IN PART DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK
37.0	TERMINATION OF CONTRACT ON DEATH
38.0	DEFAULT BY THE CONTRACTOR AND TERMINATION OF CONTRACT IN FULL OR IN PART
39.0	TIME FOR COMPLETION AND EXTENSIONS
40.0	COMPENSATION FOR DELAY
41.0	INSPECTION AND APPROVAL
42.0	COMPLETION CERTIFICATE
43.0	DEFECTS LIABILITY PERIOD
44.0	MEASUREMENTS
45.0	PAYMENT ON ACCOUNT
46.0	PRICE ADJUSTMENT/VARIATIONS
47.0	TAXES, DUTIES AND LEVIES ETC.
48.0	PAYMENT OF FINAL BILL
49.0	OVER PAYMENT AND UNDER PAYMENT

50.0	TRAINING OF APPRENTICES
51.0	CONTRACT MATTERS TO BE TREATED AS CONFIDENTIAL
52.0	LAWS GOVERNING THE CONTRACT
53.0	PROCEDURE FOR CLAIMS
54.0	SUM PAYABLE BY WAY OF COMPENSATION TO BE CONSIDERED AS REASONABLE WITHOUT REFERENCE TO ACTUAL LOSS
55.0	SETTLEMENT OF DISPUTES
56.0	DEFECTS LIABILITY CERTIFICATE & UNFULFILLED OBLIGATIONS
57.0	ECOLOGICAL BALANCE
58.0	GENERAL
59	EMPLOYMENT OF SKILLED AND UNSKILLED WORKERS

SECTION -IV

GENERAL CONDITIONS OF CONTRACT

CLAUSE-1: DEFINITIONS:

In the contract, the following expression shall, unless the context otherwise requires, have the meanings thereby respectively assigned to them:

- (i) **Contract:** means the document forming the tender, acceptance thereof and the formal agreement executed between the NHPC Limited/ BSUL and the Contractor, together with documents referred to therein.
- (ii) **Contract Price:** means the amount arrived at by multiplying the quantities shown in the Bill of Quantities by the respective item rates as included in the Letter of Acceptance.
- (iii) **Contractor:** means the successful tenderer who is awarded contract to perform the work covered under these tender documents and shall be deemed to include the contractor's successors, executors, representatives or assigns.
- (iv) **Corporation or Employer:** means the BSUL having its registered Office at TC-43/V, Vibhuti Khand, Gomti Nagar, Lucknow, Uttar Pradesh and includes therein legal representatives, successors and assigns.
- (v) **Tender Drawings:** means the drawings referred to in the Specifications and/or appended with the tender document.
- (vi) **Construction Drawing:** means such drawings approved in writing by the Engineer-in-Charge/ Employer and issued for actual construction of the Works from time to time by the Engineer-in-Charge.
- (vii) **Drawing:** means and shall include Tender drawing and Construction Drawing.
- (viii) **Engineer-in-Charge/Engineer:** means the Engineering Officer nominated by the Employer or its duly authorised representative to direct, supervise and be incharge of the works for the purpose of this contract.
- (ix) **Letter of Award or Acceptance:** means a letter from the Employer conveying the acceptance of the tender/offer subject to such reservations as may have been stated therein.
- (x) **Specifications:** means the Technical Specifications of the Works included in the Contract and any modification thereof or addition thereto made under Clause 18 or submitted by the Contractor and approved by the Engineer.
- (xi) **Sub-contractor:** means any person named in the Contract as a Subcontractor for a part of the Works or any person to whom a part of the Works has been subcontracted with the consent of the Employer and the legal successors in title to such person, but not any assignee of any such person.
- (xii) **Cost:** means all expenditure properly incurred, whether on or off the Site, including overhead and other charges properly allocable thereto but does not include any allowance for profit.

- (xiii) **Bill of Quantities (BOQ) or Schedule of Quantities & Prices:** means the priced and completed Schedule of Quantities & Prices or bill of Quantities forming part of the Contract.
- (xiv) **Time for Completion:** means the time for completing the execution of and passing the Tests on Completion of the Works as stated in the Contract (or as extended under Clause 39) calculated from the date of Letter of Acceptance.
- (xv) **Works:** means the works to be executed (including Plant) and remedying of defect therein in accordance with the Contract.
- (xvi) **Contractor's Equipment or Construction Equipment or Equipments:** means all appliances and things of whatsoever nature (other than Temporary Works) required for the execution and completion of the Works, but does not include Plant, materials or other things intended to form or forming part of the Works.
- (xvii) **Site:** means the land and/or other places, on or through which the Works are to be executed including any other lands or places which may be allotted for the purpose of the Contract.
- (xviii) **Plant:** means machinery, apparatus and like intended to form or forming part of Works.
- (xix) **Base Date:** means the Date 28 days prior to the latest date of submission of the Tender.
- (xx) **Party:** means the Employer or the Contractor as the context requires.

CLAUSE-2: INTERPRETATIONS:

- 2.1 Words imparting the singular only shall also include the plural; he includes she and vice versa unless this is repugnant to the context. Unless specifically defined, words shall have normal meaning under the language of Contract.
- 2.2 Heading and marginal notes in these General Conditions shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof of the Contract.
- 2.3 Any error in description, quantity or price in Bill of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from execution of the whole or any part of the Works comprised therein according to drawings and Specifications or from any of his obligations under the Contract.
- 2.4 Detailed drawings shall be followed in preference to small scale drawings (sketch drawings) and figured dimensions in preference to scaled dimensions. In the case of discrepancy between the Letter of acceptance issued by Employer, Special Conditions of Contract, Technical Specifications, General Conditions of Contract, the Tender Drawings and/or Bill of Quantities and other documents of Contract the following order of precedence shall prevail:
 - a) Agreement;
 - b) Letter of Acceptance ;
 - c) Special Conditions of Contract;

- d) General Conditions of Contract;
- e) Bill of Quantities;
- f) Technical Specifications;
- g) Contractor's Bid;
- h) Tender Drawings;
- i) Safety Manual.
- j) Any other document forming part of the Contract

CLAUSE-3: SECURITY DEPOSIT FOR PERFORMANCE:

3.1 The Security Deposit shall comprise of following

- i) Performance Security Deposit to be furnished by the Contractor before signing of Contract Agreement.
- (ii) Retention Money to be recovered from Running Account bills of the Contractor.

3.2 The Contractor within 28 (twenty eight) days from the date of issue of Letter of Acceptance, shall furnish a Performance security deposit of 2% (two percent) of the Contract Price for due performance of contract, in any one of the following forms:

- (a) Demand draft on any Nationalised/scheduled Bank of India in the name of Employer; or
- (b) Bank Guarantee issued / confirmed from an Indian Nationalised/Scheduled Bank of India acceptable to Employer in the prescribed Proforma.
- (c) Insurance Surety Bond issued / confirmed by Insurance Company registered in India under Insurance Act 1938 or as amended from time to time and approved by the Insurance Regulatory Development Authority of India (IRDAI) acceptable to Employer in the prescribed proforma.

If the contractor does not submit the performance security within the stipulated period due to any valid reason, Tender Inviting Authority/ BSUL may grant time extension for submission of performance security based on the request of contractor.

In case, the contractor does not submit performance security without a valid reason, the Employer shall impose simple interest @12% per annum on the full amount of applicable performance security (alongwith applicable taxes, if any) for the period of delay in submission of performance security. The interest on delayed period shall be calculated on pro rata basis for number of delayed days.

The interest accrued shall be payable by the Contractor within 14 days from the date of intimation by Tender Inviting Authority in form of Bank Demand Draft/ Banker Cheque in favour of 'NHPC Ltd', otherwise the same shall be recovered from any payment due or become due against bills / any other amount lying with NHPC.

The delayed submission of Performance Security by the Contractor shall be recorded in substantial completion and final completion certificates. Further, no claim for extension of time for completion period or any other type of claim on account of delayed submission of performance security shall be entertained.

If contractor fails to submit the Performance Security within 45 days (for the contracts having time for completion - upto 12 months) or 60-days (for the contracts having time for completion - more than 12 months) from the date of issue of Letter of Award (LOA), then following actions shall be taken against such Contractor:

- i) The bidder shall be debarred / banned to participate in the business dealings with NHPC/BSUL for a period of one year.
 - ii) The name of the Contractor shall be hosted on the NHPC/BSUL website etc. as per existing norms of NHPC / Govt. of India.
 - iii) Such defaulted contractor shall not be eligible to participate in the bidding process of re-tender of this work.
- 3.3 Retention money shall be deducted by the Engineer-in-Charge from the interim bills of the Contractor @ 3% (three percent) of the total value of each bill of the work done (including those of price variation) towards Security Deposit.
- 3.4 If the Contractor expressly requests in writing, he will be permitted to convert the amount of Retention Money deducted from his interim bills into Bank Guarantee as per prescribed proforma.
- 3.5 All compensation or other sums of money payable by the Contractor to the Employer under the terms of this Contract or any other contract or on any other account whatsoever, may be deducted from Security Deposit. Also in the event of the contractor's Security Deposit being reduced by reasons of such deductions, as aforesaid, the Contractor shall, within 14 days of receipt of notice of demand from the Engineer-in-Charge, make good the deficit in Security Deposit.
- 3.6 Should there arise any occasion under the Contract due to which the periods of validities of Bank Guarantees / Insurance Surety Bond as may have been furnished by the Contractor from time to time, are required to be extended/renewed, the Contractor shall get the validity periods of such guarantees or bonds extended/renewed, and furnish these to the Engineer-in-Charge one month before the expiry date of the aforesaid Guarantees / Bonds originally furnished failing which the existing Bank Guarantees / Insurance Surety Bonds shall be invoked by the Engineer – in – charge. Also in case of any deficit in securities on any account as might occur or is noticed, the Contractor shall forthwith recoup/replace the same with acceptable Security Deposit.
- 3.7 Bank Guarantees / Insurance Surety Bonds as aforesaid shall be valid till 90 days beyond the date of issue of Defects Liability Certificate under the Contract (Clause 43).

CLAUSE-4 : REFUND OF SECURITY DEPOSIT:

The Security Deposit less any amount due shall, on demand, be returned to the contractor after 30 days of issue of expiry of Defects Liability Period for Security Deposit as per GCC 3.1. However the Security Deposit shall not be released till Liquidated Damages, if any, is pending for recovery.

CLAUSE-5 : SUFFICIENCY OF TENDER:

- 5.1 The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Tender and of the rates and prices stated in the Schedule of Quantities and Prices all of which shall,

except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and completion of the Works and the remedying of any defects therein.

- 5.2 If, however, during the execution of the Works the Contractor encounters on ground physical obstructions or physical conditions, other than climatic conditions on the Site, which obstructions or conditions were, in his opinion, not foreseeable by an experienced Contractor, the Contractor shall forthwith give notice thereof to the Engineer-in-Charge. Physical obstruction or conditions shall mean physical ground conditions existing at site and does not include man made conditions as well as climate conditions. On receipt of such notice, the Engineer-in-Charge shall, if in his opinion such obstructions or conditions could not have been reasonably foreseen by an experienced contractor shall determine any extension of time to which the Contractor is entitled to under Clause 39.2 shall notify the Contractor accordingly, with approval of the Employer. Such determination shall take account of any instruction which the Engineer-in-Charge may issue to the Contractor in connection therewith, and any proper and reasonable measures acceptable to the Engineer-in-Charge which the Contractor may take in the absence of specific instructions from the Engineer-in-Charge.

CLAUSE-6: CONTRACT DOCUMENTS:

- 6.1 One copy of Contract shall be kept by the contractor on the Site in good order and the same shall at all reasonable time be available for inspection and use by the Engineer-in-Charge, his representatives or by other Inspecting Officers.
- 6.2 None of these Documents shall be used by the Contractor for any purpose other than that of this contract.

CLAUSE 7: BREAKDOWN OF LUMP SUM ITEMS

For the purposes of statements submitted in accordance with Sub-Clause 45, the Contractor shall submit to the Engineer-in-Charge, a breakdown for each of the lump sum items contained in the Tender. Such breakdowns shall be subject to the approval of the Engineer-in-Charge

CLAUSE 8: DUTIES AND POWERS OF ENGINEER-IN-CHARGE'S REPRESENTATIVE:

- 8.1 The duties of the representative of the Engineer-in-Charge are to watch and supervise the works and to test and examine any materials to be used or workmanship employed in connection with the works.
- 8.2 The Engineer-in-Charge may, from time to time in writing, delegate to his representative any of the powers and authorities, vested in the Engineer-in-Charge and shall furnish to the Contractor a copy of all such written delegation of powers and authorities. Any written instruction or written approval given by the representative of the Engineer-in-Charge to the contractor within the terms of such delegation shall bind the Contractor and the Employer as though it has been given by the Engineer-in-Charge.
- 8.3 Failure of the representative of the Engineer-in-Charge to disapprove any work or materials shall be without prejudice to the power of the Engineer-in-Charge thereafter to disapprove such work or

materials and to order the pulling down, removal or breaking up thereof. The Contractor shall, at his own expense, again carry out such works as directed by the Engineer-in-Charge.

8.4 If the Contractor is dissatisfied with any decision of the representative of the Engineer-in-Charge, he will be entitled to refer the matter to the Engineer-in-Charge who shall thereupon confirm, reverse or vary such decision and the decision of the Engineer-in-Charge in this regard shall be final and binding on the contractor.

8.5 **Engineer shall act in accordance with the Contract**

Any consultation that the Engineer holds with the Employer in pursuant to the Contract shall be entirely an internal matter between the Engineer and the Employer. The recommendations and determinations by the Engineer are subject to review and finalization by the employer. The same shall not be subject to matter of reference either by the Contractor or any arbitral tribunal. The Employer shall nominate one of its employees as Engineer. The Engineer shall obtain the specific approval of the Employer before taking action under the following Sub-Clauses of GCC and these Conditions:

- (a) consenting to the subletting of any part of the Works; under Clause 9;
- (b) determining an extension of Time for Completion under Clause 39;
- (c) payment pursuant to subsequent legislation under Clause 47.2 of GCC;
- (d) notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer.

CLAUSE 9: ASSIGNMENT AND SUB-LETTING:

The Contractor shall not sub-let/sub-contract, transfer or assign the whole or any part of the work under the Contract. Provided that the Engineer-in-Charge may, at his discretion, approve and authorise the Contractor to sub-let any part of the Work, which, in his opinion, is not substantial, after the Contractor submits to him in writing (at least 21 days before the contractor intends to sublet part of the work) the details of the part of the work(s) or trade proposed to be sublet, the name of the sub-contractor thereof together with his past experience in the said work/trade and the form of the proposed sub-contract. Nevertheless any such approval or authorisation by the Engineer-in-Charge shall not relieve the Contractor from his any or all liabilities, obligations, duties and responsibilities under the Contract. The Contractor shall also be fully responsible to the Employer for all the acts and omissions of the sub-contractor, his employees and agents or persons directly employed by the Contractor. However, the employment of piece-rate workers and purchase of material shall not be construed as sub-letting. Request for sub- contracting shall contain.

- a) Contractor's certification regarding the financial soundness of the proposed Sub-contractor for the work;
- b) its scope and estimated value in relation to the Contract Price;
- c) experience of the Sub-contractor, in the related areas of work;
- d) the manpower, equipment, material and other resources available with the Sub-contractor for the work;
- e) domicile of the Sub-contractor and particulars of its other existing operations or contracts if any, in India.

CLAUSE-10: FACILITIES TO OTHER CONTRACTORS:

10.1 The Contractor shall, in accordance with the requirements of the work as decided by the Engineer-in-Charge, afford all reasonable facilities to other contractors engaged contemporaneously on separate contracts and for departmental labour and labour of any other properly authorised authority or statutory body which may be employed at the site for execution of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the works. In all matters of conflict of interest, the Engineer-in-Charge shall direct what compromise should be made and his decision shall be final and binding on the parties.

10.2 If, however, pursuant to Sub-Clause 10.1 the Contractor shall, on the written request of the Engineer-in-Charge:

- (a) make available to any such other contractor, or to the Employer or any such authority, any roads or ways the maintenance of which is the responsibility of the Contractor ,
- (b) permit the use, by any such, of temporary facilities or Contractor's Equipment on the Site, or
- (c) provide any other service of whatsoever nature for any such,

the Engineer-in-Charge shall determine the payment admissible to the Contractor at the cost of other contractors or Employer as the case may be.

CLAUSE-11: CHANGES IN CONSTITUTION:

Where the Contractor is a partnership firm, prior approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu undivided family business concern, such approval, as aforesaid, shall likewise be obtained before the Contractor enters into any partnership firm which would have the right to carry out the work undertaken by the Contractor. If prior approval as aforesaid is not obtained, the Contract shall be deemed to have been assigned in contravention of Clause 38 hereof and the same action will be taken and the same consequences shall ensure as provided for in the said Clause 38.

CLAUSE-12 : POSSESSION AND USE OF SITE:

12. 1 Save insofar as the Contract may prescribe:

- (a) the extent of portions of the Site of which the Contractor is to be given possession from time to

time,

- (b) the order in which such portions shall be made available to the Contractor, and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Engineer in charge will give to the Contractor possession of so much of the Site, and such access as in accordance with the Contract, is to be provided by the Engineer as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the programme referred to in Clause 14, if any, and otherwise in accordance with such reasonable proposals of the Contractor. The Engineer will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works in accordance with such programme or proposals, as the case may be.

- 12.2 If the Contractor suffers delay from failure on the part of the Engineer in charge to give possession in accordance with the terms of Sub-Clause 12.1, the Engineer-in-Charge shall, determine any extension of time to which the Contractor is entitled under Clause 39 and shall notify the Contractor accordingly, with approval of the Engineer in charge. The contractor shall be responsible to arrange the land for Contractor's infrastructure works namely field office(s), colony, workshop(s), stores, magazines for explosives in isolated locations, assembly-yard, and access thereto over routes as may be required for execution of the Works at his own cost and Engineer in charge shall not be responsible for making available the same.
- 12.3 The Contractor shall provide at his own cost all temporary pathways/roads required at site or to quarries or borrow areas and shall alter, adopt and maintain the same as required from time to time and shall bear all expenses and charges for special or temporary way leaves required by him in connection with access to the site and shall take up and clear them away and make good all damages done to the site as and when no longer required and as and when ordered by the Engineer-in-Charge. The Contractor shall also obtain at his risk and cost, any additional facilities outside the site which he may require for the purpose of the Works.
- 12.4 The Contractor shall not interfere unnecessarily or improperly with:
 - a) the convenience of the public, or .
 - b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Engineer in charge or of others.

The Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

- 12.5 The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.
- 12.6 To transport the goods, unless otherwise stated:

- a) the Contractor shall give the Engineer not less than 21 days notice of the date on which any Plant or a major item of other Goods will be delivered to the Site,
- b) the Contractor shall be responsible for packing, loading, transporting, receiving unloading, storing and protecting all Goods and other things required for the Works, and
- c) the Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

If it is found necessary for the Contractor to move one or more loads of Goods over roads, highways, bridges on which such oversized and overweight items are not normally allowed to be moved, the Contractor shall obtain prior permission from the concerned authorities. Payments for complying with the requirements, if any, for protection of or strengthening of the roads, highways or bridges shall be made by the Contractor and such expenses shall be deemed to be included in the Contract Price.

Further, the Contractor shall comply with Carriage by Road Act 2007 & Carriage by Road Rules 2011 notified on 28.02.2011. The Contractor shall use only registered common carriers for transport of goods.

CLAUSE-13: ADVANCES AND RECOVERY THEREOF:

13.1 Financial assistance in the shape of recoverable advance on written request from the Contractor, may be provided to the Contractor for augmenting/supplementing his resources in the manner indicated hereunder.

13.1.1 Advances for Initial Mobilisation, Preliminary, Enabling and Ancillary Works

Interest bearing Advance upto a maximum of (as mentioned in Schedule D) of the Contract Price may be given to the Contractor for his preliminary mobilisation, subject to the following conditions:

- (i) The advance shall bear simple interest @ _____percent per annum (as mentioned in Schedule 'D'). The monthly interest shall be calculated on outstanding balance of advance on the last day of the previous calendar month. However, for calculation of interest for the month, in which such advance has been released, the period from the day of release of advance up to the last day of the calendar month (both days inclusive) shall be considered. Similarly for calculation of interest for the month, in which such advance is fully repaid, the period from 1st day of the calendar month upto the day of repayment of final instalment of advance shall be considered.
- (ii) Initially a lump sum advance upto _____percent (refer Schedule D) of the Contract Price, shall be paid within one month of the signing of the agreement and on Contractor's furnishing the requisite Bank Guarantee on the approved form incorporated in the contract from a Nationalised Bank or a Scheduled Bank in India.
- (iii) The balance advance shall be released upon mobilization of resources at site on production of utilization certificate by the Contractor and on the satisfaction of the Engineer-in-charge and on furnishing the requisite Bank Guarantee from an Nationalised or Scheduled Bank.

- (iv) The Bank Guarantee so furnished shall be for amount equal to 1.1 times (110%) of the advance and shall be valid till the said advance alongwith interest there upon has been fully recovered, but the amount thereof shall be progressively reduced by the amount repaid by the Contractor as indicated in Interim Payments. Should there arise any occasion under the Contract due to which the period of validities of such Bank Guarantees, are required to be extended or the same be renewed, the Contractor at his own cost shall get the validity period of such guarantees extended or the same be renewed, as the case may be, and furnish the same to the Engineer-in-Charge before the due expiry date of the aforesaid guarantees failing which the Engineer-in-Charge shall be at liberty, to invoke the existing Bank Guarantee or to withhold the payments of the Interim bills till such time the amount of outstanding advance including interest thereupon is fully recovered.
- (v) The recovery of advance shall start after the Contractor has received a gross payment equivalent to 10% of Contract Price and shall be effected on pro-rata basis to the gross value of work billed in such a way that the full advance with interest thereupon is recovered by the time 90% of the Contract Price is paid.

The interest shall be calculated on the outstanding amount of principal at the close of each month. The recovery of interest shall be started when the Contractor has received a gross payment equivalent to 5% of the Contract Price and interest as accrued/accruing till the time 10% of Contract Price is paid shall be recovered in suitable instalments in such a way that the above said accrued interest is fully recovered by the time the Contractor receives a gross payment equivalent to 10% of the Contract Price and thereafter the interest as may be due on 1st of each month will be recovered from the Running Account bills of the Contractor to be paid during that month. Recoveries will first be credited to interest due and residual applied to the principal.

13.1.2. ADVANCE FOR CONSTRUCTION EQUIPMENT:

Interest bearing advance upto a maximum of percent (refer Schedule 'D') of the Contract Price will be paid to the contractor against Bank Guarantee for procurement of new Construction Equipment subject to the following conditions:

- i) The advance shall bear simple interest @ percent per annum (as mentioned in Schedule 'D') The monthly interest shall be calculated on outstanding balance of advance on the last day of the previous calendar month. However, for calculation of interest for the month, in which such advance has been released, the period from the day of release of advance up to the last day of the calendar month (both days inclusive) shall be considered. Similarly for calculation of interest for the month, in which such advance is fully repaid, the period from 1st day of the calendar month upto the day of repayment of final installment of advance shall be considered.

The Bank Guarantee so furnished shall be for amount equal to 1.1 times of the advance and shall be valid till the said advance along with interest there upon has been fully recovered, but the amount thereof shall be progressively reduced by the amount repaid by the Contractor as indicated in Interim Payments. Should there arise any occasion under the Contract due to which the period of validities of such Bank Guarantees, are required to be extended or the same be renewed, the Contractor at his own cost shall get the validity period of such guarantees extended or the same be

renewed, as the case may be, and furnish the same to the Engineer-in-Charge before the due expiry date of the aforesaid guarantees failing which the Engineer-in-Charge shall be at liberty, to invoke the existing Bank Guarantee or to withhold the payments of the Interim Payment till such time the amount of outstanding advance including interest thereupon is fully recovered.

- ii) The Construction Equipment, as are required for the actual execution of the works Construction Equipment must reach the Site before release of advance payment.

Further provided that Advance for Construction Equipment shall be released only after signing of agreement and submission of Performance Security as per Clause 3.2.

- iii) The Construction Equipment for which the advance is to be granted shall be of unencumbered ownership of the Contractor. The Contractor shall also get such Construction Equipment insured under CPM Policy in the joint name of the Contractor and the Employer for full value against all risks at his cost. The insurance policy shall be valid till such time the advance is recovered/repaid in full.

The Insurance Policy shall be deposited by the Contractor with the Engineer-in-Charge before the advance is released.

- iv) Subject to the maximum limit fixed for such advances as above and conditions thereto, the advance shall be granted to the extent of 90% of the cost of new Construction Equipment purchased by him duly supported by due proof of payment, purchase vouchers and other connected documents. The advance can be taken by the contractor at any time during the contract subject to condition that full advance is recovered by the time 90% of Contract price is paid .
- v) In case the Contractor desires to shift any such Equipment from the Site of Work, he shall do so with the written permission of the Engineer-in-Charge and after repaying the outstanding advance of that particular Equipment.
- vi) The recovery of principal shall start after the Contractor has received a gross payment equivalent to 10% of Contract Price and shall be effected on pro-rata basis to the gross value of work billed in such a way that the full advance is recovered by the time 90% of the Contract Price is paid.

The interest shall be calculated on the outstanding amount of principal at the close of each month. The recovery of interest shall be started when the Contractor has received a gross payment equivalent to 5% of the Contract Price and the interest as accrued/accruing till the time 10% of the Contract Price is paid shall be recovered in suitable installments in such a way that the above said accrued interest is fully recovered by the time the Contractor receives a gross payment equivalent to 10% of Contract Price and thereafter the interest as may be due on 1st of each month will be recovered from the Running Account bills of the Contractor to be paid during that month. Recoveries will first be credited to interest due and residual applied to the principal.

- vii) The cost of the new Equipment for the purpose of this clause shall mean the cost as invoiced by the suppliers of the Construction equipment, inclusive of taxes and duties.

In respect of imported equipment, C.I.F. cost plus customs duty shall be deemed to be the cost of Equipment for the purpose of this clause.

CLAUSE-14 : COMMENCEMENT OF WORK:

- 14.1 The Contractor shall commence the Work(s) immediately after the issue of Letter of Acceptance and shall proceed with the same with the expedition and without delay as may be expressly sanctioned or ordered by the Engineer-in-charge. If the Contractor commits default in the commencement of work within 30 days of issue of Letter of Acceptance, the Engineer-in-Charge shall without prejudice to any other right or remedy be at liberty to cancel the Contract and forfeit the earnest money/Performance Guarantee.
- 14.2 The Contractor shall submit along with his tender, the construction planning, phasing & sequence of construction, time & progress chart within the framework of construction schedule, i.e. Schedule 'E' for achieving the completion targets of Work(s) as a whole and also of each group/sub- group of work(s) as stipulated in Schedule 'E', showing the order or procedure and a statement showing the method and techniques of construction by which the contractor proposes to carry out the Works. Such charts or programme shall be prepared in direct relation to the construction schedule i.e. schedule 'E' as well as the time stated in the Contract for completion of part of Works stipulated in Schedule 'C'. It shall indicate the commencement and completion of various trades or sections of the Works, distribution and balancing of work-load pertaining to construction activities in various structures/component parts of Works into working seasons duly taking into account working months available in each working season and number of working days available for working months, to arrive at seasonal monthly average and seasonal monthly peak progress with corresponding time periods.
- Contractor shall follow such an agreed planning & scheduling. However, Contractor shall not be relieved from any of his duties, obligations or responsibilities under the Contract.
- 14.3 Within one month of issue of Letter of Acceptance, the Contractor shall submit, to Engineer for his consent Master Control Network including but not limited to comprehensive bar chart stipulating quantities of work to be executed supported by machinery deployment schedule for the execution of Works within the overall time frame included in the schedule incorporated in the Contract.
- 14.4 During the execution of Works, if it appears to the Engineer in-charge, that actual progress of works does not conform to the programme consented by him Engineer- in charge under sub-clause 14.3 above, the Contractor shall produce a revised programme dealing modifications to such programme necessary for ensuring completion of works within Time for Completion.
- 14.5 The Contractor shall provide a detailed month-wise cash flow estimate at the beginning of each financial year duly revised at quarterly intervals if required so by the Engineer- in – charge.
- 14.6 The submission to and consent by the Engineer-in-charge of such programmes or the provision of such general descriptions or cash flow estimates shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

CLAUSE-15: WORKS TO BE CARRIED OUT IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS AND ORDERS, ETC:

15.1 Specifications and Drawings

- 15.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Engineer In-Charge or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer. 15.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Engineer In-Charge.

15.2 Codes and Standards

Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of bid submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied after approval by the Employer without any cost adjustment / implication to either party.

15.3 Approval/Review of Technical Documents by Engineer In-Charge

- 15.3.1 The Contractor shall prepare and furnish to the Engineer In-Charge the documents listed in Appendix 6 (List of documents for Approval or Review) to the Contract Agreement for its approval or review as specified and as in accordance with the requirements of GCC Sub-Clause 14.2

Any part of the Facilities covered by or related to the documents to be approved by the Engineer In-Charge shall be executed only after his approval thereof.

GCC Sub-Clauses 15.3.2 through 15.3.6 shall apply to those documents requiring the Engineer In-Charge's approval, but not to those furnished to the Engineer In-Charge for its review only.

- 15.3.2 Within ten (10) days after receipt by the Engineer In-Charge of any document requiring the Engineer In-Charge's approval in accordance with GCC Sub-Clause 15.3.1, the Engineer In-Charge shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefor and the modifications that the Engineer In-Charge proposes. Should the Employer not give its approval/ comments within the said period of ten (10) days, Contractor shall serve notice on the Employer to this effect and the Employer shall give its approval/ comments within seven (7) days from receipt of such notice. In case such approval/ comment is not communicated within seven (7) days, submittals of the Contractor will be deemed to have been approved.

- 15.3.3 The Engineer In-Charge shall not disapprove any document, except on the grounds that the document does not comply with some specified provision of the Contract or that it is contrary to good engineering practice.
- 15.3.4 If the Engineer In-Charge disapproves the document, the Contractor shall modify the document and resubmit it for the Engineer In-Charge's approval in accordance with GCC Sub-Clause 15.3.2. If the Engineer In-Charge approves the document subject to modification(s), the Contractor shall make the required modification(s) and upon resubmission with the required modifications the document shall be deemed to have been approved. The procedure for submission of the documents by the Contractor and their approval by the Engineer In-Charge shall be discussed and finalized with the Contractor.
- 15.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Engineer In-Charge of any document and/or any modification(s) thereto that cannot be settled between the Parties within a reasonable period, such dispute or difference shall be settled in accordance with GCC Clause-55.
- 15.3.6 The Engineer In-Charge's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Engineer In-Charge.
- 15.3.7 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Engineer In-Charge an amended document and obtained the Engineer In-Charge's approval thereof, pursuant to the provisions of this GCC Sub-Clause 15.3.

CLAUSE-16: SETTING OUT THE WORKS:

- 16.1 The Engineer-in-Charge shall establish/indicate the Bench Marks and convey the same in writing to Contractor immediately after Letter of Acceptance. Engineer in-charge shall be responsible for correctness of such data / bench marks conveyed to the Contractor.
- 16.2 The Contractor shall be responsible for the true and proper setting out of all the work (in relation to the afore-mentioned Bench Marks) for the correctness of the location, grades, dimensions and alignment of all components of the work; and for the provisions of all instruments, appliances, materials and labour required in connection therewith. If at any time during the progress of Works, any error shall appear or arise in the location, grades, dimensions, or alignment of any part of the Works, the Contractor on being required to do so by the Engineer-in-Charge shall, subject to Clause 16.1 hereof, at his own expense, rectify such error to the satisfaction of the Engineer-in-Charge.
- 16.3 The Contractor shall afford all reasonable facilities and assistance to the Engineer-in-Charge for checking the setting out and lines and grades established by the Contractor. The checking of any setting out or of any line and grade by the Engineer-in-Charge shall not in any way relieve the contractor of his responsibility for the correctness thereof.

CLAUSE-17: URGENT WORKS:

Urgent works means any urgent measures, which in the opinion of the Engineer-in-Charge, become necessary at the time of execution and/or during the progress of work to obviate any risk of accident or failure or to obviate any risk of damage to the structure, or required to accelerate the progress of work or which become necessary for security or for any other reason the Engineer-in-Charge may deem expedient.

If any urgent work (in respect whereof the decision of the Engineer-in-Charge shall be final and binding) becomes necessary, the Contractor shall execute the same as may be directed.

CLAUSE-18: DEVIATIONS: Deleted

CLAUSE-19: CONTRACTOR'S SUPERVISION:

- 19.1 The Contractor shall appoint at his own expense adequate number of engineers with sufficient experience to supervise the Works.

The contractor or his authorized representatives present at the Site shall superintend the execution of the Works with such additional assistance in each trade, as the work involved shall require and considered reasonable by the Engineer-in-Charge. Directions/instructions given by the Engineer-in-Charge to the Contractor's authorized representatives shall be considered to have the same force as if these had been given to the Contractor himself.

- 19.2 The Contractor shall communicate in writing to the Engineer-in-charge, the name of the accredited representative(s) who would be responsible for taking instructions from the Engineer-in-charge.

CLAUSE-20: INSTRUCTIONS AND NOTICES:

- 20.1 Except as otherwise provided in this Contract, all notices to be given on behalf of the Employer and all other actions to be taken on its behalf may be given or taken by the Engineer-in-Charge or any officer for the time being entrusted with the functions, duties and powers of the Engineer-in-Charge.
- 20.2 All instructions, notices and communications etc. under the Contract shall be given in writing and any such oral orders/instructions given shall be confirmed in writing and no such communication which is not given or confirmed in writing shall be valid. Further, if the Engineer in Charge or his representative gives an oral instruction and receives a written confirmation of the instruction from (or on behalf of) the Contractor within 2 working days after giving the instruction and Engineer in Charge does not reply by issuing a written rejection and/or instruction within 7 working days after receiving the confirmation then the confirmation shall constitute the written instruction of the Engineer in Charge or authorized representative as the case may be.
- 20.3 Either Party may change a nominated address to another address by prior notice to the other Party.
- 20.4 The Engineer-in-Charge shall communicate or confirm the instructions to the Contractor in respect of the execution of work in a 'Work Site Order Book' maintained in the office of the Engineer-in-Charge or his representative and the Contractor or his authorised representative shall confirm receipt of such

instructions by signing the relevant entries in this book. If required by the Contractor, he shall be furnished a certified true copy of such instruction(s).

CLAUSE-21: CONSTRUCTION EQUIPMENT:

21.1 The Contractor shall provide and install all necessary Construction Equipment required for the execution of the Works under the Contract, at his cost and shall use such methods and appliances for the purpose of all the operations connected with the Work covered by the Contract which shall ensure the completion of Work(s) within the specified Time for Completion.

21.2 Deleted

21.3 The Contractor shall not remove Construction Equipment, except for purpose of removing it from one part of the Site to another, without written consent of the Engineer.

Provided always that any such approval of Construction Equipment schedule shall not absolve the Contractor of his obligations for due execution of the Works within the Time for Completion as per the Contract.

Subject to the availability of any of Employer's Equipment and at the written request of the Contractor, such, Equipment may be issued to the Contractor on hire for being deployed on the Work contracted for, at pre-determined rates, terms and conditions at the sole discretion of the Engineer-in-Charge.

CLAUSE-22: PATENT RIGHTS:

The Contractor shall indemnify the Employer, its representatives or its employees against any action, claim or proceedings relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties or other charges which may be payable in respect of any article or material or part thereof included in the Contract. In the event of any claim being made or action being brought against the Employer or any agent, servant or employee of the Employer in respect of any such matters as aforesaid, the Contractor shall immediately be notified thereof. Provided that such indemnity shall not apply when such infringement has taken place in complying with the specific directions issued by the Employer, but the Contractor shall pay any royalties or other charges payable in respect of any such use, the amount so paid being reimbursed to the Contractor only if the use was the result of any drawings and/or specifications issued after submission of the tender.

CLAUSE-23: MATERIALS:

23.1 Subject to clause 31.2, the Contractor shall at his own expense provide/arrange all materials required for the bonafide use on Works under the Contract except those listed and specified in Schedule 'B'.

23.2 All materials to be provided by the Contractor shall be in conformity with the Specifications laid down in the Contract and the Contractor shall furnish from time to time proof and samples, at his cost, of the materials as may be specified by the Engineer-in-Charge for his approval before use in the Works. The Engineer-in-Charge shall also have powers to have such tests, in addition to those

specified in the Contract, as may be required and the Contractor shall carry out the same. The cost of materials consumed in such tests and also expenses incurred thereon shall be borne by the Contractor in all cases except when the materials are agreed to be issued by the Employer under the Contract and also where such tests which are in addition to those provided in the Contract.

- 23.3 The Contractor shall maintain an account of receipt and use of materials brought by Contractor for incorporation in the Works for the purpose of check and accounting and same shall be available for inspection of Engineer-in-charge.

The Engineer-in-Charge or his representative shall be entitled at any time to inspect and examine any materials intended to be used in or on the works, either on the site or at factory or workshop or other place(s) where such materials are assembled, fabricated, manufactured, or at any place where these are lying or from where these are being obtained. For this purpose, the Contractor shall afford such facilities as may be required for such inspection and examination.

- 23.4 Deleted

- 23.5 The Engineer-in-Charge shall have full powers for removal of any or all materials brought to site by the Contractor, which are not in accordance with the Contract Specifications or samples, approved by him. Should the Contractor fail to remove the rejected materials, the Engineer-in-Charge shall be at liberty to have them removed by other means at the Contractor's cost. The Engineer-in-Charge shall have full power to procure other proper materials to be substituted at Contractor's costs.

- 23.6(a) Deleted

- (b) Deleted

- 23.7 Deleted .

- 23.8 Deleted .

- 23.9 Deleted .

- 23.10 Deleted.

CLAUSE-24: POWER SUPPLY:

- 24.1 The Employer, if requested by the Contractor will provide full assistance to the Contractor to obtain construction power from grid to meet part requirement as standby arrangement. Contractor will not have any claim, if construction power is not available from the grid. The Contractor will also be responsible for making all payments to the concerned authorities and will make no claims if the power is not available due to grid failure or otherwise. The Contractor shall make arrangements for the full anticipated requirement of construction power by installing Diesel Generating sets and operate these sets for generation of power required for execution of Works under the Contract, at no extra cost to the Employer.

- 24.2 No payment shall be made by the Employer for generation, distribution and consumption of electricity in execution of Works by the Contractor.

CLAUSE-25: SUPPLY OF WATER:

The Contractor shall make his own arrangements for water required for and in connection with the work at his cost. It shall be the responsibility of the Contractor to satisfy himself that the water arranged by him is fit for construction & consumption & he shall adequately treat such water whenever it is not found fit for the said purposes.

CLAUSE-26: WATCHING AND LIGHTING:

The Contractor shall provide and maintain at his expense all lights, guards, fencing and watching when and where necessary or as required by the Engineer-in-Charge for the protection of the works or for the safety and convenience of those employed on the works or the public.

CLAUSE-27: WORK DURING NIGHT OR ON SUNDAYS AND HOLIDAYS:

- 27.1 Subject to any provisions to the contrary contained in the Contract, the Contractor shall have the options to carry out the works continuously during night, Sunday or holidays, without any additional cost to Employer.

CLAUSE-28: SITE DRAINAGE, PROTECTION OF TREES AND PREVENTION OF NUISANCE:

- 28.1 The Contractor shall, throughout the execution and completion of the Works and remedying of any defects therein have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons.
- 28.2 The Contractor shall endeavor to protect from damage, the trees marked by the Engineer-in-Charge at the site of work or in the lands licensed to him for use under the contract. Where necessary, the contractor shall provide at his expense temporary fencing to protect such trees. No tree shall be cut unless authorised by Engineer-in-Charge in writing to do so.
- 28.3 The Contractor shall at no time, cause or permit any nuisance on the site or cause any thing which shall cause unnecessary disturbance or inconvenience to the public in general and owners/tenants/occupants of adjacent properties.

CLAUSE-29: LABOUR:

- 29.1 The Contractor shall employ labour in sufficient numbers to maintain the required rate of progress and quality to ensure workmanship of the degree specified in the Contract. The Contractor shall not employ in connection with the works any person who has not completed fourteen years of age in terms of Child Labour (Prohibition and Regulation) Act 1986. The Contractor is encouraged, to the

extent practicable and reasonable, to employ staff and labour with appropriate qualifications and experience from the region of the project. Unskilled labour shall be recruited from local region only.

29.2 The Contractor shall furnish and deliver fortnightly to the Engineer-in-Charge, a distribution return of the number and description by trades of the works of people employed on the works. The contractor shall also submit on the 4th and 19th of every month to the Engineer-in-charge a true statement showing in respect of the second half of the preceding month and the first half of the current month.

i) The accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and

ii) The number of female workers who have been allowed maternity benefit as provided in the Maternity Benefit Act, 1961 or Rules made thereunder.

29.3 The Contractor including its subcontractor shall have the registration with EPFO and ESIC. Further all the workers deployed by Contractors or sub-contractors shall be members of Provident Fund and should be given the Universal Account Number (UAN). The EPF and ESI contribution on the part of employer in respect of this contract shall be paid by the contractor.

The Contractor including its subcontractor shall ensure that the payment is being made to contract workers through bank and shall submit the account statement in respect of salary paid to workers if required by Employer. The Contractor including its subcontractor should produce the documentary proof of depositing the ESI & EPF to the concerned departments along with monthly bills.

29.4 During continuance of the Contract, the Contractor and his sub-contractors shall abide at all times by all existing labour enactments and rules made thereunder, regulations, notifications and bye laws of State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Principal Employer indemnified in case any action is taken against the Principal Employer by the competent authority on account of contravention by the Contractor of any of the provisions of any Act or rules made thereunder, regulations or notifications including amendments. If the Principal Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/acts/rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Principal Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Principal Employer.

The employees of the Contractor and his sub-contractor in no case shall be treated as the employees of the Principal Employer at any point of time.

Salient features of some of the major labour laws that are applicable to construction industry are given below.

(i) Employee Compensation Act 1923 or as amended.

The Act provides for compensation in case of injury or death by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act 1972

Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death or on retirement or superannuation at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees PF and Miscellaneous Provision Act 1952 including FPS-71/EPS-95.

The Contractor is required to possess PF Code from the concerned Regional Provident Fund Commission. The benefits payable under the Act are:

- (a) Pension or family pension on retirement or death as the case may be.
- (b) Deposit linked insurance on the death in harness of the worker.
- (c) Payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act 1961 (Amended)

The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act 1970 with Rules framed there under as amended.

The Act provides for certain welfare measures and wages to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law and recover the same from the Contractor from any amount/monies due to him. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments of contractor if they employ 20 or more contract labour.

(vi) Minimum Wages Act 1948 (Amended)

The Contractor is to pay not less than the Rate of Minimum Wages notified by the appropriate Government as per provisions of the Act.

(vii) Payment of Wages Act 1936 (Amended)

It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act 1979

The Act provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act 1965 and any further amendments thereof.

The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing ₹ 21,000/- P.M. or less. The bonus to be paid to employees getting ₹ 7,000/- P.M. or above upto ₹ 21,000/- P.M. shall be worked out by taking wages as ₹ 7,000/- P.M. or the minimum wages for the scheduled employments as fixed by the appropriate Govt. whichever is higher. All amounts of Bonus are required to be paid within eight months of closing of financial year. The Act does not apply to certain establishments, classes of employees. The newly set up establishments are exempted for five years in certain circumstances.

(x) Industrial Disputes Act 1947(Amended)

The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act 1946 (Amended)

It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Contractor on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act 1926

The Act lays down the procedure for registration of trade unions of workmen and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii)Child Labour (Prohibition and Regulation) Act 1986

The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act 1979

The Act is applicable to an establishment, which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain

facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.

- (xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996

All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess @ 1% of the cost of construction. The Contractor to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

- (xvi) The Factories Act 1948

The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

- (xvii) The Personal Injuries (Compensation Insurance) Act, 1963 and any modifications thereof and rules made there under from time to time.

- (xviii) Employees' State Insurance Act, 1948:

The Act provides for certain benefits to employees in case of sickness, Maternity and Employment injury and for certain other matter in relation thereto.

The compliance of the labour laws/acts shall be along with amendments (if any) of the respective acts.

The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

The definition of 'Principal Employer' for this Clause shall be as per Contract Labour (Regulation and Abolition) Act 1970.

- 29.5 The Engineer-in-Charge shall on a report having been made by an authorised Inspecting Officer as defined in the Contract Labour (Regulation and Abolition) Act and Rules or on his own in his capacity as Principal Employer, have the power to deduct from the amount due to the Contractor any sum required or estimated to be required for making good the loss suffered by worker(s) by reasons of non-fulfilment of the conditions of the Contract for the benefit of workers, non-payment of wages or of deductions made by him from wages which are not justified by the terms of the contract or non-observance of the relevant Acts and Rules with amendments made from time to time. If the Employer makes payment to Contractor's labour due to non-payment of wages to labour by the Contractor, the Employer shall recover the amount thus paid from the next Interim Payment of the Contractor.

- 29.6 The Contractor shall indemnify the Employer against any payments to be made under and for observance of the Regulations, Laws, Rules as stipulated in clause 29.4 above without prejudice to his

- right to claim indemnity from his sub-contractors. In the event of the Contractor's failure to comply with the provisions of sub-clause 29.4 or in the event of decree or award or order against the Contractor having been received from the competent authority on account of any default or breach or in connection with any of the provisions of sub-clause 29.4 above, the Engineer-in-Charge, without prejudice to any other right or remedy under the Contract, shall be empowered to deduct such sum or sums from the bills of the Contractor or from his Security Deposit or from other payments due under this contract or any other Contract to satisfy within a reasonable time the provisions of the various Acts/Laws/Rules/Codes as mentioned under sub-clause 29.4 above, on the part of the Contractor under the Contract on behalf of and at the expenses of the Contractor and make payment and/or provide amenities/facilities/services accordingly. In this regard, the decision of the Engineer-in-Charge shall be conclusive and binding on the contractor.
- 29.7 The Contractor shall at his own expense comply with or cause to be complied with the Provisions/Rules provided for welfare and health of Contract Labour in the Contract Labour (Regulation & Abolition) Act and other relevant Acts and Rules framed thereunder or any other instructions issued by the Employer in this regard for the protection of health and for making sanitary arrangements for workers employed directly or indirectly on the works. In case, the Contractor fails to make arrangements as aforesaid, the Engineer-in-Charge shall be entitled to do so and recover the cost thereof from the Contractor.
- 29.8 The Contractor shall at his own expense arrange for the safety provisions as required by the Engineer-in-Charge, in respect of all labour directly or indirectly employed for performance of the Works and shall provide all facilities in connection therewith. In case the Contractor fails to make arrangements and provide necessary facilities as aforesaid, the Engineer-in-Charge shall be entitled to do so and recover the cost thereof from the Contractor. But this will not absolve the Contractor of his responsibility or otherwise thereof.
- 29.9 In the event of any injury, disability or death of any workmen in or about the work employed by the Contractor either directly or through his sub-contractor, Contractor shall at all times indemnify and save harmless the Employer against all claims, damages and compensation under the Employee Compensation Act, 1923 as amended from time to time or in other law for the time being in force and rules there under from time to time and also against all costs, charges and expenses of any smooth action by proceedings arising out of such accidents or injury, disability or death of a workmen and against all sum or sums which may with the consent of the Contractor be paid to compromise or compound any claim in this regard. If any award, decree or order is passed against the Contractor for recovery of any compensation under the Employee Compensation Act, 1923, for any injury, disability or death of a workman by any competent court, the said sum or sums shall be deducted by the Engineer-in-charge from any sum then due or that may become due to the Contractor or from his Security Deposit or sale thereof in full or part under the Contract or any other contract with the Employer towards fulfillment of the said decree, award or orders.
- 29.10 Provided always that the Contractor shall have no right to demand payments/claims whatsoever on account of his compliance with his obligations under this clause and Labour Regulation and the same are deemed to be covered in unit rates of BOQ.

CLAUSE-30: REMOVAL OF CONTRACTOR'S MEN:

The Contractor shall employ on the execution of the Works only such persons as are skilled and experienced in their respective trades and the Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any persons employed by the Contractor on the execution of the works who, in the opinion of the Engineer-in-Charge, misconducts himself or is incompetent or negligent in the proper performance of his duties. The contractor shall forth-with comply with such requisition and such person shall not be again employed upon the works without permission of the Engineer-in- charge. Any person so removed shall be replaced immediately.

CLAUSE-31: MATERIALS OBTAINED FROM EXCAVATION AND TREASURE, TROVE, FOSSILS ETC:

- 31.1 Materials of any kind obtained from excavation on the Site shall remain the property of the Employer and shall be disposed off as directed by the Engineer-in-Charge.
- 31.2 However, if any of the materials thus obtained from excavation on the site is such as can be used in the execution of the Works under the Contract, the Contractor will be allowed to use the same free of cost (except that any amount of royalty, levies are paid by the Contractor) for the aforesaid purposes provided the same is found suitable and is approved by the Engineer-in-Charge.
- 31.3 Fossils, coins, articles of value, structures and other remains or things of geological or archeological interest discovered on the site shall be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his labour or any other person from removing or damaging any such article or thing and shall immediately upon the discovery thereof and before removal acquaint the Engineer-in-Charge with such discovery and carry out the Engineer-in-Charge's directions as to the disposal of the same at the expense of the Employer.

CLAUSE-32: FORCE MAJEURE:

32.1 The term "Force Majeure" shall herein means an exceptional event or circumstance:

- a) which is beyond a Party's control.
- b) which such Party could not reasonably have provided against before entering into the Contract.
- c) which, having arisen, such Party could not reasonably have avoided or overcome, and
- d) which is not substantially attributable to the other Party.

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

- i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- ii) rebellion, revolution, insurrection, military or usurped power, or civil war,

- iii) riot or commotion or disorder, strike by persons other than the Contractor's personnel and other employees of the Contractor and Subcontractors,
- iv) ionising radiation or contamination by radio-activity, and
- v) pressure waves caused by air craft or other aerial devices travelling at sonic or super sonic speed.
- vi) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.
- vii) Spread of pandemic in the country where works are being executed.

32.2 If a Party is or will be prevented from performing any of its obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or Circumstance constituting Force Majeure.

The Party shall, having given notice, be excused performance of such obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause. Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

32.3 Each Party shall at all times use all reasonable endeavours to minimize any delay in the performance of the Contract as a result of Force Majeure.

A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

32.4 On occurrence of Force Majeure, the liability of either Party shall be dealt with, in accordance with the provisions of sub-clause 34.2

32.5 Should there be a request for extension of time arising out of "Force Majeure" the same shall be considered in accordance with clause 39.

CLAUSE 33: LIABILITY FOR DAMAGE, DEFECTS OR IMPERFECTIONS AND RECTIFICATIONS THEREOF:

33.1 If the Contractor or his labour or sub-contractor, injure, destroy or damage roads, fence enclosures, water pipes, cables, buildings, drains, electricity or telephone posts, wires, trees, grass line, cultivated land in the area in which they may be working or in the areas contiguous to the premises on which the work or any part of it is being executed or if any damage is caused during the progress of work, the Contractor shall upon receipt of a notice in writing in that behalf from the Engineer-in-Charge, make the same good at his costs.

33.2 If it appears to the Engineer-in-Charge or his representative at any time during construction or reconstruction or prior to the expiration of the Defects Liability Period that any work has been executed with unsound, imperfect or unskilled workmanship or that any materials or articles provided by the Contractor for execution of the Works are unsound or of a inferior quality, or otherwise not in accordance with the Contract, or that any defect, shrinkage or other faults found in the work arising out

of defective or improper materials or workmanship, the Contractor shall, upon receipt of a notice in writing in that behalf from the Engineer-in-Charge, forthwith rectify or remove and reconstruct the work so specified in whole or in part, as the case may be, and/or remove the materials/articles so specified and provide other proper and suitable materials at his own expense.

- 33.3 If the Contractor fails to rectify, make good or remove and reconstruct the work as notified herein above, the Engineer-in-Charge shall have power to carry out such damages, defects or imperfections by any means or through any other agency or by himself at the risk and cost of the Contractor. In such a case the value of such rectification/replacement, reconstruction through such agencies shall be recovered from the Contractor from any amount due to him. The decision of Engineer-in-Charge in this regard shall be final and binding on the contractor.

CLAUSE-34: CONTRACTOR'S LIABILITY AND INSURANCE:

- 34.1 From commencement to completion of the Work(s) as a whole, the Contractor shall take full responsibility for the care thereof and for taking precautions to prevent loss or damage. He shall be liable for any damage or loss that may happen to the Works or any part thereof and to the Employer's Plant, Equipment and Material (hired or issued to the Contractor). Any such loss or damage shall be restored in good order and condition and in conformity in every respect with the requirements of the Contract Technical specifications and instructions of the Engineer-in-Charge.

- 34.2 i) Neither Party to the Contract shall be liable to the other in respect of any loss or damage which may occur or arise out of "Force Majeure" to the Works or any part thereof or to any material or article at site but not incorporated in the Works or to any person or anything or material whatsoever of either Party provided such a loss or damage could not have been foreseen or avoided by a prudent person and the either Party shall bear losses and damages in respect of their respective men and materials. As such liability of either Parties shall include claims/compensation of the third Party also.

- ii) Provided, however, in an eventuality as mentioned in sub-clause 34.2 (i) above, the following provisions shall also have effect:

- (a) The Contractor shall, as may be directed in writing by the Engineer-in-Charge proceed with the erection and completion of the works under and in accordance with the Contract Specifications; and
- (b) The Contractor shall, as may be directed in writing by the Engineer-in-Charge, re-execute the works lost or damaged, remove from the site any debris and so much of the works as shall have been damaged and carry the Employer's Material etc, to the Employer's stores. The cost of such re- execution of the works, removal of damaged works and carrying of Employer's store shall be ascertained in the same manner as for deviations and this shall be paid separately to the Contractor.

Provided always that the Contractor shall, at his own cost, repair and make good so much of the loss or damage as has been by any failure on his part to perform his obligations under the Contract or not taking precautions to prevent loss or damage or minimize the amount of such loss or damage.

34.3 The Contractor shall indemnify and keep indemnified the Employer against all losses and claims for death, injuries or damage to any person or any property whatsoever which may arise out of or in consequence of the construction and maintenance of works during the Time for Completion and also against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto, and such liabilities shall include claims/compensations of the third Party.

34.4 Within 30 days of issuance of Letter of Acceptance the Contractor shall, without in any way limiting his obligations and responsibilities under this condition, insure and pay all costs and maintain the insurance premium throughout the period of Contract, with the following coverage:

- (a) the Works, together with materials and Plant for incorporation therein, to the full replacement cost (the term "cost" in this context shall include profit), (CAR / EAR Policy).
- (b) an additional sum of 15 per cent of such replacement cost as per (a) above, to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature (CAR / EAR Policy). The deductibles shall be as mentioned in Schedule D.
- (c) the Contractor's Equipment brought at the Site by the Contractor, and in terms of Clause 13.1.2(iii) of GCC., and
- (d) the contractor's workmen, property and public liability.

34.5 Scope of Cover:

The insurance in paragraphs (a), (b) and (c) of Sub-Clause 34.4 shall be in the joint names of the Contractor and the Employer and shall cover:

- (a) The Employer and the Contractor against all loss or damage from whatsoever cause arising other than as provided in Sub-Clause 34.6 from the Commencement date until the date of issue of the relevant Completion Certificate in respect of the Works, and
- (b) the Contractor for his liability:
 - (i) during the Defects Liability Period for loss or damage arising from a cause occurring prior to the commencement of the Defects Liability Period, and

- (ii) for loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clause 43.

The Insurance Policy shall have a clause of taking no objection certificate from Engineer in Charge before release of any settled claim by insurance company to the Contractor.

- 34.6 There shall be no obligation for the insurances in Sub-Clause 34.4 to include loss or damage caused by:
- (a) war, hostilities (whether war be declared or not), invasion act of foreign enemies.
 - (b) rebellion, revolution, insurrection, or military or usurped power, or civil war.
 - (c) ionizing radiations, or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof or
 - (d) pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds.
 - (e) defects in design in the scope of Engineer.
- 34.7 If the Contractor receives instructions from the Employer to insure against any of the risks mentioned in sub-clause 34.6, or any other risk, such insurance if available shall be effected, at the cost of the Employer.
- 34.8 In case of any loss from the reason other those detailed Para 34.6 & 34.7 above, difference of loss and amount realized from Insurance Company including deductibles shall be borne by the Contractor.
- 34.9 The Contractor shall, without limiting his or the Employer's obligations and responsibilities, insure, in the joint names of the Contractor and the Employer, against liabilities for death of or injury to any person or loss of or damage to any property (other than the Works) arising out of the performance of the Contract for at least the amount stated here under:
- (i) Public liability limits for bodily injury not less than Rs.2, 50,000 and/or for death not less than Rs. 5, 00,000 per person for each accident.
 - (ii) Property liability limits for each accident not less than Rs.10, 00,000 (ten lacs).

Limit of total liability both for Public and Property under sub-clause 34.9 (i) and 34.9(ii) shall be 10 % of Contract Price, In case, the total liability exceeds the limit of 10% of contract price, the minimum liability as mentioned under Para (i) & (ii) shall be applicable.”

- 34.10 The insurance policy shall include a cross liability clause such that the insurance shall apply to the Contractor and to the Employer as separate insured.
- 34.11 The Employer shall not be liable for in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or any subcontractor, other than death or injury resulting from any act or default of the Employer, his agents or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and

compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages costs, charges and expenses whatsoever in respect thereof or in relation thereto.

- 34.12 The Contractor shall insure against such liability and shall continue such insurance during the whole of the time and that any persons are employed by him on the Works. Provided that, in respect of any persons employed by any subcontractor, the Contractor's obligations to insure as aforesaid under this liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Contractor shall require such sub-contractor to produce to the Employer, when required, such policy of insurance and the receipt for the payment of the current premium.
- 34.13 Within 84 days of the Commencement Date, the Contractor shall provide the insurance policies / evidence of insurance to Engineer-in-charge. Such insurance policies shall be consistent with the general terms agreed prior to the issue of the Letter of Acceptance. The Contractor shall effect all insurances for which he is responsible with insurers and in terms approved by the Employer.
- 34.14 The Contractor shall notify the insurers of changes in the nature, extent or Programme for the execution of the Works and ensure the adequacy of the insurances at all times in accordance with the terms of the Contract and shall, when required, produce to the Employer the insurance policies in force and the receipts for payment of the current premiums.
- 34.15 If the Contractor fails to effect and keep in force any of the insurances required under the Contract, or fails to provide the policies to the Engineer-in-charge within the period required by Sub-Clause 34.12 then and in any such case the Engineer-in-charge may effect the recovery of such premium on pro-rata basis from the Running Account bills of the Contractor. Additionally the payment of Running Account bills may also be suspended until the Contractor complies with the requirements of sub clause 34.12 of these conditions. If non-insurance prolongs for a period of continuous 2 months, the Employer may treat it as Default of Contractor as per the provisions of clause 38 of GCC.
- 34.16 In the event that the Contractor or the Employer fails to comply with conditions imposed by the insurance policies effected pursuant to the Contract, each shall indemnify the other against all losses and claims arising from such failure.
- 34.17 The Contractor shall at his own expense arrange for the safety provisions as laid down in applicable Law & Regulations and in Safety Manual of the Employer in respect of the works covered under this Contract. In case, the Contractor fails to comply with the provisions of the safety manual, the Engineer-in-Charge shall be entitled to and make the necessary arrangement at the risk and cost of the Contractor. This will, however, not absolve the Contractor of his overall responsibility to execute the works under the Contract.

CLAUSE 35: SUSPENSION OF WORKS:

- 35.1 The contractor shall on the order of the Engineer-in- charge suspend the progress of the Works or any part thereof for such time or times and in such manner as the Engineer-in-Charge may consider necessary and shall during such suspension properly protect and secure the work so far as is necessary in the opinion of the Engineer-in- charge. If such suspension is:

- (a) provided for in the Contract, or
- (b) necessary for the proper execution of the Works or by reason of weather conditions or by some default on the part of the Contractor, or
- (c) necessary for the safety of the Works or any part thereof.

The Contractor shall not be entitled to extra costs (if any) incurred by him during the period of suspension of the works; but in the event of any suspension ordered by the Engineer-in-Charge for reasons other than aforementioned and when each such period of suspension exceeds 14 days, the Contractor shall be entitled to such extension of Time for Completion of the Works as the Engineer-in-Charge may consider proper having regard to the period or periods of such suspensions under clause 39 and shall notify the Contractor accordingly, with approval of the Employer .

- 35.2 If the progress of Works or any part thereof is suspended on the order of the Engineer-in-Charge for more than three months at a time the Contractor may serve a written notice on the Engineer-in-Charge requiring permission within 15 days from the receipt thereof to proceed with the Works or that part thereof in regard to which progress is suspended and if such permission is not granted within that time the Contractor by a further written notice so served may (but is not bound to) elect to treat the suspension where it affects part only of the Works as an omission of such part or where it affects the whole of the Works as an abandonment of the Contract by the Employer.

CLAUSE 36: FORECLOSURE OF CONTRACT IN FULL OR IN PART DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK:

- 36.1 If at any time after acceptance of the tender the Employer decides to abandon or reduce the scope of the Works for reason whatsoever and hence does not require the whole or any part of the Works to be carried out, the Engineer-in-Charge shall give notice in writing to that effect to the Contractor, and the contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he could not derive in consequence of the fore- closure of the whole or part of the Works.

The Contractor shall be paid at Contract rates for full amount of the works executed at Site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilised on the works to the full extent because of the foreclosure:

- (a) Any expenditure incurred on preliminary works, e.g. temporary access roads, temporary labour huts, staff quarters and Site office; storage accommodation workshop, installation and dismantling of Construction Equipment (batching plant, crushing plant) and water storage tanks.
- (b) i) The Employer shall have the option to take over Contractor's materials or any part thereof, either brought to site or of which the Contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the Work), provided, however, the Employer shall be bound to take over the material or such portions thereof as the Contractor does not desire to retain. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the Contractor.

- ii) For Contractor's materials not retained by the Employer, reasonable cost of transporting such materials from Site to Contractor's permanent stores or to his other Works, whichever is less. If materials are not transported to either of the said places, no cost of transportation shall be payable.
 - (c) If any materials issued by the Employer are rendered surplus, the same except normal wastage for the materials used in the works shall be returned by the Contractor to the Employer.
 - (d) Reasonable compensation for transfer of T&P from Site to Contractor's permanent stores or to his other works whichever is less. If T&P are not transported to either of the said places, no cost of outward transportation shall be payable.
- 36.2 The Contractor shall, if required by the Engineer-in-charge, furnish to him books of account, wage books, time sheets and other relevant documents as may be necessary to enable him to certify the reasonable amount payable under this condition.

CLAUSE-37: TERMINATION OF CONTRACT ON DEATH:

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies, or if the Contractor is a partnership concern and one of the partners dies, then, unless the Engineer-in-Charge is satisfied that the legal representatives of the individual Contractor or of the proprietor of the proprietary concern and in the case of partnership, the surviving partners are capable of carrying out and completing the contract, the Engineer-in-Charge shall be entitled to terminate the Contract as to its uncompleted part without the Employer being in any way liable to payment of any compensation whatsoever on any account to the estate of the deceased Contractor and/or to the surviving partners of the Contractor's firm on account of termination of the Contract. The decision of the Engineer-in-Charge that the legal representatives of the deceased Contractor or the surviving partners of the Contractor's firm cannot carry out and complete the Works under the Contract shall be final and binding on the parties. In the event of such termination, the Corporation shall not hold the estate of the deceased Contractor and/or the surviving partners of the Contractors firm liable for damages for not completing the Contract. Provided that the power of the Engineer-in-charge of such termination of Contract shall be without prejudice to any other right or remedy, which shall have accrued or shall accrue to him under the Contract.

CLAUSE-38: DEFAULT BY THE CONTRACTOR AND TERMINATION OF CONTRACT IN FULL OR IN PART:

38.1 If the Contractor:

- i) commits default in complying with or commits breach of any of the conditions of the Contract and does not remedy it or take effective steps to remedy it immediately after a notice in writing is given to him by the Engineer-in-Charge; or
- ii) fails to complete the Works or any item of Works within the time specified in Schedule 'C' or any extended time under the Contract and does not complete the Work(s) or any item of Work(s) within the period specified in a notice given in writing by the Engineer-in-Charge; or

- iii) is engaged in corrupt or fraudulent or Collusive or Coercive practices in competing for or in the execution of the Contract, then the Employer may, after giving 14 days notice to the Contractor, terminate the contract and expel him from the Site. The Contractor shall not be entitled for any compensation whatsoever under this clause. For the purpose of this clause
- a) **‘Corrupt Practice’** means offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement or execution of Contract.
 - b) **‘Fraudulent Practice’** means mis-representation of fact in order to influence the tendering process or the execution of a Contract and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the employer of the benefits of free and open competition.
 - c) **‘Collusive Practice’** means a scheme or arrangement between two or more bidders, with or without the knowledge of Borrower/Employer, designed to establish Bid prices at artificial, non-competitive levels.
 - d) **‘Coercive Practice’** means harming or threatening to harm, directly or indirectly, person or their property to influence or affect the execution of Contract,
- iv) being an individual, or if a firm, any partner thereof, shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation for the purpose of amalgamation or reconstruction under any insolvency Act for the time being in force or make any conveyance or assignment of his effective or composition or arrangement for the benefit of his creditors or purport as to do, or if any application be made under any insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors; or
- v) being a company shall pass a resolution or the Court shall make an order for the liquidation of its affairs or a receiver or manager on behalf of the debenture holders shall be appointed or circumstances shall arise which entitle the Court or debenture holders to appoint a receiver or manager; or
- vi) shall suffer an execution in an execution being levied on his goods; or
- vii) assigns, transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not being incorporated in the work shall not be deemed to be subletting) or attempts to assign, transfer or sublet the entire works or any portion thereof without the prior written approval of the Engineer-in-Charge,
- Then the Employer shall have powers to terminate the Contract in full or in part as aforesaid without prejudice to any other right or remedy which shall have accrued or shall accrue of which cancellation notice in writing to the Contractor under the hand of the Engineer- in-charge shall be conclusive evidence.
- viii) the Employer has in place a Policy for suspension and Banning of Business Dealings as provided on NHPC Website www.nhpcindia.com , the business dealings may be suspended or banned with the Contractor on account of any default by the Contractor under GCC Clause 38.1
- 38.2 The Employer shall, on such termination of the Contract, have powers to take possession of the site of work under the contract as well as the land/premises allotted to the contractor for his preliminary,

enabling and ancillary works and any materials, constructional equipment, implements, stores, structures etc. thereon. The Employer shall also have powers to carry out the incomplete work by any means or through any other agency or by himself at the risk and cost of the Contractor.

- 38.3 If the expenses incurred or to be incurred by the Employer for carrying out and completing the incomplete work or part of the same, are in excess of the value of the work credited/to be credited to the Contractor, the difference shall be paid by the Contractor to the Employer. If the Contractor fails to pay such an amount, as aforesaid, within thirty days of receipt of notice in writing from the Engineer-in-Charge, the Engineer-in-Charge shall recover such amount from any sums due to the Contractor on any account under this or any other contract or from his Security Deposit or otherwise.
- 38.4 The Engineer-in-Charge shall have the right to sell any or all the Contractor's unused materials, Constructional Equipment, implements, temporary buildings/structures etc. and apply the proceeds of sale thereof towards the satisfaction of any sums due from the Contractor under the Contract and if thereafter there may be any balance outstanding from the Contractor, the Employer shall have powers to recover the same as debt.
- 38.5 All decisions/actions of the Engineer-in-Charge under this clause, as aforesaid, shall be conclusive and binding on the contractor.

CLAUSE-39 : TIME FOR COMPLETION AND EXTENSIONS:

- 39.1 Time for Completion allowed for execution of the Works is as specified in Schedule 'C' of these conditions.
- 39.2 However, if the work is delayed on account of:
- i) Delay in handing over of site to the Contractor as per clause 12; or
 - ii) Suspension of work as per clause 35; or
 - iii) Rebuilding of work as per clause 34; or
 - iv) "Force Majeure" conditions as per clause 32 or
 - v) physical conditions not foreseeable by an experienced contractor as defined in clause 5.2 of GCC, or
 - vi) Any other cause which, in the opinion of the Engineer-in-Charge is beyond the Contractor's control;

then, immediately upon the happening of any such event as aforesaid, the Contractor shall inform the Engineer-in-charge accordingly, but the Contractor shall nevertheless use constantly his best endeavors to prevent and/or make good the delay and shall do all that may be required in this regard. The Contractor/Engineer-in-Charge is required to jointly maintain Hindrance Registers (**Annexure-I**) for recording hindrances if any, while executing the Works. The Contractor shall request, in writing, for extension of time, to which he may consider himself eligible under the Contract, within 14 (fourteen) days of the date of happening of any such events as indicated above failing which the same shall not be considered or taken into account for any purpose whatsoever.

Provided further that no monetary claims shall be admissible to the Contractor for such extension of Time for Completion except for reimbursement of cost of extension of bank guarantee for security deposit and insurance policy(ies).

- 39.3 In any such case as may have arisen due to any of the events, as aforesaid, and which shall be brought out by the Contractor in writing, the Engineer-in-Charge may give a fair and reasonable extension of Time for Completion, after taking into consideration the nature of the work delayed and practicability of its execution during the period of extension.

Such extensions, if admissible, shall be communicated to the Contractor by the Engineer-in-Charge in writing.

Provided that Engineer- in – charge is not bound to make any determination unless the Contractor has;

- a) within 14 days after such event has first arisen notified the Engineer and
- b) within 28 days or such other reasonable time as may be agreed by the Engineer – in – charge detailed particulars of any extension of Time for Completion to which the Contractor may consider himself entitled.

CLAUSE-40: COMPENSATION FOR DELAY:

- 40.1 If the Contractor fails to complete the work as a whole as specified in Schedule 'C' before the expiry of the period(s) of completion as stipulated in the aforesaid Schedule, or any extended period under Clause 39 as may be allowed, he shall without prejudice to any other right or remedy of the Employer on account of such default, pay as an ascertained/agreed compensation as stipulated in the aforesaid Schedule 'C' not by way of penalty. However, maximum amount of compensation for delay on account of work as a whole shall not exceed 10% of the Contract Price.
- 40.2 The amount of compensation may be adjusted/withheld/ deducted or set-off against any sum due or payable to the Contractor under this or any other contract with the Employer. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works or from any other obligations and liabilities under the Contract.

CLAUSE-41: INSPECTION AND APPROVAL:

- 41.1 All works embracing more than one process shall be subject to examination and approval at each stage thereof and the Contractor shall give due notice to the Engineer-in-Charge or his authorised representative, when each stage is ready. In default of such notice, the Engineer-in-Charge shall be entitled to appraise the quality and extent thereof and the decision of the Engineer-in-Charge in this regard shall be final and binding.
- 41.2 No work shall be covered or put out of view without the approval of the Engineer-in-Charge or his authorised representative and the Contractor shall afford full opportunity for examination of foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer-in-Charge or his authorised representative whenever any such work or foundation is ready for examination and the Engineer-in- charge or his representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, examine and measure such

work or such foundations. In the event of the failure of the contractor to give such notice, he shall, if required by the Engineer-in-Charge, uncover such work at the Contractor's expense.

- 41.3 The Engineer-in-Charge or his representative shall have powers at any time to inspect and examine any part of the works and Contractor shall give such facilities as may be required for such inspection and examination.
- 41.4 The Contractor shall uncover any part of the Works and/or make opening in or through the same as the Engineer-in-charge may from time to time direct for his verification and shall reinstate and make good such part to the satisfaction of the Engineer-in-Charge. If any such part has been covered up or put out of view after being approved by the Engineer-in-Charge and is subsequently found, on uncovering, to be executed in accordance with the contract, the expenses of uncovering and/or making openings in or through, reinstating and making good the same, shall be borne by the Employer. In any other causes all such expenses shall be borne by the Contractor.

CLAUSE-42: COMPLETION CERTIFICATE:

- 42.1 The Works shall be completed to the entire satisfaction of the Engineer-in-Charge and in accordance with the time mentioned in Schedule 'D' and terms and conditions mentioned in clause-39. As soon as the Works under the Contract is completed as a whole, the Contractor shall give notice of such completion to the Engineer-in-Charge. The Engineer-in-Charge, within two week of receipt of such notice, shall inspect the Works and shall satisfy himself that the Work(s) has been completed in accordance with the provisions of the Contract and then issue to the Contractor a certificate of completion indicating the date of completion except for any minor outstanding works and minor defects which will not substantially affect the use of Works for their intended. Should the Engineer-in-Charge notice that there are major defects in the Works or the Works are not considered to be substantially complete, he shall issue a notice in writing to the Contractor to rectify/replace the defective Works or any part thereof or complete the Works, as the case may be, within such time as may be notified and after the Contractor has complied with as aforesaid and gives notice of completion, the Engineer-in-Charge shall inspect the work and issue the completion certificate in the same manner as aforesaid.
- 42.2 No certificate of completion shall be issued as stipulated under 42.1 above nor Work be considered to be completed unless the Contractor shall have removed from the work site and/or premises all his belongings/temporary arrangements brought/made by him for the purpose of execution of the work and clean the site and/or premises in all respects and made the whole of the site and or premises fit for immediate occupation/use to the satisfaction of the Engineer-in-Charge. If the Contractor fails to comply with the above mentioned requirements on or before the date of completion of the Work, the Engineer-in-Charge, may, as he thinks fit and at the risk and cost of the Contractor, fulfill such requirements and remove/dispose off the Contractor's belongings/temporary arrangements, as aforesaid, and the Contractor shall have no claim in this respect except for any sum realized by the sale of Contractor's belongings/temporary arrangements less the cost of fulfilling the said requirements and any other amount that may be due from the Contractor. Should the expenditure on the aforesaid account exceed the amount realised by sale of such Contractor's belongings/temporary arrangements than the Contractor shall on demand, pay the amount of such excess expenditure.

CLAUSE-43: DEFECTS LIABILITY PERIOD:

- 43.1 The "Defect Liability Period" for the entire work under the Contract is 24 months from the certified date of completion as per clause 42.
- 43.2 If during the Defects Liability Period any portion of the Works is found defective or deficient in any manner and is repaired/rectified/replaced pursuant to the defects liability provisions of the Contract, the Defects Liability Period for such portion of the Works, shall, notwithstanding anything to contrary contained herein, be operative for a further period of 6 months from the date of such repair/rectification/ replacement but shall not in any case be operative for more than 30 months from the date of completion stated in the Completion Certificate.

CLAUSE-44: MEASUREMENTS:

- 44.1 The Engineer-in-Charge shall except as otherwise stated ascertain and determine by measurement, the value of work done in accordance with the Contract.
- 44.2 Notwithstanding any provision in the relevant standard method of measurement or any general or local custom, measurement of work done under the Contract shall be taken in accordance with the procedure set forth in the Technical Specifications or Bill of Quantities under the Contract. In the case of items of work, which are not covered by the Technical Specifications or Bill of Quantities, measurement shall be taken in accordance with the relevant standard methods of measurements laid down by the Bureau of Indian Standards (BIS).
- 44.3 All items having a financial value shall be entered in measurement book, level book, etc., prescribed by the Employer so that a complete record is maintained of all work performed under the Contract.
- 44.4 Measurement shall be taken jointly by the Engineer-in- charge or his representative and by the Contractor or his authorised representative.
- 44.5 Before taking measurement of any works, the Engineer-in- charge or his representative, shall give a reasonable notice to the Contractor. If the Contractor fails to attend or send an authorised representative for measurement after such a notice or fails to countersign or to record the objection within a week from the date of taking the measurements, then in that event the measurements taken by the Engineer-in- charge shall be taken to be correct and final measurements of such work.
- 44.6 The Contractor shall, without extra charge, provide assistance with every appliance, labour and other appliances (theodolite, level etc.) and things necessary for measurement.
- 44.7 Measurement shall be signed and dated by both parties on the Site on completion of measurement. If the Contractor objects to any of the measurements recorded by the representative of the Engineer-in-Charge a note to that effect shall be made in the measurement book against the item objected to and such note shall be signed and dated by both parties engaged in taking the measurement. The decision of the Engineer-in-Charge on any such dispute or difference or interpretation shall be final and binding on the contractor in respect of all contract items, substituted items, extra items and deviations. Provided that items of work which are not susceptible to measurement at the later date must be measured jointly and signed accordingly by both the parties at the time of execution of such items.

CLAUSE-45: PAYMENT ON ACCOUNT:

- 45.1 Running Account bills shall be submitted by the Contractor monthly on or before the date fixed by the Engineer-in-Charge for the work executed. The Engineer-in-Charge shall then verify the bills with reference to the measurements recorded in the measurement book(s).
- 45.2 Payment on account for amount admissible shall be made on the Engineer-in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment for the work executed, after deducting therefrom the amounts already paid, the security deposit and such other amounts as may be withheld/deductable or recoverable in terms of the Contract.
- 45.3 Payment of the Contractor's bills shall be made by the Employer within 28 days from the date of submission of the bill subject to the acceptance of the Engineer-in-charge.
- In case of any disagreement between EIC and Contractor on any part of the bill, such part shall be severed from the rest and payment of such part shall be withheld by the EIC and payment of balance admissible part of Contractor's bill shall be processed and released within specified 28 days. The clarification on disagreed part, if any, required on any item of Contractor's bill shall be sought by the EIC within 21 days of bill submission and except in exceptional circumstances, these clarification shall be sought in one go. Similarly, the Contractor shall also be required to submit the clarification sought within next 21 days.
- 45.4 Payments due to the Contractor shall be made by crossed Cheque/RTGS/NEFT by the Engineer-in-Charge or his representative. Such cheques shall be issued direct to the Contractor on furnishing a stamped receipt for the amount of the cheque or to his constituted attorney duly authorised to receive such payments from the Engineer-in-charge.
- 45.5 Any Running Account bills given relating to work done or materials delivered, may be modified or corrected by any subsequent Running Account bills or by the final bill. No certificate(s) of the Engineer-in-Charge supporting an Running Account bill shall itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the Contract.
- 45.6 Should there be a request for extension of Time for Completion, pending its consideration, interim payments shall continue to be made as provided herein.
- 45.7 After receipt of clarifications as per Clause 45.3 / modifications furnished by contractor as per Clause 45.3 and acceptance thereof by the Employer, payment in respect of such withheld items shall be released to the contractor through next Running Account bill.
- 45.8 Deleted
- 45.9 The Contractor shall be paid 75% (seventy five percent) of the admissible Running Account bill amount, after due recoveries within 10 days of submission of Running Account bill. The balance due amount under the Running Account bill shall be paid to the Contractor within 28 days of submission of bills after due certification by the Engineer-in-charge.

45.10 Omissions on the part of the Engineer to pay the amount due upon measurement or otherwise shall neither vitiate nor make the contract void. Further, no claim for interest or damages will be entertained or payable by the Employer upon

- i). any Bank Guarantee or
- ii). payments in arrears or
- iii). any balance which may become due on final settlement/re-conciliation of the account or
- iv). withheld by the Employer owing to any dispute or difference between the parties.

45.11 DELAYED PAYMENT:

All the undisputed payments for the works performed by Contractor under the Contract shall be released within twenty eight days from the receipt of invoice/bills from the Contractor complete in all respect.

In case, payment are not released as mentioned above, the Employer shall pay the principal amount plus simple interest from the date immediately following the date agreed upon @ 6% p.a.

45.12 Compliance of BRSR Policy:

In order to comply with Policy on Business Responsibility and Sustainability Report (BRSR) of Employer, the contractor as a Value Chain Partner shall submit disclosures with every RA Bill and Final Bill during execution of contract in the format prescribed at Schedule-D certifying their compliances towards Sustainability Standards based on Environment, Social and Governance (ESG) Parameters. The contractor shall provide free and smooth access to the authorized person(s) of Employer in its premises (office/assets/locations/units etc.) to confirm /evaluate / rectify the same, as and when required.

CLAUSE-46: PRICE ADJUSTMENT/VARIATIONS: Deleted

CLAUSE-47: TAXES, DUTIES AND LEVIES ETC:

47.1 All existing customs duty, Goods and Service Tax (GST), business taxes, Income tax or any other applicable indirect / direct tax or duty or levy such as royalty, terminal tax, cess that may be levied in accordance with laws and regulation in force as on 28 days before the last date of submission of price bid that the Contractor has to pay on the Contractor's Equipment, Plant, materials and supplies (permanent, temporary and consumables) acquired for the purpose of the Contract and for the services performed under the Contract shall be payable by the Contractor, and the Employer shall not entertain any claim in this regard. The Contract unit rates shall be deemed to be inclusive of all such taxes, duties, levies etc. including those assessed on the Employer. The Contract unit rates shall also be inclusive of GST liability of the Employer on works (service recipient), if any, which shall be recovered from the Contractor. The Contract unit rates shall also be after taking into account the Input Tax Credit (ITC) and other benefits. Any statutory variation in the rate of aforesaid taxes if any, during the currency of the Contract including extension thereof shall be to the account of Employer provided the amount thus claimed is not paid under price variation clause 46.

Changes in the advance tax rates of Income Tax and any other direct tax payable to appropriate authorities shall not be construed as a change in the rate(s) of taxes and will not be subject to adjustment.

- 47.2 However, if a new tax or duty or levy, other than those existing on 28 days before the last date of submission of price bid i.e.----- (date to be entered in Agreement) is imposed in India under a statute or law during the currency of the Contract and the Contractor becomes legally liable thereunder to and actually pays the same for bonafide use on the Works contracted, then the Contractor shall immediately inform the Engineer-in-Charge in this regard. The Employer will reimburse the same to the Contractor on production of satisfactory proof of payment, provided that the amount thus claimed is not paid under Price variation clause 46 of General Conditions of the Contract. Provided always that in the event of variation in the rates of royalty charges/fresh levy of royalty on materials, the same shall be reimbursed to or recovered from Contractor upon submission of satisfactory documentary evidence of having made the payment at revised rates.
- 47.3 The Contractor's staff and labour will be liable to pay personal income taxes in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.
- 47.4 Provided further that, the Contractor shall not be entitled for reimbursement under Sub-clause 47.1 & 47.2 if the changes in the existing tax or duty or levy or imposition of new tax or duty or levy as mentioned in Sub-clause 47.1 & 47.2 pertains to indirect transactions between Contractor and any third party (e.g. Tax(es) on Insurance Premium).
- 47.5 Notwithstanding anything contained elsewhere in the contract, the Employer shall deduct at source from the payment due to the Contractor, the taxes as required to be deducted under applicable Tax Act or Rule. The amounts so deducted shall be deposited by the Engineer-in-charge with the Tax authorities as per Law. Immediately thereafter, the Engineer-in-charge shall inform the Contractor of the detailed calculations of such deductions and shall provide the Contractor with the corresponding receipts from the tax authorities. It is for the Contractor to deal with the Tax authorities directly in respect of any claim or refund relating to the above deductions and the Employer shall not be liable or responsible for any claims or payments or reimbursement in this regard.
- 47.6 Invoices and other documents submitted by contractor for payment under Interim Payment Certificate/Final Payment Certificate, or any other payment under the contract shall be in accordance with the GST Law.
- 47.7 The contractor shall furnish a certificate along with Interim Payment Certificate/Final Payment Certificate that GST payable by him has been deposited / will be deposited to the Govt. Treasury.

CLAUSE-48 : PAYMENT OF FINAL BILL:

The final bill shall be submitted by the Contractor within one month of the date fixed for completion of the Work or of the date the Certificate of Completion furnished by the Engineer-in-Charge. No further claim in this regard unless as specified herein under shall be entertained. Payment shall be made within 03 months, of the submission of Final bill. The clarification, if any, required on any item

of final bill, shall be sought by the EIC within a period of 45 days. The Contractor shall be required to submit his clarifications within next 45 days. If there shall be any dispute about any item or items of the work then the undisputed item or items only shall be paid within the said period of three months. The Contractor shall submit a list of the disputed items within thirty days from the disallowance thereof and if he fails to do so, his claim shall be deemed to have been fully waived and absolutely extinguished. Provided further the Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or execution of the Works, unless the Contractor shall have included a claim in respect thereof in his Final Bill.

The contractor with RA bill / Final Bill shall submit a certificate for compliance of integrity pact & provisions of contract and certificate for compliance of BRSR Policy of Employer in the format prescribed at Schedule-D.

CLAUSE-49: OVER PAYMENT AND UNDER PAYMENT:

- 49.1 Whenever any claim whatsoever for the payment of a sum of money to the Employer arises out of or under this Contract against the Contractor, the same may be deducted by the Employer from any sum then due or which at any time thereafter may become due to the Contractor under this Contract and failing that under any other contract with the Employer or from any other sum whatsoever due to the Contractor from the Employer or from his security deposit, or he shall pay the claim on demand.
- 49.2 The Employer reserve the right to carry out post- payment audit and technical examination of the final bill including all supporting vouchers, abstracts, etc. The Employer further reserves the right to enforce recovery of any overpayment when detected, notwithstanding the fact that the amount of the final bill may be included by one of the parties as an item of dispute before an arbitrator appointed under clause 55 of this Contract and notwithstanding the fact that the amount of the final bill figures in the arbitration award.
- 49.3 If as a result of such audit and technical examination any overpayment is discovered in respect of any work done by the Contractor or alleged to have been done by him under the Contract, it shall be recovered by the Employer from the Contractor by any or all of the methods prescribed above, and if any under-payment is discovered, the amount shall be duly paid to the Contractor by the Employer.
- 49.4 Provided that the aforesaid right of the Employer to adjust overpayments against amounts due to the Contractor under any other contract with the Employer shall not extend beyond the period of two years from the date of payment of the final bill or in case the final bill is a MINUS bill, from the date the amount payable by the Contractor under the MINUS final bill is communicated to the Contractor.
- 49.5 Any sum of money due and payable to the Contractor (including the security deposit returnable to him) under the Contract may be withheld or retained by way of lien by the Engineer-in-Charge or Employer against any claim of the Employer or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the Contractor with the Engineer-in-Charge or Employer or with such other person or persons.

The sum of money so withheld or retained under this clause by the Engineer-in-Charge or Employer will be kept withheld or retained as such by the Engineer-in- Charge or Employer or till his claim

arising out of in the same Contract or any other contract is either mutually settled or determined by the arbitrator under Clause 55 hereof, or by the competent court.

CLAUSE-50 : TRAINING OF APPRENTICES:

The Contractor shall, during the currency of the Contract, engage and also ensure engagement by his sub- contractor and other employed by the Contractor in connection with the Works, such number of apprentices and in such categories for such periods as may be required under the Apprenticeship Act 1961 as amended in 2014 and he shall be responsible for all obligations of the Employer under the aforesaid Act, including the liability to make payment to Apprentices as required under the Act.

CLAUSE-51 : CONTRACT MATTERS TO BE TREATED AS CONFIDENTIAL:

- 51.1 All documents, correspondence, decisions and orders concerning the Contract shall be considered as confidential and/or restricted in nature by the Contractor and he shall not divulge or allow access to them by any unauthorised person.
- 51.2 The Contractor shall take necessary steps to ensure that all persons employed on any work in connection with this Contract have noted that the Indian Official Secret Act, 1923 (XIX of 1923) applies to them and shall continue so to apply even after the execution of such Works under the Contract.

CLAUSE-52 : LAWS GOVERNING THE CONTRACT:

Unless otherwise hereinafter provided, this Contract shall be construed, interpreted and governed by laws of India.

CLAUSE-53 : PROCEDURE FOR CLAIMS:

If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 15 days after the Contractor became aware, or should have become aware, of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of 15 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the EIC/Engineer.

Within 90 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed.

If the event or circumstance giving rise to the claim has a continuing effect:

- a) This fully detailed claim shall be considered as interim.
- b) The Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed and such further particulars as the Engineer may reasonably require; and
- c) The Contractor shall send a final claim within 15 days after the end of the effects resulting from the event or circumstance or within such other period as may be proposed by the Contractor and approved by the Engineer.

If the Contractor fails to submit the fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of Time for Completion within such period as specified above, the Time for Completion shall not be extended and the Contractor shall not be entitled to additional payment/claim and the Employer shall be discharged from all liability in connection with the claim.

Within 45 days after receiving all particulars supporting claim or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval or with disapproval and detailed comments on the admissibility of claim. If the Contractor does not receive the approval or disapproval from the Engineer on the admissibility of the Claim within such time, then the claim made by the Contractor will be deemed to have been considered admissible. The detailed evaluation of Claim (if considered admissible) shall be done by the Engineer in due course of time.

Each Payment Certificate shall include such amounts for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim under the contract, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

Further, the resources (Equipment/Manpower) are solely the Contractor's estimate and the Contractor has committed to deploy the resources to complete the Works within the Time for

Completion. No claims will be entertained on the grounds that there has been less progress than anticipated using these resources. The causes or hindrances would have to be established by the Contractor independently. No payments would be made towards the expenses incurred on deploying the additional resources as such unless expressly agreed by the Employer in writing.

No interest shall be paid by the Employer on the disputed/ claimed amount for the period up to determination and notification of the same to the Contractor by the Engineer.

The Engineer shall proceed in accordance with Sub-Clause to agree or determine the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 39 [Time for Completion and Extensions] to which the Contractor is entitled under the Contract.

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub- Clause in relation to any claim, any extension of time shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

CLAUSE-54: SUM PAYABLE BY WAY OF COMPENSATION TO BE CONSIDERED AS REASONABLE WITHOUT REFERENCE TO ACTUAL LOSS:

All sums payable by way of compensation to the Employer under any of these conditions shall be considered as reasonable compensation without reference to the actual loss or damage sustained and whether or not damage shall have been sustained.

CLAUSE -55: SETTLEMENT OF DISPUTES

55.1 Amicable Settlement

55.1.1 If any dispute arises between the Employer and the Contractor arising out of the Contract, whether during the execution of the Works or after their completion and whether before or after the repudiation or after termination of Contract, including any disagreement by either Party with any action, inaction, opinion, instruction, determination, certificate or valuation of the Employer, an attempt shall be made to resolve the matter in dispute amicably.

Any dispute, in respect of which the Employer and the Contractor have failed to reach at an amicable settlement pursuant to GCC Clause 55.1.1, shall be finally settled by reference to Commercial / Competent Court.

55.2: Settlement of commercial disputes between Central Public Sector Enterprises CPSE(s) / Port Trusts *inter se* and also between CPSEs and Government Departments /Organizations (excluding disputes related to Railways, Income Tax, Customs & Excise Departments) - Administrative Mechanism for Resolution of CPSEs Disputes (AMRCD).

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts *inter se* and also between CPSEs and Government Department(s)/Organization(s) (excluding disputes related to Railways, Income Tax, Customs & Excise Departments), such dispute or

difference shall be taken up by either party for its resolution through AMRCD as mentioned in DPE OM No. 05/0003/2019-FTS-10937 dated 14th December, 2022 (Annexure-IV) and the decision of AMRCD on the said dispute will be binding on both the parties.

This provision is applicable to disputes with Central PSEs / Port Trusts / Government Department(s) / Organization(s) (excluding disputes related to Railways, Income Tax, Customs & Excise Departments) only.

CLAUSE 56: DEFECTS LIABILITY CERTIFICATE & UNFULFILLED OBLIGATIONS:

The Contract shall not be considered as completed until a Defects Liability Certificate shall have been signed by the Engineer-in-Charge and delivered to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Works and remedy any defects therein to the Engineer-in-Charge's satisfaction. The Defects Liability Certificate shall be given by the Engineer-in-Charge within 28 days after the expiration of the Defects Liability Period.

Notwithstanding the issue of the Defects Liability Certificate the Contractor and the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Defects Liability Certificate which remains unperformed at the time such Defects Liability Certificate is issued and, for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties to the Contract.

CLAUSE 57: ECOLOGICAL BALANCE

57.1 The Contractor shall be required to ensure that there shall be no indiscriminate felling of trees by him or his labourers or their family members and he will be solely responsible for their acts in this regard. The Contractor shall try to maintain ecological balance by preventing deforestation, water pollution and defacing of natural landscape in the vicinity of work areas. The Contractor shall so conduct his construction operations as to prevent an unnecessary destruction of, scarring or defacing the natural surroundings in the vicinity of the work area. In order to maintain the ecological balance, the Contractor shall specifically observe the following instructions:

- a) Where unnecessary destruction, scarring, damage or defacing may occur as a result of the Contractor's operation, the same shall be repaired, replanted or otherwise corrected at the Contractor's expense. The Contractor will prevent scattering of rocks and other debris outside the work areas. All work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape as directed by the Engineer-in-Charge.
- b) All trees and shrubs, which are not specifically required to be cleared or removed for construction purposes, shall be preserved and shall be protected from any damage that may be caused by the Contractor's construction operation and equipment. The removal of trees or shrubs will be permitted only after prior approval by the Engineer-in-charge. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting,

and excavating, dumping, chemical damage or other operation and the Contractor shall adequately protect such trees by use of protective barriers or other methods approved by the Engineer-in-Charge. Trees shall not be used for anchorage.

- c) The Contractor's construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter contaminants, debris and other objectionable pollutants and wastage into river. Pollutants and wastes shall be disposed of in a manner and at sites approved by the Engineer in-Charge. The Contractor shall fully comply with Water (Prevention and Control of Pollution) Act, 1974 section -33(A).
 - d) In the Conduct of construction activities and operation of equipment, the Contractor shall utilise such practicable methods and devices as are reasonably available to control, prevent and otherwise minimise air pollution. The contractor shall fully comply with Air (Prevention and Control of Pollution) Act, 1981 section -31(A).
 - e) Burning of materials resulting from clearing of tree, bush, combustible construction materials and rubbish may be permitted only when atmospheric conditions for burning are considered favourable.
 - f) The Contractor shall be required to prevent flowing of debris and muck in to the river. Necessary retaining structures like walls/crates etc shall be constructed for the purpose. The Contractor shall also stabilize the muck fully i.e. consolidation and compaction of the muck shall be carried out in the muck dumpsites before handing it over to the Employer at the end of construction period.
 - g) All the equipment which are likely to generate high noise levels are to be fully equipped (with noise reduction measures) to meet the ambient noise control standards.
- 57.2 Separate payment will not be admissible to the Contractor for complying with the provisions of this clause except the protection work as specially provided for in BOQ. All other costs shall be deemed to have been included in the items mentioned in the Bill of Quantities. If any provision(s) is not complied with, within a reasonable time even after issue of a notice in this respect, the necessary operations would be carried out by the Engineer-in-charge at the cost of the Contractor.

CLAUSE 58 : GENERAL:

Save and except as expressly provided elsewhere in this Contract all costs, expenses, charges and liabilities for the completion of the Works in accordance with the Contract and/or for the due and faithful performance and/or the fulfillment of all of the Contractor's obligations under the Contract including furnishing of bank guarantees / Insurance Surety Bonds to the Employer pursuant to the Contract shall be to the account of and be borne by the Contractor and shall be deemed to be included in the unit rates provided for in the Bill of Quantities and the Employer shall not be liable in any manner whatsoever therefore.

Whenever any claim whatsoever for the payment of a sum of money to the Employer arises out of or under this contract against the Contractor, the same may be deducted by the Employer from any sum then due or which at any time thereafter may become due to the Contractor under this Contract and failing, that under any other contract between the Employer and the Contractor or from any other sum whatsoever due to the Contractor from the Employer or from his Security Deposit or he shall pay the claim on demand.

Clause 59: Employment of Skilled/Semiskilled workers:

The contractor shall, at all stages of work, deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/Industrial Training Institute/National Institute of construction Management and Research (NICMAR)/National Academy of Construction, CDIC or any similar reputed and recognized Institute managed/certified by State/Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi-skilled workers required in each trade at any stage of work.

The Contractor shall submit number of man days required in respect of each trade, it's scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer in charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-In-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer in Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

HINDRANCE REGISTER

Annexure-I

Refer Clause 39.2 of GCC)

NAME OF PROJECT: _____

1. Name of Work: _____

2. Agreement No. _____

3. Executing Agency: _____

Sl. No.	Nature/ Reason of Hindrance	Item/Component of works which could not be executed on account of this Hindrance	Date of Start of Hindrance	Date of removal of Hindrance	Overlapping period (if any)	Net Hindrance in days	Signature of Engineer's Representative	Signature of Contractor	Remarks
1	2	3	4	5	6	7	8	9	10

Schedules

Schedule-A	Schedule of Quantities and Prices
Schedule-B	Issue of Departmental materials to the Contractor
Schedule-C	Compensation for delay
Schedule-D	Schedule for chargeable interest rates against advances, completion time, defect liability period, percentages of various components for price variation/adjustment
Schedule-E	Construction Schedule
Schedule-F	Deleted
Schedule-G	Construction methodology duly supported with broad calculations (separate sheet to be attached)
Schedule-H	Site Visit Report

GENERAL SUMMARY

ABSTRACT

SCHEDULE OF QUANTITIES AND PRICES (BILL OF QUANTITIES)

Separate ‘**Schedule of Quantities and Price (Bill of Quantities)**’ attached as **Section-VII** of Bid document and shall be filled by the Bidder in E-Tendering mode.

Signature of Bidder

**ISSUE OF DEPARTMENTAL MATERIALS TO THE
CONTRACTOR**

(Refer Clause 23 of General Conditions of
Contract)

Sl. No.	Particulars of materials to be issued.	Unit	Stock Issue Rate (Rs.)	Place of issue.
NIL				

Note:

Remarks: Penal recovery rate in case of excess consumption of materials shall be 25% more than the prevailing stock issue rates at the time of invitation of bids. Depending upon time required for award works as well as duration of construction period for the work in question the escalation factor shall be duly accounted for while working out the penal recovery rate.

Penal recovery rate shall be filled in by the Project at the against each of the material to be issued free of cost by the Employer and the above remarks be deleted in the Bid document.

SCHEDULE-C**SCHEDULE FOR ACHIEVEMENT OF WORK AND COMPENSATION FOR
DELAY**

(Refer Clause-40 of General Conditions of Contract and Schedule-E)

Sl. No.	Description Mile Stones	Schedule completion period from the date of issue of Letter of Acceptance.	Compensation for delay
1.	Completion of works as a whole	350 Days	0.035% of Contract Price per day of Delay

SCHEDULE - D

Schedule for chargeable interest rates against advances, completion time, defect liability period, percentages of various components for price variation/adjustment

S.NO.	CLAUSE No.	DESCRIPTION	STIPULATION
1	3.2	Performance Security Deposit	2% of Contract Price
2	3.3	Retention Money	3% of Contract Price
3	13.1.1	Mobilisation Advance Limit	5% of Contract Price
4	13.1.1(i)	Simple interest per Annum on Mobilization Advance	State Bank of India MCLR for 3 years plus margin of 150 basis points as on 28 days prior to Price Bid submission date.
5	13.1.1(ii)	Initial limit	2% of contract Price
6	13.1.2	Advance for Construction Equipment limited to	10% of contract Price Sub Clause 13.1.2. This advance shall be admissible against new Construction Equipment only and shall be limited to 90(ninety) percent of the price of such new construction equipment.
7	13.1.2(i)	Simple interest per Annum on sum advanced for purchase of new equipment	State Bank of India MCLR for 3 years plus margin of 150 basis points as on 28 days prior to Price Bid submission date
8	34.4(b)	Deductibles:	5% of each loss subject to minimum of Rs. 5.0 Lakhs
9	34.9 GCC	Public Liability Limits plus Property Liability Limits not exceeding	10% of Contract Price In case, the total liability exceeds the limit of 10% of contract price, the minimum liability as mentioned under Clause 34.9(i) & 34.9(ii) shall be applicable.
10	39.1	Time allowed for execution of the Work as a whole	350 Days from date of issue of LOA
11	43	Defects Liability Period	24 Months

12	45.7	Interest Rate for Delayed Payment	_____ 6%_____ per Annum
13	45.12	Certificate for compliance of BRSR Policy	Placed at Annexure-II
14	48	i) Certificate for compliance of Integrity Pact & Provisions of Contract, ii) Certificate for compliance of BRSR Policy	Placed at Annexure-III Placed at Annexure-II

Certificate for compliance of BRSR Policy

[Certificate to be submitted by Contractors on their letter head on quarterly basis with every RA Bill and Final bill]

Name of the work:

RA Bill No. (Period) / Final Bill

It is certified that;

We, M/s(Name of Contractor) have complied with all the provisions of Business Responsibility and Sustainability Reporting (BRSR) Policy of Employer as per following details:

E/ S/ G	Topic	Sr. No.	Questions	Response	If Yes, provide link for supporting documents
Environment	Environmental Policies and Processes	1	Does your company have an environment or sustainability policy?		
		2	Does your company have Environment Management System (ISO 14001 or equivalent) in place		
		3	Does your company have climate change strategy in place?		
	Energy & Emission	4	Has your company taken any initiatives to ensure that the energy mix has a dominance of cleaner sources of energy? Has your company set targets on renewable energy procurement?		
		5	Does your company assess, monitor and report its carbon and/or other GHG Emissions (Scope 1, 2 and 3 emissions) through recognised greenhouse gas emission calculation methodology?		
	Waste Management	6	Does your company have written policy/ procedures on waste management?		
		7	Does the company have targets on resource efficiency such as waste minimization, water recycle and reuse?		
		8	Does your company maintain records and monitor the trends of different streams of waste generated including hazardous wastes, plastic waste, batteries waste, e-Waste, etc.		
		9	Has your company identified and signed formal agreements with authorised agencies for disposal of such wastes?		
	Water Management	10	Does your company maintain records of water use and the various water sources?		
		11	Does your company have adequate treatment facilities for raw water, process effluent and sewage?		

E/ S/ G	Topic	Sr. No.	Questions	Response	If Yes, provide link for supporting documents
		12	Does your company conduct periodic quality monitoring of treated wastewater and treated raw water from accredited laboratories?		
Social	Health and Safety	13	Does your company have in place a formal health and safety policy?		
		14	Is your company certified to ISO 45001/ 18001/ 9001?		
		15	Does your company have formal procedure to record, track and monitor accident/ incident that occur in their premises?		
		16	Does your company have an onsite Emergency Response plan (ERP)?		
		17	Does your company regularly inspect the available firefighting equipment such as extinguishers, hydrant system, etc.?		
		18	Does your company conduct regular medical examination for all its employees and workers?		
	Legal Compliance	19	Does your company maintain legal register or tracker to ensure statutory compliances?		
		20	Has your company obtained valid operating licenses, as required under the national and local laws of the region where they are operating: - Consent to Establish and Operate - Waste Authorization - Factory License - Fire NOC		
		21	Does your company conduct periodic monitoring of emissions such as stack monitoring, ambient noise level monitoring, etc.?		
		22	Did your company receive any showcase or closure notices/ penalties/ fines for non-compliance with respect to EHS and social regulatory requirements?		
	Social (Community engagement and labour conditions)	23	Does your company have a documented policy on the following aspects: - Prohibition of child and forced labour - Sexual harassment - Code of Conduct - Equal Opportunities and non-discrimination - Working hours - Fair and equal wages - Leave policy		
		24	Does your company pay overtime under legal rate to employees?		
		25	Did your company experience any human rights violation against the surrounding communities in last 5 years?		
	Customer Welfare	26	Does your company provide communication channel/ grievance and remediation action to customers?		

E/ S/ G	Topic	Sr. No.	Questions	Response	If Yes, provide link for supporting documents
	Employee Engagement , Diversity and Inclusion	27	Does your company train its employees in handling and resolving customer complaints?		
		28	Does your company has formal programs on: - Induction training - Refresher training - On job training		
		29	Does your company have KPIs on diversity and inclusion that needs to be achieved during hiring, performance and development / appraisals etc.?		
		30	Does your company conduct a periodic pay equity survey as well as employee satisfaction survey? If yes, how often is this conducted?		
	Supply Chain	31	Does your company follow a sustainable procurement plan or responsible sourcing program?		
		32	Is there an environment and social criteria for screening the suppliers and vendors?		
Governance	Policy and Strategy	33	Does the organization have a formal board diversity policy that clearly requires diversity factors such as gender, race, ethnicity, country of origin, nationality or cultural background in the board nomination process?		
		34	Does your company have a specific ESG budget and ESG training programs?		
	Business Ethics	35	Do your company have written procedures on: - Confidentiality of information - Conflicts of interest - Antitrust/anti-competitive practices		
		36	Did your company face any criminal charges/ litigations/ penalties associated with issues such as anti-bribery, fraud, corruption, unfair labour practices, human rights abuses, and other malpractices?		
		37	Was your company subjected to negative publicity in light of breach of integrity?		
		38	Is your company presently involved in any litigation that could impact its financial stability?		

We M/s(name of company) hereby confirm that the above declared information is true. We M/s(name of company) declare that we accept and are in compliance with the requirements stated in the terms of engagement with NHPC.

Authorized Representative of Contractor.

Certificate for compliance of Integrity Pact and Provisions of Contract

[Certificate to be submitted by Contractors on their letter head along with each and every bill (whether running or final)]

“Name of the work:

RA Bill No. (Period) / Final Bill

It is certified that;

1. We, M/s(Name of Contractor) and M/s (Name of approved Sub-Contractor(s), if applicable) have complied with all the provisions of Integrity Pact contained in the contract agreement of the subject work.
2. The work is being / has been carried out as per provisions of the Contract.

Authorized Representative of Contractor.

No. 05/0003/2019-FTS-10937
Government of India
Ministry of Finance
Department of Public Enterprises

Public Enterprises Bhawan,
Block No. 14, CGO Complex,
Lodhi Road, New Delhi-110003.

Dated: 14th December, 2022

OFFICE MEMORANDUM

Subject: Settlement of commercial disputes between Central Public Sector Enterprises (CPSEs) *inter se* and CPSE(s) and Government Department(s)/Organization(s) - Administrative Mechanism for Resolution of CPSEs Disputes (AMRCD).

Whereas guidelines for resolution of commercial disputes between Central Public Sector Enterprises (CPSEs) *inter se* and also between CPSEs and Government Departments/Organizations were issued vide DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22nd May, 2018 followed by clarification dated 4th July, 2018 and 11th July, 2018. These guidelines were further amended vide DPE OM No. DPE-GM-05/0003/2019-FTS-10937 dated 20.02.2020.

2. And whereas a need has been felt to streamline the existing guidelines with a view to consolidate them and institutionalise a better monitoring mechanism for faster resolution of disputes.

Now therefore the Revised Guidelines (in supersession of the aforesaid notifications/Office Memoranda) shall be as follows: -

3. Replacement of PMA and Applicability: -

- 3.1 Permanent Machinery of Arbitration (PMA) stands wound up from the date of issue of DPE OM dated 22-05-2018. All pending cases with Sole Arbitrator, PMA and Appellate Authority stand transferred to concerned administrative Ministries/Departments.
- 3.2 A decentralised 'Administrative Mechanism for Resolution of CPSEs Disputes' (AMRCD) having two level (tier) structures shall replace the erstwhile Permanent Machinery of Arbitration (PMA) mechanism of DPE.

3.3 Any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts *inter se* and also between CPSEs and Government Departments/Organizations (excluding disputes relating to Railways, Income Tax, Customs & Excise Departments), shall be taken up by either party for its resolution through AMRCD only.

3.4 No appeals are to be made to Cabinet Secretary in such matters, including those in which Sole Arbitrator has passed order before the date of notification of AMRCD, unless the resolution of the disputes has been considered at the level of Administrative Ministry / Department as per procedure prescribed below.

4. Procedure and Structure of Committees: -

4.1 At the First level (tier), the disputes shall be arbitrated upon by a Committee comprising of Secretaries of the Administrative Ministries/Departments to which the disputing CPSEs/Parties belong and Secretary, Department of Legal Affairs. In case the two disputing parties belong to the same Ministry/Department, the above said Committee will comprise Secretary of the Administrative Ministry/Department concerned, Secretary, Department of Legal Affairs and Secretary, Department of Public Enterprises. In case of a dispute between CPSE and State Government Department/Organization, the matter shall be arbitrated through a committee comprising Secretary of the Ministry/Department of the Union to which the CPSE belongs, Secretary- Department of Legal Affairs and a Senior Officer (not below the rank of Secretary in the State Government) nominated by the Chief Secretary of the State concerned.

4.2 In case the dispute remains unresolved even after consideration by the above Committee, the same will be referred through DPE at the Second level (tier) to the Cabinet Secretary whose decision will be final and binding on all concerned.

4.3 At the First level (tier), the claiming party (Claimant) will approach the FA of its administrative Ministry/Department for referring the dispute to the DPE through DPE web-portal. The FA of the administrative Ministry/Department of the claimant after initial scrutiny would intimate DPE through DPE web-portal for notification of the constitution of CoS. This may be done within 30 days of the receipt

of the dispute claim. DPE will notify the constitution of the CoS to all members of CoS and FAs of the concerned administrative Ministry/Department within 15 days of receipt of FA's reference. The meetings of CoS will be organized by FA of claimant party and would be held in the Administrative Ministry / Department of the claiming party to examine the facts and resolve the dispute on merit. The FAs of the concerned Administrative Ministries / Departments will represent the issues related to the dispute in question before the above Committee. After arriving at a decision by the Committee, the Secretary of the administrative Ministry / Department of the claiming party will write down the decision and it will be signed jointly by the two Secretaries and Secretary, Department of Legal Affairs. A copy of the decision will be communicated by the Secretary of the administrative Ministry / Department of the claiming party to each party to the dispute for implementation and also uploaded on DPE web-portal (<http://pesurvey.nic.in>).

- 4.4 In case where one party (1st party) to the dispute is a Department /Organization of a State Government, the procedure for admitting the dispute will be the same as above. However, in such cases, all meetings in connection with resolution of the dispute will be held in the Administrative Ministry/Department (Union) of other party (2nd Party) irrespective of the position of the 1st Party whether as a Claimant or Respondent. The presentation of the issues before the above Committee in this case will be done by the FA of the concerned Administrative Ministry/Department and the nominated officer of the State Government Department/Organization.
- 4.5 The CoS at the first level (tier) shall finalise its decision within three months of the constitution of the Committee by DPE.

5. Appeal

- 5.1 Any party aggrieved with the decision of the Committee at the First level (tier) may prefer an appeal before the Cabinet Secretary at the Second level (tier) within 30 days from the date of receipt of decision of the Committee at First level, through its administrative Ministry/Department on DPE web-portal. The appeal should be in the form of a concise self-contained Note which should invariably include the comments / views of the Opposite Party (Respondent) through its administrative Ministry / Department.

5.2 Appeal in reference to resolution of the dispute as per para 5.1 above is to be made to Cabinet Secretary only after exhausting the channel of dispute resolution at the first level (1st tier) of the Committee of Secretaries as per procedure prescribed *ibid*.

5.3 The decision of Cabinet Secretary will be final and binding on all concerned.

6. **Arbitration Clause**

6.1 All CPSEs will ensure inclusion of a clause in all the existing and future commercial contracts between CPSEs, *inter-se* and CPSEs and Government Departments/Organizations as under: -

"In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs) / Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes relating to Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for its resolution through AMRCD as mentioned in DPE OM No. 05/0003/2019-FTS-10937 dated 14th December, 2022 and the decision of AMRCD on the said dispute will be binding on both the parties."

6.2 The on-going contracts shall also be suitably amended accordingly.

7. **Review of Progress:-**

7.1 DPE shall be the single point for capturing all details related to AMRCD cases through its web-portal (<http://pesurvey.nic.in/>). DPE shall also provide secretarial assistance to the Cabinet Secretariat in all matters relate to AMRCD including appeal cases.

7.2 The decision taken by the CoS / Appellate Authority will be implemented by the concerned CPSEs within one month from the date of the decision and action taken would be updated on web portal of DPE.

7.3 A monthly status report of pending cases will be sent to Cabinet Secretariat through DPE web-portal. The FA of the concerned Administrative Ministry / Department of the claimant CPSE will get the position updated by 10th of the following month so that a consolidated report could be sent by 15th of every month to Cabinet Secretariat.

- 7.4 The administrative Ministry of the claimant CPSEs will also report the delay in disposal of the cases beyond the stipulated three months' time in their monthly DO to Cabinet Secretariat with reasons of delay and the likely extended date for final disposal.
8. All the administrative Ministries / Departments concerned with Central Public Sector Enterprises/ Govt. Organisations / Port Trusts etc. are requested to bring these consolidated guidelines to the notice of all CPSEs/organisations under their administrative control for strict compliance of the above guidelines including adhering to the timelines stipulated therein.
9. This issues with the approval of the Competent Authority.


पवनेश कुमार शर्मा/(Pavanesh Kumar Sharma)
निदेशक/ Director
Tel.:011- 24363066

- (i) Secretary of all Ministries / Departments of the Government of India.
(ii) Chief Secretary of all the States and Union Territories.

Copy to:

Chief Executive of all CPSEs for information and necessary compliance.

Copy forwarded for kind information to:

- (i) The Prime Minister's Office, South Block, New Delhi.
(ii) The Cabinet Secretariat, Rashtrapati Bhawan, New Delhi.
(iii) PS to the Minister (Finance), Udyog Bhawan, New Delhi.
(iv) Secretary (DPE), CGO Complex, New Delhi
(v) Secretary (Law), Department of Legal Affairs, Shastri Bhawan, New Delhi.


पवनेश कुमार शर्मा/(Pavanesh Kumar Sharma)
निदेशक/ Director
Tel.:011- 24363066

CONSTRUCTION SCHEDULE
(To be submitted in separate sheet)

Schedule-F

Deleted

CONSTRUCTION METHODOLOGY

(To be submitted in separate sheet)

(Ref: ITB Cl. 5.4)

Schedule-H

Detailed Site Visit Report

The bidder shall submit a report about the site mentioning the brief details of the area. The bidder shall submit detailed write-up alongwith data as sought under various sections of the Bidding Document.

SECTION V

FORMS

Form-1:	Agreement Form
Form-2:	Bank Guarantee format for Earnest Money.
Form-3:	Format of Insurance Surety Bond for Earnest Money.
Form-4:	Bank Guarantee format for Performance Security.
Form-5:	Format of Insurance Surety Bond for Performance Security.
Form-6:	Bank Guarantee format for Advance Payment.
Form-7:	Bank Guarantee format for Release/Payment of Retention Money.
Form-8:	ECS FORM
Form-9	Deleted

FORM-1

AGREEMENT FORM

(To be executed on non-judicial Stamp paper of appropriate value)

AGREEMENT

This agreement is made on _____ day of _____ Two Thousand ----- between the BSUL, registered under the Laws of India and having its registered Office at TC-43/V, Vibhuti Khand, Gomti Nagar, Lucknow, Uttar Pradesh. (hereinafter referred to as the 'Owner' which expression shall unless repugnant to the context or meaning thereof, called the 'Employer' which expression shall unless repugnant to the subject or context include its administrators, successors and assigns) of the one part and M/s _____ registered under the _____ Act and having its principal / registered office at _____ (herein after called "the Contractor" which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the other part.

WHEREAS the Employer is desirous that certain Works should be executed by the Contractor, viz: and has accepted the Bid of the Contractor for the execution and completion of such Works and the remedying of any defects therein at the cost of RS. ----- (Rupees----).

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:
 - a) the Agreement
 - b) the Letter of Acceptance issued by Employer;
 - c) the Special Conditions of Contract (SCC);
 - d) the General Conditions of Contract (GCC);
 - e) the Technical Specifications;
 - f) the Schedule of Quantities and Price(Bill of Quantities);
 - g) the Tender Drawings;
 - h) the Information for Bidder(s)

- i) the Safety Manual.
 - j) any other document forming part of the Contract
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy the defects therein in conformity in all respect in accordance with the provisions of the Contract.
 4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the works and remedying of defects therein the Contract Price or such other sum as may become payable under the provisions of the Contract at the time and in the manner prescribed by the Contract.

In Witness whereof the parties hereto have caused this Agreement to be executed the day and year first before written, at ----- (name of place).

The Common Seal of _____ was hereunto
affixed in the presence of:

For and on behalf of the Contractor

For and on behalf of BSUL

Signature-----

Signature-----

(Designation)-----

(Designation) -----

Place:

Place:

Witnessed by:

Witnessed by:

Name & Address

Name & Address

APPENDICES:

Appendix-1: Terms of Payment

Appendix-2: Time Schedule

Appendix-3: List of Documents for Approval or Review

Appendix-1: Terms of Payment

The total amount of the contract shall be released to the contractor as per the below payment terms on pro-rata basis:

Sl. No.	Events	Percentage Payment
1.	Approval of Drawings	05%
2.	Completion of the Sub Structure / foundation upto plinth level	15%
3.	Completion of Super Structure upto roof level	20%
4.	Completion of Super Structure Roof/Slab work	20%
5.	Interior Fit-out Completion (Furniture & Fixtures)	20%
6.	Miscellaneous & Balance work (drainage, apron, septic tank etc.)	10%
7.	Completion of the facility*, Final Inspection and building ready for occupancy.	05%
8.	Within 60 days from the date of issuance of the Completion certificate	05%

NOTE: Mobilization advance 5% shall be released and recovered as per relevant GCC clauses.

**Completion of the facility shall be as defined in Technical Specifications*

Appendix-2: Time Schedule

1.0 Time for Completion

- a) Completion Period of **EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh** is 350 Days reckoned from the date of issue of Notification of Award.
- b) Duration of Defects liability period -24 Months from the certified date of completion of Project.

2.0 Submission with the Bid:

- a) The Bidder shall furnish the detailed activity wise schedule on Project Management Tools like Primavera or Microsoft Project, considering the above completion period in Bar Chart Form alongwith the offer.
- b) The Schedule shall cover all aspects like ordering, manufacturing and delivery and construction.

Appendix 3. List of Documents for Approval or Review

Pursuant to GCC Sub-Clause 15.3.1, the Contractor shall prepare, and present to the Engineer in charge in accordance with the requirements of GCC Sub-Clause 14.2 for approval of Employer/Engineer in charge, the following documents for

A. Approval

1. Drawings / documents in respect of various activities as per Technical Specifications.
2. QAP of Equipment / Materials as per Technical Specifications
3. Construction Methodology for execution of work as per Technical Specifications
4. Detailed Data Sheet of Equipment/ Materials as per Technical Specifications.
5. Test Certificates of Equipment / Materials as per Technical Specifications.
6. Any other document mutually agreed between Employer and Contractor within the Scope of Work.

B. Review / Information

1. Drawings/ documents in respect of various equipment as per as per Technical Specifications
2. Any other documents desired by the Employer /Engineer in charge within the Scope of Work.

FORM-2

Bank Guarantee Format for Earnest Money

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Date: _____

(Name of Contract)

To:

General Manager (Civil Contracts-I)
Room No. 218, 2nd Floor, Jyoti Sadan,
NHPC OFFICE COMPLEX,
Sector-33, Faridabad-121003, Haryana, India

WHEREAS (name of Bidder) (hereinafter called "the Bidder") has submitted its Bid dated (date of bid) for the performance of the above named Contract (hereinafter called "the Bid")

KNOW ALL PERSONS by these present that We (name of Bank) of (address of bank) (hereinafter called "the Bank"), are bound unto NHPC Limited (a Govt. of India Enterprises) (hereinafter called "the Employer") for the sum of: (amount), for which payment well and truly to be made to the NHPC Limited, the Bank binds itself, its successors and assigns by these presents.

THE CONDITIONS of this obligation are as follows:

1. If the Bidder (a) withdraws or modifies its Bid during the period of bid validity, or (b) adopts corrupt or collusive or coercive or fraudulent practices or defaults under Integrity Pact.
2. If the Bidder, having been notified of the acceptance of its Bid by NHPC during the period of bid validity.
 - a) fails or refuses to sign the Contract Agreement when required, or
 - b) fails or refuses to submit the performance security in accordance with the Tender Documents.

We undertake to pay to the NHPC up to the above amount upon receipt of its first written demand, without the NHPC having to substantiate its demand, provided that in its demand the NHPC will mention that the amount claimed by it is due, owing to the occurrence of one or both of the two above-named CONDITIONS, and specifying the occurred condition or conditions.

The Bank declares that this Bank Guarantee is issued by the Bank, utilizing the credit limit of M/s (name of contractor).

This guarantee will remain in force up to and including (date 90 days after the period of bid validity), and any demand in respect thereof must reach the Bank not later than the above date.

For and on behalf of the Bank

in the capacity of

Common Seal of the Bank with complete address including Tel./fax. Nos.

Staff Authority No. of the officer of the Bank/Signatory

INSTRUCTIONS FOR EXECUTION OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

1. Bank Guarantee for Earnest Money Deposit should be executed on non-judicial Stamp papers of requisite value in accordance with the stamp Act if applicable to that particular state of Indian Union country of executing Bank, where executed. In case the same is issued by a first class International bank, the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Bank Guarantee. However, in such a case, the Bank Guarantee for Earnest Money Deposit shall be got confirmed by the Bidder through any Indian Scheduled/Nationalized Bank.
2. The executing officers of the Bank Guarantee for Earnest Money/Bid Security shall clearly indicate in (block letters) his name, designation, Power of Attorney No. / Signing Power No. as well as telephone/ fax numbers with full correspondence address of the issuing Guarantee etc.
3. Each page of the Bank guarantee for Earnest Money Deposit shall be duly signed/initialed by the executing officers and the last page shall be signed in full, indicating the particulars as aforesaid (sub-para 2) under the seal of the Bank.
4. Stamp paper shall be purchased in the name of Bank issuing the Bank Guarantee, after the date 'Notice Inviting Tender', not more than six (6) months prior to execution/ issuance of the Bank Guarantee. The name of the purchaser should appear at the back side of stamp paper in the

Vendors Stamp. The issuing Bank shall be requested independently for verification/confirmation of the Bank Guarantee issued, non-confirmation of which may lead to rejection of 'Bid Security'.

5. Irrevocable, valid and fully enforceable Bank Guarantee in favor of the employer (Name of Employer) issued by any scheduled bank approved by the Reserve bank of India which is acceptable to the Employer. The Bank Guarantee issued by a Foreign Bank shall be routed through the corresponding branch of such scheduled foreign banks in India or any scheduled Bank, acceptable to the employer.
6. Bank Guarantee for Bid security in original shall be submitted along with the Bid. However, the issuing Bank shall submit an unstamped duplicate copy of Bank Guarantee directly by registered post (A.D.) to the Employer (authority inviting tenders) with a forwarding letter.

FORM-3

Format of Insurance Surety Bond for Earnest Money Deposit

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Insurance Surety Bond No.....

Date:_____

(Name of Contract)

To:

General Manager (Civil Contracts-I)
Room No. 218, 2nd Floor, Jyoti Sadan,
NHPC OFFICE COMPLEX,
Sector-33, Faridabad-121003, Haryana, India

WHEREAS (name of Bidder) (hereinafter called "the Bidder") has submitted its Bid dated (date of bid) for the performance of the above named Contract (hereinafter called "the Bid")

KNOW ALL PERSONS by these present that We (name of Insurance Company) of (address of Insurance Company) (hereinafter called "the Surety"), are bound unto NHPC Limited (a Govt. of India Enterprises) for the sum of (amount), for which payment well and truly to be made to the NHPC Limited, the Surety binds itself, its successors and assigns by these presents.

THE CONDITIONS of this obligation are as follows:

1. If the Bidder (a) withdraws or modifies its Bid during the period of bid validity, or (b) adopts corrupt or collusive or coercive or fraudulent practices or defaults under Integrity Pact.
2. If the Bidder, having been notified of the acceptance of its Bid by NHPC during the period of bid validity.
 - a. fails or refuses to sign the Contract Agreement when required, or
 - b. fails or refuses to submit the performance security in accordance with the Tender Documents.

We undertake to pay to NHPC up to the above amount upon receipt of its first written demand, without NHPC having to substantiate its demand, provided that in its demand NHPC will mention that the amount claimed by it is due, owing to the occurrence of one or both of the two above-named CONDITIONS, and specifying the occurred condition or conditions.

The Surety declares that this Insurance Surety Bond is issued by the (name of Insurance Company) as per the applicable rules and regulations of Insurance Regulatory Development Authority of India (IRDAI).

This Insurance Surety Bond will remain in force up to and including (date 90 days after the period of bid validity), and any demand in respect thereof must reach the Surety not later than the above date.

For and on behalf of the Insurance Company

in the capacity of

Common Seal of the Insurance Company with complete address including Tel. Nos. / e-Mail Id.

Staff Authority No. of the officer of the Insurance Company /Signatory

INSTRUCTIONS FOR EXECUTION OF INSURANCE SURETY BOND FOR EARNEST MONEY DEPOSIT

1. Insurance Surety Bond for Earnest Money Deposit should be executed on non-judicial Stamp papers of requisite value in accordance with the stamp Act if applicable to that particular state of Indian Union country of executing Insurance Company, where executed. In case the same is issued by an International Insurance Company (it should be registered under Insurance Act 1938 or as amended from time to time and approved by the Insurance Regulatory Development Authority of India (IRDAI)) the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Insurance Surety Bond. However, in such a case, the Insurance Surety Bond for Earnest Money Deposit shall be got confirmed by the Bidder through any Indian Scheduled/Nationalized Insurance Company.
2. The executing officers of the Insurance Surety Bond for Earnest Money/Bid Security shall clearly indicate in (block letters) his name, designation, Power of Attorney No. / Signing Power No. as well as telephone/ fax numbers with full correspondence address of the issuing Guarantee etc.
3. Each page of the Insurance Surety Bond for Earnest Money Deposit shall be duly signed/initialed by the executing officers and the last page shall be signed in full, indicating the particulars as aforesaid (sub-para 2) under the seal of the Insurance Company.
4. Stamp paper shall be purchased in the name of Insurance Company issuing the Insurance Surety Bond, after the date 'Notice Inviting Tender', not more than six (6) months prior to execution/ issuance of the Insurance Surety Bond. The name of the purchaser should appear at the back side of stamp paper in the Vendors Stamp. The issuing Insurance Company shall be requested independently for verification/confirmation of the Insurance Surety Bond issued, non-confirmation of which may lead to rejection of 'Insurance Surety Bond'.

6. Irrevocable, valid and fully enforceable Insurance Surety Bond in favor of the Employer (Name of Employer) issued by any Insurance Company registered under Insurance Act 1938 or as amended from time to time and approved by the Insurance Regulatory Development Authority of India (IRDAI) in Indian currency (INR) only is acceptable to the Employer.
6. Insurance Surety Bond for Bid security in original shall be submitted along with the Bid. However, the issuing Insurance Company shall submit an unstamped duplicate copy of Insurance Surety Bond directly by registered post (A.D.) to the Employer (authority inviting tenders) with a forwarding letter.

FORM-4

BANK GUARANTEE FORMAT FOR PERFORMANCE SECURITY

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Bank Guarantee No.....

Date.....

To,

[Employer's Name & Address]

Dear Sirs,

In consideration of the ... *[Employer's Name]*..... (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s*[Contractor's Name]*..... with its Registered/Head Office at (hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Employer's Letter of Acceptance No..... dated..... and the same having been acknowledged by the contractor, for ----- *[Contract sum in figures and words]* for*[Name of the work]* and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to(*).....of the said value of the aforesaid work under the Contract to the Employer.

We*[Name & Address of the Bank]*.....having its Head Office at.....(hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any and all monies payable by the Contractor to the extent of(*)..... as aforesaid at any time upto(@)..... *[days/month/year]* without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantees herein contained shall continue to be enforceable till the Employer discharges this guarantee or till(+)..... *[days/month/year]* whichever is earlier.

The Employer shall have the fullest liberty, without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the

Contractor. The Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving the Bank.

The Bank declares that this Bank Guarantee is issued by the Bank, utilizing the credit limit of M/s(name of contractor) and also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Employer may have in relation to the Contractor's liabilities.

- i) Our liability under this Bank Guarantee shall not exceed _____(*)_____.
- ii) This Bank Guarantee shall be valid upto _____(+)_____.
- iii) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if Employer serves upon Bank a written claim or demand on or before (@)_____

Dated this day of 20_.....at.....

WITNESS

..... (Signature).....

(Signature)

.....

(Name)

(Name).....

.....

(Official Address)

.....

(Designation with Bank Stamp)/with staff Authority no.

Complete Address of the Bank with Tele-Fax

Notes: 1. (*) This sum shall be two percent (2%) of the Contract Price denominated in the types and proportions of currencies.

(@) This date will be Ninety (90) days beyond the issue of Defects liability Certificate as specified in the Contract.

(+) This date will be the date of issue of Defects Liability Certificate.

2. Bank Guarantee should be executed on appropriate stamp paper of requisite value, such stamp paper should be purchased in the name of Issuing Bank, not more than six (6) months prior to execution / issuance of Bank Guarantee. The name of the purchaser should appear at the back side of stamp paper in the Vendors Stamp. Bank guarantee should contain rubber stamp of the authorized signatory of the bank indicating the name, designation and signature/ power of attorney number as well as telephone/ fax numbers with full correspondence address of the Bank.

In case the same is issued by a first class International Bank, the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Bank Guarantee. However, in such a case, the bank Guarantee shall be got confirmed through any Indian Scheduled/Nationalized Bank.

3. Bank Guarantee is required to be submitted directly to the Employer by the issuing bank (on behalf of Contractor) under registered post (A.D.). The Contractor can submit an advance copy of Bank Guarantee to the Engineer.
4. The issuing bank shall write the name of bank's controlling branch/ Head Office along with contact details like telephone/ fax and full correspondence address in order to get the confirmation of BG from that branch/ Head office, if so required.

FORM-5

FORMAT OF INSURANCE SURETY BOND FOR PERFORMANCE SECURITY

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Insurance Surety Bond No.....

Date.....

To,

[Employer's Name & Address]

Dear Sirs,

In consideration of the ... *[Employer's Name]*..... (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s*[Contractor's Name]*..... with its Registered/Head Office at (hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Employer's Letter of Acceptance No..... dated..... and the same having been acknowledged by the contractor, for ----- *[Contract sum in figures and words]* for*[Name of the work]* and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to(*).....of the said value of the aforesaid work under the Contract to the Employer.

We*[Name & Address of the Insurance Company]*.....having its Head Office at.....(hereinafter referred to as the 'Surety, which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any and all monies payable by the Contractor to the extent of(*)..... as aforesaid at any time upto(@)..... *[days/month/year]* without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the Insurance Company shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Surety undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantees herein contained shall continue to be enforceable till the Employer discharges this guarantee or till(+)..... *[days/month/year]* whichever is earlier.

The Employer shall have the fullest liberty, without affecting in any way the liability of the Insurance Company under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to

enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Insurance Company shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under the law would, but for this provision have the effect of relieving the Insurance Company.

The Surety declares that this Insurance Surety Bond is issued by the(Name of Insurance Company)as per the applicable rules and regulations of Insurance Regulatory Development Authority of India (IRDAI) and also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Insurance Company as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Employer may have in relation to the Contractor's liabilities.

- i) Our liability under this Insurance Surety Bond shall not exceed _____(*)_____.
- iii) This Insurance Surety Bond shall be valid upto _____(+)_____.
- iii) We are liable to pay the guaranteed amount or any part thereof under this Insurance Surety Bond only and only if Employer serves upon Surety a written claim or demand on or before (@)_____

Dated this day of 20_.....at.....

WITNESS

..... (Signature).....

(Signature)

.....

(Name)

(Name).....

.....

(Official Address)

.....

(Designation with Stamp of Insurance Company)/with staff Authority no.

Complete Address of the Insurance Company with Telephone No. and e-Mail Id.

Notes: 1. (*) This sum shall be two percent (2%) of the Contract Price denominated in the Indian currency.

(@) This date will be Ninety (90) days beyond the issue of Defects liability Certificate as specified in the Contract.

(+) This date will be the date of issue of Defects Liability Certificate.

2. Insurance Surety Bond should be executed on appropriate stamp paper of requisite value, such stamp paper should be purchased in the name of Issuing Insurance Company, not more than six (6) months prior to execution / issuance of Insurance Surety Bond. The name of the purchaser should appear at the back side of stamp paper in the Vendors Stamp. Insurance Surety Bond should contain rubber stamp of the authorized signatory of the Insurance Company indicating the name, designation and signature/ power of attorney number as well as telephone numbers / e-Mail Id with full correspondence address of the Insurance Company.

In case the same is issued by an International Insurance Company (it should be registered under Insurance Act 1938 or as amended from time to time and approved by the Insurance Regulatory Development Authority of India (IRDAI)), the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Insurance Surety Bond. However, in such a case, the Insurance Surety Bond shall be got confirmed through any Indian Scheduled/Nationalized Insurance Company.

5. Insurance Surety Bond is required to be submitted directly to the Employer by the issuing Insurance Company (on behalf of Contractor) under registered post (A.D.). The Contractor can submit an advance copy of Insurance Surety Bond to the Engineer.
6. The issuing Insurance Company shall write the name of Insurance Company's controlling branch/ Head Office along with contact details like telephone no., e-Mail Id and full correspondence address in order to get the confirmation of Insurance Surety Bond from that branch/ Head office, if so required.

FORM-6

BANK GUARANTEE FORMAT FOR ADVANCE PAYMENT

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Bank Guarantee No.....

Date.....

To,

[Employer's Name & Address]

Dear Sir,

In consideration of the *[Employer's Name]*..... (hereinafter referred to as the 'Employer', which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s.....*[Contractor's Name]*..... with its Registered/Head Office at (hereinafter referred to as the 'Contractor' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract, by issue of Employer's Letter of Acceptance No. dated and the same having been acknowledged by the Contractor, resulting into a Contract bearing No. dated.....valued at.....for*[Name of Contract]*(hereinafter called the 'Contract') and the Employer having agreed to make an advance payment to the Contractor for performance of the above Contract amounting (in words and figures) as an Advance against Bank Guarantee to be furnished by the Contractor.

We.....*[Name and address of the Bank]*..... having its Head Office at (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, immediately on demand any or, all monies payable by the Contractor to the extent of*[advance amount]*..... as aforesaid at any time upto(@)..... without any demur, reservation, contest, recourse or protest and/ or without any reference to the Contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Employer discharges this guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time to vary the advance or to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner,

and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The Bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision have the effect of relieving the Bank.

The Bank declares that this Bank Guarantee is issued by the Bank, utilizing the credit limit of M/s(name of contractor) and also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

Notwithstanding anything contained herein:

- i) Our liability under this Bank Guarantee shall not exceed._____.
- ii) This Bank Guarantee shall be valid upto _____.
- iii) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if Employer serve upon Bank a written claim or demand on or before (@)_____

Dated this day of at

WITNESS

..... (Signature).....

(Signature)

..... (Name).....

(Name)

..... (Official Address)

(Designation with Bank Stamp)/Staff Authority No.

Complete Address of the Bank with Tele-Fax

Dated.....

- Notes:**1. (@) This date shall be ninety (90) days beyond the date of Completion of the Works.
2. Bank Guarantee should be executed on appropriate stamp paper of requisite value, such stamp paper should be purchased in the name of Issuing Bank, not more than six (6) months prior to execution / issuance of Bank Guarantee. The name of the purchaser should appear at the back side of stamp paper in the Vendors Stamp. Bank guarantee should contain rubber stamp of the authorized signatory of the bank indicating the name, designation and signature/ power of attorney number as well as telephone/ fax numbers with full correspondence address of the Bank.
- In case the same is issued by a first class International Bank, the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Bank Guarantee. However, in such a case, the bank Guarantee shall be got confirmed through any Indian Scheduled/Nationalized Bank.
3. Bank Guarantee is required to be submitted directly to the Employer by the issuing bank (on behalf of Contractor) under registered post (A.D.). The Contractor can submit an advance copy of Bank Guarantee to the Engineer.
4. The issuing bank shall write the name of bank's controlling branch/ Head Office along with contact details like telephone/ fax and full correspondence address in order to get the confirmation of BG from that branch/ Head office, if so required.

FORM-7

BANK GUARANTEE FORM FOR RELEASE / PAYMENT OF RETENTION MONEY

(To be executed on Non-Judicial Stamp Paper of Appropriate value)

Bank Guarantee No.....

Date.....

To,

[Employer's Name & Address]

1. We.....*[Name and address of the Bank]* having our Registered/Head Office at (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby undertake and agree to indemnify and keep indemnified the.....*[Employer's Name]* (hereinafter referred to as "the Employer " which expression shall, unless repugnant to the subject or context, include its administrators, successors and assigns), to the extent of*[amount]*..... on behalf of M/s.....*[Contractor's Name]*..... with its Registered/Head Office at (hereinafter referred to as "the Contractor) in lieu of an equal cash amount of Retention Money deposited by the Contractor and/or deducted by the Employer from the bills of the Contractor and which the Employer has agreed to substitute with a bank guarantee as hereunder, under the provisions of Contract No.....dt. which the Contractor has entered into with the Employer in connection with the construction of..... (*Name of Work*) at a total cost of..... (*Contract Sum*) (hereinafter called the `Contract').
2. We, the Bank also do hereby agree to pay unequivocally and unconditionally immediately on demand, in writing, from the Employer, of any amount upto and not exceeding*[amount]*..... to the Employer for any purpose or cause or on any account whatsoever under the provisions of the Contract in which respect the decision of the Employer shall be final and binding on us.
3. We, the Bank, further agree that this guarantee shall be valid and binding on us upto and including(@).....and shall not be terminable by notice or any change in the constitution of the said Bank or the Contractor or by any other reasons whatsoever and our liability hereunder shall not be

impaired or discharged by any extension of time or variations made, given conceded, or agreed with or without our knowledge or consent, by or between the parties to the Contract.

4. We also undertake not to revoke this guarantee during its currency except with the previous consent, in writing, of the Employer.
5. Our liability under this guarantee is restricted to *[amount]*..... Our guarantee shall remain in force until(@)
6. The Bank declares that this Bank Guarantee is issued by the Bank, utilizing the credit limit of M/s(name of contractor) and also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Employer may have in relation to the Contractor's liabilities

In the presence of

Witness

For and on behalf of the Bank with Staff Authority No.

.....

Bank's common seal with complete address including
Tel./fax. Nos.

Dated this.....day of 20

Notes:

1. (@) This date will be Ninety (90) days beyond the issue of Defects liability Certificate as specified in the Contract.
2. Bank Guarantee should be executed on appropriate stamp paper of requisite value, such stamp paper should be purchased in the name of Issuing Bank, not more than six (6) months prior to execution / issuance of Bank Guarantee. The name of the purchaser should appear at the back side of stamp paper in the Vendors Stamp. Bank guarantee should contain rubber stamp of the

authorized signatory of the bank indicating the name, designation and signature/ power of attorney number as well as telephone/ fax numbers with full correspondence address of the Bank.

In case the same is issued by a first class International Bank, the law prevalent in the country of execution shall prevail for the purpose of Stamp Duty on the Bank Guarantee. However, in such a case, the bank Guarantee shall be got confirmed through any Indian Scheduled/Nationalized Bank.

3. Bank Guarantee is required to be submitted directly to the Engineer by the issuing bank (on behalf of Contractor) under registered post (A.D.). The Contractor can submit an advance copy of Bank Guarantee to the Engineer.
4. The issuing bank shall write the name of bank's controlling branch/ Head Office along with contact details like telephone/ fax and full correspondence address in order to get the confirmation of BG from that branch/ Head office, if so required.

FORM-8

ECS

N.H.P.C. Limited.

ELECTRONIC CLEARING SERVICE (CREDIT CLEARING)
(PAYMENT TO PARTIES THROUGH CREDIT CLEARING MECHANISM)

No. :

1. BIDDER'S NAME	:	_____
Address	:	_____ _____
Phone/Mobile No.	:	_____
2. PERTICULARS OF BANK ACCOUNT	:	_____
A. BANK NAME	:	_____
B. BRANCH NAME	:	_____
Address	:	_____
Telephone No.	:	_____
C. IFSC code of the Bank	:	_____
(For payments through RTGS)		
D. ACCOUNT TYPE	:	_____
(S.B. Account/Current Account or Cash Credit with Code 10/11/13)		
E. ACCOUNT NUMBER	:	_____
(As appearing on the Cheque Book)		

I hereby declared that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold the user Company responsible.

Date: _____ (.....)
Signature of the Bidder

Certified that the particulars furnished above are correct as per our records.

(Bank's Stamp) _____ (.....)
Signature of the Authorised
Date: _____ Official from the Bank

FORM-9

Deleted

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SECTION-VI

SPECIAL CONDITIONS OF CONTRACT (SCC)

SPECIAL CONDITIONS OF CONTRACT

1.0 INTRODUCTION

The following special conditions shall be read in conjunction with the corresponding relevant provisions made in the General Conditions of Contract and in case of any discrepancy or variation or contradiction between them, the provisions made under these Special Conditions of Contract, shall prevail.

Special Conditions of Contract

1. The Bidder shall visit the site and apprise himself with existing site conditions.
2. List of non-encumbered land in the possession of the Owner will be provided to the Bidder.
3. BSUL will provide the topographical survey map and Gata/Khasara/Survey number (as per revenue record) of land site.
4. Any Liaison work will be in the scope of the bidder, BSUL will provide possible assistance.
5. All works related to site clearance including removal of bushes, trees, required grading etc. and other additional works shall be carried out by the Contractor.
6. Any additional work incurred by the bidder during the execution of the contract due to the reasons not attributable to the Owner, including but limited to, design changes, layout changes, etc shall be executed by the Bidder at its own expense.
7. Construction of drainage system wherever required for safe draining of water along the roads till the draining point will be in the scope of the bidder.
8. Payments shall be released inline with Payment terms of contract as per approved Bill break-up. On award of works, Engineer-in-charge shall be approving authority of Bill breakup.
9. Adequate Garbage collection facility should be in scope of bidder.
10. All the construction work should be executed in line with scope of work and technical specification of the contract.
11. There shall not be any deviation in the contract price for the scope of the work.

SECTION-VII

SCHEDULE-A

SCHEDULE OF QUANTITIES AND PRICES (BILL OF QUANTITIES)

Validate

Print

Help

Item Rate BoQ

Tender Inviting Authority: General Manager (CC-I), Contracts Civil Division, NHPC Ltd, Corporate Office Faridabad, Haryana.

Name of Work: EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh

Tender Reference No: NH/CCW/CC-I/CO-367/BSUL/PR/JSP/2024-25/383

Tender ID: 2025_NHPC_849250_1

Name of the Bidder/ Bidding Firm / Company :						
<u>PRICE SCHEDULE</u>						
(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)						
Notes:						
1. All payments/invoices shall be as per the actual quantities and not as per the indicative Tender quantities.						
NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	RATE (including taxes) In Figures To be entered by the Bidder in Rs. P	TOTAL AMOUNT With Taxes in Rs. P	TOTAL AMOUNT In Words
1	2	3	4	5	6	7
1	Development of Solar Park Common infrastructure such as Admin building, Guest house, Canteen building, Security building as per Technical specification for Jalaun 1200MW Solar Park	1.00	Lump sum		0.00	INR Zero Only
Total in Figures					0.00	INR Zero Only
Quoted Rate in Words		INR Zero Only				

SECTION-VIII

TECHNICAL SPECIFICATION AND SAFETY MANUAL

Contents

Section - A

General Technical Requirements	
1. PROJECT INFORMATION	
2. SCOPE OF WORK AND SERVICES	
3. SUBMISSION OF DOCUMENTS TO THE OWNER AFTER AWARD OF CONTRACT.....	
4. DESIGN BASIS.....	
5 HANDING OVER AND TAKING OVER	
6 TRAINING	
7 TIME FOR COMMENCEMENT AND COMPLETION	
8 EMPLOYER'S RESPONSIBILITIES	
9 WORK PROGRAM	
10 TRANSPORTATION	
11 DELETED	
12 INSTALLATION	
13 GENERAL CONDITION FOR TEST AND INSPECTION	
14 COMPLETION OF FACILITIES	
15 COMMISSIONING AND OPERATIONAL ACCEPTANCE	
16 WORK HEALTH AND SAFETY	
17 DELETED	
Annexure A - Project Information.....	
Annexure B - Tentative Bill of Quantity.....	
Annexure C - List of Drawings.....	

Section - B

Detailed Technical Requirements	
18 ARCHITECTURAL, CIVIL & STRUCTURAL WORKS.....	
19 EARTHING AND LIGHTNING PROTECTION SYSTEM.....	
20 ILLUMINATION SYSTEM	
21 LT SWITCHGEAR & DISTRIBUTION BOARDS	
22 AIR CONDITION AND VENTILATION SYSTEM	
23 FIRE DETECTION AND PROTECTION SYSTEM	
24 SURVEILLANCE AND SECURITY SYSTEM	
25 MISCELLANEOUS ITEMS	

SECTION - A

General Technical Requirements

(Hereinafter M/s BSUL is referred as Owner/Employer/Purchaser/ Client)

1. Project Information

1.1 Introduction

- 1.1.1 Bundelkhand Saur Urja Limited (BSUL) intends to implement a 1200 MW Solar Power Park in Jalaun district as an outcome of developing the renewable energy penetration in the country.
- 1.1.2 The 1200 MW Jalaun Solar Park shall be administrated by M/s BSUL personnels in the Madhogarh Location. For that purpose, the common area infrastructure development package shall be developed on Madhogarh.
- 1.1.3 The 1200MW Jalaun Solar Park project shall be executed in Two phases of each 600 MW. This specification is intended to provide the requirements of common infrastructure development.
- 1.1.4 This technical specification is for development of Solar Park Infrastructure consisting of admin building, staff quarters/guest house, security building, canteen and building mechanical, electrical, and plumbing systems, surveillance and access, illumination, etc as described in detail in this specification.
- 1.1.5 This bidder shall provide all the common infrastructure facilities such as administrative building, canteen building, guest house, and other facilities such as Surveillance system, Ventilation system, Water and power supply system for the common infrastructure facilities.
- 1.1.6 The entire project shall be implemented on lump sum turnkey basis under "Engineering Procurement and Construction" (Contractor) mode by the Successful bidder and allotted plot is free of charge to the bidder. The scope and service of bidder shall be referred in other clause of this specification.
- 1.1.7 Contractor shall visit the site before participation in the bid. The Contractor shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site-specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.
- 1.1.8 Bidder must comply with all the statutory requirements. The Contractor's work shall cover complete requirements as per IS codes, fire safety norms, requirements of various statutory bodies, International Standards, best prevailing practices and to the complete satisfaction of the Owner / Owner's Engineer.
- 1.1.9 The following clearances shall be arranged by bidder. However, necessary documentations/applications shall be in the name of M/s BSUL
 - a. Water Requirement during construction
 - b. Power Requirement during construction
 - c. Chief Electrical Inspector clearance

2. Scope of Work and Services

2.1 Intent of Specification

- 2.1.1 This specification covers requirements of common infrastructure for the Solar Park
- 2.1.2 The work to be performed under this contract consists of design, engineering and providing all labour, materials, consumables, equipment, temporary works, temporary storage sheds, temporary colony for labour and staff, temporary site offices, constructional plants, fuel supply, transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of roads and drainages, all in strict accordance with the specifications including revisions and amendments thereto as may be required during the execution of work.
- 2.1.3 This specification covers the scope requirements of Design, Engineering, Supply, Construction, Erection, Testing and commissioning of Security Building, Civil works (Administrative Building, Canteen Building, Guest House and other common facilities), IT infrastructure, Surveillance system and power supply system for the common infrastructure facilities for Madhogarh Location. Bidders shall ensure efficient and trouble-free operation of the equipment/system supplied by the bidder.
- 2.1.4 The scope shall also include setting up by the Contractor a complete testing laboratory in the field to carry out all relevant tests required for the Works.
- 2.1.5 This specifications document is not exhaustive, and the Contractor shall be responsible not only for the requirements specified herein but for the correct choice of materials, for proper fabrication and for the conformity to codes, regulations and legal requirements and for supplying all the documentation of these materials. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous safety operation and commercial operation up to agreed guarantee.
- 2.1.6 The Contractor shall make the layout and levels of all structures from the general grid of the plot and the nearest GSI benchmark or other acceptable benchmark of Govt. dept. as per the directions of the Owner / Owner's Engineer. The Contractor shall be solely responsible for the correctness of the layout and levels and shall also provide necessary instruments, materials, access to works, etc., to the Owner
/ Owner's Engineer for general checking of the correctness of the works.
- 2.1.7 The Contractor shall obtain approval of Civil drawings from concerned authorities before taking up the construction work.
- 2.1.8 The general terms and conditions, instruction to Bidders and other attachments referred to elsewhere be hereby made part of the technical specification. Bidder's offer shall conform to all requirements stipulated in the specification.
- 2.1.9 Any item(s) not included in the specification / schedule but required for completion of the

work shall have to be carried out/supplied without any extra cost. Such works, not listed in the schedule of works but elaborately described to perform or to facilitate particular operation(s) required for completion of the project shall be deemed to have been included in the scope of this work and the Contractor shall supply, install the same without any extra cost to BSUL.

- 2.1.10 Supplies and services shall be rendered in conformity with proven design principles, considering the current technology. The requirements of the contract must be fulfilled in its entirety. The supplies and services shall be rendered inclusive of all appliances and interconnecting arrangements with other supplies, necessary for installation of all accessories, needed for proper and reliable continuous operation and for satisfactory maintenance and repair. It is not the intent to completely specify all the details of design, construction and installation herein.
- 2.1.11 The work to be carried out shall be all in accordance with the requirements, conditions, appendices etc. given in Technical Specifications together with those stated in other Parts/ Sub-Parts/tender drawings of Bid Documents which shall be considered as a part of this volume as completely as if bound herewith.
- 2.1.12 Bidders are requested to carefully examine and understand the specifications and seek clarifications, if required, to ensure that they have understood the specifications. Such clarifications should be sought within a specific time period. Bidder's offer should not carry any parts like clarifications, interpretations and/or assumptions. However, if the bidder feels that, in his opinion, certain features brought out in his offer are superior to what has been specified, these may be highlighted separately.
- 2.1.13 In case of any conflicts / contradiction among various clauses / Parts / Appendix / Annexure/chapters / appendices / tender drawings of bid documents, the most stringent requirement shall govern; decision of the Owner (BSUL) shall always be final & binding on the Bidder/Successful bidder. No extra claims shall be allowed on this account.
- 2.1.14 Bidder shall furnish all relevant data required by the Owner, at interface points within schedule as required. Further, the scope shall also include submission, in proper shape & format, of all types of manuals, handbooks & documents in requisite numbers to the Owner at different phases of the project as per the requirement of Owner.
- 2.1.15 The bidder shall be responsible for providing all materials, equipment and services, specified or otherwise which are required to fulfil the intent of ensuring operability, maintainability, and reliability of the total work covered under this specification within his quoted price. This work shall be consistent with modern practice and shall be in compliance with all applicable codes, standards, guides, statutory regulations and safety requirements in force on the date of award of this contract.
- 2.1.16 The Bidder shall furnish as per Data Requirements, Schedules and other applicable sections, full

details regarding all equipment and systems including complete Bill of Materials, Design basis & aspects, drawings, data, information, technical literature and other details required to fully establish the capability and performance of the equipment and systems offered by him. Any bid not containing sufficient details to fully describe the equipment and systems offered or sufficient details regarding past experience for meeting the qualifying requirements may be treated as non-responsive and hence rejected.

- 2.1.17 The drawings enclosed with the specification are indicating the minimum requirement and all bidders shall comply with it. Any further improvement required during detailed engineering and execution shall also be implemented by bidder. Bidder shall confirm that the type, make, model of all bought out items supplied by the bidder under the specification shall be subject to the approval of the Owner during detailed engineering stage.
- 2.1.18 A monthly Co-Ordination meeting with all stake holders of the project, mainly BSUL, Common Infrastructure package contractor, Solar Park developer contractor and Solar plant contractors will be conducted. Contractors must participate in this meeting.

2.2 Scope of Work and Services

- 2.2.1 The scope of work involves creation of the Administration Block along with the security buildings and other facilities. Administration Block consists of Administration Building, Canteen Building, Guest House.
- 2.2.2 The scope of work covers design, engineering, supply of all materials, construction, fabrication / assembly, and testing at works, packing / dispatch / loading / unloading and transportation (including internal transportation and material handling at site) to site (including transit insurance) and erection of the following
- a. Site investigations- Topographic survey, Geotechnical investigation and electrical soil resistivity measurements
 - b. Site grading including slope protection and stabilization, filling/levelling (If required) of the allotted plot. Site preparation works including cutting, clearing, transporting and disposal of bushes and other vegetation, roots.
 - c. Compound wall and Gates
 - d. Parking
 - e. Security Cabins (10 numbers)
 - f. Administration Building.
 - g. Canteen Building
 - h. Guest House
 - i. Common Area Illumination system
 - j. Solar Park surveillance system
 - k. Fire detection and Protection System
 - l. HVAC for buildings

- m. Potable water supply system (including borewells)
- n. Septic Tanks and soak pits
- o. Other common facilities
- p. Any other miscellaneous works as required for the complete project.

The work also includes

- Design and preparation of working drawings (Civil and Structural), fabrication drawings, excavation drawings, shuttering drawings, bar bending schedule drawing and construction of all structures as applicable.
- Preparation of as built drawings of all structures and facilities to reflect as built status of construction AutoCAD latest version in CD / DVD and hard copies.
- Air-conditioning & ventilation system for the buildings
- Fire detection and protection system
- Plumbing & sanitary works
- Painting of all applicable works
- Anti-termite treatment for all buildings.
- Handing over of complete facilities to the satisfaction of Owner/Employer.
- The office cabins with IT infrastructure for Administration Building shall be in bidder's scope.
- All statutory clearances / NOC required for implementation of the project from various departments / agencies shall be obtained by the Contractor.
- The Contractor shall fill or excavate or blast the areas to the required formation levels and dispose the excavated materials as directed by the Owner/Employer.
- Cable trays for Telecom, SURVEILLANCE, Data and Communication & IT system shall be in Contractor scope.
- All statutory clearances / NOC required for implementation of the project from various departments/agencies like PWD, Highways, local bodies etc, shall be obtained by the Contractor. However necessary Authentication letter will be provided by Owner.

2.2.3 Preparation of drawings and design calculations, single line diagram, electrical layout.

2.2.4 Necessary test and survey required for design of solar park is also in the scope of the bidder.

2.2.5 IP cameras system is required for effective park surveillance. Continuous visual monitoring of the common area facilities and the surveillance system shall be able to monitor all over the solar park area, as well as create tamperproof record for post event analysis. The IP cameras is to be linked with surveillance monitoring system of Solar Park main surveillance placed in the Administration building. The SURVEILLANCE equipment mainly server shall be located in the Main control building or Administration building of solar park as per Owner's advice.

2.2.6 Any other equipment / items / civil and structural works, which is not specifically mentioned in the specification, but which are required for successful erection, testing, commissioning and

satisfactory operation and maintenance of the park in all respects consistent with the best engineering practices are deemed to be included in the scope.

2.2.7 The scope of supply shall also include the following:

- a. First fill of consumables, If any
- b. Spare parts required for successful commissioning of electrical installations.
Bidder shall submit the list of the spare parts required for successful commissioning of the plant.
- c. Mandatory Spares.
- d. AMC support for all software and IT infrastructure, surveillance system, Fire Protection system.

2.2.8 Inspection of Site by Bidder

- a. Bidder shall inspect the site, examine, and obtain all information required and satisfy himself regarding matters and things such as access to site, communications, transport, right of way, the type and number of equipment and facilities required for the work, availability of local labour, materials and their rates, including and irrespective lead and lift from project site. local working conditions, weather, subsoil conditions, natural drainage etc, ignorance of the site conditions shall not be accepted by the Owner as basis for any claim for compensation or extension of time. Bidder visiting the site should inform to Owner in advance to enable to get necessary permission from the concerned authorities to visit the project site.

2.2.9 Construction Tools and Materials supplied by Contractor

- a. Contractor shall provide and maintain at the site necessary number and type of machinery and equipment including survey instruments in good working condition for proper setting out and timely completion of the various works covered under this specification. All arrangements for transporting the equipment to and from the site shall be done by the Contractor at his own expense. No claim shall be entertained for mobilizing additional equipment and / or personnel to complete the work within the stipulated time.
- b. Contractor shall provide all fuels and lubricants required for the operation and maintenance of construction machinery and equipment as well as his transport vehicles at his own cost.
- c. The Contractor shall ensure that the work shall proceed uninterrupted even in the event of power failure. As such, adequate number of diesel operated equipment shall be provided by the Contractor at his own cost as an alternative arrangement, in case electrically operated equipment is proposed to be brought to site.
- d. The Contractor shall ensure continuous supply of course and fine aggregate and other raw materials conforming to the specification for the duration of the contract period

- and extended period if any. Adequate stocks are to be ensured before the on-set of monsoons, because the approaches to the quarries become difficult during monsoon.
- e. Adequate stocks of material shall be ensured such that there is no interruption of works due to shortage of material at any point of time during the contract period and extended periods, if any.
 - f. Stockpile of earth material, fine and coarse aggregate shall be covered to protect against over saturation during monsoon season. Steel bar shall not be placed and in direct contact with soil and shall also covered with plastic sheet.
 - g. All materials supplied by Contractor shall be original, new and of the best quality and shall conform to the given / relevant specifications. Approval in writing shall be obtained from the Owner before any alternative or equivalent material is used other than what is specifically mentioned in the drawings.
 - h. Contractor shall furnish manufacturer's test certificate for all the manufactured items supplied by him. Representative specimens of the material shall also be submitted to the Owner and shall be tested as per Field Quality Plan at a recognized testing laboratory at Contractor's cost in case Owner so desire.
 - i. The Owner reserves the right to test any construction material supplied by the Contractor in Owner's approved laboratory at Owners' cost and result of the same shall be binding to the contractor Irrespective of approval / comments from Owner.
 - j. The Owner reserves the right to instruct the Contractor to remove all materials which do not meet the specification requirements.

2.2.10 Work Execution and Supervision

- a. Contractor shall have at the site accredited and qualified engineers and foremen / supervisors with adequate number of years of experience in execution of similar works and operators of machinery and equipment, for satisfactory progress and timely completion of the works.
- b. Contractor's engineer-in-charge of the work at site shall be capable of interpreting the specification and drawings and make adequate site decisions as and when required. He shall also take instructions from the Owner and be responsible for carrying out the instructions.
- c. Contractor shall be fully responsible for the correctness and accuracy of the tests performed, results obtained / tabulated, interpretation of test results and recommendations made. The work shall be executed in a professional manner, with fully understanding of the importance of work for a project of this magnitude.
- d. In the event of occurrence of any accidents at / near the site of the work or in connection with execution of the work, a report shall be made immediately to the

Owner, giving full details of the accident. He shall also report such accidents to all the competent authorities wherever such reports are required by them as mandated by statutory laws.

- e. All temporary electrical installation shall be supervised by a qualified electrical supervisor of the Contractor.
- f. Owner reserves the right to order in writing, from time to time, during the progress of the work, removal and re-execution of any work which in the opinion of the Owner, is not in accordance with the specification.
- g. During inclement weather, rains etc., Contractor shall suspend all works for such time as the Owner may direct and shall protect from damage all works already in progress or completed just then. All such temporary protective measures shall be at Contractor's cost and any damage to works shall be made good by the Contractor at his own expense.
- h. However, suspension of work for such time may not relieve the contractor for any time extension of work completion schedule. In such situation contractor shall deploy additional work force to catch up the work completion schedule.
- i. Should the work be suspended by reasons of strikes / riot by Contractor's own employees, or any other causes whatsoever save and except the force majeure condition, Contractor shall take all precautions necessary for the protection of works and make good at his own expense any damage arising from any other than these causes. No compensation, whatsoever, will be given by the Owner.
- j. During Contractor's works, other works either by the Owner or by other Contractors or by both simultaneously will be in progress within the project area. Contractor shall make his best effort to work in harmony with others in the best overall interest of the project and towards its speedy completion.
- k. A quality control laboratory shall be set up with all required testing equipment's. The quality control laboratory shall be operated and maintained by contractor. However, testing of all materials must be carried out by the Contractor. The contractor must re-calibrate the testing equipment's brought to site by competent authorities from time to time to maintain the accuracy.
- l. Contractor should furnish the list of equipment's that will be provided in the laboratory.
- m. The Contractor shall be responsible for maintaining cleanliness of the site. The site shall be free of unwanted rubbish or filth which is hazardous and detrimental to health and affect safety of the workplace.
- n. All material supplied shall conform to the specification. Entry of unwanted materials shall be prohibited.

3. Submission of Documents to the Owner after award of Contract

3.1 Intent

- 3.1.1 Contractor has to carryout detailed geo-technical investigation after the award of contract, through some approved / reputed agency and submit geo-technical investigation report with recommendation for Owner's review & approval.
- 3.1.2 Preliminary Geotechnical Soil investigation details are available as given by Owner. Any other details and information required by the Bidder for designing and execution of the work given in the tender are to be arranged by bidder at their risk and cost. Owner does not take any responsibility for the correctness of the contents given in this Preliminary Soil investigation report.
- 3.1.3 Bidder/EPC Contractor is advised to verify the content of report by taking few bore logs at site and analyzing the same before submission of bids. Alternatively, Bidder may make his own assessment for the completion of road, drain and pond works & envisaged based on this report at his own risk. In any case, the Bidder/EPC Contractor has to carryout detailed geo-technical investigation after the award of contract, through some approved / reputed agency and submit geo-technical investigation report with recommendation for Owner's review & approval.
- 3.1.4 The recommendations given in approved final report becomes binding on the Contractor. The Contractor is not eligible to increase his cost or demand any extension of time because the final report is in variance from preliminary report available with Owner/Employer. The Bidder / EPC Contractor is solely responsible to carry out detailed Geotechnical investigation to ascertain soil and water parameters of the proposed site for the use of planning /designing / construction / providing guarantee / warranty of all work.
- 3.1.5 After completion of soil investigation, Contractor shall submit a detailed soil investigation report to the Owner, within one month from award of contract, giving all data from tests conducted, conclusions there from, safe allowable bearing pressures, level of ground water, presence of aggressive chemicals to concrete etc., to design the roads, drain and retention pond. The Contractor shall incorporate all changes suggested by the Owner at no extra cost to the Owner and with no extension of time.
- 3.1.6 The Contractor shall begin further works like preparation of design criteria only after obtaining approval of the report.
- 3.1.7 Detailed design calculations / drawings shall be commenced by Contractor only after approval is obtained from the Owner on the basic design criteria for Roads, Drains and Retention Ponds to be submitted by the Contractor. No later deviation from the approved design criteria shall

- be permitted unless specifically approved by the Owner in writing, prior to its adoption.
- 3.1.8 Design calculations and drawings and other documents shall be submitted sequentially after obtaining approval in a phased manner as per approved L2 schedule. Contractor shall ensure that design calculations / drawings for various components are not submitted at one time. For this purpose, design
- / drawing submission schedule furnished during bidding stage and agreed upon by Owner shall be followed. Owner will review and furnish comments / approval, if any, to the designs and drawings. The Contractor shall resubmit the design documents and drawings within a maximum period of one week from the date of receipt of comments from owner. Timely submission of designs / drawings to the Owner for review / approval is the sole responsibility of the Contractor and postal or other delays as reasons for late / non-submission shall not be entertained by the Owner.
- 3.1.9 If there be a requirement for preparation of separate drawings to show enlarged details to facilitate construction / erection, then such drawings shall also be prepared by the Contractor at no extra cost.
- 3.1.10 Owner or his representative has every right to go to Contractor's design office to check the quality control being implemented at their design office to ensure that the documents being prepared are of approved quality. The Contractor shall provide all assistance required by Owner for carrying out the audit.
- 3.1.11 Checking for any interference is the sole responsibility of the Contractor.
- 3.1.12 All design calculations and drawings shall be in English and shall be in SI units.
- 3.1.13 Designs drawings and other documents submitted by the Contractor for approval of the Owner shall be thoroughly checked and approved by the authorized Contractor's engineers. Any unchecked / unsigned documents will not be reviewed by the Owner. Also design calculations not accompanied by supporting engineering drawings, incomplete or shabbily done design calculations, design calculations without adequate reference or backup data and documents where previous comments have not been incorporated will not be reviewed by the Owner. No claim from the Contractor for extension of time or extra cost on this account shall be entertained by the Owner under any circumstances.
- 3.1.14 Owner reserve the right to verify arithmetical / numerical accuracy of the calculations, input data, compatibility of dimensions among various drawings or between drawings and design calculations. However, the entire design responsibility lies with the Contractor.
- 3.1.15 All modification suggested by the Owner to meet specification requirements and sound engineering practice shall be incorporated by the Contractor at no extra cost to the Owner. In this respect, the decision of the Owner shall be binding on the Contractor. Owner will accord his approval only after the Contractor has incorporated in the design and drawings all modifications required by the Owner.

- 3.1.16 Soft copies of all design calculation and drawings shall be submitted for review and approval by contractor. After approval the final design calculation and drawings shall be submitted to the Owner (Both Hard and Soft copies).
- 3.1.17 Payment will not be made for defective works and other works completed without approved design and drawings.
- 3.1.18 Completion report shall be furnished by the Contractor including narrative report with as built drawing in consultation with Owner. Hard copies of 10 set and soft copies 3 set.
- 3.1.19 **Site related technical and geo-technical details and other information/technical reports and assessment:**

If required the Technical and geo-technical details and other information/ technical reports related to project site shall be provided by BSUL.

The information provided in above documents may be treated as indicative only, bidder needs to verify/ acquaint/apprise himself for the actual details. No Claims and objections due to any information contained in the above report shall be considered. Before submitting his bid, the bidder should inspect and examine the site and its surroundings and should satisfy himself as to the nature of the ground and subsoil, the quantities and nature of work, materials necessary for completion of the work and their availability, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No consequent extra claims on any misunderstanding or otherwise shall be allowed by the Employer.

- 3.1.20 Contractor shall make necessary arrangements for storing of equipment within the allocated plot only and security arrangement of storage yard/Shed shall be contractor responsibility. Owner shall not be responsible for any theft/stolen property.

3.1.21 **Details about identified dumping area:**

Disposal of waste excavated material not reusable in levelling and construction shall be disposed by the contractor in the disposal sites arranged by him after seeking prior permission of the concerned local authorities and in compliance to all applicable laws. Dumping area shall not be made available by the Employer. In no case shall it be disposed in the nearby Rivers and is strictly prohibited.

3.1.22 **Contractor's infrastructural facilities:**

The contractor must make his own arrangement to develop infrastructure for all their man and materials required during the construction period. Necessary residential and labour camps including other facilities like water supply, sanitation etc. is to be developed /arranged by the contractor on his own including its maintenance during the construction period & O&M(If applicable) of the Project. All the camps, facility areas, main works area etc. are required to be

fenced and protected by the contractor on his own. The manpower engaged by the Contractor for the works of the project shall be mainly from local population to the extent available. However, in case of non-availability of highly skilled/semi-skilled manpower among local population, the same shall be arranged from outside.

3.1.23 **Site Visit:**

The bidders, in their own interest, should inspect and examine the site and its surroundings and satisfy themselves, before submitting their tender, in respect of the site conditions including but not restricted to the following which may influence or affect the work or cost thereof under the Contract:

- a. Site conditions including access to the site, existing and required roads and other means of transport/ communication for use by them in connection with the works.
- b. Requirement and availability of land and other facilities for their enabling works, colonies, stores and workshops etc.
- c. Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there from;
- d. Source and extent of availability of suitable materials including water, etc. and labour (skilled and un-skilled), required for work and Laws and Regulations governing their use and employment;
- e. Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work;
- f. The limit and extent of surface and sub-surface water to be encountered during the performance of the work and the requirement of drainage and pumping;
- g. The type of equipment and facilities needed, preliminary to, for and in the performance of the work; and
- h. All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.
- i. Transportation & Logistic constraints etc. to the locations. The bidders should note that information, if any, in this tender document, has been given merely to assist the bidders and is not warranted to be complete. The bidders should note and bear in mind that the Employer shall bear no responsibility for the lack of acquaintance of the site and other conditions or any information relating thereto, on their part. The consequences of the lack of any knowledge, as aforesaid, on the part of the bidders shall be at their risk and cost and no charges or claims whatsoever consequent upon the lack of any information, knowledge or

understanding shall be entertained or payable by the Employer.

3.2 Exclusions

The following items of work are specifically excluded from the scope of the specifications:

- Internal roads inside the individual solar blocks
- Peripheral roads along the boundary
- Approach road and village extension road as mentioned in Layout.
- Strengthening of Village roads
- Approach Road illumination

3.3 Terminal points

- 3.3.1 The buildings such as Administration building, Security Building, Canteen Building, Staff Quarters / Guest House, Parking area, shall be developed in the area demarcated in the Proposed Master Plan Layout.
- 3.3.2 A compound wall for overall administration block.
- 3.3.3 The 415V Auxiliary Power cables of all the Main DBs shall be terminated at the respective feeders of the Park Infrastructure DB in Pooling substation. The cables up to Park Infrastructure DB shall be laid and terminated by the bidder.
- 3.3.4 All LT/Instrumentation/communication cable termination within the Administration block, Surveillance systems and Security cabins.

4. Design Basis

4.1 Intent

- 4.1.1 This Chapter gives a definition of the standard drawings/documents of various equipment which along with those listed in the Particular Specifications, shall be delivered by the Contractor to the Engineer in- Charge within the periods, and in a number and quality as specified in the bidding document.
- 4.1.2 The Engineer in-Charge reserves the right to request the Contractor for additional drawings/documents as may be required for proper understanding and definition of constructional, operational, co-ordination or other matters.
- 4.1.3 All documents shall be submitted in accordance with the agreed programme during detail engineering so that any comment and change requested by the Engineer in- Charge can be taken into account before starting of the manufacture of the equipment in the workshop and/or erection or installation at the Site.
- 4.1.4 If the Contractor fails to submit such documents, then the later execution of changes requested by the Engineer in-Charge and the resulting additional cost and/or delays shall be the Contractor's responsibility. The Contractor shall not be absolved of his responsibility and

guarantee even after drawings and computations have been approved by the Engineer in-Charge.

4.1.5 On drawings, catalogue sheets or pamphlets of standard Works submitted to the Engineer in-Charge, the applicable types, paragraphs, data, etc. shall either be marked distinctively or the non-applicable parts shall be crossed out. Documents not marked in such a manner will not be accepted and approved by the Engineer in- Charge.

4.1.6 If required for proper understanding of the documents, additional descriptions/explanations shall be given on these documents or on separate sheets. All symbols, marks, abbreviations, etc., appearing on any document shall clearly be explained by a legend on the same document or on an attached sheet.

4.1.7 Each device appearing on any document (drawing, diagram, list, etc.) shall clearly be designated. The abbreviation mark used for an individual device shall be identical throughout the complete documentation so as to avoid confusion. All documents shall have a uniform title-block and agreed by the Engineer in-Charge. Beginning with the very first submittal to the Engineer in-Charge, the Contractor's drawings shall bear a serial number corresponding to a drawing classification plan to be agreed upon by the Contractor and the Engineer in-Charge.

4.1.8 **Drawing**

a. Foundation Drawings

- i. If a piece of Works requires its own foundation or needs a special area for installation, the Contractor shall submit drawings indicating all pertinent dimensions, static and dynamic loads, etc. They shall include all essential details required for proper design and construction of the foundations and/or buildings.
- ii. In addition, these shall include openings, sleeves, slopes and the arrangement of any supporting structure, i.e., base-frames or other steel constructions for permanent fixing or erection purposes.
- iii. If conduits are to be installed in the foundations, the relevant information such as diameter, length, and purpose shall be indicated on the drawings

4.1.9 Bidder has to take Comprehensive Annual Maintenance Contract (AMC) from Original Equipment Manufacturer (OEM) or OEM authorized service provider for a period of 10 years for the following components:

- i. CCTV
- ii. Access Control System
- iii. IT System for Administration

a. Arrangement Drawings

- i. All arrangement drawings shall be drawn to scale. The General Arrangement

Drawings shall show the physical arrangement of Works/ equipment/assemblies in relation to each other and to agreed co-ordinates and boundaries.

- ii. The Arrangement or Layout Drawings of electrical and instrumentation and control equipment shall indicate the location of all apparatus wherever used, i.e. in or on machines, control boards, switchboards, cubicles, control desks and panels, etc. The apparatus shall be denominated with the same standardised abbreviations as used in all other documents.
- b. Outline Drawings: The Outline Drawing shall show all elements and the main dimensions of individual components where necessary in plan view, cross-section, side and top views. If reasonably possible such dimensions can be shown on arrangement Drawings
- c. Design Drawings: The Design Drawings shall include outline drawings, assembly manufacturing drawings of components, erection drawings, showing the dimensions, design and data of all constructions, apparatus, and Works to be furnished under this Contract The drawings shall - where applicable - substantially conform to the Tender Drawings and shall show:
 - i. Assembly of the Works in plan and elevation with main dimensions
 - ii. Sub-assembly of the principal components of the Works with overall dimensions, adjustment and clearance tolerances, and numbers of corresponding detail drawings.
 - iii. Sub-assemblies in which the Contractor proposes to ship the Works
 - iv. All necessary details of the parts connecting to the Works supplied by others
 - v. Location and size of the instruments and accessories provided.
 - vi. Method and sequence of installation & erection
- d. Installation Drawings: The construction, mechanical, electrical and I & C Installation Drawings shall provide detailed information on the disposition of the various items of a system.

4.1.10 **Diagrams:**

For electrical diagrams general reference is made to IEC 113-1.

Notwithstanding reference made to various standards all equipment and works as per provisions and requirements of relevant and latest Indian Standards shall be acceptable.

- a. Block Diagrams
 - i. The Block Diagrams shall be used to show in a simplified manner the main inter-relationships between the elements of a system by means of symbols, block symbols and pictures without necessarily showing all the connections. The symbols used for the individual kinds of components etc., shall clearly be explained on the diagram or on an attached legend.
 - ii. When recommendable, a Block Text Diagram may be prepared, consisting essentially of explanatory texts enclosed in outlines which are linked by lines showing the functional relationships that exist between the various parts of an installation, Works or circuit.

b. Logic Diagrams

The Logic or Functional Diagrams shall be used for representation of logic and sequence controls and interlocking by showing only binary logic elements and their effect on the various process equipment disregarding their electrical realisation. Logic function elements (AND, OR, NOR, NAND, STORAGE, etc.) shall be used for processing and combining binary signals.

c. Schematic/Single-Line Diagrams

- i. This is a simplified diagram of the essential Works and their interconnections. Each circuit shall be represented by a single line only. It shall contain all required technical information of the Works represented.
- ii. Single-line diagrams of individual main components and switchboards shall additionally show the control, indicating, measuring, metering, protection, automatic and other auxiliary devices separated for each individual installation site and location as applicable:
- iii. Furthermore, the applied recommended setting of adjustable devices (protection and control elements, time relays, etc.) shall be indicated.

d. Electrical Circuit Diagrams

- iv. The Circuit Diagrams shall show the power circuits in all the phases with the main apparatus as well as the pilot circuits (measuring and control circuits). It shall show in full the functioning of part or all installations, Works or circuits with all required technical information
- v. The control part shall be subdivided into separately drawn "current paths", each showing all its components regardless of their actual physical location. The individual circuits are to be drawn in a straight-line sequence, avoiding line crossings. The current paths (to be designated by numbers) shall be drawn starting from two horizontal lines, which represent the control voltage source. All devices belonging to the Works or forming part of the Works or control devices shall appear between these two lines.
- vi. Contact developments of the installed switches, contactors, relays and other apparatus which appear in the diagram shall be shown below the respective contactor coil, indicating by means of numbers and, if not on the same, also the page No., the current path in which the corresponding contact has been used.
- vii. Interconnections to other circuit diagrams shall be clearly marked by means of dotted line separations and the corresponding functional designation. The power circuit portion of the installation shall be drawn at the left side of the drawing.
- viii. Circuit diagrams shall also contain all terminals and their correct designations. Terminals grouped together to terminal blocks of switchboards, distributors, etc. shall be shown on the circuit diagrams in one fictitious horizontal line surrounded by demarcation lines. If, for any reason, the current paths of circuit

diagrams must be separated, the corresponding counter terminal has to be indicated by all means.

ix. The representation of electrical Works and control circuits shall not be terminated at the limits of the scope of supply but has to be extended beyond this limit by all switchgear, protective, measuring and monitoring equipment required for full comprehension of the whole circuit.

x. Standard Circuit Diagrams are patterns of circuit diagrams which have been standardised regarding scope, arrangement, representation and allocation of Works with the aim of simplification and easy surveillance of electrical circuitry.

e. Terminal Diagrams

i. Such diagrams shall be prepared for any type of terminal box, marshalling rack, control cubicle, switchboard, etc., and shall show the terminals (properly numbered) and the internal and/or external conductors (wires or cables) connected to them.

ii. The terminal diagram of each individual switchboard, terminal box, panel, etc. shall contain, but not be limited to the following information:

iii. Terminal number of terminal board with targets (terminal number and current path) of incoming and outgoing cables and wires

- Cable designation
- Type of cable
- Number and cross-section of conductors
- Assignment of conductors
- Number of spare conductors
- Approximate length of cable and its destination

4.2 The Administrative block power supply scheme:

4.2.1 The administration block shall consist of Administration building, Canteen building, Guest house / Staff quarters and Security building.

4.2.2 The Administration block power supply system comprises of AC Distribution Boards, LV cables, and other miscellaneous items.

4.2.3 The power supply system for administrative block shall be tapped from the Park Infrastructure DB located in the Pooling Substation

4.2.4 LT Power cables from the Park Infrastructure DB, which shall be connected to Downstream Distribution boards with respect to the loads.

4.2.5 The following loads shall be connected in the respective DBs are listed:

DB name	Connected Load	Dedicated Downstream Feeders
Common Area DB	Outdoor Area Lighting and All outdoor supplies	

Administration Building DB	All the power requirements of the Administration Building	1. HVAC 2. Illumination 3. Power Receptacles (minimum 4 feeders) 4.3-ph Loads 5. UPS (for Server room and Access control system)
Guest House DB	All the power requirements of the Guest house	1. HVAC 2. Illumination 3. Power Receptacles 4.3-ph Loads
Canteen Building	All the power requirements of the Canteen Building	1. HVAC 2. Illumination 3. Power Receptacles 4.3-ph Loads
Surveillance Network	All the IP / CCTV cameras and allied infrastructure	
Any other Building / Complex	All the power requirements of 1. Security Building 2. Security Cabins	

- 4.2.6 For all the indoor & outdoor power requirements of administration block, Power shall be fed from AC Distribution Boards.
- 4.2.7 All the cables taken for Common Infrastructure facilities from Park infrastructure DBs shall be terminated at the park infrastructure DBs is at bidder's scope.
- 4.2.8 The incoming feeders for the respective downstream DBs shall have circuit breaker as protection element. Based on the finalised load current during detailed engineering, the type of circuit breakers shall be selected. i.e., MCCB, MCB, ACB.
- 4.2.9 The MCCB used for incomers from Park infrastructure DB shall have the LSIG provision (long time, short time, instantaneous and ground fault with inbuilt current element).
- 4.2.10 All the incoming feeders from the Park Infrastructure DB shall be having energy metering facility in the Distribution Box.
- 4.2.11 Security building/cabin supply shall be tapped from Park infrastructure DB.
- 4.2.12 Power supply for surveillance cameras shall be taken from Park infrastructure DB.
- 4.2.13 Bidder shall refer the attached Admin block power supply scheme.
- 4.2.14 All the above-mentioned equipment shall be defined in respective chapters of this document. Bidder shall comply the technical requirements strictly.

4.3 Solar Park Infrastructure communication scheme

- 4.3.1 The network elements in the administration block such as IT infrastructure, Access control system, surveillance systems, fire detection & protection system shall be interconnected with main control room in 400kV / 33kV Pooling Substation. The communication shall opt optical fibre technology for fast and effective communication.

- 4.3.2 The Surveillance system communication network shall remain separate. Bidder shall refer surveillance system scheme diagram for reference.
- 4.3.3 The Access control system shall be connected to the building management system.
- 4.3.4 The RTU for the Solar Park main network switch shall be supplied and installed by the bidder with all required accessories. The bidder shall be responsible for establishing successful communication between administration block and 400kV / 33kV Pooling Substation.

5. Handing Over and Taking Over

- 5.1.1 On successful completion of plant(s) and equipment will be handed over to the employer in completely healthy and safe condition without any pending defect. During the handing over of the plant(s), the Contractor shall submit the following to consider final closer of contract.
 - a. All as-built Drawings
 - b. Technical document with detailed specification, test results for all deliverable items, Operation & Maintenance & Safety Instruction Manual and other information about the project.
 - c. All specified/mandatory spares, tools & tackles in healthy condition as per contract. The items supplied by employer on returnable basis, such as spares parts, consumables, tools and plants, documents etc. shall be returned back to employer.
 - d. Bill of Material

6. Training

- 6.1.1 Bidder shall be responsible for providing training to Owner's personnel on offered systems at Bidder's Works/Bidder's Associate's Work/Site. It shall include training operators in the use of system, in operation and maintenance of the equipment to the extent that the Owner's personnel can make maintenance of the systems.
- 6.1.2 The bidder shall provide training to the personnel of BSUL for minimum of 45 man-days at his works and at site for erection, testing, commissioning and O&M at free of cost. If owner queries / any functional requirement is unresolved during training than bidder shall extend the training period without any additional cost.

The bidder shall provide a training of suitable duration on all supplied materials especially surveillance system, IT servers, special tools, testing kits etc. for Customer/Client's personnel to provide working knowledge of the equipment, operation and diagnostic tools, supervision and monitoring using local craft terminal. The training may be provided by the Contractor or its sub-vendor at the site itself, preferably during installation, and will include training materials and presentation equipment. No separate charges for training shall be payable to the Contractor.

7. Time for Commencement and Completion

- 7.1.1 The following shall be the schedule for completion of work for this package:

WORK	SCHEDULE
EPC Work of Construction of Package-3: Solar Park Common Infrastructure of Security Buildings, Civil Works (Administrative Buildings, Canteen Building, Guest House & Other common facilities) of Solar Power Park for the development of 1200 MW Solar Power Park under UMPPRE at Madhogarh, District: Jalaun, Uttar Pradesh	350 Days from the date of issue of Notification of Award

- 7.1.2 The Contractor shall commence work on the Facilities as per the date of start as stated in the Notification of award and shall thereafter proceed with the Facilities in accordance with the time schedule specified in the Contract Agreement. If the Contractor commits default in the commencement of work within 30 days of issue of Letter of Acceptance, the Employer shall without prejudice to any other right or remedy be at liberty to cancel the Contract and forfeit the earnest money/Performance Guarantee
- 7.1.3 The Contractor shall attain Completion of the Facilities within the time stated in the Contract or within such extended time to which the Contractor shall be entitled hereof.

8. Employer's Responsibilities

If requested by the Contractor, the Employer shall use its best endeavors to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings require the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be

9. Work Program

9.1 Contractor's Organization

The Contractor shall supply to the Employer a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities. The chart shall include the identities of the key personnel together with the curricula vitae of such key personnel to be employed within twenty-one (21) days of the Effective Date. The Contractor shall promptly inform the Employer in writing of any revision or alteration of such an organization chart.

9.2 Program of Performance

Within twenty-eight (28) days after the date of notification of award, the Contractor shall prepare and submit to the Employer a detailed program of performance of the Contract, made in the form of the critical path method (CPM), the PERT network, MS-Project or other internationally used programme and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and pre-commission the Facilities, as well as the date by which the Contractor reasonably requires that the Employer shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve Completion, Commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in the Contract Agreement and any other

dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Employer, but without modification in the Times for Completion given and any extension granted and shall submit all such revisions to the Employer.

9.3 Progress Report

The Contractor shall monitor progress of all the activities and supply a progress report to the Employer every month. The progress report shall be in a form acceptable to the Employer and shall indicate:

- a. percentage completion achieved compared with the planned percentage completion for each activity; and
- b. where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.

10. Transportation

- 10.1.1 The Contractor shall at its own risk and expense transport all the Plant and Equipment and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances
- 10.1.2 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the Plant and Equipment and the Contractor's Equipment to the Site. The Employer shall use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the Plant and Equipment and the Contractor's Equipment to the Site.
- 10.1.3 The Contractor has to comply with the provisions of carriage by Road Act 2007 Govt. of India and its rules and its further amendments (if any).

11. Deleted

12. Installation

12.1 Setting out / Supervision / Labour

- 12.1.1 Benchmark: The Contractor shall be responsible for the true and proper setting-out of the Facilities
- 12.1.2 Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand
- 12.1.3 Labour
 - a. The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labour that has the necessary skills

- b. Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation and catering of all labour, local or expatriate, required for the execution of the Contract and for all payments in connection therewith
- c. The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labour and personnel to be employed on the Site into the country where the Site is located.
- d. The Contractor shall at its own expense provide the means of repatriation to all of its and its Subcontractor's personnel employed on the Contract at the Site to their various home countries. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.
- e. The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labour of its Subcontractors
- f. The Contractor shall, in all dealings with its labour and the labour of its Subcontractors currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labour

12.1.4 Contractor's Equipment

- a. All Contractor's Equipment brought by the Contractor for this Project shall be deemed to be intended to be used for the execution of the Contract. The Contractor shall not remove the same from the Site without the Employer's consent which shall not be unreasonably withheld, that such Contractor's Equipment is no longer required for the execution of the Contract.
- b. Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor onto the Site and any surplus materials remaining thereon

12.1.5 Site Regulation and Safety

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Engineer In-Charge, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld. Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care and fire prevention

12.1.6 Emergency Work

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work

12.1.7 Site Clearance

- a. Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract
- b. Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities clean and safe

12.1.8 Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the Employers and occupiers of adjacent property and for the safety of the public

12.1.9 Work at Night and Holidays

- a. Unless otherwise provided in the Contract, no work shall be carried out during the night and on public holidays of the country where the Site is located without prior written consent of the Employer, except where work is necessary or required to ensure safety of the Facilities or for the protection of life, or to prevent loss or damage to property, when the Contractor shall immediately advise the Employer, provided that provisions of this Sub-Clause shall not apply to any work which is customarily carried out by rotary or double shifts.
- b. Notwithstanding Sub-Clauses 12.1.9a, if and when the Contractor considers it necessary to carry out work at night or on public holidays so as to meet the Time for Completion and requests the Employer's consent thereto, the Employer shall not unreasonably withhold such consent.

13. General condition for Test and Inspection

13.1 Testing

- 13.1.1 The Contractor shall at its own expense carry out at the place of manufacture and/or on the Site all such tests and/or inspections of the Plant and Equipment and any part of the Facilities as are specified in the Contract.
- 13.1.2 The Employer and the Engineer In-Charge or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all travelling and board and lodging expenses
- 13.1.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give a seven (7) days advance notice of such test and/or inspection and of the place and time thereof to the Engineer In-Charge. The Contractor shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Employer and the Engineer In-Charge (or their designated representatives) to attend the test and/or inspection

- 13.1.4 The Contractor shall provide the Engineer In-Charge with a certified report of the results of any such test and/or inspection. If the Employer or Engineer In-Charge (or their designated representatives) fails to attend the test and/or inspection, or if it is agreed between the parties that such persons shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of such persons, and may provide the Engineer In-Charge with a certified report of the results thereof
- 13.1.5 If any Plant and Equipment or any part of the Facilities fails to pass any test and/or inspection, the Contractor shall either rectify or replace such Plant and Equipment or part of the Facilities and shall repeat the test and/or inspection upon giving a notice
- 13.1.6 The Contractor shall afford the Employer and the Engineer In-Charge, at the Employer's expense, access at any reasonable time to any place where the Plant and Equipment are being installed, in order to inspect the progress and the manner of installation, provided that the Engineer In-Charge shall give the Contractor a reasonable prior notice
- 13.1.7 No part of the Facilities or foundations shall be covered up on the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Engineer In-Charge whenever any such parts of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice thereof shall be subject to the requirements of the Contract
- 13.1.8 Acceptance and Commissioning Tests
Acceptance and commissioning tests shall be carried out in accordance with GCC and as specified below. The following tests are specified:
- a. Factory Acceptance test – at the Manufacturing Facility;
 - b. Acceptance tests – upon arrival at the site;
 - c. Instrumentation Tests – when installed;
 - d. Mechanical tests – after installation;
 - e. Functional tests – after installation;
 - f. Performance tests – after installation.
- 13.1.9 Factory Acceptance Test
The test specification for a factory acceptance test (FAT) shall include a program for the tests and detail the following:
- a. Requirement to be tested;
 - b. Step-by step method of testing;
 - c. Expected results of tests.
- 13.1.10 Approval of the test specification/procedure will not prejudice the Employer's right to order additional tests, should the Employer deem necessary, following approval but before his acceptance of the material, equipment, software or system(s) for shipment, that certain conditions or combination of conditions were not foreseen in the test specification, in order to demonstrate that performance requirement of this Specification have been met.
- 13.1.11 Tests shall only be conducted with the aid and in accordance with test specification(s) and standards clearly identified as approved for use by the Employer, and, where applicable, employ test instruments of suitable quality calibrated to manufacturer's recommendations by a reputable agency within the previous six (6) months.

13.1.12 In addition to the specifications already provided for the Plant, the test specification shall be supplied with the test results, and it shall include at least:

- a. Indicate the model;
- b. Indicate the time of the tests;
- c. Indicate the standards followed;
- d. Cover a substantial percentage of the supported features of the equipment;
- e. Indicate who carried it out.

13.1.13 If done by a third party, all above requirements shall apply.

The factory acceptance tests shall be carried out by the manufacturer in accordance with the requirements of IEEE 1547, including at least:

- a. Response to abnormal voltage test;
- b. Response to abnormal frequency test;
- c. Synchronization test.

13.1.14 Acceptance Test

The following tests will be carried out:

- a. The PV modules shall be prior to installation and upon arrival at the site of the project:
- b. Inspected visually for defects;
- c. The flash tests of all the modules shall be verified.
- d. The inverters shall be prior to installation and upon arrival at the site of the project:
- e. Inspected visually for defects.
- f. The mounting structures shall be prior to installation and upon arrival at the site of the project:
- g. Inspected visually for defects;
- h. Coating must be visually verified and inspected.
- i. DC and AC Cables, junction boxes and other electrical components shall be prior to installation at the site of the project:
- j. Inspected visually for defects.
- k. The monitoring equipment shall be upon delivery at the site of the project:
- l. Inspected visually for defects.

13.1.15 Mechanical Tests

The mechanical test is the first test to be performed with respect to the PV systems and shall occur on a date to be proposed by the Contractor and as approved by the Project Manager. The notice should not be less than 10 days before the test date;

The Mechanical test is the standard procedure to verify that the Pooling substation systems have been built according to the requirements and includes:

- a. Visual inspection;
- b. Verification of installation of all

equipment. The areas for inspection include:

- c. Mounting structure, bolts and fixtures;
- d. AC cables;
- e. Distribution system;

- f. Monitoring system and weather station;
- g. Plant substation: transformer, switchgear, capacitor banks, etc.,

The Employer shall determine whether the Mechanical Test has been successfully completed.

13.1.16 Functional Test

The functional tests shall be done after the successful completion of the mechanical tests. The contractor shall submit a proposed date not less than 10 days before the test date;

The Functional Tests on the PV array shall be done according to IEC 62446 and include at least:

- a. Continuity of earthing tests;
- b. Polarity test;
- c. String open circuit voltage test;
- d. String short circuit current test;
- e. Insulation resistance of the DC circuits;
- f. Thermographic tests.
- g. The functional tests of the inverter shall be as per the equipment manufacturers' commissioning procedures and shall include at least:
 - h. Thermographic tests.
 - i. Low Voltage equipment test according to IEC 62446-6 and IEC 62446-7 including also:
 - j. Thermographic tests of cables.
- k. The functional tests of the monitoring equipment shall be as per the manufacturer's guidelines:
 - l. Communication at the string level is required;
 - m. Verification of the weather station operation.

The Project Manager/Employer shall determine whether the Functional Tests have been successfully completed.

13.2 Inspection

- 13.2.1 The Contractor shall provide the Employer with the technical details of the equipment/works to be inspected, however such inspection shall in no way exonerate the Contractor from any of his obligations. The Contractor, if requested by the Employer, shall arrange inspections before installation of any equipment which has been delivered to the Construction Site partly assembled.
- 13.2.2 The Contractor shall provide a copy of the packing list, packing declaration, certificate of origin and bill of lading, accompanied by an asbestos declaration and a fumigation treatment declaration (where applicable) to the Employer for each container at the time of its arrival at the relevant Port and shall provide access to the container and its contents for inspection by the Employer following the containers clearance by customs.
- 13.2.3 The following inspections are to be conducted by the Employer:
 - a. Construction of all civil foundations and structure: essential quality observation shall be on observing how top levels of foundations are laid accurately.
 - b. Construction of roads: essential observation shall be on road compaction level, alignment, shoulders and culverts placement/alignment
 - c. Control building walls: essential observation on structure, walls, floors and ceilings.

- d. Construction of all electrical items: essential quality observation shall be on observing the equipment mounting and layout.

14. Completion of facilities

The completion of facilities shall be accepted after it inspected visually by OWNER / OWNER's Representative.

15. Commissioning and Operational Acceptance

15.1 Commissioning and Operational Acceptance

The Operational Guarantee Test of the Facilities shall be successfully completed within 30 days from the date of Completion.

The Operational Guarantee shall be 99.99% of successful operation of all the equipment connected together.

15.2 Partial Acceptance

Not Applicable.

15.3 Defect Liability

As per General Conditions of Contract of the bidding document

16. Work Health and Safety

As per the details available in the relevant part of bidding document

17. Deleted

Annexures

Annexure A - Project Information

1. Owner

Bundelkhand Saur Urja Limited

Owner's Consultant	FICHTNER Consulting Engineers (I) Pvt Ltd
Project	1200 MW Jalaun Solar Park
Site Location	Part A: Orai, Jalaun District, Uttar Pradesh Part B: Pathrahi, Jalaun District, Uttar Pradesh
Nearest Airport	Kanpur
Nearest Railway Station	Orai

2. Meteorological Information

Annual Average Ambient Temperature	25.77° C
Design Ambient Temperature for Electrical Equipment	50° C
Relative humidity for design	95%
Basic wind speed and wind pressure	47 m/s
Seismic Zone	Zone II
Corrosion Zone	C2-Low

3. Electrical Details

3.1 Voltage Levels

Power Frequency	50Hz (+)3% to (-)5%
EHV system	400 kV (±) 5% volts, 3 phase, solidly earthed system

HV system	33 kV ($\pm$)10% volts, 3 phase, solidly earthed system
LV system	415 Volts ($\pm$)10%, 3 phase, 4 wire, solidly earthed system
Auxiliary Supply	240V ($\pm$)10%, 1 phase
Control Supply for SSB	220VDC (+)10% (-)15%
DC supply for Substation Control	220V (+)10% to (-) 15%, unearthed
UPS supply	230V ($\pm$)10%, 1 phase

3.2 Short Circuit Levels

400kV System	63kA for 1 second
33kV System	31.5kA for 1 second
415V System	50kA for 1 second

Annexure B - SCHEDULE OF QUANTITIES AND PRICES (BILL OF QUANTITIES)

Item No.	Description	UoM	Qty	Rate (including Taxes) in Rs.	Amount (including Taxes) in Rs.
1	Development of Solar Park Common infrastructure such as Admin building, Guest house, Canteen building, Security building as per Technical specification for Jalaun 1200MW Solar Park	Lump Sum	1		

Annexure C - List of Drawings

Sl. No.	Drawing No.	Description
1)	FCE-20523122-RE-DWG-LAY-9020-002	Proposed Master Plan Layout
2)	FCE-20523122-ST-DWG-LAY-1300-001	Administration Building Layout
3)	FCE-20523122-ST-DWG-LAY-1300-002	Canteen Building Layout
4)	FCE-20523122-ST-DWG-LAY-1300-003	Guest House / Staff Quarters Layout
5)	FCE-20523122-ST-DWG-LAY-1300-004	Administration Block - Layout
6)	FCE-20523122-RE-DWG-SLD-9020-005	Administration Block Power Supply Scheme
7)	FCE-20523122-RE-DWG-SCH-9280-001	Surveillance System - Scheme Diagram
8)	FCE-20523122-RE-DWG-SLD-9020-006	Access Control System - Scheme Diagram

SECTION - B

Detailed Technical Requirements

(The technical requirements mentioned in this section shall be divided into Part A and Part B. The Part A consists of the requirements for Orai Pooling Infrastructure and Part B deals with Patrathi Pooling Infrastructure)

(Hereinafter M/s BSUL is referred as Owner/Employer/SPPD)

18. Architectural, Civil & Structural Works

18.1 Introduction

18.1.1 This section covers requirements in the scope for Architectural, Civil and Structural works for Common Infrastructure Package as follows:

1. Scope of Work
2. Codes and Standards
3. General Requirements
4. Site Related Investigations
5. Site Development Works
6. Buildings and Civil Works
7. Common Requirements for Civil Works
8. Design Loads for Civil Structures and Buildings
9. Quality Control
10. Inspection and Testing
11. Drawing and Documents

18.2 Scope Of Work

18.2.1 The scope of work shall include the following.

1. Site related investigations by Bidder/Contractor.
 - a. Topographic survey.
 - b. Geotechnical investigation.
2. Site Development works
 - a. Site Grading including Soil stabilization and slope protection.
 - b. Green Belt, Landscape development and horticulture including associated water supply system.
 - c. Compound wall with gates.
 - d. Internal roads.
 - e. Storm water drains and interconnection to outside main drains.
3. Structural Steel works.
4. Buildings and Civil Works
 - a. Security Cabins
 - b. Administration building
 - c. Canteen
 - d. Guest House
 - e. Septic tanks and soak pits.
 - f. Service and Potable Water Supply System within the boundary.
5. Any other civil and structural works, which is not specifically mentioned in this document but required to complete the total the scope of work.

18.3 Codes And Standards

18.3.1 The work to be executed under this specification shall be in accordance with the applicable section of the latest version of the relevant IS standards including amendments, if any, except where modified and / or supplemented by this specification. Some of the applicable standards are listed below:

18.3.2 Structural Design Loads

- IS:875 : Code of practice for design loads
- IS:1893 : Criteria for earthquake resistant design of structures

18.3.3 Structural works

- IS:800 : Code of practice for general construction in steel
- IS:808 : Rolled steel beams, channels and angle sections
- IS:1161 : Steel tubes for structural purposes.
- IS:2062 : Steel for general structural purposes
- IS:7205 : Safety code for erection of structural steel work
- IS:7215 : Tolerances for fabrication of steel structures

18.3.4 Civil Works

- IS:456 Codes of Practice for plain and reinforced concrete.
- IS:1080 Code of practice for Design and Construction of simple spread foundation.
- IS 13920 Ductile detailing of reinforced concrete structures subjected to seismic forces
- NBC :2016 Guidelines for regulating the building construction activity

18.3.5 In case any specification for any particular item of work is not covered, the same shall be executed in accordance with the relevant IS Standards / CPWD Standards, as applicable.

18.4 General Requirements

18.4.1 Construction Facilities

The Contractor shall provide all temporary offices, sanitary conveniences, store, compounds, parking areas, etc. necessary for the completion of the works. The setting and layout of these shall be in such a manner as to not interfere with the construction and operation of the plant when completed and shall be to the general approval of the Owner. The temporary buildings shall be disposed of as directed by the Owner.

All temporary buildings shall be maintained in a clean condition and operated efficiently. All buildings must at all times be open to the inspection of the Owner / Government authorities and, the Contractor shall comply with any instruction given by him for the proper cleaning, disinfection, and general maintenance in a sanitary and hygienic condition of the buildings.

In order to enable the Owner for providing the space, the Contractor shall give a layout and the area requirement. The Contractor shall be fully responsible for mobilization and demobilization of the temporary site facilities.

18.4.2 Plant Levels

It is contractor's responsibility to make a reference datum, and its accuracy shall be maintained throughout the construction period. All levels shall be referred to this datum. Surveying instruments with high quality and one second accuracy and in appropriate quantities shall be used by the Contractor during Construction. The Contractor is fully responsible for the accuracy of the site levels. Latest and validated calibration report of respective equipment used for survey work shall be submitted before carrying out survey work as per manufacturer manuals and instruction.

18.4.3 Methods of Construction

The Contractor shall submit documents with the details of methodology of construction and the equipment he proposes to utilize for all major structures. The Contractor shall also submit his reports and quality assurance plan to the Owner prior to work and its commencement subjected to owner approval.

18.4.4 Coordination at Site

The Contractor shall at all times maintain accesses, facilities without hindrance to others, carry out his work in such a way and in close coordination with other agencies working at the site so that the work proceeds in a systematic and planned way. No stoppage of work due to disputes arising from lack of coordination will be entertained by the Owner.

18.4.5 Safety

Contractor shall ensure all safety measures are taken at site to avoid accident of his Employees, owner's employee or his co-contractor's employee as per prevailing safety rules. Contractor shall deploy enough number of safety personnel at project site. Contractor shall make all necessary rigid and temporary design to support permanent ongoing Construction activities.

18.4.6 Industrial Sign Boards and Safety Signs

Contractor shall install and fix industrial sign boards and safety signs as per relevant safety regulations. Safety signs and boards shall be in fluorescent Acrylic Night glow stick on the door, framed on walls, and hang on false ceiling with Solid 8mm GI rod and Clamps. Contractor shall submit relevant drawings to owner for approval.

18.4.7 Foundations

Contractor shall carry out design and detail engineering for all type of foundations. Possibility of rise of water table during monsoon and effect of rainwater shall be accounted in design of foundations. The type of reinforcement bars used in foundations shall be chosen considering the saline condition & seismic zone of the project site.

18.4.8 Levels

Finished ground floor level (FFL) for buildings shall be minimum 700mm above finished ground level (FGL).

Roads, storm water drains, cable trench top levels shall be decided during detail engineering.

18.5 Site Related Investigations

18.5.1 Topographical survey

Drone based preliminary topographical survey has been carried out by the Owner and the same is available for information. The Contractor shall carryout additional topographic survey at no additional cost to owner.

18.5.2 Geotechnical Investigation

The Contractor shall carry out detailed Geotechnical investigation for the project area to finalize the foundation design parameters at no additional cost to owner. Credentials of the Geotechnical investigation agency shall be submitted for owner's review and approval.

Layout and number of boreholes shall be decided based on final approved plot plan and the same shall be submitted for Owner review and approval before start of Soil Investigation work.

Type of foundations – pile, raft or open foundations, shall be decided based on the recommendations of the final Geotechnical Report.

18.6 Site Development Works

18.6.1 Site Grading

The land will be handed over to the Contractor as it is basis. Contractor to do levelling of the site.

18.6.2 Green Belt

1.5 m wide green belt made of bushes shall be developed inside the periphery of the boundary.

18.6.3 Landscaping

Landscaping shall be developed around the buildings.

18.6.4 Compound Wall

Compound wall of 2.2 m height above FGL, with over and above 600 mm dia barbed wire concertina wire with HDG 'Y-Post' angle, shall be provided around entire area. Material of construction for compound wall shall be either precast wall panels or masonry with plastering. Wall shall be resting on

grade beam which in turn will be resting on columns and foundations. Coping shall be provided at top. Both surfaces (internal and external) shall be painted with weather proof paint. Contractor shall take into account the stability of boundary wall against any settlement.

18.6.5 Gates

Number of gates shall be as per proposed Layout, which is part of this tender document. Wicket gates shall be provided near to each vehicle entry gate.

Gates shall be double swing gates of adequate size, 2.2 m height and 6.0 m wide (or maximum width of objects to be brought in plus 1.0 m free space on either side). Wicket gate shall be of 1.5 m wide single leaf. Necessary locking arrangement shall be provided for gates, but gates should not be self- locking.

Gate shall be fabricated out of tubular sections conforming to IS : 1161 and shall be hot dipped galvanized. At any point, the minimum thickness of HDG shall be 126 micron and no averaging is allowed. Outer frame shall be 65 NB (medium) tube and diagonal 50 NB (medium) tube 50 mm sq. Welded mesh with 4 mm dia GI wire fabric shall be welded to 25 mm × 6 mm thick GI flat which in turn shall be welded to the outer tubular frame. The gate shall be provided with 20 mm wide × 80 mm dia flat M.S. roller at the bottom. The gate frame shall be fixed to GI tubular post or RCC post. Painting of gate and its colour scheme & painting thickness shall be decided during detail engineering based on environment condition at site.

18.6.6 Storm water Drain Network

Storm water drainage network shall be provided for the entire area and the same shall be discharging to main storm water network of the solar park near the approach road.

Drain shall be of RCC construction. The drawings shall indicate the basic drainage plan from the various units within the area. Invert level of drainage network and at outfall point shall be decided in such a way that water can easily be discharged outside the station Boundary. The maximum velocity and non-silting velocity shall be ensured.

18.6.7 Roads

Road network shall be as per proposed Layout, which is part of this tender document. Width of roads shall be 6.0 m with 1.0 m wide shoulders on both sides.

All roads shall be of RCC construction. Thickness of different layers of road shall be based on design as per applicable IRC standards and shall be decided during detailed Engineering.

Shoulders shall be constructed of interlocking paver blocks.

Sufficient number of Hume pipe (Class-NP3) shall be provided below the roads for cables and utilities crossing.

18.6.8 Walkway / footpath

Footpath with concrete or light weight paving blocks shall be provided as per requirements.

18.6.9 Car parking

Aesthetically pleasant covered car parking shall be provided at locations shown in the layout

18.7 Buildings And Civil Works

Scope shall cover design and constructional requirement for all civil works such as foundation for buildings, paving, drains, etc.

18.7.1 Security Cabins

Suitable weatherproof security cabins of 3.0m x 3.0m size, prefab type, resting on concrete foundation or block masonry building with RCC frame shall be provided near the entry gates. Suitable numbers of chairs and desk, fan and lightings shall be provided. Suitable location for security cabins shall be decided during detail engineering.

18.7.2 Administration Building

Indicative architectural scheme of the building is shown in attached tender drawing. Building shall be of RCC construction with brick walls. Toilet floors shall be sunk and shaft shall be provided to route the soil pipe. Sunken floor shall be provided with damp proofing treatment. Building shall be completely air conditioned. Office area, cabins, conference room and reception area shall be provided with false ceiling. False ceiling shall be designed aesthetically properly arranging, HVAC and light fittings.

Entrance to building shall have glazed aluminium swing type double leaf door. Internal partition in the building shall be provided with a combination of pre-laminated particle board and frosted glass in powder coated aluminium frame work. Doors shall be single leaf glazed aluminium doors for all cabins. In other areas, aluminium glazed or steel flush doors shall be used. Toilet may be provided with PVC doors.

Roof shall have provision for installation of solar panels.

18.7.3 Guest House

Indicative architectural scheme of the blocks is shown in attached tender drawing.

Building shall be of RCC construction with brick walls. Staircase shall extend up to roof. Roof shall have provision for installation of solar panels. Toilet floors shall be sunk and shaft shall be provided to route the soil pipe. Sunken floor shall be provided with damp proofing treatment.

Doors shall be of aluminium glazed swing type with two leaves. All windows shall be glazed aluminium.

All rooms, recreation rooms and office room shall be air conditioned. All air conditioned areas to be provided with false ceiling.

18.7.4 Canteen Building

Indicative architectural scheme of the building is shown in attached tender drawing.

Dining halls shall be air conditioned. Tables and chairs in the dining hall shall have heavy-duty stainless-steel topping.

Building shall be of RCC construction with brick walls. Adequate space shall be provided for stores, preparation, cooking, serving and washing facility. Toilet and hand wash shall be kept sufficiently away from cooking area. Adequate exhaust fans and ventilation facility shall be given in the cooking area and in dining area. Special arrangement shall be made to lead off the waste water from canteen to the soak pits.

Doors shall be of aluminium glazed swing type with two leaves. All windows shall be glazed aluminium. Sinks and wash basins shall be of heavy-duty stainless steel. Walls of dining area, serving and cooking area shall have glazed ceramic tile dado till bottom of ceiling.

Flooring in dining area, serving and cooking area shall have heavy duty anti-skid ceramic tiles. Adequate number of platforms and racks shall be provided in kitchen and stores area. Working platforms in kitchen shall have granite topping.

18.8 Common Requirements For Civil Works

18.8.1 Grading of Concrete

The type of cement shall be as per the soil investigation report. All structural concrete shall be design mixes only. Cement content shall be 350 kg / m³ of concrete unless otherwise specified in the detailed soil investigation report. All necessary test related to materials of concrete mix like cement, sand, steel, aggregates etc. shall be carried out regularly as per relevant IS code.

The following grades of concrete as per IS: 456 shall be adopted for the type of structures noted against each.

M 25	-	RCC structures below ground
(min). M 25	-	RCC structures above ground
(min). M 25	-	Precast trench covers
M15	-	PCC
1: 4: 8	-	Mud mat

18.8.2 Clear Cover

Clear cover to reinforcement shall be as follows:

	Top (mm)	Bottom (mm)	Sides (mm)
Footings / Pile caps	50	50	50
Column / Pedestal	40	40	40
Grade Beam	40	40	40
Beam	25	25	25
Precast units	25	25	25

18.8.3 Minimum thickness of structural elements

The following minimum thickness shall be followed:

a)	Ground floor slab (non - suspended)	150 mm
b)	Water Retaining Slab / Walls	200 mm
c)	Cable / Pipe Trenches / Underground pit	125 mm
d)	All footings (including raft foundations)	300 mm
e)	Precast trench cover slabs – indoor	100 mm
f)	Precast trench cover slabs – outdoor	100 mm
g)	RCC Paving	150 mm
h)	RCC Paving with vehicular load	200 mm

18.8.4 Excavation and Backfilling

Excavation and backfilling shall be accordance to IS standards. Contractor shall carry out deep / shallow excavation by considering safety at side against any collapse. Temporary design against sliding and supports shall be providing by contractor. Backfilling shall be with non-expansive soil. Excavated non-expansive soil can also be used for backfilling subjected to Field and laboratory test by bidder at his own cost and approval from owner.

Any organic matter like roots and barks of trees shall be removed, if found at foundation level and surplus excavation shall be filled with PCC 1:4:8.

18.8.5 Dewatering from construction site

Whenever water table is met during excavation, it is contractor responsibility to dewater and water table shall be maintained below the bottom level of excavation during excavation, concreting and backfilling. Delay due to such cause will not be entertained and at no additional cost to Owner.

18.8.6 Compaction of soil

Density to which filler material is compacted shall be as per relevant IS codes and as per direction of employer. Backfilling earth shall be compacted to minimum 95% of the standard proctor's density at OMC. Burrow Earth material shall be free from lumps and concrete debris.

18.8.7 Reinforcement

All reinforcement shall be Fe 500D TMT bars. Reinforcement fixing shall be as per IS 2502. Reinforcement supports shall include all spacers, chairs, ties, slab bolster, clips, chair bars, and other devices for properly assembling, placing, spacing; supporting, and fastening the reinforcement. Spacers shall be cast from concrete of the same quality as that in which they will be embedded. Concrete block spacers shall be cast in metal moulds with an approved means of separating blocks and of ensuring that the blocks are of the proper size. Coated binding wire shall be incorporated into the blocks to enable them to be securely attached to vertical or horizontal bars and the contractor shall demonstrate both that the blocks are of the requisite strength and that the means of attachment to the reinforcement are adequate.

18.8.8 **Formwork**

Formwork shall be designed and constructed so as to remain sufficiently rigid during placing and compaction of concrete and shall be such as to prevent loss of cement slurry. The face of formwork in contact with concrete shall be cleaned and treated with form release agent. Stripping out formwork shall be as per IS:456 standards. Formwork shall be in good condition to have good surface of concrete. Approved quality make and same grade of Concrete spacer block shall be provided as a cover in concrete structure.

18.8.9 **Concrete placement**

Concrete shall be placed in the forms as close as possible to its final position in a single operation to the full thickness of slabs and beams and shall be placed in horizontal layers, not exceeding 2.5 m height in a single pour in walls, columns and similar members.

The contractor shall organize the pouring of concrete in such a manner that once concreting of a section has started the operation shall be continuous and each operation shall be completed prior to a stoppage.

The temperature of concrete shall not exceed 40°C measured at discharge into the works.

The maximum allowable temperature of any point within any cast element is 60°C. The maximum allowable temperature differential between any two points in the same element is 15°C. Additional temperature control measures during construction (such as the use of insulated formwork) will be required. Contractor to prepare a process control chart and method statement verifying measures to achieve these requirements. Temperature monitoring of concrete work is required where:

- a) the minimum dimension of any casting is 0.8 metres or more, or
- b) where otherwise instructed by the Owner.

Where specified on the drawings, construction, expansion or contraction joints shall be provided and the concrete shall be poured continuously between two adjacent joints. No other joints than shown on the drawings shall be permitted. Stoppage (cold) joints formed between two concreting operations separated by more than 6 hours time shall be subject to the same treatment as the construction joints.

Concrete shall not be dropped into place from a height exceeding 1.5 metres.

Concrete which has partially hardened shall not be exposed to injurious vibration or shock, except for controlled re-vibration where specified. When concreting of a certain large structural element is specified strictly as to be poured continuously, then the concreting operations shall be organized for day and night working, in long shifts, as necessary.

18.8.10 **Compaction and mechanical vibration of concrete**

As concrete is being placed it shall be compacted by mechanical vibrators complying with IS:2505, IS:2506, IS:2514 & IS:4656, to obtain a dense material free from honeycombing, free from water and air holes. The contractor shall ensure that the vibrators are used in such a manner that the reinforcement is not displaced, the formwork not damaged and no segregation caused, but complete compaction of the concrete is achieved.

18.8.11 Finish of concrete

The concrete face shall have the finishes indicated on the drawings or in the present specification. The finished surface of the concrete shall be sound, solid and free from honeycombing, protuberances, air holes or exposed aggregate. No plastering, cement wash, mortar or paint shall be applied to cover defective concrete surfaces.

18.8.12 Curing

Concrete shall be protected from loss of moisture for not less than 7 days after the concrete is placed. Trowelled surfaces, except those that receive a separate finish or coating, shall be cured with a membrane curing compound. Float finished surfaces, except those that receive a separate finish, may be cured with either a membrane curing compound or with water. Only water curing shall be used if the surface receives a separate finish.

Water curing

Water saturation of concrete surfaces shall begin as quickly as possible after initial set of the concrete. Water curing shall begin within 12 hours in dry weather and within 24 hours in damp weather. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff. The application of water may be interrupted for surface rubbing. The concrete surface shall not be permitted to dry. After the rubbing has been completed, rubbed surfaces shall be covered with burlap and kept saturated for the remainder of the curing period.

Membrane curing

Membrane curing compound shall be applied within 30 minutes after final finishing of the surface or as soon as possible after finishing without causing damage to the surface. Membrane curing compound shall be spray applied at a coverage of not more than 7.4 square meters per litre. Membrane curing shall not be used on surfaces that shall be covered at a later date with mortar, concrete, damp—proofing, tile, or any coating. Membrane curing shall not be used on cast-in-place concrete bases for field erected tanks.

18.8.13 Plumbing and Sanitation

All plumbing work shall be executed to comply with the requirement of the appropriate bye-laws, Rules and regulation of the Local Authority and owner's requirement. HDPE roof water tank of adequate capacity depending on the numbers of users for 24 hours storage shall be provided. Contractor shall provide permanent access and platform to supervise and cleaning of water tanks.

Chlorinated polyvinyl chloride (CPVC) pipes having thermal stability for hot and cold-water supply including all CPVC plain and brass threading confirming to relevant IS code.

HDPE pipes with lead joint confirming to relevant IS codes shall be used for sanitary works above ground level and HDPE pipes shall be used for sanitary works below ground.

Each toilet shall have the following fittings.

- WC (western type) with toilet paper roll holder and all other fitting.
- Urinals (430mm X 260mm X 350mm in size) with all fittings and built –in sensor for automatic flush after use
- Wash basin (550mm X 450mm) with all fittings.
- Bathroom mirror (600mm X450mm X 6mm) with hard board backing.
- CP brass tower rail (600 mm X 20mm) with CP brass bracket
- Soap holder and liquid soap dispenser.
- Automatic hand dryer.

Water cooler for drinking water with adequate water storage facility shall be provided.

Stainless steel kitchen sink with drain board for pantry shall be provided.

All fittings, fasteners, gratings shall be chromium plated.

18.8.14 Septic tank and Soak pit

Contractor shall provide necessary no. of septic tank; soak pit and inspection chambers with adequate capacity to treat the sewage / sullage from the buildings. Septic tank shall be RCC made.. Septic tank location shall be accessible for vehicle.

18.8.15 Water Supply for horticulture and Domestic use

Water storage provision of suitable size and adequate water capacity shall be constructed with necessary power supply, water pipeline network with rated pressure and pump provision for horticulture of landscaping area and green belt.

18.8.16 Construction / Expansion Joints

All water retaining structure shall be water tight with provision of 225mm wide PVC ribbed water stopper at all construction joints and expansion joints.

18.8.17 Leak test of water retaining structure and roofs.

Contractor shall perform water leak test as per relevant IS code. In case of water leakage found in structures, contractor shall submit the repair methodology and attend leakages with approved material as per International / IS standards at no additional cost to owner.

18.8.18 Provision for Roof Solar Panel fixing

Suitable provision shall be provided on roof for future installation of solar panels.

18.8.19 Roof Access

Galvanized Steel Cage ladder of required size shall be fixed outside to access roof. If the height is more than 3.0 m, then intermediate steel platform shall be provided with steel gratings. Anchoring of ladder shall be with RCC. Cage ladder shall extend to 1.0 m up vertically above the roof level.

18.8.20 Doors and Partitions

External doors shall be double leaf glazed aluminium door. All internal doors shall be single leaf glazed aluminium door or Fire rated steel doors as per requirements.

18.8.21 Signage Boards

Outdoor Facility Informatory Sign

Sign boards shall be made out of 2mm aluminium sheet / 4mm ACP (Aluminium composite Panel) as per design of IRC-67-2012. Pretreated with phosphate process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint reflectorized with Micro Prismatic Grade retro reflective sheeting of type 11 as per ASTM D-4956 and latest M.O.S.T. Specifications; with Min 1.5 mtr long stand post of 75x75x6mm / 65NB Circular 126 micron HDG Pipe as required and frame fabricated from suitable size iron angle of 35*35*3 mm; painted with best quality epoxy coatings in black and white bends of required painting. Painting thickness will be finalized during engineering phase considering environment condition at project site. . The details of symbol for each board shall be as per the instruction of engineer in charge. A Warranty for 10 years for the Retro reflective sheeting from original manufacturer & certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (A) Class-C Type-11 Retro Reflective sheeting. All sign boards at open area and on road shall be placed on 400 X 400 mm and 600mm deep RCC foundations

Contractor shall provide to the owner, detailed specification of sign boards. All sign boards at open area and on road shall be placed on 400 X 400 mm and 600mm deep RCC foundations. Post shall be in two pieces. Short arm embedded in concrete pedestals and long arm above the ground shall be connected with short arm by bolt and nut connection

Each room shall be provided identification name plate of 2mm thick stainless steel with black letter engraving on it.

18.8.22 Damp proof Course (DPC)

For all buildings, contractor shall make provision of Damp proof course to prevent moisture raising by capillary action in block masonry walls as per relevant IS code and approved make by owner.

18.8.23 Plinth Protection

Around all buildings, plinth protection in 100 mm thick PCC shall be provided, with a width of 1000 mm or the distance between the building outer wall to the RCC garland drain and at suitable expansion joint. It shall be laid over prepared subgrade and base formed with 40mm down rubble stone to a thickness of 150 mm. Grade of concrete shall as specified in section related to Reinforced Concrete Works.

18.8.24 Block masonry

Contractor shall use light weight block for ordinary block masonry walls in buildings. Surfaces of block shall be rough to achieve good bond with plastering. All blocks shall be well soaked during wall erection. Contractor shall provide Mullions with minimum reinforcement in case the block work span between two columns exceed limit specified in relevant IS standards.

18.8.25 Plastering

All external surface of masonry shall have 18mm thick plaster in two layers, with the under layer of 12mm thick 1:4 cement – sand plaster and the top layer of 6mm thick 1:6 cement sand plaster. Inside surface shall be 12mm thick 1:6 cement sand plaster.

18.8.26 Switch Boards and Cable Wiring

Contractor shall provide all required power outlets in each room with some extra provision with concealed wiring.

18.8.27 Furniture, Fixtures and Cabinets.

Adequate numbers of furniture, fixtures, cabinets in buildings, as per fixture layout plan and owner's requirement shall be provided. Drawings and Quantities shall be finalized during detail engineering.

18.8.28 External painting

External plastered surface of building walls shall be painted with exterior acrylic paint as per manufacturer specification and approval of owner.

18.8.29 Finishes

The finishes for the buildings be as follows.

Building Room	Flooring with 150mm skirting	Wall (internal)	Ceiling

Conference room	Vitrified tiles	Premium acrylic emulsion paint with on smooth surface applied with plaster of Paris on block wall	False Ceiling
Office room Bedrooms Recreation rooms Dining hall	Vitrified tiles	Premium acrylic emulsion paint with on smooth surface applied with plaster of Paris on block wall	Oil bound washable distemper
Lobby / Corridor	Vitrified tiles	Premium acrylic emulsion paint with on smooth surface applied with plaster of Paris on wall	Oil bound washable distemper

Building Room	Flooring with 150mm skirting	Wall (internal)	Ceiling
Kitchen / pantry / Toilet	Heavy duty anti skid ceramic tiles	2.0m high Dado glazed tiles	Oil bound washable distemper
Stairs	Anti-skid and high grade Precast terrazzo tile with nosing.	Handrail- stainless steel of grade 304	
Weather proofing for RC roof slabs	Elastomeric water proofing membrane with foam concrete		

18.8.30 Aluminium doors / Windows / Ventilators

All aluminium section shall be anodized. Section of door and window frame shall be approved make. Door shutter shall be made out from Aluminium and combination of compact sheet and clear float / wired glass of 5.5mm thick with sun film sheet on it. Rooms shall have adequate size and number of fixed / openable sliding windows and louvers with sun film over it to facilitate adequate ventilation / fresh air circulation. All windows shall have hot dip GI coated MS grill. All windows shall have curtains of approved make and have mosquito / fly net. These nets shall be removable for cleaning purpose. All doors / windows / louvers shall have weather shade. All door / window / ventilators' sills shall have 20mm thick granite lining.

18.9 Design Loads For Civil Structures And Buildings

18.9.1 Dead Load

Dead loads consist of the weights of the structure complete with finishes, fixtures, partitions, wall panels and all equipment of semi-permanent nature including partitions, roofing, piping, cable trays, bus ducts etc. The following unit weight of material shall be considered for computation of loads:

Plain Cement Concrete	24 kN / m ³
Reinforced Cement Concrete	25 kN / m ³
Structural Steel	78.5 kN / m ³
Brick work	19 kN / m ³

18.9.2 Earth Pressure Loads

Earth pressure for all underground structures shall be calculated using coefficients of earth pressure at rest.

In addition to earth pressure and ground water pressure, etc. a minimum surcharge load of 20 kN / sqm shall also be considered for the design of all underground structures including channels, sumps, cable and pipe trenches, etc. to take into account the vehicular traffic in the vicinity of the structure.

18.9.3 Imposed Load

Imposed loads in different areas shall include live loads, minor equipment loads, cable trays, erection loads, operation / maintenance loads etc. The loads considered shall not be less than that specified in IS : 875 (Part II).

Switchgear room floor	:	15 kN / m ²
Battery room floor	:	15 kN / m ²
Flat roof	:	1.5 kN / m ² + Equipment load

18.9.4 Wind Load

Wind loads on structures shall be calculated as per provisions of IS : 875 (Part 3). The wind shall be assumed to blow in any direction and most unfavourable condition shall be considered.

Basic Wind Speed	=	as per project information data sheet
K2 factor	=	Corresponding to Terrain Category 2

The external / internal pressure coefficients shall be as per respective clauses of IS : 875.

18.9.5 Seismic Load

Seismic forces shall be as per IS:1893-2005. Seismic zone shall be as per project information data sheet.

18.9.6 Load Combinations

The individual members of the structures/buildings shall be designed for the worst combination of forces such as bending moment, axial force, shear force and torsion. Permissible stresses for different load combinations shall be taken as per IS:875 (Part-V) and other relevant IS codes. Wind and seismic forces shall not be considered to act simultaneously. Load factors shall be based on the factors given in the relevant codes of practice – in general all loads which are variable (including earth and ground water pressure) shall be treated as live loads for purpose of determining the load factor.

18.10 Quality Control

Contractor shall establish fully equipped quality control laboratory at site to conduct all acceptance test on all construction materials, concrete cube test, compaction of soil testing. This shall be housed with

covered buildings. All testing equipment like Owen, Electric operated cube testing equipment, sieves for grading of sand and aggregates, flakiness and elongation index testing sieve, density of aggregates, abrasion testing equipment, impact testing equipment, bitumen testing equipment like thermometer, Marshall test apparatus.

Other apparatus like cube moulds, sump cones. Vicat apparatus, moisture meter, dry film thickness gauge meter.

All Field Quality Control tests shall be carry out at project site –laboratory set up by contractor as per NABL standard. The laboratory shall have all necessary equipment to carry out test as required and as per relevant codes. If required, owner engineer may instruct to get the test done at approved NABL laboratory and in such case, bidder shall make necessary arrangement and bear all costs.

All the laboratory test for concrete design mix, pavement crest gradation mix and for all type of construction materials used in project work shall be carry out at approved laboratories. Such cases the Bidder shall make necessary arrangements and bear all costs. Owner reserve rights to collect samples/Specimen of construction material and earth materials from contractor and perform the quality test at his own laboratory and obtain results to be bind to the contractor without any additional cost to owner.

Contractor shall arrange for design mix of concrete for each grade of concrete and gradation mix for Rigid and flexible pavement works-Murram, granular sub base, Wet mix macadam, Water Bound macadam, dense bitumen macadam, bituminous coarse from BSUL approved NABL laboratories (National accreditation board for testing and calibration laboratories).

All testing equipment shall be periodically calibrated to the satisfaction of owner and as per manufacturer manual and instruction

18.11 Inspection And Testing

The Owner shall have free access at all times to those parts of the manufacturer's works which are concerned with fabrication of the steel work and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with the provisions of this specification.

Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch Tolerance for fabricated structures shall be as per IS:7215.

Should any structure or part of a structure be found not to comply with any of the provisions of this specification, it shall be liable to rejection. No structure or part of the structure once rejected shall be resubmitted for test, except in cases where the Owner considers the defect as rectifiable.

Defects which may appear during fabrication shall be made good with the consent of and according to the procedure laid down by the Owner.

All gauges and templates necessary to satisfy the Owner shall be supplied by the manufacturer.

The Owner may, at his discretion, check the test results obtained at the manufacturer's works by independent tests at the Government Test House or BSUL approved NABL laboratory, the costs of such tests shall be borne by the Contractor and test result to be bind to bidder.

Before dispatch from fabrication shop, prototype of each structure shall be shop assembled and checked for fabrication tolerance. Also, if ordered, by the Owner, the same shall be presented for inspection.

Basis for Rejection:

If, as a result of an examination, inspection, measurement or testing, any plant, materials, design or workmanship is found to be defective or otherwise not in accordance with the provision of this agreement, the owner shall reject the plant, materials, design or workmanship by giving notice to the contractor, with reasons. The contractor shall then promptly make good the defect and ensure that the rejected item complies with the requirement of this agreement.

If the owner requires the plant, materials, design or workmanship to be retested or any additional test at owner approved laboratory, the tests shall be repeated under the same terms and conditions, as applicable in each case and result to be bind to bidder and all costs shall be borne by bidder. If the rejection and retesting cause the owner to incur any additional costs, such cost shall be recoverable by the owner from the contractor and shall be deducted by the owner from any monies due to be paid to the contractor.

18.12 Drawings & Documents

The Contractor shall submit his detailed schedule for submission of all information, documentation, calculations, drawings, schedules etc within such periods or dates, which are required to guarantee a smooth handling of the project without delays.

After award of contract, the Contractor shall submit the designs, layout and construction drawings and detailed working drawings including fabrication drawings and bar bending schedule for all structures and items covered under the scope of this contract. The quality of the submitted documents must be in accordance with acceptable national practice and allow a speedy checking procedure.

The design drawings shall consist of general arrangement drawings showing location of tower and various equipment foundation along with cable trenches and all other related items / services required for the project. Subsequently detailed drawings along with design calculation shall be submitted by the Contractor for approval. Subsequent to approval of GA drawings, fabrication drawings for steel

structures and Bar Bending Schedule for RCC structures shall be submitted before commencement of construction.

Detailed dimension drawings and design calculation for all civil and structural works shall be submitted to the Owner for scrutiny and approval. No construction shall commence prior to obtaining of written approval from the Owner. Any approval given by the Owner to the designs & drawings shall not relieve the Contractor of his responsibilities for the correctness of the same and for execution of the work in accordance with the terms of the specifications. Detailed drawings approved by the Owner shall supersede the general drawings when they differ from them.

The drawings bearing the Owner's approval or drawings corrected in accordance with the comments of the Owner shall be deemed to be contract drawings and no variation there from shall be taken without the Owners written consent.

The Contractor shall submit Brief Design basis for structural works including description of software to be used.

The successful Contractor shall submit the following after award of Contract in line with the scope of work:

Civil Works

- a. Design Basis for Civil and Architectural Works
- b. General layout drawing / Master Plan layout drawing including boundary
- c. Architectural and civil construction drawings of buildings
- d. Design and detailed drawings for roads, drainage, culverts etc.
- e. Detailed drawings for Fencing and gates, paving etc.
- f. Landscape drawing
- g. Bar Bending Schedule
- h. Any other drawing or document required by the Owner for completion of project.

Unless otherwise stated, the Contractor shall be responsible for all necessary lists such as indents, rivet and bolt lists, material lists, Dispatch lists and lists for all bought out items.

19. Earthing and Lightning Protection System

19.1 Intent of Specification

- 19.1.1 This specification covers the design, engineering, manufacturing, testing, delivery, including all materials, accessories, erection and commissioning of the Earthing and Lightning Protection system for Common Area Infrastructure.
- 19.1.2 The Bidder shall submit the detailed design calculations, GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before at site commencement of works.

~~19.1.3 All design calculations, GTP and drawings shall be submitted to the Owner/Purchaser for approval before execution.~~

19.2 Scope of Work

19.2.1 Scope of Work shall include the following:

- Equipment earthing of all the equipment in the common infrastructure package.
- Earthing of all the electrical equipment in various building
- Lightning protection of common area infrastructure package
- Electronic earthing for workstations & Servers

19.3 Codes and Standards

19.3.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following Indian Standards, IEC publications and any other standards of latest edition including amendments, except where modified and /or supplemented by this specification.

IS 3043	Code of practice for earthing
IS 2633	Methods of testing uniformity of coating on zinc coated articles
IS 6005	Code of practice for phosphating iron and steel
IS 2629	Recommended practice for hot dip galvanizing on iron and steel
IS 2633	Methods for testing uniformity of coating of zinc coated articles
IS 2309	Code of practice for the protection of building and allied structures against lightning
IEEE 80	IEEE guide for safety in AC substation grounding

19.4 Technical Requirements for Earthing system

19.4.1 The earth mat design shall be done by the Vendor as per IEEE 80. The main earth mat shall be laid in the Substation area in accordance with the approved design requirements. The scope of earthing system shall include the earthing of all the equipment in the Substation and Substation control building.

19.4.2 Earthing Conductor Sizing including Step & Touch potential shall be carried out for Substation in accordance IEEE-80 using grounding software.

19.4.3 The earthing system of Substation shall meet the following requirements:

- Ensure adequate earth fault current for operation of earth fault protection.
- Limit step and touch voltages to acceptable limits during earth fault
- Earthing conductors and connections shall withstand earth fault current for the duration of the fault

19.4.4 The earth mat shall be designed with grid spacing such that safe voltage gradients are maintained. Bare mild steel (MS) rods to be installed below grade shall be spaced in a grid pattern to provide the earthing mesh grid throughout the site. Substation earth mat shall be interconnected with main power plant earth mat by a minimum of two parallel conductors. Size of Mild steel rod for laying of main Earth mat shall be decided during Detailed Engineering.

19.4.5 The mild steel earth grid shall be designed to withstand 30 years of corrosion and still retain safe touch and step potentials in accordance with IEEE 80.

19.4.6 ~~Buried earthing conductors shall have at least 600mm of earth cover unless stated otherwise. After~~ installation, the trench shall be backfilled and firmly re-compacted to maintain structural integrity of the compacted fill materials.

19.4.7 Neutrals of 400 kV systems, 33 kV system and 415 V System are solidly earthed. Each neutral of transformer should be solidly connected to the grid by duplicate earth connections, one going directly to earth electrodes and other going to the common earth bus. The size of the neutral earthing conductor should in no case be less than that of the size of the main earthing conductor. System earth fault currents of 63kA for 400kV system shall be considered for earthing design. The earthing design shall be carried out as per IEEE-80 and shall consider the following:

- Earth fault current duration for conductor sizing : 1 sec
- Shock duration for mesh sizing : 0.5 sec
- Type of buried earthing conductor : Mild steel rod
- Type of joint for below ground earth mat : Welded
- Rate of corrosion of steel : To be decided based on soil data
- Design life for earthing grid : 30 years
- Ambient earth temperature : 40°C
- Human body weight for step / touch voltage calculation : 60kg
- Surface material : Gravel
- Resistivity of gravel : 1000-ohm m
- Soil resistivity in Substation area : Vendor shall measure actual values at site and carry out the design accordingly.

19.4.8 Wherever earthing conductor crosses cable trenches, underground service ducts, pipes, tunnels railway tracks etc., it shall be laid minimum 300mm below them and shall be circumvented in case it fouls with equipment / structure foundations.

19.4.9 Earthing conductors or leads along their run on cable trench, ladder, walls etc. shall be supported by suitable welding / cleating at intervals of 750mm. Wherever it passes through walls, floors etc., galvanized iron sleeves shall be provided for the passage of the conductor and both ends of the sleeve shall be sealed with silicon or, PU Foam material to prevent the passage of water through the sleeves.

19.4.10 Earthing of the panels(all C&R panel, all battery charger panels, all lighting panels, junction boxes, communication panels like PLCC, FOTE, server, transformer marshalling box, cooler control box, OLTC box, NIFPS panel, online Partial discharge panels etc) shall be done at two separate locations by means of earthing terminal block mounted on suitable din rails by single core unarmoured, multistrand PVC insulated copper cable fixed with suitable gland and heavy-duty long barrel copper ring type nickel plated lugs to the nearest earthing conductor.

19.4.11 Earthing conductor around the building shall be buried in earth at a minimum distance of 1500mm from the outer boundary of the building. In case high temperature is encountered at some location, the

- 19.4.12 Earthing conductors crossing the road shall be laid 300mm below road or at greater depth to suit site conditions.
- 19.4.13 Earthing pads shall be provided for the apparatus / equipment at accessible position. The connection between earthing pads and the earthing grid shall be made by two short earthing leads (one direct and another through the support structure) free from kinks and splices.
- 19.4.14 Steel / RCC structures & columns, metallic stairs etc. shall be connected to the nearby earthing grid conductor by two earthing leads. Electrical continuity shall be ensured by bonding different sections of handrails and metallic stairs.
- 19.4.15 Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval. Apart from intermediate connections, beginning points shall also be connected to earthing system.
- 19.4.16 Metallic conduits shall not be used as earth continuity conductor.
- 19.4.17 Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.
- 19.4.18 Light poles, junction boxes on the poles, cable and cable boxes / glands, lockout switches etc. shall be connected to the earthing conductor running along with the supply cable which in turn shall be connected to earthing grid conductor at a minimum two points.
- 19.4.19 Earthing conductor shall be buried 2000mm outside the Substation fence. All the gates and every alternate post of the fence shall be connected to earthing grid.
- 19.4.20 Flexible earthing connectors shall be provided for moving parts.
- 19.4.21 A continuous earth conductor of 16 SWG GS wire shall be run all along each conduit run. The conductor shall be connected to each panel earth bus. All junction boxes, receptacles, switches, lighting fixtures etc. shall be connected to this 16 SWG earth conductor.
- 19.4.22 50mm x 6mm MS flat shall run on the top tier and all along the cable trenches and the same shall be welded to each of the racks. Further, this flat shall be earthed at both ends and at an interval of 30m. The MS flat shall be finally painted with two coats of red oxide primer and two coats of post office red enamel paint.
- 19.4.23 Chemical earth pit with earth electrode shall be provided as per IS:3043 to connect down conductor of lightning mast and towers with peak.
- 19.4.24 Earthing connections with equipment earthing pads shall be bolted type. Contact surfaces shall be free from scale, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making earth connection. Equipment bolted connections, after being checked and tested, shall be painted with anti-corrosive paint / compound.
- 19.4.25 Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protection, the welds shall be treated with red lead and afterwards coated with two layers bitumen compound to prevent corrosion.
- 19.4.26 Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingress.
- 19.4.27 Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.
- 19.4.28 All ground connections shall be made by electric arc welding. Welding shall be done with welding rod of low halogen content (7018 as per AWS/SFA-5.1 or, equivalent of IS: 814). All welded joints shall be

allowed to cool down gradually to atmospheric temperature before putting any load on it. Artificial cooling shall not be allowed.

- 19.4.29 Bending of earthing rod shall be done preferably by gas heating.
- 19.4.30 Metallic sheaths and armour of all multi-core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.
- 19.4.31 Earthing terminal of each lightning arrester and capacitor voltage transformer shall be directly connected to rod earth electrode which in turn, shall be connected to station earthing grid.
- 19.4.32 All earth pits shall be conventional earth pit with bentonite powder except for SAS, CRP & servers for which chemical earth pits shall be provided
- 19.4.33 Copper bonded earth electrode (with minimum 250-micron copper uniform coating, the copper used shall be type DHP alloy No 122 CDA, 99.5% copper) having required diameter and 3000 mm length OR Pipe in pipe type earth electrode shall be galvanized iron of minimum 40mm diameter
- 19.4.34 Inside dimension of the earth pit shall not be less than 600x600 mm.
- 19.4.35 Top cover of Earth Pit shall be of heavy duty cast iron (600x600mm) of reputed make. Cover shall be hinged type. (HDPE/Precast covers are not permitted).
- 19.4.36 For earth electrode CPRI type test report shall be submitted.
- 19.4.37 Earthing system calculations / results shall consider scenario of disconnection of one of the earth conductors from the Main Earthing Grid.
- 19.4.38 Detail Bill of Material (BOM) shall be submitted by the EPC during details engineering stage for owner's approval.
- 19.4.39 All bolt joints must be protected from corrosion by applying suitable paste / grease / petroleum jelly etc. at the time of installation. Same shall be included in the notes of all relevant drawings.
- 19.4.40 SS /HDG bolts, nuts with plain and spring washer (on both sides) shall be provided for petty clamp of earth electrode.
- 19.4.41 For entry of earth wire / earth strip / earth cable to earth chamber, 75 mm PVC/HDPE pipe shall be provided at least on two sides or as required.
- 19.4.42 Each earth pit shall have permanent identification with engraved plate fixed on OR near to Earth pit. The engraving shall have sufficient depth and letter size shall be not less than 25 mm. Material of engraving plate may be aluminium / aluminium alloy / SS 304.
- 19.4.43 Date of testing, value of earth resistance measured, and next date of testing shall be provided on each earth pit either by painting or by weather proof vinyl sticker. Letter size shall be not less than 25 mm.
- 19.4.44 Petty clamp shall be designed for connection of minimum 4 nos of earth wire/flat/ rod.
- 19.4.45 Petty clamp and earth conductor shall be designed so as to facilitate easy disconnection of for testing of earth resistance of earth electrode.
- 19.4.46 Top of earth rod / petty clamp shall be 75 mm below the top cover.
- 19.4.47 Earth pit shall be 50 mm above FGL.
- 19.4.48 Pre galvanised GI Strip with GI coating not less than 85 microns shall be used. Approved make of GI Flat are TISCO, JSW, AMNS or SAIL. Sufficient documentary evidence shall furnish to verify make of GI Flat/ strip / rod used by the contractor. NO Negative tolerance on size / dimensions (Width and thickness individually) / cross sectional area of earth strip / rod etc. is permitted.

~~19.4.49 Chemical Compound (Backfill material) for chemical earth pits and bentonite powder for pipe type earth pits.~~

19.4.50 The backfill material shall be highly conductive. The backfill Material shall be carbon based and of low resistance, non-corrosive, highly conductive carbon-based powdered material that improves grounding effectiveness, especially in areas of high soil resistivity such as rocky and sandy areas. This material shall be suitable to be installed in either slurry or dry form. The material shall attain the hardening characteristics of cement when mixed with water or exposed to moisture while retaining its' properties. The backfill material shall confirm to the following specifications:

- Shall be highly electrically conductive and non-soluble.
- Shall not leach into ground.
- Shall have a resistivity less than 0.1-ohm meter as per clause 14.5 (d) of IEEE 80
- Shall be compatible with all copper grounding systems.
- Shall contain a corrosion inhibitor to mitigate corrosion of copper
- Shall not contain hazardous chemicals
- Shall not be affected by drought and shall be stable between -10° to + 50° C temperature.
- Shall not depend on presence of moisture for conductivity but shall be electronically Conductive like metals.
- Shall be suitable for any kind of soil.

19.4.51 The compound should have been tested in a reputed laboratory for not containing any hazardous chemicals as per EPA Chapter 7.

19.4.52 Minimum sizes of earthing conductors shall be as follows:

Sl.No.	Equipment	Size/ type of Earthing material
1.	Main earthing conductor	Mild steel rod of adequate size
2.	Earth risers	Mild steel rod
3.	Rod earth electrode	Copper bonded or GI pipe as per requirement
4.	Earth conductor embedded in concrete	50X6 mm MS flat
5.	Chemical earth pit	As per IS 3043 and Earthing Calculation
6.	Electronic earthing	Chemical earth pit
7.	400 kV Equipment	
	• Equipment Earth pad to structure, Structure to earth mat	2 nos. 75X8mm GS flat
	• Control cubicle, Mechanism box	2 Nos. 50X6mm GS flat
	• Lightning arrester Insulating base to surge counter	Min. 50mm ² copper cable
	• Lightning arrester Surge counter to earth (without touching structure)	75X8mm GS flat
	• CVT, Wave trap, Current Transformer neutral to earth electrode	75X8mm GS flat

	Earth switch rod to isolator frame	2 nos. copper flexibles
8.	Tower with peak/lightning mast	
	Tower peak to test link	7/3.66mm galvanized steel shield wire
	Test link to main earth mat	50X6mm GS flat
	Structure to earth mat	75X8mm GS flat
	Bay marshalling kiosk	50X6mm GS flat
9.	33 kV Switchgear	50X6mm GS flat
10.	415 V Switchgear	50X6mm GS flat
11.	415 V PDB / DCDB / Emergency DB	50X6mm GS flat
12.	LT Transformer	50X6mm GS flat
13.	Charger / UPS	50X6mm GS flat
14.	Lighting panels	25X6mm GS flat
15.	Relay panels / SAS panel	25X6mm GS flat
16.	Cable trays	50X6mm GS flat
17.	Cable trays (along each side of trench)	50X6mm GS flat
18.	CT junction box / PT junction box/ Lighting junction box (if any)	50X6mm GS flat

- 19.4.53 For UCMS, SAS & UPS electronic earth pit shall be provided as recommended by the system supplier. The system supplier shall provide the requirements in writing for the electronic earth pit.
- 19.4.54 Auxiliary earthing mat comprising of MS rods closely spaced (300mm x 300mm) conductors shall be provided at depth of 300mm from ground level below the operating handles of the operating mechanism box of the isolators. Operating mechanism boxes shall be directly connected to the auxiliary earthing mat. Auxiliary earth mat shall be interconnected with main earth mat by welding.
- 19.4.55 All earth electrodes shall preferably be driven to a sufficient depth to reach permanently moist soil. Electrodes shall preferably be situated in a soil which has a fine texture, and which is packed by watering and ramming as tightly as possible. The electrodes shall have a clean surface, not covered by paint, enamel, grease or other materials of poor conductivity.
- 19.4.56 Earth pits shall be located avoiding interference with road, building foundation, column, equipment foundation etc. The disconnect facility shall be provided for individual earth pits to check their earth resistance periodically. Proper symmetry and distance between earth pits shall be maintained as per applicable standards and procedures. Treated earth pits shall conform to relevant standard.
- 19.4.57 Construction of trench for earthing conductor shall include excavation, laying of conductor, back filling and compacting. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150mm. Minimum earth coverage of 300mm shall be provided between earth conductor and the bottom of trench / foundation / underground pipes at crossings.
- 19.4.58 On completion of installation, continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured in presence of Owner's representatives. Equipment required for testing shall be furnished by Vendor.
- 19.4.59 Measurement of Ground Resistance

After completion of grounding system installation, the measurement of ground resistance shall be performed by the Vendor. Before measurement, the overhead ground wires shall be disconnected from the Substation / substation. The method of measurement shall be as per relevant standards / codes. The ground resistance of Substation grounding system shall be not more than 1 ohm.

19.5 Lightning Protection System

- 19.5.1 Direct stroke lightning protection (DSLPP) shall be provided in the Substation by lightning masts and shield wires including connections, earth pits etc. to make the lightning protection complete for the outdoor Substation. The arrangement shall be based on DSLPP calculations. Vendor shall furnish necessary design calculation for approval by Owner.
- 19.5.2 Lightning protection shall be provided for various buildings as per IS:2309.
- 19.5.3 Conductors of the lightning protection system shall not be connected with the conductors of the safety earthing system above ground level.
- 19.5.4 Down conductors shall be cleated on the structures at 1000mm interval.
- 19.5.5 Connection between each down conductor and rod electrodes shall be made via test joint (pad type compression clamp) located approximately 1500mm above ground level.
- 19.5.6 Lightning conductors shall not pass through or run inside galvanized iron (GI) conduits.
- 19.5.7 For the building, lightning protection system shall comprise air terminations, down conductors, test links, earth terminations and earth electrodes.
- 19.5.8 Materials for lightning protection system shall be as follows:
- 25x6mm galvanized steel strip for horizontal air termination and down conductors
 - 20mm diameter 1000mm long galvanized steel rod for vertical air termination
- 19.5.9 Air termination network consisting of vertical or horizontal conductors or combination of both shall be provided for the building. Down conductors shall follow the most direct path possible between the air terminal network and the earth termination network. Each down conductor shall be provided with a test link for testing. An earth electrode shall be connected to each down conductor.

19.6 Guarantee

- 19.6.1 Electrical and mechanical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, BSUL shall have right to reject the material. Guaranteed Technical particulars are to be submitted by the successful bidder during detailed engineering along with submitted drawings / documents

19.7 Tests

- 19.7.1 Materials offered shall be of type tested and proven type. Type test reports shall be submitted for approval. All routine and acceptance tests in accordance with the latest versions of applicable standards shall be conducted

19.8 Drawings, Data and Manual

- 19.8.1 To Be Submitted After Award of Contract:
- Technical data sheet
 - General arrangement drawings

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- Earthing layout drawing
 - Earthing design calculations
 - Lightning protection design calculations
 - Lightning protection layouts
 - Earthing installation details
 - Lightning protection installation details
-

20. Illumination System

20.1 Intent of Specification

- 20.1.1 This specification is intended to cover the Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of the indoor and outdoor Lighting system Common Area Infrastructure.
- 20.1.2 The Bidder shall submit the detailed design calculations, GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before manufacturing commencement.
- 20.1.3 All design calculations, GTP and drawings shall be submitted to the Owner/Employer for approval before execution.

20.2 Codes and Standards

- 20.2.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following Indian Standards, IEC publications and any other standards of latest edition including amendments, except where modified and /or supplemented by this specification. Some of the applicable standards are listed below:

IS:3646(Pt.1,2) and IS:3646(Pt.3)	Lighting
IS:418	Tungsten filament general service electric lamps.
IS:1258	Bayonet lamp holders.
IS:1569	Capacitors for use in tubular fluorescent, high pressure mercury vapour and low pressure sodium vapour discharge lamp circuit.
IS:1777	Industrial luminaire with metal reflectors.
IS:1913	General and safety requirements for luminaries.
IS:2148	Flame proof enclosures of electrical
IS:2215	Starters for fluorescent lamps.
IS:2418	Tubular fluorescent lamps for general lighting services.

IS:3323	Bi-pin lamp holders for tubular fluorescent lamps.
IS:3324	Holders for starters for tubular fluorescent lamps
IS:3646	Code of practice for interior illumination.
IS:4013	Dust-tight electric lighting fittings
IS:6616	Ballasts for high pressure mercury vapour lamps.
IS:8224	Electric Lighting fittings for Division 2 areas.
IS:9900	High-pressure mercury vapour lamps.
IS:9974	High pressure Sodium vapour lamps.
IS:10276	Edison screw lamp holders.
IS:10322	Luminaires.
IS:13021	AC Supplied Electronic Ballasts for tubular fluorescent lamps

20.3 Lighting Fixtures

- 20.3.1 The lighting fixtures and accessories shall be designed to operate at 240V AC 50Hz with supply voltage variation of $\pm 10\%$, frequency variation of $\pm 5\%$ and combined voltage and frequency variation of $\pm 10\%$.
- 20.3.2 All fixtures shall be complete with accessories like ballasts, igniters, power factor improvement capacitors etc. These shall be mounted inside the fixtures as far as possible. If these cannot be accommodated inside, then a separate metal enclosed weatherproof box shall be included to accommodate these. The starting time of these lamps to attain full light output shall be minimum. Each fixture shall have terminals suitable for 2.5 sq.mm stranded flexible copper conductor.
- 20.3.3 The mounting facility and conduit knockouts for the fixtures shall be as required and shall be suitable for cable/conduit entry.
- 20.3.4 On completion of the manufacture, all surfaces of the fixtures shall be thoroughly cleaned and degreased. The fixtures shall be free from scale, rust, sharp edges and burns.
- 20.3.5 All enamel finishing shall have a minimum thickness of 2 mils for outside surface and 1.5 mils for inside surface. The finish shall be non-porous and free from blemishes, blisters and fading.
- 20.3.6 The housing shall be stove enamelled or vitreous enamelled or anodised aluminium as relevant for the type of fixtures.

20.4 Lighting Accessories

- 20.4.1 Lamps
- a. Lamps shall be LED type only.

b. The contractor shall furnish typical wiring diagram for LED flood light fitting including all accessories.

The diagram shall include all technical details of accessories.

20.5 Lighting panels

- 20.5.1 Each panel shall be provided with one incoming triple pole switch fuse unit with neutral link and outgoing MCB's as required.
- 20.5.2 Separate DB for Main and emergency lightings shall be provided.
- 20.5.3 The panel shall have degree of protection of IP55 as per IS 2147. The panel shall be single front construction, front hinged and front connected, suitable for floor mounting.
- 20.5.4 The panel shall be provided with a circuit directory plate (of anodised aluminium with the inscriptions indelibly etched on the plate) which is fitted on the inside of the door.
- 20.5.5 Each panel shall be provided with one no. ON indicating lamp for each phase.
- 20.5.6 The main busbars of the panel shall be of aluminium alloy with adequate cross section to carry rated and short circuit currents. The maximum temperature of the busbars shall not exceed 85 degree C. The busbars shall be able to withstand a fault level of 9KA for 1 sec.
- 20.5.7 Switches shall be hand operated air break type, heavy duty conforming to IS 4064. The fuses shall be of class 3 type (9KA prospective breaking current).
- 20.5.8 The MCB's shall in general conform to IS 8828. The rating shall be well coordinated with the corresponding circuits.
- 20.5.9 The contactors shall be of full voltage, direct on line air break, single throw, electromagnetic type. They shall be provided with atleast 2 NO and 2 NC type auxiliary contacts.
- 20.5.10 The panels shall be provided with proper identification labels for the panel, incoming and outgoing circuits etc.

20.6 Illumination Levels and Type Of Fixtures And Luminaires

Location	Average Illumination level - Minimum (lux)	Type of Fixture
Common Area (Outdoor)	20(general)	LED flood light, weather proof
	50(on strategic equipment)	LED flood light, weather proof
Admin Building: 1. Open Office 2. Conference cum Training Hall 3. Server Room 4. Record Room 5. Executive Rooms 6. Reception 7. First Aid & Medical Room 8. Dining Room	300	LED-Recessed Mounting (With respect to the ceiling type)

9. Surveillance Room		
10. Pantry Room		
11.		
Canteen Building:		
1. Canteen		

Location	Average Illumination level - Minimum (lux)	Type of Fixture
2. Kitchen 3. Staff Accommodation Room 4. Store Room Guest House: 1. VIP suites 2. Rooms 3. Caretaker Room 4. Dining 5. Kitchen 6. TV Lounge 7. Recreation Room 8. Entrance Lobby		
Admin Building: 1. Toilets 2. Electrical Room Canteen Building: 1. Toilets 2. Electrical Room Guest House: 1. Toilets 2. Electrical Room	150	LED-Surface mounted/Wall mounted
Roads / General Area (outdoor)	15	LED - Suitable fixture

20.1 Guarantee

20.1.1 Electrical and mechanical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, BSUL shall have right to reject the material. Guaranteed Technical particulars are to be submitted by the successful bidder during detailed engineering along with submitted drawings / documents

20.2 Tests

20.2.1 Materials offered shall be of type tested and proven type. Type test reports shall be submitted for approval. All routine and acceptance tests in accordance with the latest versions of applicable standards shall be conducted

20.3 Drawings, Data and Manual

20.3.1 To Be Submitted After Award of Contract:

- Technical data sheet
- General arrangement drawings
- Layout drawing
- Lighting design calculations
- Simulation design calculations
- Installation details
- Wiring Diagrams

21. LT Switchgear & Distribution Boards

21.1 Intent of Specification

- 21.1.1 This specification is intended to cover the Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of the LT switchgear & DBs Common Area Infrastructure.
- 21.1.2 The Bidder shall submit the detailed design calculations, GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before manufacturing commencement.
- 21.1.3 All design calculations, GTP and drawings shall be submitted to the Owner/Employer for approval before execution.
- 21.1.4 For power supply scheme, bidder shall refer the LT AC SLD attached with this document.

21.2 Codes and Standards

21.2.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following Indian Standards, IEC publications and any other standards of latest edition including amendments, except where modified and /or supplemented by this specification. Some of the applicable standards are listed below:

IEC-947, IS-13947 : LT switchgear and DBs

All other standards relate to Cables, Enclosures, Instrumentation transformers, sensors, indication lamps, etc.,

21.3 Constructional Details of Switchboards

21.3.1 All Switchboards. i.e., 415V Switchgears, AC Distribution Boards (ACDBs), Lighting Distribution Boards (LDBs) shall be of metal enclosed, indoor, floor-mounted, free-standing type.

- 21.3.2 All switchboard frames and load bearing members shall be fabricated using suitable mild steel structural sections or pressed and shaped cold-rolled sheet steel of thickness not less than 3.0 mm. Frames shall be enclosed in cold-rolled sheet steel of thickness not less than 1.6 mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. The gland plates thickness shall be 3.0 mm (minimum) for hot / cold rolled sheet steel and 4.0 mm (minimum) for non-magnetic material.
- 21.3.3 All panel edges and cover / door edges shall be reinforced against distortion by rolling, bending or by the addition of welded reinforcement members. The top covers of the panels should be designed such that they do not permanently bulge/ bend by the weight of maintenance personnel working on it.
- 21.3.4 The complete structures shall be rigid, self-supporting, free from flaws, twists and bends. All cutouts shall be true in shape and devoid of sharp edges.
- 21.3.5 All switchboards shall be of dust-proof and vermin-proof construction and shall be provided with a degree of protection of IP: 52 as per IS:13947. Provision shall be made in all compartments for providing IP: 52 degrees of protection, when circuit breaker or module trolley has been removed. All cutouts shall be provided with synthetic rubber gaskets. The switchboards which are meant for outdoor duty shall be provided with degree of protection of IP: 54 as per IS: 13947.
- 21.3.6 Provision of louvers on switchboards would not be preferred.
- 21.3.7 All switchboards shall be of uniform height not exceeding 2500 mm.
- 21.3.8 Switchboards shall be easily extendable on both sides by the addition of vertical sections after removing the end covers.
- 21.3.9 Switchboards shall be supplied with base frames made of structural steel sections, along with all necessary mounting hardware required for welding down the base frame to the foundation / steel insert plates. The base frame height shall be such that floor finishing (50 mm thick) to be done by EPC after erection of the switchboards does not obstruct the movement of doors, covers, with drawable modules etc.
- 21.3.10 All switchboards shall be divided into distinct vertical sections (panels), each comprising of the following compartments:
- a. **Bus Bar Compartment**

A completely enclosed bus bar compartment shall be provided for the horizontal and vertical busbars. Bolted covers shall be provided for access to horizontal and vertical busbars and all joints for repair and maintenance which shall be feasible without disturbing any feeder compartment. Auxiliary and power busbars shall be in separate compartments.
 - b. **Switchgear/Feeder Compartment**

All equipment associated with an incomer or outgoing feeder shall be housed in a separate compartment of the vertical section. The compartment shall be sheet steel enclosed on all sides with the withdrawable units in position or removed. Insulating sheet at rear of the compartment is also acceptable. The front of the compartment shall be provided with the hinged single leaf door with captive screws for positive closure.
 - c. **Cable Compartment or Cable Alley**

A full-height vertical cable alley of minimum 175 mm width shall be provided for power and control cables. Cable alley shall have no exposed live parts and shall have no communication with busbar compartment. Cable terminations located in cable alley shall be suitably shrouded to prevent accidental contact by falling of tools etc. For distribution boards, the partition between the feeder compartment and cable alley made of FRP sheet may also be offered. It shall be of such construction as to allow cable cores with lugs to be easily inserted in the feeder compartment for termination. Wherever, cable alleys are not provided for distribution boards, segregated cable boxes with complete shrouding for individual feeders shall be provided at the rear for direct termination of cables in each individual feeder. For circuit breaker external cable connections, a separately enclosed cable compartment shall also be acceptable. The contractor shall furnish suitable plugs to cover the cable openings in the partition between feeder compartment and cable alley. Cable alley door shall be hinged.

d. Control Compartment

A separate compartment shall be provided for relays and other control devices associated with a circuit breaker.

- 21.3.11 Sheet steel barriers shall be provided between two adjacent vertical panels running to the full height of the switchboard, except for the horizontal busbar compartment. Synthetic rubber gasket shall be provided between the panel sections to avoid ingress of dust into panels. Each shipping section shall have full metal sheets at both ends for transport and storage.
- 21.3.12 After isolation of power and control circuit connections it shall be possible to safely carryout maintenance in a compartment with the busbar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose. Wherever two breaker compartments are provided in the same vertical section insulating barriers and shrouds shall be provided in the rear cable compartment to avoid accidental touch with the live parts of one circuit when working on the other circuit.
- 21.3.13 All 415 V switchgear (circuit-breaker) panels shall be of single -front type. MCCs and DBs shall be of single -front construction. All single-front switchboards shall be provided with single-leaf, hinged or bolted covers at the rear. The bolts shall be of captive type. The covers shall be provided with "DANGER" labels. All panel doors shall open by 90 deg. or more.
- 21.3.14 All ACDBs, Lighting DBs and DCDBs shall be of fixed module type. All 415 V circuit breaker modules and MCC modules shall be of fully drawout type having distinct 'Service' and 'Test' positions. The equipments pertaining to a drawout type incomer or feeder module shall be mounted on a fully withdrawable chassis which can be drawn out without having to unscrew any wire or cable connection. Suitable arrangement with cradle/ rollers and guides shall be provided for smooth movement of the chassis. For modules of size more than half the panel height, double guides shall be provided for smooth removal or insertion of module. All identical module chasis of same size shall be fully interchangeable without having to carry out any modifications.
- 21.3.15 All disconnecting contacts for power and control circuits of drawout moduels shall be of robust and proven design, fully self-aligning and spring -loaded. Both fixed and moving contacts shall be silver - plated and replaceable. The spring- loaded power and control drawout contacts shall be on withdrawable chassis and same on fixed portion shall not be accepted. Detachable plug and socket

- type control terminals shall also be acceptable.
- 21.3.16 Individual opening in the vertical bus enclosure shall permit the entry of moving contacts from the drawout modules into vertical droppers.
- 21.3.17 All equipment and components shall be neatly arranged and shall be easily accessible for operation and maintenance. The internal layout of all modules shall be subject to Employer's approval. The Contractor shall submit dimensional drawings showing complete internal details of busbars and module components, for each type and rating for approval of Employer.
- 21.3.18 The power and control cable entries shall be from the bottom.
- 21.3.19 Each switchboard shall be provided with undrilled, removable type gland plate which shall cover the entire cable alley. Bidder shall ensure that sufficient cable glanding space is available for all the cables coming in a particular section through gland plate. For all single core cables, gland plate shall be of non-magnetic material. The gland plate shall preferably be provided in two distinct parts for the easy of terminating addition cables in future. The gland plate shall be provided with gasket to ensure enclosure protection. Recommended drilling chart of gland plates for all power and control cables in the vertical panels shall be indicated by the Contractor in the respective G.A. drawings of the boards.
- 21.3.20 The Bidder shall consider layout of panels in a switchboard consisting of various feeder modules required for the system in a straight line, unless specified otherwise. The actual composition and disposition of various modules in a switchboard shall be finalised during detailed engineering.
- 21.3.21 **Clearances**-The minimum clearance in air between phases and between phases and earth for the entire run of horizontal and vertical busbars and bus-link connections at circuit breaker shall be 25 mm. For all other components, the clearance between "two live parts", "a live part and an earthed part", shall be atleast ten (10) mm throughout. Wherever it is not possible to maintain these clearances, insulation shall be provided by sleeving or barriers. However, for horizontal and vertical busbars the clearances specified above should be maintained even when the busbars are sleeved or insulated. All connections from the busbars up to switch / fuses shall be fully shrouded / insulated and securely bolted to minimise the risk of phase to phase and phase to earth short circuits.

21.4 Power Busbars and Insulators

- 21.4.1 All 415 V Switchboards and ACDBs shall be provided with three phase and neutral busbars.
- 21.4.2 All busbars and jumper connections shall be of high conductivity aluminium alloy / copper of adequate size.
- 21.4.3 The cross-section of the busbars shall be uniform throughout the length of switchboard and shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Neutral busbar short circuit strength shall be same as main busbars.
- 21.4.4 All busbars shall be adequately supported by non-hygroscopic, non-combustible, track resistant and high strength sheet moulded compound or equivalent type polyester fibre glass moulded insulator. Separate supports shall be provided, for each phase and neutral busbar. If a common support is provided, anti-tracking barriers shall be provided between the supports. Insulator and barriers of inflammable material such as Hylam, shall not be accepted. The busbar insulators shall be supported on the main structure.

- 21.4.5 All busbar joints shall be provided with high tensile steel bolts, Belleville/ spring washers and nuts, so as to ensure good contacts at the joints. Non-silver plated busbar joints shall be thoroughly cleaned at the jointed locations and a suitable contact grease shall be applied just before making a joint. All bolts shall be tightened by torque spanner to the recommended value. The overlap of the busbars at each joint surface shall be such that the length of overlap shall be equal to or greater than the width of the busbar.
- 21.4.6 All copper to aluminium joints shall be provided with suitable bimetallic washers.
- 21.4.7 All busbars shall be colour coded as per IS: 375. Wherever the busbars are painted with black matt paint, the same should be suitable for temperature encountered in the switchboard under normal operating conditions.
- 21.4.8 The Bidder shall furnish calculations establishing the adequacy of busbar sizes for specified current ratings.
- 21.4.9 All busbars shall have PVC sleeves (not taped) wherever called for in the Specification.

21.5 Auxiliary Busbars and Control Transformers

21.5.1 AC control supply Busbar

Each bus-section of all Switchgears shall be provided with two (2) nos. 415V / 110V control transformers. The 110V AC control supply from the control transformers shall be run through the MCC by means of two sets of control supply busbars of electrolytic copper. In case of one transformer failure, whole bus section can be fed through single transformer. The control supply to different modules shall be tapped individually from the control supply busbars.

21.5.2 Space Heater Busbar

Panel and motor space heaters shall be fed from separate AC auxiliary busbars running throughout the switchboard. The supply for these busbars shall be tapped from incomer before the isolating switch/ circuit breaker.

21.5.3 Control Transformers

The control transformers shall be 415 V/110 V with neutral point-earthed, of insulation class 'B' or better. The sizing of Control transformers shall be carried out by Bidder considering the actual load of power contactors, auxiliary contactors, indicating lamps and other equipment in the module circuit. An additional load of 15 watts should also be considered for each module, for remote auxiliary relays and lamps to be connected in the control circuit of modules. Bidder shall also ensure that control transformers are adequately designed for meeting the momentary loading requirements & the voltage drop during this condition shall not be more than 5%.

21.6 Earth Bus and Earth

- 21.6.1 A galvanised steel earth bus shall be provided at the bottom of each panel and shall extend throughout the length of each switchboard. It shall be welded / bolted to the framework of each panel and breaker earthing contact bar. Vertical earth bus shall be provided in each vertical section which shall in turn be bolted / welded to main horizontal earth bus.
- 21.6.2 The earth bus shall have sufficient cross section to carry the momentary short circuit and short time fault current to earth, as indicated in "Technical Parameters", without exceeding the allowable

temperature rise.

- 21.6.3 Suitable arrangements shall be provided at each end of the horizontal earth bus for bolting to Employer's earthing conductors. The horizontal earth bus shall project out of the switchboard ends and shall have predrilled holes for this connection. All joint splices to earth bus shall be made through atleast two bolts and taps by proper lug and bolt connection.
- 21.6.4 All non-current carrying metal work of the switchboard shall be effectively bonded to the earth bus. Electrical conductivity of the whole switchgear enclosure framework and truck shall be maintained even after painting. The carriage and breaker frame shall get earthed while being inserted in the panel and positive earthing of the breaker frame shall be maintained in all positions, i.e. SERVICE & ISOLATED, as well as throughout the intermediate travel.
- 21.6.5 Each module frame shall get engaged to the vertical earth bus before the disconnecting contacts on the module are engaged to the vertical busbars.
- 21.6.6 All metallic cases of relays, instruments and other panel-mounted equipments shall be connected to earth by independent stranded copper wires of size not less than 2.5 sq. mm. All the equipment mounted on the door shall be earthed through flexible wire/braids. Insulation colour code of earthing wires shall be green. Earthing wires shall be connected to terminals with suitable clamp connectors, soldering is not acceptable. Looping of earth connections which would result in loss of earth connections to other devices, when a device is removed, is not acceptable. However, looping of earth connections between equipments to provide alternative paths to earth bus is acceptable.
- 21.6.7 VT and CT secondary neutral point earthing shall be at one place only, i.e. on the terminal block. Such earthing shall be made through links so that earthing of one secondary circuit shall be removed without disturbing the earthing of other circuit.
- 21.6.8 All hinged doors having potential carrying equipment mounted on it shall be earthed by flexible wire/ braid. For doors not having potential carrying equipment mounted on it, earth continuity through scraping hinges/ hinge pins of proven design may also acceptable. The Contractor shall establish earth continuity at site also.

21.7 Circuit Breaker

- 21.7.1 Circuit breakers shall be three pole, air break, horizontal drawout type, and shall have fault making and breaking capacities as specified. The circuit breakers which meet specified parameters of continuous current rating and fault making / breaking capacity only after provision of cooling fans or special device shall not be acceptable.
- 21.7.2 Circuit breakers along with its operating mechanism shall be provided with suitable arrangement for easy withdrawal. Suitable guides shall be provided to minimise misalignment of the breaker.
- 21.7.3 There shall be "SERVICE", "TEST" and "FULLY WITHDRAWN" positions for the breakers. In "Test" position the circuit breaker shall be capable of being tested for operation without energising the power circuits i.e. the power contacts shall be disconnected, while the control circuits shall remain undisturbed. Locking facilities shall be provided so as to prevent movement of the circuit breaker from the "SERVICE", "TEST" or "FULLLY WITHDRAWN" position. It shall be possible to close the door in "Test" position.

- 21.7.4 All circuit breakers shall have short circuit releases and shunt trip coil irrespective of the type of operating mechanism.
- 21.7.5 All circuit breakers shall be provided with “4 NO” and “4NC” potential free auxiliary contacts. These contacts shall be in addition to those required, for internal mechanism of the breaker and should be directly operated from breaker operating mechanism. In case the manufacturer does not have a proven arrangement for providing the required number of circuit breaker auxiliary contacts on the fixed portion of the cubicle, necessary electrically reset latched relays like GE make type VAJC11 relays or similar of ABB/Siemens make shall be provided complete with all wiring in series with service position limit switch contacts, for multiplying the circuit breaker mounted auxiliary contacts and provide 4 NO and 4 NC contacts. Separate limit switches, each having required numbers of contacts shall be provided in both “SERVICE” and “TEST” position of the breaker. All contacts shall be rated for making, continuously carrying and breaking 10 Amp at 240 V AC and 1 Amp (Inductive) at 220 V DC respectively.
- 21.7.6 Suitable mechanical indications shall be provided on all circuit breakers to show “OPEN”, “CLOSE”, “SERVICE”, “TEST” AND “SPRING CHARGED” positions.
- 21.7.7 Main poles of the circuit breakers shall operate simultaneously in such a way that the maximum difference between the instants of contacts touching during closing shall not exceed half a cycle of rated frequency.
- 21.7.8 All circuit breakers shall be provided with the following interlocks:
- Movement of a circuit breaker between “SERVICE” and “TEST” position shall not be possible unless it is in open position. Attempted withdrawal of a closed-circuit breaker shall preferably not trip the circuit breaker. In cases the offered circuit breaker trips on attempted withdrawal as a standard interlock, it shall be ensured that sufficient contact exist between the fixed and draw out contact at the time of breaker trip so that no arcing takes place even with the breaker carrying it’s full rated current.
 - Closing of a circuit breaker shall not be possible unless it is in “SERVICE” position, “TEST” position or in “FULLY WITHDRAWN” position.
 - Circuit-breaker cubicles shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage, to cover the stationary isolated contacts when the breaker is withdrawn. It shall however be possible to open the shutters intentionally against pressure for testing purposes.
 - Circuit breakers shall be provided with coded key / electrical interlocking devices.
- 21.7.9 Circuit breaker shall be provided with electrical anti-pumping and trip free feature, even if mechanical anti-pumping feature is provided.
- 21.7.10 Mechanical tripping shall be possible by means of front mounted Red “trip” pushbutton.
- 21.7.11 In case of electrically operated breakers these push buttons shall be shrouded to prevent accidental operation.
- 21.7.12 Means shall be provided to slowly close the circuit breaker in “withdrawn position”, if required, for inspection and setting of contacts. In “service position” slow closing shall not be possible.

21.8 Guarantee

21.8.1 Electrical and mechanical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, BSUL shall have right to reject the material. Guaranteed Technical particulars are to be submitted by the successful bidder during detailed engineering along with submitted drawings / documents

21.9 Tests

21.9.1 Materials offered shall be of type tested and proven type. Type test reports shall be submitted for approval. All routine and acceptance tests in accordance with the latest versions of applicable standards shall be conducted

21.10 Drawings, Data and Manual

21.10.1 To Be Submitted After Award of Contract:

- Technical data sheet
- General arrangement drawings
- Layout drawing
- Electrical design calculations
- Installation details
- Wiring Diagrams

22. Air Condition and Ventilation System

22.1 Intent Of Specification

- 22.1.1 This specification is intended to cover the Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of the Air condition and Ventilation system Administrative block.
- 22.1.2 The Bidder shall submit the detailed design calculations, GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before fabrication commencement.
- 22.1.3 All design calculations, GTP and drawings shall be submitted to the Owner/Employer for approval before execution.

22.2 Codes and Standards

22.2.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the relevant IS / IEC standards including amendments, if any, except where modified and /or supplemented by this specification. Some of the applicable standards are listed below:

ASHRAE 15	: Safety code for mechanical refrigeration
IS 325	: Three phase induction motors
IS 655	: Metal Air ducts
IS 3103	: Code of practice of Industrial Ventilation
AMCA 210	: Test code for air movement device

IS 2312	: Propeller type AC ventilation fans
IS 3588	: Electric axial fans
IS 4894	: Centrifugal fans
UL 555	: Fire dampers

22.3 Scope of Work

22.3.1 The scope of work shall include provision of Air-Conditioned and ventilation of various area/rooms of Administration Block Buildings as below:

Sr. No.	Building	Well Ventilated Area / Room	Air-Conditioned Area / Room	Dehumidified Room
1.	Admin Building	1. Pantry Room 2. Storeroom 3. Toilets	1. Conference Room 2. Executive Rooms 3. Reception 4. Open office 5. First Aid and Medical Room 6. Server Room	1. PPE Room 2. Electrical Room
			7. Dining Room 8. Surveillance room	
2.	Canteen Building	1. Caretaker Room 2. Storeroom 3. Toilets 4. Bathroom 5. Kitchen	1. Staff Accommodation 2. Canteen	1. Store Room 2. Electrical Room
3.	Guest House	1. Utility Room 2. Recreation Room 3. Toilets 4. Caretaker Room 5. Kitchen	1. Vip Suite 2. TV lounge 3. Twin Bed Rooms 4. Dining	1. General Store Room 2. Electrical Room

- a) Air conditioning units for conference room etc. shall be set to maintain the inside DBT at 24-degree C $\pm$ 2-degree C and the air conditioning system for Electrical room and Surveillance room shall be set to maintain DBT inside rooms below 24-degree C. Electrical room, Surveillance room, and Server Room shall be provided with temperature transducer to monitor the temperature of the room.
- b) Controllers shall be provided in electrical for controlling and monitoring the AC units in these rooms. All instruments and local control panels along with controls and interlock arrangements and accessories as required for safe and trouble-free operation of the units. Local start / stop facility for local starting/ stopping of all electrical equipment/ drives

- c) The Temperature transducer shall have the following specification:
- Sensor: Air temperature sensor (indoor use)
 - Output: 4 to 20Ma
 - Temperature range: -5 deg.C to 60 Deg.C
 - Resolution: 0.1 Deg.C
 - Accuracy: 0.5 deg.C or better
 - Motors shall also confirm to the requirements

22.4 Technical Requirements of Air Conditioning System

- a) Air conditioning requirement shall be met using following types of Air Conditioning units as required. For various rooms, Vendor shall choose appropriate system, based on the heat load.
- b) Required number of Ductable split type AC units with air cooled outdoor condensing unit with semi hermetic/hermetic compressors including refrigerant pipes, controls, thermostats, filters, outlet dampers, etc.
- c) Required number of Cassette type split AC units complete with air cooled outdoor condensing unit having hermetically sealed compressor unit with cordless remote controller.
- d) Required number of High wall type split AC units complete with air cooled outdoor condensing unit having hermetically sealed compressor and high wall type indoor evaporator unit with cordless remote controller.
- e) Copper refrigerant piping complete with insulation between the indoor and outdoor units as required shall be provided. First charge of refrigerant and oil shall be supplied with the unit.
- f) GSS/Aluminium sheet air distribution ducting for distributing conditioned dehumidified air along with supply air diffusers and return air grilles with volume control dampers and necessary splitters etc., suitable fixtures for grilles/diffusers and supports for ducting complete with insulation shall be provided.
- g) Power and control cable and earthing, all instruments and local control panels along with controls and interlock arrangements and accessories as required for safe and trouble-free operation of the units shall be provided.
- h) MS Brackets for outdoor condensing units, condensers as required, PVC drain piping from the indoor units up to the nearest drain point shall be provided.

22.4.1 Ductable Split type AC units

- a) Each Split Air conditioner shall have an indoor unit and an outdoor unit, designed to provide free delivery of conditioned air to the conditioned space. The indoor unit shall be suitable for mounting on the ceiling concealed above the false ceiling. Outdoor unit can be placed on the roof. Each unit shall include a primary source of refrigeration for cooling and dehumidification, means for circulation and cleaning air.
- b) The cabinets housing the components of indoor units & outdoor units shall be of heavy gauge sheet steel and suitable for floor mounting/mounting from ceiling. The access panels shall be of easily removable type. The entire casing shall be lined with 25mm thick insulation of totally flame proof type. Suitable drain connection shall be provided for removal of condensate collected inside

a tray under cooling coil.

- c) The compressor shall be Semi hermetically/hermetically sealed type and complete with drive motor. The compressor shall be mounted on spring inside the lower most section of the unit so that it is easily accessible for servicing.
- d) Air cooled condenser of adequate surface area shall be offered. The air cooled condenser shall be made of copper tubes with external fins.
- e) The air handling fan shall be centrifugal type complete with belt drive and electric motor. Pre-filter at the suctions to remove dust particles down to 10 micron size with 90% efficiency and fine filters to remove dust particles down to 5 micron size with 99% efficiency at the outlet. All filters shall be of panel type.
- f) Cooling coils shall be of direct expansion type and made of heavy gauge copper with aluminium fins. Rows shall be staggered in the direction of air flow. Separate tubings from the distributor shall feed refrigerant uniformly to different sections of the coil.
- g) Refrigerant piping shall be of heavy gauge copper to IS:2501 or IS:1239 heavy class seamless M.S. pipe complete with thermostatic expansion valve, liquid strainer, dehydrator, liquid line shut off valve, high and low pressure gauges.
- h) An adequate method of condensate removal shall be provided. Condensate tray of adequate size, made of corrosion-resistant material or suitably treated with corrosion-resistant coating shall be provided. The tray shall be adequately insulated to avoid condensation over its external surface.
- i) A refrigerant strainer shall be provided in the liquid line immediately before the expansion device.
- j) A minimum of six (06) 25 thick neoprene rubber pads shall be supplied for each unit.

22.4.2 Cassette type AC units

- a) The Cassette type AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote-control units.
- b) Outdoor unit shall comprise of hermetically/ semi hermetically sealed compressors mounted on vibration isolators, fans and copper tube aluminium finned coils all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.
- c) Indoor units shall be of 4-way, ceiling mounted cassette type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi-function cordless remote-control unit with special features like programmable timer, sleep mode etc.

22.4.3 High Wall type Split AC units

- a) The split AC units shall be complete with indoor evaporator unit, outdoor condensing units and cordless remote-control units.
- b) Outdoor unit shall comprise of hermetically/semi hermetically sealed compressors mounted on

vibration isolators, propeller type axial flow fans and copper tube aluminium finned coils all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air.

- c) The indoor units shall be high wall type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by suitable motors and copper tube aluminium finned cooling coils. Removable and washable polypropylene filters shall be provided. They shall be complete with multi-function cordless remote-control unit with special features like programmable timer, sleep mode and soft dry mode etc.
- d) It shall have energy efficiency rating of 5 star.

22.4.4 **Centralized AC units**

For Centralized AC units, AC Scheduler / AC Controllers shall be provided to control and monitoring of AC units and shall have the following facilities:

- a) 100% Standby units (one working & one standby) shall be provided for rooms where control system & server equipment are there and 50% standby units shall be provided for all other rooms (office room, conference room etc.).
- b) Standby units shall come in to operation automatically when the running main unit fails
- c) Main and standby units shall be changed over periodically.
- d) Following minimum alarms shall be provided:
 - Compressor On/OFF condition of each unit
 - Compressor failure of each unit
 - Cooling water Pressure and Temperatures
 - Power Supply failure to AC unit
 - Power OFF to AC unit
 - High temperature in room.

22.4.5 **De-Centralized AC units**

For Decentralized AC units;

Wherever decentralized AC units are envisaged like Ductable split type AC units/ High wall type split AC units/ Cassette type split AC units etc. then the system shall be as follows:

- a) 2x100% Main Units shall be provided and changed over periodically.
- b) 20% Standby additional units shall be provided and shall come into operation.
- c) Following alarms shall be provided:
 - Power Supply failure to AC unit
 - High temperature in room

22.4.6 All Split AC units shall be of minimum 5.40 or, better ISEER rating.

22.4.7 Individual AC power supply cable & earth wire shall be of 2.5 SQMM for 1.5T & 4 SQMM for 3T AC units.

22.4.8 MCB's & ELCB's of adequate current capacity shall be provided for individual AC.

22.5 Technical Requirements of Ventilation System

22.5.1 In PEB's for 33KV Switchgear and LT switchgear room at Control Room Building (CRB), Ventilation system shall consist of multiple axial flow supply air fan units. To ensure that the air being supplied is free from dust particles, a minimum two stage dust filtration process shall be supplied with pre filters and fine filters.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

The ventilation system for each area shall be sized based on either air flow rate calculated considering a room temperature of 50C (Maximum) above ambient DBT during peak summer considering all heat loads or air flow rate calculated considering minimum number of air changes / hour, whichever results in higher air flow rate shall be considered.

22.5.2 Wall mounted axial flow exhaust fan for Store, Toilet, Maintenance room, Pantry etc., Each wall mounted axial flow exhaust fan complete with,

- Fan impeller & casing/short duct as required.
- Electric drive motor with coupling if any, including motor brackets.
- Grouting frame work, if any and nuts, bolts, foundation bolts etc.
- Rain protection cowl with bird-screen, made of GI, louvered shutter

22.5.3 Ceiling fans (BLDC) of approved make shall be provided in various rooms in addition to AC/ Ventilation system as per requirement.

22.5.4 Separate vent distribution boards shall be provided with components of owner approved make & specifications wherever applicable.

22.6 Technical Requirements of Dehumidifier System

22.6.1 The respective rooms mentioned in the Technical requirements equipped with proper De-humidification system.

22.6.2 The system shall be designed to maintain Indoor relative humidity (RH) of 50% - 60% all time.

22.6.3 The system shall be capable of maintaining the humidity without affecting the equipment inside the respective room.

22.6.4 The heat generated from the equipment shall be suitably evacuated.

22.6.5 To restrict the atmospheric air flow inside the rooms while door opening/closing, the room shall be equipped with air curtain or the room shall have higher pressure than atmospheric pressure.

22.6.6 Real time monitoring and supervision of the system shall be communicated for continuous data logging.

22.6.7 The system shall be robust and designed with additional margin.

22.6.8 AMC for the de-humidification system shall be provided.

22.7 Guarantee

22.7.1 Electrical and mechanical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, BSUL shall have right to reject the material. Guaranteed Technical

particulars are to be submitted by the successful bidder during detailed engineering along with submitted drawings / documents

22.8 Tests

22.8.1 Materials offered shall be of type tested and proven type. Type test reports shall be submitted for approval. All routine and acceptance tests in accordance with the latest versions of applicable standards shall be conducted

22.9 Drawings, Data and Manual

22.9.1 To Be Submitted After Award of Contract:

- Technical data sheet
- General arrangement drawings
- Layout drawing
- Design calculations
- Simulation design calculations
- Installation details
- Scheme Diagrams

23. Fire Detection and Protection system

23.1 Intent of Specification

23.1.1 This specification is intended to cover the Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of the FDPS for Administrative Block.

23.1.2 The Bidder shall submit the detailed GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before manufacturing commencement

23.2 Scope of Work

23.2.1 The scope of the work shall include provision of the following for Administration block including associated control building.

- a. Fire Detection and alarm System
- b. Portable Fire Extinguishers
- c. Wheel/ Trolley mounted Fire Extinguishers
- d. Sand buckets (min. 9Ltrs capacity) with stand

All the systems shall be designed in such a way so as to make the system complete and acceptable to TAC/nominated agency of insurance companies.

All equipment supplied under FAS shall conform to TAC norms

23.3 Codes and Standard

The equipment offered shall comply with the relevant Indian Standards. The Fire Alarm & Detection system shall comply with the following latest standards/codes:

IS 694 : Installation & maintenance of power cable

IS 2175	: Specification for heat sensitive detector
IS 11360	: Specification for photo smoke detector
IS 9779	: Specification of sound level
IS 2189	: Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System Code of Practice
NFPA Codes	: National Fire Protection Association Codes (U.S.A.)
TAC Manual - Manual of Tariff Advisory Committee of Insurance Cos. Of (India)	
Fire Detection & Alarm system components are UL/FM approved.	
CEA regulation - Measures relating to Safety and Electricity Supply Regulations, 2010, 2015, 2019 and 2018, Draft 2021	

23.4 Technical Requirements

23.4.1 Fire Detection and alarm System

- a. The Fire Detection and Alarm System shall provide instantaneous audio alarm when Fire is detected, in order to prevent loss of life, property and valuables etc by warning inhabitants in the affected premises immediately, so as to obtain necessary help from Fire Fighting and Salvage Staff
- b. The Fire Alarm System may be activated by automatic detection devices or by manual operation. Fire Detection and Alarm System performs the function of monitoring the areas from Fire continuously and giving an Audible Alarm in case of sensing of "Fire". The sensing of the Fire is accomplished through various types of Detector etc
- c. Various areas shall be provided with the adequate number of Detectors for continuous monitoring. Suitable Fire Detection system using Optical beam type smoke detectors and/or heat detectors shall be provided for entire Admin block buildings.
Air conditioned rooms shall have the Reflective Beam Smoke Detector technology (Transmitter receiver & reflector)
- d. The Fire Detection and Alarm System shall be Intelligent, Analogue Addressable, Microprocessor type. The System shall consists of addressable 3D Multi-sensor & Photoelectric Detector to detect any abnormal change in smoke, heat level and provide signal to the Fire alarm panel to actuate the corresponding output devices (Hooters & Relays) as programmed to take appropriate alarming measures
- e. The System shall consist of addressable 3D Multisensor Detector & addressable Manual Call Points. All the detectors and detection devices shall be connected with the Fire Alarm Panel. The Fire Alarm Panel shall be equipped with battery backup using Lead Acid type Sealed maintenance-free batteries with suitable boost cum float charger unit.
- f. The Fire Alarm System shall consist of following:-
 - i. Intelligent, Analogue Addressable type Microprocessor based Fire Alarm Panels at suitable locations as per requirement.
 - ii. Intelligent, Microprocessor based Repeater Panel in the Security room.
 - iii. Intelligent Detectors of 3D Multi-sensor & Photoelectric type.
 - iv. Intelligent Manual Call Point (MCP).

- v. Intelligent Monitor Module (Interface Unit), Control Relay Module & Output Module.
- vi. Electronic Hooters & Response Indicator.
- g. The Fire Alarm Panels shall be kept in control room. The Fire Alarm Panels shall be provided with computer, Monitor & all accessories such as video display unit, keyboard and printer for the Graphical Display & monitoring of all the areas. The Monitor shall Display the Graphical representation of all the areas protected by Fire Alarm System. When any of the Detector, MCP, Monitor Module, Control Relay Module operates, the indication of the corresponding device and the area shall flash on the Graphics of the PC.
- h. The Fire Alarm Panel shall consist of necessary indication and control push buttons and other accessories required for operation of the system. When any of the detectors detects any fire inside the protected premises through any type of detector, then the Fire Alarm Panel shall display the corresponding location on the LCD & the Fire LED of the panel shall start glowing. The audio-visual alarm comes ON in Panel indicating that the fire condition has been detected. Also, "EVACUATION" display unit (Hooter) located at strategic location shall start sounding.

Following salient features/ parameters shall be considered for design of fire alarm system.

- i. The Multisensor & Smoke detectors shall be provided in the protected areas.
- ii. The spacing of detectors shall be decided as per IS: 2189 in each protected area, considering the construction features.
- iii. Response indicators shall be provided for above false ceiling detectors.
- iv. Manual Pull Stations shall be provided near exit points.
- v. Fault Isolator modules shall be provided in the loop after every 20 detectors in the area to be protected.
- vi. Electronic hooters shall be provided in each protected area.
- vii. The cables shall be 1.5mm² (Cu) FRLS, PVC insulated, unarmoured for indoor and armoured for outdoor installation complying with IS: 1554.
- viii. Fire Alarm Panel shall have the capability to receive signal from smoke detector/fire alarm and relay the signal to all the doors with access control to "OPEN/UNLOCK" without access card or biometric.
- i. Fire alarm system shall be fully programmable and user friendly. The system shall have reliability, flexibility, and ease of installation, commissioning and maintenance. Robust power supply, large display option, fast response keypad
- j. Fire alarm system control panel shall function both as stand-alone system as well as interference between the Central Processing Unit and Fire Detectors and their accessories and control device.
- k. Fire alarm system (FAS) shall have electronics, necessary relays and modules, alarm output module for external hooter and lamp, control output modules for various functions through relay contact and communication module for interfacing with other Fire alarm system.
- l. Class A wiring of fire detector with fire alarm panel shall be provided.
- m. FAS shall scan all loops in parallel/simultaneously.
- n. Hooters shall have frequency between 500 Hz to 1000 Hz. Hooter sound level should not exceed 120

dB.

- o. Addressable detector/ manual call point & required devices in various areas shall be connected to FAS by Class A wiring to detector interface unit. No of detector in a single loop shall be more than 99. FAS shall support 5 loops.
- p. FAS shall have short circuit protection and appropriate alarm shall be displayed on the screen along with hooter sound.
- q. All addressable devices shall be interrogated in order from FAS.
- r. It shall support repeater panel and It shall have individually controlled, monitored alarm output for external hooters, lamps, etc.
- s. Redundant power supply for the whole system and communication among all FAS panels shall be provided.
- t. It shall be possible to change the sensitivity of each addressable detector to required value from the control room. It shall be possible reads sensitivity for each detector from the control room.
- u. FAS shall have the facility to set date and time.
- v. FAS shall have the facility to disable/isolate detector, Zone interference unit from the control panel for maintenance purpose and restore the same whenever required.
- w. FAS shall check for each detector, zone interface unit for alarm, pre-warning, fault disabling/isolating shall be possible from control room panel.
- x. FAS shall store more than 250 events.
- y. Software changes shall be possible from FAS without re-burning of Erasable Programmable Read-Only Memory (EPROM).
- z. Software database shall be maintained in non-volatile memory. It shall be possible to reprogram the software by authorized person only.

23.4.2 Portable fire extinguisher

- a. Adequate number of portable / trolley mounted fire extinguishers shall be provided in various rooms in each control building based on approved detail engineering scheme by BSUL / Owner without any extra/additional cost.
- b. Portable fire extinguishers shall be of following types:
 - i. Dry chemical powder type fire extinguishers, 6 kg capacity (SS-304 body) - 10 Nos.
 - ii. Carbon Dioxide type fire extinguishers, 4.5 kg capacity (SS-304 body) - 20 Nos.
- c. All the extinguishers offered by the Bidder shall be of reputed make and shall be ISI marked.
- d. All the portable extinguishers shall be of freestanding type and shall be capable of discharging freely and completely in upright position.
- e. All extinguishers shall be supplied with initial charge and accessories as required. Each extinguisher shall have the instructions for operating the extinguishers on its body itself.
- f. Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns.
- g. Dry chemical powder type portable extinguisher shall conform to IS: 15683.
- h. Carbon Dioxide type portable extinguisher shall conform to IS: 15683
- i. Wheel/Trolley mounted Mechanical foam type fire extinguishers (SS-304 body) of 45 litre capacity,

conforming to IS: 16018, shall be provided, one number.

23.5 Testing and Inspections

- 23.5.1 All routine and acceptance tests as per latest issue of relevant IS shall be conducted in presence of BSUL representative at original manufacturer's works. Routine and Acceptance tests shall be carried out for Control Panels & all other accessories to be used for Fire Protection System. In addition to above all relevant site tests shall be carried out to prove the guaranteed performance of Control Panels & all other accessories.
- 23.5.2 Three (3) copies of test reports duly signed by the representative of manufacturer, Contractor & duly signed by the BSUL's engineer witnessing the tests shall be furnished for approval. The contractor shall rectify at his own cost any defect detected during tests and retesting shall be done till satisfactory results are obtained

23.6 Guarantee

- 23.6.1 Electrical and mechanical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, BSUL shall have right to reject the material. Guaranteed Technical particulars are to be submitted by the successful bidder during detailed engineering along with submitted drawings / documents

23.7 Tests

- 23.7.1 Materials offered shall be of type tested and proven type. Type test reports shall be submitted for approval. All routine and acceptance tests in accordance with the latest versions of applicable standards shall be conducted

23.8 Drawings, Data and Manual

- 23.8.1 To Be Submitted After Award of Contract:

- Technical data sheet
- General arrangement drawings
- Layout drawing
- Design calculations
- Simulation design calculations
- Installation details

- 23.8.2 Scheme Diagrams

24. Surveillance and Security System

24.1 Introduction

- 24.1.1 The solar plant main security system consists of Solar plant surveillance system and Access control system.
- 24.1.2 The Solar plant surveillance system shall be the main surveillance system which shall be interfaced with the surveillance system of PV blocks and Pooling Substation.

- 24.1.3 The access control system manages entry to the respective building / room using authentication methods such as security cards and Biometrics. The Access control system shall include the access control of Administration building.

24.2 Codes and Standards

- 24.2.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following Indian Standards, IEC publications and any other standards of latest edition including amendments, except where modified and /or supplemented by this specification.

ANSI/ISA-TR99.00.01-2007	Security Technologies for Industrial Automation and Control Systems.
IEC 60839	Alarm and electronic security systems
IEC 62676-1-1:2013	Video Surveillance Systems for Use in Security Applications
IEC 62443-3-3:2013	Industrial communication network-Network and system security
BS En 50132-5:2001	Alarm system. CCTV surveillance system for use in security application.
ANSI C 39.5-1974	Safety requirement for electrical electronics measuring and controlling instrumentation
IEC 130-11	Edge socket connectors
IS 7405(PART-I)-1973	General Requirement and tests for printed wiring boards.
ISO/IEC 27002-2022	Information Security, Cybersecurity and Privacy Protection - Information Security Control
ISO/IEC 24760-1	IT security & Privacy - A framework for Identity Management

24.3 Scope of Work

- 24.3.1 The scope of work Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of Surveillance system shall include the following equipment:

- a. IP cameras for switchyard and Main control room
- b. NVR for entire park
- c. Network switches
- d. Server for Surveillance storage
- e. Surveillance workstation
- f. Large Video Screen
- g. Suitable software
- h. Entire Park camera controlling system with PTZ controller.

The bidder shall utilise the street lighting pole (not in bidder scope) to mount the IP cameras, but if specific positioning needed, bidder shall install new poles to mount IP / CCTV cameras.

- 24.3.2 The scope of work Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of Access control system shall include the following equipment:

- a. RFID Card cum Biometric Reader and logger
- b. Magnetic locks and switches
- c. Suitable software

24.4 General Requirements - Surveillance System

- 24.4.1 The Solar Plant Surveillance system has control of entire Plant surveillance system. All the solar PV blocks, Solar Park infrastructure system and pooling substation surveillance system shall be connected to the solar plant surveillance system.
- 24.4.2 The surveillance workstation (SWS) in administration building shall have the provision to display and control all the CCTV / IP cameras inside the solar park.
- 24.4.3 The network controller switch placed in the administration building shall be the interface point for all the surveillance camera networks. The Network Video Recorder with central management server shall be placed in Surveillance room of Admin Building.
- 24.4.4 The surveillance system shall communicate with dedicated communication system / channel and shall not use UCMS network to communicate.

24.4.5 Common Area Surveillance System:

- a. Indoor and outdoor areas shall be provided with IP cameras for 24 X 7 surveillance. The type of cameras shall be installed in different locations are as follows:

S.No	Type of IP Camera	Installation	Requirement	Location
1.	Bullet Type	Pole mount	Pan-Tilt-Zoom with wiper system and IR	All outdoor areas in common area including Roads, Gates and Main Entrance
2.	Bullet Type	Wall Mount	Pan-Tilt-Zoom with wiper system and IR	Outdoor Areas around the buildings.
3.	Bullet Type / Dome type	Wall Mount	Fixed Type with IR	Administration Building: 1) Reception
				2) Electrical Room 3) Server Room Canteen Building: 1) Dining Hall 2) Kitchen Guest House/Staff quarters: 1) Entrance Lobby 2) Recreation Room 3) Electrical Room

- b. The IP cameras installed in various place shall be connected in ring topology for data transfer/communication. Bidder shall provide the communication network by creating ethernet network or optical fibre network whichever is applicable. Bidder shall be responsible for all the required equipment and accessories to install the surveillance system on above mentioned areas.
- c. All the IP cameras shall be connected to the network controller switch located in the Administration Building.
- d. Surveillance Workstation(s) shall be provided in the Admin building for surveillance and to perform Pan-Tilt-Zoom Operation.
- e. Uninterrupted power supply shall be provided to all the cameras and accessories. Power supply shall be tapped from nearest available power source provided by the bidder. Power over ethernet shall not be recommended for the surveillance system.
- f. The surveillance system shall be designed as a standalone IP based network architecture. System shall use video signals from different cameras at different locations, process the video signals for viewing on monitors at different locations and simultaneously record all the video streams using H.264 or better compression technique.
- g. The design and manufacturing shall be such that equipment / components of same type and rating are interchangeable.
- h. A large video screen of 80" shall be installed to monitor all the surveillance with required amount of sub-screens
- i. Dry Joystick and mouse-keyboard controllers shall be used for pan, tilt, zoom and other functions of desired cameras.
- j. The surveillance system along with all its system components i.e., network switches, media converters /LIU etc. shall be powered 24X7 uninterrupted power supply system supplied from Park infrastructure DB.
- k. The exact locations of the cameras shall be decided during detailed engineering. Bidder to refer Master plan layout and Surveillance scheme diagram for reference.
- l. All System shall ensure that once recorded, video cannot be altered.
- m. System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the LAN.
- n. The system offered shall be of sound engineering and proven quality.
- o. All the electronic circuitries shall be built-up with plug in modules providing maximum flexibility and easy servicing.
- p. The location of the camera and their field of view shall be coordinated with the lighting such that field of view of camera is well lit up and there shall be no lighting glare on camera lens.
- q. The entire system shall use latest state-of-the-art advanced technologies and shall have a guaranteed life span and support commitment in terms of spares and services for 15 years. All the components offered as a part of the system shall be of the latest version and shall not be nearing end of life.
- r. The network shall be designed in such a way that it shall tolerate single point failures to avoid total shut down.
- s. The network shall be designed to have provisions of minimum 50% spare bandwidth under worst loading scenario while all components are connected and are operating normally.
- t. SS Legend plates shall be provided for all items supplied to identify the equipment.
- u. Overall dimensions of the nameplates shall be decided by the text of legend maintaining overall consistency and clarity and avoiding size variations.
- v. The system shall be able to accept potential free contacts from other system and use the same for predefined actions (like zoom/pan/tilt of cameras, bringing out predefined views on predefined monitors etc.) This feature shall be extensively used for linking fire related signals. 10 nos of potential free contact shall

be considered.

- w. The field mounted instruments and control equipment shall, however, be suitable for operation under ambient temperature not less than 55 deg. C and mean relative humidity of 88 per cent.
- x. All the instruments shall be capable of dust (electrically conducting) laden atmosphere normally experienced in steel plants.
- y. The system supplied shall be complete in all respects for reliable performance. The bidder shall submit the details of block schematics.
- z. In general, the protection class of enclosures for panel, desk, cabinets, JB's, Network switches & associated components, media convertors/LIU, camera, network switches etc. shall be as follows:
 - 1) Indoor air-conditioned area : IP-42 (Minimum)
 - 2) Indoor non-air-conditioned areas
 - i) Ventilated area : IP-42
 - ii) Non-ventilated areas : IP-54
 - 3) All Outdoor shaded & non-shaded areas : IP-67 (Minimum)

24.4.6 Perimeter intruder detection system

- a. The PIDS functionality of the surveillance systems in Solar PV blocks, PSS shall be interfaced with Common area infrastructure surveillance and the event shall be alarmed in PSS.
- b. The system shall be capable of providing 24-hour continuous surveillance by means of a network of IP video cameras.
- c. The intruder detection system shall be based on video motion detection technology.
- d. The system shall be able to identify and distinguish between whether the intruder is a human being or an animal.
- e. Upon detection of intrusion, suitable alarms to be raised to security guards and corresponding camera image shall be displayed on a high-resolution dedicated alarm screen. The surveillance workstations shall have the alarm system as an integral part. The alarm system shall have ACKNOWLEDGE, RESET and TEST functions.
- f. The system shall allow for the adjusting the sensitivity to reduce false alarms.
- g. When there is no intrusion, the camera images shall be displayed and recorded on a multiplexed basis.

24.5 General Requirements - Access control System

- 24.5.1 Fingerprint based biometric / security card access system shall be provided at specific places in Main Control Building.
- 24.5.2 The access control system shall permit access to the secured area separately by smart card reader or fingerprint reader or a combination of both.
- 24.5.3 Access system cards shall be suitable for individual configuration of access privileges via access control software for controlling access at Administration Building
- 24.5.4 Access controlled area entry/exit doors shall be fitted with Electro-magnetic locks. Access card reader shall be proximity card reader type / Biometric reader type.
- 24.5.5 The Access control system consist of the following elements:
 - a. Card cum Biometric Reader
 - b. Door Contact
 - c. Electric Lock
 - d. Emergency Exit Button
 - e. Exit Button
 - f. Access Controller / Network Controller switch to interface with PSS Control room

g. LIU and Fiber Optic Cables

- 24.5.6 The biometric and access card system shall be placed in the following locations inside the Administration building:
- a. Reception
 - b. Server Room
 - c. Electrical Room
 - d. Surveillance room
 - e. Record Room
- 24.5.7 All the servers, workstations and other required equipment for Access control system shall be placed in Surveillance room.
- 24.5.8 The card system / fingerprint reader shall be provided with an Audio/Visual Feedback with back lit LCD display and shall confirm to ISO14443A.
- 24.5.9 The system shall also have provision for providing visitor pass entry and record maintenance of entry and exit of visitor along with photo capturing facility. All necessary hardware, software, cables, accessories etc. shall also be provided by the bidder.
- 24.5.10 The administration block access control elements shall be interfaced with the main access control network. The network switch of access control system in administration block shall be the interface point for the pooling substation access control system.
- 24.5.11 Access Control System shall include a special fire alarm relay (dry contacts) to interface directly with the local fire alarm control panel at each entry/exit.
- 24.5.12 Power supply of electromagnetic lock / turnstile / barrier shall go through this special fire alarm relay. In case of fire detection in a particular location, all doors / gates / turnstiles / barriers controlled by access controller for the specific entry / exit points shall be automatically unlocked / open. The same time fire alarm's relay's relay must send information signal about activation to the relevant ACS controller. Once the fire alarm is reset (cleared) all access control operated doors / turnstiles will return to the normal state with lock enabled.
- 24.5.13 All the smart card readers and or fingerprint readers will be connected to the LAN via TCP/IP Converters.
- 24.5.14 The integration of the smart card reader and the fingerprint reader, wherever required, will allow the smart cards and the finger impressions to be read near simultaneously in a fast and single presentation.
- 24.5.15 Database of all locations shall be maintained in a single server located on Surveillance Room
- 24.5.16 Fingerprint based biometric and Security Card access system shall be provided with server, operator workstation and A3/A4 sized B/W printer and those shall be placed in Surveillance room.
- 24.5.17 The Access system cards shall be suitable for individual configuration of access privileges via access control software for controlling access at pooling station control room. Both the biometric and access card system shall be provided.
- 24.5.18 Access controlled area entry/exit doors shall be fitted with Electro-magnetic locks. Access card reader shall be proximity card reader type.
- 24.5.19 The card system shall be provided with an AUDIO/VISUAL Feedback with back lit LCD display and shall confirm to ISO14443A.

- 24.5.20 A Card access server along with OS shall be provided which shall be kept in the Surveillance room.
- 24.5.21 The access control system shall be capable to collect data of the entry/exit events and shall make report from the collected data automatically.
- 24.5.22 If the unauthorised access detected for repeatedly more than three times, an alarm shall be engaged to alert the security personnels.
- 24.5.23 Bidder shall ensure that all the time-dependent access control elements shall be time synchronised with the surveillance workstation provided for Access control system. The server shall also receive redundant signal from Master clock system which shall be either in IRIG-B or NTP protocol. The type of protocol shall be decided during detailed engineering.
- 24.5.24 Dedicated Uninterrupted Power supply shall be provided for all the access control elements.
- 24.5.25 The access control system shall comply the electromagnetic compatibility directive. The Access control system shall comply with ISO/IEC 27002:2022.
- 24.5.26 The personnels shall have the operational access, as a minimum, password-protected for the following levels:
- a. Level 1: Ability to display all point data.
 - b. Level 2: As Level 1 with ability to initiate data logging functions.
 - c. Level 3: As Level 2 with ability to change user-adjustable set-points and time schedules.
 - d. Level 4: As Level 3 with ability to change control strategies, schematic/graphics functions and password arrangement.
- 24.5.27 Ensure that password-protected operator access is set up for both surveillance workstations and field controllers which have an operator interface.
- 24.5.28 The passwords that permit shall have at least 8 Alpha-numeric-special characters as characteristics.
- 24.5.29 The Access control Software shall be protected from unauthorized entry. Bidder shall be responsible for the software support up to 10 years from the date of commissioning. Any kind of update and repair shall be on bidder's cost. No charges shall be provided by the employer.
- 24.5.30 The system shall also have provision for providing visitor pass entry and record maintenance of entry and exit of visitor along with photo capturing facility. All necessary hardware, software, cables, accessories etc. shall also be provided by the bidder.
- 24.5.31 All the data of access control system shall be stored in the redundant servers.

24.6 Specific Requirements

24.6.1 Network Video Recorder

- a. The NVR Server(s) must be capable of supporting a large amount of disk space for online video storage and access to high-capacity archiving mechanisms for the removal of stored video to off-line media.
- b. The NVR Server shall:
 - i. Manage live video from camera streamers.
 - ii. Transmit live video to Operator Stations
 - iii. Receive camera control commands from Operator Stations and then send the commands to cameras.
 - iv. Store live video to hard disk

- v. Transmit previously stored video to Operator Stations
 - vi. Archive previously stored video to off-line storage media
 - vii. Retrieve archived video from off-line storage media.
 - viii. Provide Video Analytics including Video Motion Detection
 - ix. Export the recordings into MPEG format so that it can be viewed using standard tools including Microsoft's Video Player.
- c. The NVR Servers shall rely on the Database Server for all camera database information. Proprietary hardware platforms are not acceptable. The server shall also receive redundant signal from Master clock system which shall be in NTP protocol.
 - d. The NVR Server shall be able to operate with no performance degradation using the same hardware and operating system configuration of database server and also redundant same as database server.
- e. Requirements of memory of database & NVR server shall be at least minimal as specified above; memory shall be suitable to have 1 month recording in server. Further DVD/Memory storage device shall be provided by bidder for past data storage of minimum one year for retrieval.
- f. Bidder shall ensure that the Network Video Recorder shall have sufficient channels to accommodate all the IP cameras installed in the solar power plant project.

24.6.2 Database Servers

- a. Video input: 32 channel; Video output: 2 (1 VGA+ 1 S-Video); Shall support NVR Network, NVRs intercom in the same Network; Support HDD extend case, extend HDD DIY; H.264 PLUS video compression; shall support CIF, DI, HD resolution recording; Local live resolution shall be 720p60/1080i60/1080p30; shall support manual, schedule, motion detection, alarm etc. record model; shall support search record by CH, time, date, event; HDD interface: shall support 5 SATA interface; Alarm input/output: 16/4; Network interface: 1/1000 Ethernet (RJ45); High performance embedded processor; Backup device: 1 USB2.0; 32" LED monitor, mouse; Communication: RS 232/485; Power supply: 240VAC, V $\pm$ 10%, 50Hz.
- b. Redundant database server shall be considered. The camera and database server shall offer both video stream management, video stream storage management. The servers shall also manage and store configuration information/ database for the whole system. Recording frame rate & resolution in respect of individual camera shall be programmable. It shall be possible to view and record at different resolutions and frame rates and this shall be individually programmable on every camera. The system shall ensure that all configuration information, video recordings, and user database etc., is automatically replicated on the standby camera/database server(s) so that in the event of failure of one server, the performance of the system is not affected. It shall be possible to take back-up of system configuration and database on portable media device and restoring the same if required.
- c. Camera server shall be provided with sufficient storage space to store recordings of all cameras at 25 FPS, 4CIF for SD cameras for a period of Sixty (60) days or more using necessary compression techniques. All recordings shall have camera ID, Location, Date and time of recording.
- d. Facility shall be provided to select a camera or a group of cameras in a zone for recording in CIF, 2CIF or 4 CIF resolutions for SD cameras.
- e. It shall be possible to export selected portion of recording to portable media devices. The exported clip shall be in commonly used movie file formats e.g. MPEG, AVI and no special software shall be required to view the same.
- f. Server software shall allow the clients seamless operation of all cameras regardless of the actual

connection to different recording servers. Software shall allow the client applications to interact with all the camera/database servers simultaneously and allow simultaneous display of live video/recorded video regardless of the zone in which the client is connected. It shall be possible to view, record, search and replay simultaneously without affecting performance of the system.

g. The Database Server shall:

i. Manage the system database, containing details including

- System configuration
- Camera configuration and settings
- Recording configuration and settings
- Configuration of Quad Views and Sequences
- Details of recordings
- Schedules
- Operator security details
- Configuration of Surveillance and Alarm Monitors
- Configuration of Video Analytics

ii. Manage communication between the Surveillance Workstations and the Camera Servers

iii. Manage database of Video Motion Detection

iv. Allow alarms/events in the Security System or Control System to initiate recordings

v. Report any camera failures or recording failures to the integrated Control system or Security system

vi. Provide a full audit log of all system status (camera, streamer, server availability) and operator actions.

- h. The Database Server shall be able to be use in a redundant configuration, using two separate Database Servers. The backup Database Server shall be continuously synchronized with the master Database Server to ensure that it is always up-to-date and ready for a fail-over, when required. The server shall also receive redundant signal from Master clock system which shall be NTP protocol.
- i. The Video Management System must be capable of running a pair of similarly configured computers in a hot backup configuration where at any point in time, one is the acting Primary and the other is acting as the Hot Backup. An on-line database duplication mechanism must be supported.
- j. Simply having each database server to scan each camera server or requiring the camera servers send all updates to both Database Servers is not acceptable. The database duplication must be performed on a per-transaction basis for two reasons:
- i. To ensure that the duplicated Backup database is always consistent with the Primary database.
 - ii. To avoid unnecessary loading of Camera Servers caused by duplicate polling. It must be possible to remove one of the redundant systems for maintenance without interrupting operation, and upon its reinstatement, re-synchronize the databases, again without interruption to system operation.

24.6.3 Surveillance Workstation

24.6.4 The surveillance workstation(s) (SWS) shall be provided in the Surveillance room. The following shall be the minimum requirement for the SWS. Addition to this any necessary system to complete the operation shall be provided by bidder.

Sl.No	Parameters	Descriptions
1	Processor Type	Intel Xeon quad core or higher
2	Motherboard	Server chipset with latest clock speed
3	RAM	16 GB expandable to 32 GB or more

4	Operating system	Windows 2023 or latest proven at the time of supply
Sl.No	Parameters	Descriptions
5	Hot swappable HDD drive	Min 5x250 GB SCSI type with hardware RAID feature
6	Power supply and fan	Redundant hot swappable
7	Online configuration changes possible	Required
8	Power supply	Redundant UPS supply of 230V as applicable, 50 Hz
9	Other accessories	KVIVl switch, anti-virus
10	Mouse	Optical / Scroll type
11	Keyboard	Standard-Industrial type
12	CD/DVD drive	DVD combo drives (R&W)
13	Magnetic media backup device	Ultrim 5 or higher
14	Ethernet interface card	10/100/1000 Base T 04 PORTS
15	Additional ports	Four (4) USB, two (2) serial and one (1) parallel
16	Colour monitor	32" LED (Full HD screen)

24.6.5 The Pan-Tilt-Zoom Keyboard shall be provided along with the surveillance workstation(s) (SWS). The following shall be the minimum requirement. Addition to this any necessary system to complete the operation shall be provided by bidder.

Sl.No	Parameters	Descriptions
1	Joystick Type	3-Axis Joystick Controller
2	Input Voltage	230VAC - Single Phase
3	Interface	Ethernet, USB 3.0, HDMI, DVI, Network, RS-232, RS-422, RS-485
4	Control Method	Network Control / and Serial control
5	Working Temperature	-10 °C to 55 °C (14 °F to 131 °F)

6	Working Humidity	10% to 90%
7	Protocol	Pelco-D

24.6.6 IP Cameras for PSS surveillance

24.6.7 All the cameras shall be colour, suitable for day and night surveillance and network compatible. There will be two types of cameras viz. PTZ & Fixed. The type and location of cameras shall be as per clause

24.6.8 Camera shall be directly connected to network and use of external encoder for connecting to network is not acceptable. The cameras shall be rugged, high performance color cameras. These cameras shall provide high resolution and high sensitivity suitable for operation in a power plant, both in natural and artificial lighted areas.

(i) PTZ Bullet cameras

High Definition PTZ cameras

- The camera at outdoor shall be mounted minimum 6-meter poles back-to-back (camera per pole facing opposite direction) with weatherproof outdoor enclosure fitted with wiper.
- The system shall have the following facility.
 - zooming
 - pan control.
 - tilt control
 - computer interface
 - multiple prepositions
 - programmability
 - alarm interface

Particular	Description
Image Device	1/2.8-1/3" Progressive scan CMOS
working temperature	- 30 deg C to 60 deg C
Number of Pixels	1280 X 720 (Full HD) 2MP at 25/30 IPS
Focal length	4.8 mm-120mm
Lens	2.7-12mm, MFZ,F1.4
Lens mount	CS-mount
Focus	Auto with manual override
Optical Zoom	25 X or better
Digital Zoom	12 X or better
Iris Range	F1.6-F2.9
Audio	Full duplex or 2-way
IR cut filter	Yes
Back light compensation	Required
White balance	Automatic with mode selection options

S/N Ratio	>50dB
Automatic Gain Compensation	Up to 18dB
Power Supply	As per manufacturer's standard to be arranged by bidder
Gain Control	Auto/manual
IR cut-filter	Required (in built)
Other Features (Support protocols)	IPV4/IPV6,RTP, UDP, TCP, IP, HTTP,
	HTTPS, FTP,
	DHCP, IGMP V2/V3, ICMP, ARP,
	SMTP, SNTP, SNMP or equivalent.
Security	Password protection
	Yes
Operating resolution	Primary stream – 1080P(1920X1080)
	FPS & other minimum 720X576 at
	25/30FPS
Analytics	Motion face detection
Ingress Protection Rating	IP66
SD/SDHC/SDXC in Camera (For Local alarm recording & scheduled local recording)	Yes, minimum 32 GB capability
Housing	IP66 (Minimum), Weatherproof IP 67 for outdoor applications. Ex. Proof for hazardous areas.

(i) Bullet camara - Indoor

Particular	Description
Image Device	1/2.8-1/3” Progressive scan CMOS
working temperature	minus 30 deg C to 60 deg C
Number of pixels	1280 X 720 (Full HD) 2MP at 25/30 IPS
Focal length	4.8 mm-120mm
Lens	2.7-12mm, MFZ,F1.4
Lens mount	CS-mount
Focus	Auto with manual override
Optical Zoom	25 X or better
Digital Zoom	12 X or better
Iris Range	F1.6-F2.9
Audio	Full duplex or 2-way
IR cut filter	Yes
Back light compensation	Required
White balance	Automatic with mode selection options

S/N Ratio	>50dB
Automatic Gain Compensation	Up to 18dB
Power Supply	As per manufacturer's standard to be
	arranged by bidder
Gain Control	Auto/manual
IR cut filter	Required (in built)
Other Features (Support protocols)	IPV4/IPV6, RTP, UDP, TCP, IP, HTTP,
	HTTPS, FTP,
	DHCP, IGMP V2/V3, ICMP, ARP,
	SMTP, SNMP, SNMP or equivalent.
Security	Password protection
Auto Resume after Power Failure	Yes
Operating resolution	Primary stream –1080P(1920X1080)
	FPS & other minimum 720X576 at
	25/30FPS
Analytics	Motion face detection
Standards	IP66
SD/SDHC/SDXC in Camera (For Local alarm recording & scheduled local recording)	Yes, minimum 32 GB capability
Housing	IP66 (Minimum)

24.6.9 Camera Housing & Mount

- All the cameras and accessories are to be housed in Weatherproof IP 67 environmental housing made of aluminium and Sun shroud. The housing, with heater and blower installed, shall provide protection for camera/lens assemblies in the ambient temperature range of - 0 deg. C to 50 deg C.
- For Non-Dome type cameras, the housing shall also have thermostatically controlled heater kit. Continuous duty blower kit (with suitable filters) for purge air arrangement / Window wipers shall be available within the housing for cameras as indicated against each application (as required) same shall be decided during detailed engineering stage.
- The camera mount should be of the same make as that of camera and suitable for the model no. offered as specified by the manufacturer and should be an integrated unit.
- Required Pole and wall bracket with accessories shall be provided.

24.6.10 Network Hub

- The network hub is a manageable sub-ethernet switch which shall be used to interconnect the cameras in ring topology. These sub-ethernet switches shall connect with the Ethernet switches in the appropriate area. The location of network switches shall be decided during detail engineering and shall be subject to approval of employer.

- b. Switch shall be industrial manageable grade; Switch shall withstand temperature min of 50°C

24.6.11 **Media Convertor / LIU**

- a. Media convertors / LIU shall be of latest version / high quality units. The units shall be of Front mounted / powder coated aluminium material for light mounting, which can be able to manage both splices & terminations.
 - Adapter panels for maximum 24 SC, 24 FC terminations.
 - Snap in Lock Design for easy change.
 - Removable front and rear covers for easy access.
 - Rubber fitted slotted brackets built-in, metal splice shelves to protect the fibers.
 - Provisions to couple armored cable from rear panel.
 - 24 SC Connectors, 24 Pigtails to be fully loaded.

24.6.12 **Network Controller Switch**

- a. All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. The common switch to which all networks are connected shall be Layer-III switch/router. The location of network switches shall be decided during detail engineering and shall be subject to approval of employer.
- b. Ethernet Switches shall be Manageable type with at least Layer 3 functionality.
- c. 10/100/1000 Ethernet FO/UTP interface
- d. Floor standing switch rack cabinets with front & back glass doors, cooling fan units etc. for locating the switches and LIUs.
- e. Switch shall be industrial manageable grade; Switch shall withstand temperature min of 50°C

24.6.13 **Power Supply**

- I. The Surveillance System along with all its system components i.e. IP cameras, network switches, storage devices, servers, switches, media converters / LIU etc. shall be powered from UPS system.
- II. All the IP cameras shall be fed from UPS from the respective area UPS / sub-DB. For cameras to be located in the areas where the UPS power supply cannot be extended due to voltage drop etc., then, 230V AC, 1 phase, 50 Hz uninterrupted power supply shall be arranged by the Bidder from the respective area power supply system.
- III. In case the IP cameras cannot operate with the normal 230V AC, 1 phase, 50 Hz Power supply system and no UPS can be extended for the same, then mini-UPS are to be provided by the Bidder for such applications within his quoted lump sum price.
- IV. Bidder shall also provide local power distribution boxes (PDB) for sub distribution of power supply to the cameras. If more than two no's of cameras are being fed from the same PDB.
- V. If the offered equipment is operating at voltage level other than what has been specified in Spec, Bidder must provide all required hardware and for their bidder power supply arrangement.
- VI. The power supply cable size and route shall be finalized during detailed engineering.
- VII. The supply mains shall be tapped from Park infrastructure DB.
- VIII. Power over ethernet is not recommended for the system.

24.6.14 **Instrumentation & Communication Cables**

24.6.15 **signal cable**

The signal cable shall be pair cable or triad cable. The Signal cables shall comply with the following minimum requirements:

Conductor type	:	Stranded (7) Annealed tinned Electrolytic copper
Conductor size	:	1.0 Sq.mm for 4-20 mA signal & 1.5 for voltage signal (tried cable)
Resistance	:	36.7 Ω /km for 0.5 mm ² , 18.2 Ω /km for 1.0 mm ² at 20 deg. C
Mutual capacitance @ 1KHz	:	250 pF/m.
Max. capacitance btw any core/ screen @ 1 KHz	:	400 nF/Km.
High voltage test	:	1 KVrms for 1 min.
Conductor Insulation	:	HRPVC extruded (850C) Type-C (IS- 5831, 1984 or Equivalent) 0.6 mm thick minimum (FS cable)
Voltage grade	:	650 V
No. of twist / meter	:	10-12
Twisting Direction	:	All pairs in the same direction
Individual Pair & Overall Shield	:	Aluminium myler tape with a thickness of 0.05mm (For individual shield) and 0.075mm (for overall Shield) and 25% overlapped edges & 100% coverage.
Drain wire	:	Annealed tinned copper drain wire of size. 0.8 mm ²
Inner Sheath	:	Extruded FRLS PVC, (Category C2) ST-2 as per IS 5831
Armoring	:	Galvanized steel wire/strip as per IS-3975 and IS-1554 part 1 or equivalent
Outer Sheath	:	Extruded FRLS PVC (Category C2) ST-2 As per IS 5831
Rip Cord	:	Yes
Temperature Range	:	85 Deg. C
Insulation at 20 Deg..C	:	100 M ohms/Km [Min]
Capacitance at 800 Hz	:	70 nf/km [Typical]

Signal cables are for 4-20 mA DC Signal or any other Low Voltage or Current signals.

Control Cables are for carrying voltages like 110/240V AC, 110/220V DC & Interrogation Voltage for DI/DO Contacts. Separate cable shall be used for DI & DO signals although both are 100 VAC.

24.6.16 **Control cable**

The Control cables shall comply with the following minimum requirements:

Conductor type	Stranded (7) tinned Electrolytic copper
Conductor size	Minimum 1.5 Sq.mm
Resistance	12.2 Ohms / Km (max.) at 20 °C
Conductor Insulation	HRPVC extruded (850C) Type-C (IS- 5831,1984 or Equivalent) 0.5 mm thick minimum
Voltage grade	1100 V
Overall Shield	Aluminum myler tape with a thickness 0.075mm (for overall shield) and 25% overlapped edges
Inner Sheath	Extruded PVC, 90 ° C
Armoring	Galvanized steel wire/strip as per IS-3975 and IS-1554 part 1 or equivalent
Outer Sheath	Extruded FRLS PVC
Temperature Range	85 °C
Insulation at 20 °C	100 M ohms/km [Min]
Capacitance at 800 Hz	70 nf/km [Typical]

24.6.17 **Fibre optic cable**

- I. **Single mode Fiber Optic Cables** shall be suitable for data communication as required by application outside the building or as the backbone. The technical particulars of the cables shall conform to the following and as specified:
 - i. Optical source support : 850 nm /1300 nm
 - ii. No. of cores : minimum eight (8)
 - iii. Core diameter : 50 µm
 - iv. Cladding diameter :125 µm
 - v. Cable type : Indoor/outdoor armoured (jelly filled with protection for direct burial cables) / non armoured.
 - vi. Attenuation (dB/km) : 3.0-3.5 at 850 nm / 1.0 at 1300 nm

24.6.18 **Ethernet cable**

I. **Cat-6 cable.**

- i. Construction : Shielded 4 twisted pairs
- ii. Conductor : Stranded bare copper (7 x 0.16mm)
- iii. Conductor Dia : AWG 23
- iv. Conductor insulation : PE
- v. Shield : Aluminium / polyester foil
- vi. Jacket material : PVC (flame retardant)

- vii. NVP : 0.75c
- viii. Average thickness : 0.50

Remaining electrical & environmental characteristics shall be as per proven vendor standard.

24.7 Tests

- 24.7.1 Testing at manufacturer's works, testing/commissioning of Surveillance at site is included in the successful bidder's scope of work. Testing of the system shall be as per relevant Indian standards.
- 24.7.2 The calibration equipment shall cover complete range and shall have desired accuracy of not less than 0.1%. All the calibration equipment shall have certification from National Physical Laboratory or 'IDEMI' traceable to International / National Standards for the duration of the contract period. The Bidder shall follow the standard procedures for calibration of various instruments and as set by the manufacturer of instruments and as instructed by the Purchaser including any requirements of field calibration. First, the calibrations shall be carried out independently by the Bidder and later in the presence of Purchaser who shall certify the same. Proper documentation in this regard shall be maintained and handed over to the Purchaser.
- 24.7.3 All the instruments shall be calibrated for the entire range of the instrument for which it is designed. Calibration shall include test for repeatability. After first commissioning, the instruments shall be tested for calibration again to check whether the instrument maintains its zero and maximum of the range.
- 24.7.4 All instruments and control equipment shall be calibrated to read correctly to the satisfaction of equipment supplier / Purchaser.

24.8 Drawings and Documents

- 24.8.1 The following drawings and documents shall be submitted for approval during detail engineering stage.
 - a) Reference list with capacity of plant, year of commissioning & user's certificate shall be furnished to with each copy of offer.
 - b) Clause wise compliance to this specification.
 - c) Project execution methodology
 - d) Surveillance System: System Architecture, Camera grouping philosophy, cabinet arrangements, power supply & earthing philosophy and concepts including major BOQ.
 - e) Access control System: System Architecture, Arrangements, power supply &
 - f) Details of the UPS Loads requirement (area wise) for Surveillance System.
 - g) Details of control elements of Surveillance system
 - h) List of technical, commercial deviations
 - i) Quality Assurance Plan & FAT procedures
 - j) Time schedule for design, manufacture, FAT, delivery, erection, SAT and commissioning in the form of a bar chart.
 - k) List of spare parts & consumables for commissioning.
 - l) List of sub-Bidders
 - m) Catalogues and literatures of the offered system

25. Miscellaneous Items

25.1 Intent of Specification

- 25.1.1 This specification is intended to cover the Design, Engineering, Manufacture, Assembly, Inspection, Erection, Testing and Commissioning of the Miscellaneous Items for the Common Area Infrastructure Facilities.
- 25.1.2 The Bidder shall submit the detailed design calculations, GTP and drawings, bill of materials and their specifications / standards to the Owner/Purchaser for approval before manufacturing commencement.
- 25.1.3 All design calculations, GTP and drawings shall be submitted to the Owner/Employer for approval before execution.

25.2 Codes and Standards

- 25.2.1 The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the relevant IS / IEC standards including amendments, if any, except where modified and /or supplemented by this specification. Some of the applicable standards are listed below:

IS 5561	Electric power connectors
IS 2121	Fittings for aluminium and steel cored aluminium conductors for overhead power lines
IS 731	Porcelain insulators for overhead power lines with a nominal voltage greater than 1000V
IS 2486	Insulator fittings for overhead power lines with a nominal voltage >1000V
IEC 60120	Dimensions of ball and socket couplings of string insulator units
IEC 60137	Insulated bushings for alternating voltages above 1000V
IEC 60168	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V
IEC 60273	Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V
IEC 60305	Insulators for overhead lines with nominal voltage above 1000V ceramic or glass insulator units for AC systems characteristics of string insulator units of the cap and pin type
IEC 60372	Locking devices for ball and socket couplings of string insulator units: dimensions and tests
IEC 60383	Insulators for overhead lines with a nominal voltage above 1000V
IEC 60433	Characteristics of striping insulator units of the long rod type
IEC 60471	Dimensions of clevis and tongue couplings of string insulator units
IS 2678	Dimensions and tolerances for wrought aluminium and aluminium alloys drawn round tube
IS 1255	Code of practice for installation and maintenance of power cables up to and including 33kV rating

IS: 13573	Joints and Terminations for polymeric cables for working voltages from 6.6 kV up to and including 33 kV-Performance requirements and type tests
BS:6121	Mechanical cable glands (Part 1 -Specification for metallic glands)
IS: 12943	Brass Glands for PVC Cables
IS: 8309	Specification for compression type tubular terminal ends for aluminium conductors of insulated cables.
ISO 12944	Corrosion protection of steel structures by protective paint systems

25.3 General Requirements

25.4 Cable Trays, Fittings and Accessories

25.4.1 Cable trays shall be ladder / perforated type as specified, prefabricated, made out of hot / cold rolled mild steel sheets, complete with matching fittings, accessories and hardware as required. All the items (including hardware) shall be hot dip galvanized. Thickness of galvanizing shall be not less than 126 microns i.e. zinc deposition for galvanization shall be 910 gm/sq.m. Cable trays shall be with standard width of 150mm, 300mm, 450mm and 600mm and standard lengths of 2.5m or more. Minimum thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2mm. For ladder trays, rung spacing shall be 250mm maximum. The thickness of side coupler plates shall be minimum 2.5mm and of tray covers shall be minimum 1.6mm.

25.4.2 Separate cable trays shall be provided for the following cables:

- LT power cables
- Control cables
- Signal cables
- Fiber optic cables

Cable trays shall be designed to cater to a load of minimum 75kg/m.

25.4.3 Support System for Trays and Cables

The support system shall be fabricated from ISMC / ISA steel members and shall be painted. The painting shall be considering CORROSION zone as per ISO 12944.

25.5 Conduits / Pipes, Fittings and Accessories

25.5.1 Conduits / pipes offered shall be complete with fittings and accessories (tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples, clamps, fasteners of SS-304etc.). The size of the conduit / pipe shall be selected on the basis of maximum 40% fill criteria.

25.5.2 Hume pipes shall be of reinforced concrete conforming to class NP3 for road crossings as per IS 458. GI pipes shall be of medium duty as per IS 1239.

25.5.3 Rigid steel conduits conforming to IS 9537 shall be suitable for heavy mechanical stresses, threaded on both sides and threaded length shall be protected by zinc rich paint considering the CORROSION zone as per ISO 12944. Conduits shall be smooth from inside and outside. Fittings and accessories shall also be hot dip galvanized. Thickness of galvanizing shall not be less than 910 gm/sq.m. The galvanized surfaces shall consist of a continuous and uniformly thick coating firmly adhering to the steel surface. The finished surface shall be clean and smooth and free from defects.

- 25.5.4 Flexible conduits where required, near equipment terminations, shall be made with bright, cold rolled, annealed and electro-galvanized mild steel strips. Flexible conduits shall be supplied with suitable end coupler nipple and check nut. In corrosive areas, epoxy coated conduits shall be provided.

25.6 Junction Boxes

25.6.1 Outdoor Type:

- a) Junction boxes shall be made of stainless steel of at least 1.5 mm thick or aluminum enclosure of at least 1.6 mm thick and shall be dust tight and water & vermin proof. Stainless steel used shall be of grade SS304 (SS316 for coastal area) or better. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. Junction box with IP-65 (minimum) degree of protection, shall comprise of a case with hinged door constructed from sheet steel material. The junction box shall be provided with extended canopy and dimensions shall be finalized during detail engineering as per purchasers/BSUL requirement. The boxes shall include brackets, bolts, nuts, screws, glands, lugs, brackets, bolts, nuts, screws etc. and shall be of SS-304.
- b) Earthing to be done by appropriate size of single core copper cable terminated to Rail mounted earthing TB inside the JB. Earthing cable entry shall be from the bottom gland plate with nickel plated heavy duty double compression gland. Other end of the cable shall be connected to earthing strip. (Normally length of cable is 1 to 2 meter maximum), Lug shall be of heavy duty long barrel tinned plated copper.
- c) Terminal blocks shall be of 650V grade, rated for 10A and in one piece moulding. It shall be complete with insulating barriers, clip-on-type terminal numbering on wiring diagrams. 20% spare TB's duly mounted on rail of each type shall be provided for future use.
- d) Test Terminal Block (TTB) shall be of 3 phase 4 wire screw type of large size. All terminals, shorting links, screws shall be nickel plated to prevent corrosion.
- e) The boxes shall have provision for wall, column, pole or structure mounting and shall be provided with cable / conduit entry knockouts and terminals.
- f) The JB shall be structure / foundation mounted type as per site suitability. They shall have double hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with suitably profiled EPDM/Neoprene/PU gaskets. The gasket shall be tested in accordance with approved quality plan, IS: 11149 and IS: 3400.
- g) Cable entry shall be from bottom. Removable gland plates shall be provided as per requirement. Removable gland plate shall be of min 3mm thickness and shall be provided with predrilled holes. Gland plate shall have 20% knock out holes for future use covered with grommet.

25.6.2 Indoor Type:

- a) Junction boxes shall be made of stainless steel (SS-304 or, better) of at least 1.5 mm thick and shall be dust, water and vermin proof. The box shall be properly braced to prevent wobbling. Junction box with IP-55 (minimum) degree of protection, shall comprise of a case with hinged door constructed from stainless steel material. The boxes shall include brackets,

bolts, nuts, screws, glands, lugs, brackets, bolts, nuts, screws etc and shall be of SS-304.

- b) Earthing to be done by appropriate size of single core copper cable terminated to Rail mounted earthing TB inside the JB. Earthing cable entry shall be from the bottom gland plate with nickel plated heavy duty double compression gland. Other end of the cable shall be connected to earthing strip. (Normally length of cable is 1 to 2 meter maximum), Lug shall be of heavy duty long barrel tinned plated copper.
- c) Terminal blocks shall be of 650V grade, rated for 10A and in one piece moulding. It shall be complete with insulating barriers, clip-on-type terminal numbering on wiring diagrams. 20% spare TB's duly mounted on rail of each type shall be provided for future use.
- d) Test Terminal Block (TTB) shall be of 3 phase 4 wire screw type of large size. All terminals, shorting links, screws shall be nickel plated to prevent corrosion.
- e) The boxes shall have provision for wall, column, pole or structure mounting and shall be provided with cable / conduit entry knockouts and terminals.
- f) Cable entry shall be from bottom. Removable gland plates shall be provided as per requirement. Removable gland plate shall be of min 3mm thickness and shall be provided with predrilled holes. Gland plate shall have 20% knock out holes for future use covered with grommet.

25.7 Motors

25.7.1 All AC motors shall be squirrel cage induction type. Power supply for AC motors shall be as follows

- Below 0.2 kW : 240V, 1 Phase, 50Hz.
- From 0.2 kW to < 160 kW : 415V, 3 Phase, 50Hz solidly earthed system

25.7.2 Motors shall be capable of delivering the rated output with supply voltage variation of $\pm 10\%$ and frequency variation of $\pm 5\%$ and absolute sum of 10%.

25.7.3 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperatures when supply voltage is 85% of the rated voltage.

25.7.4 Motors shall be designed for design ambient temperature of 50°C. Temperature of the stator winding shall not exceed 120°C while delivering maximum continuous rating.

25.7.5 Motors shall have IP 55 (minimum) degree of protection. Type of cooling for LT motors shall be TE / TEFC.

25.7.6 Continuous duty motors shall be energy efficient type IE2 class.

25.7.7 All insulated winding shall be of copper. Motors shall have class B or class F insulation but limited to class B temperature rise. Windings shall be impregnated to make them non-hygroscopic and oil resistant. The windings, fittings and hardware shall be corrosion resistant. The windings shall be tropicalized and suitably varnished, baked and treated for operating satisfactorily in humid and corrosive atmosphere. Separate terminal boxes of IP 55 (minimum) degree of protection shall be provided for stator leads.

25.7.8 The frame of each motor shall be provided with two separate and distinct earthing pads complete with tapped hole, GI bolts and washer. The cable terminal box shall have a separate earthing terminal.

25.7.9 Motor shall be factory-painted with epoxy-based paint. Painting procedure shall be suitable for saline environment as per ISO 12944. Corrosivity grade CORROSION shall be considered for outdoor

equipment. Shade of paint shall be RAL 7035. Painting shall be carried out by approved process. Sufficient quantity of touch-up paint shall be furnished for application at site.

25.8 Fire Stop Sealing System

- 25.8.1 Fire barriers / fire sealing system shall be provided for all fire rated wall and floor penetrations and for all direct cable entries into the Admin block building. Fire barriers / fire stops shall provide a fire endurance rating of at least 2 hours. The sealing system shall be proven type and tested as per relevant standard.
- 25.8.2 Fire barriers / fire stops shall be either one of the following methods:
- a) Panel sealing method (comprising encasing panels, cavity fill material and sealant)
 - b) Mortar / powder sealing method (comprising mixing mortar and curing with water)

25.9 Joints & terminations

- 25.9.1 Termination and jointing kits shall be of proven design and make which have already been extensively used and fully type tested. Kits shall be complete with all accessories and consumables required for complete termination or jointing. Heavy duty long barrel Copper cable lugs & jointing ferrules for straight through joints shall form part of the kit.
- 25.9.2 Termination and jointing kits shall be suitable for the following types of cables as per IS.
- 1.1 kV grade power cables
- 25.9.3 Termination kits shall be 'heat shrinkable type' for LV Cables.
- 25.9.4 Cable joints shall be avoided to the extent possible. If joints are unavoidable due to circuit length, in excess of permissible maximum drum length. Jointing kits shall be 'heat shrinkable type'.
- 25.9.5 Straight through joint and termination shall be capable of withstanding the fault level of 31.5 kA for 33 kV cables.
- 25.9.6 Straight through joints shall be protected against mechanical damage, rodent and termite attack. It shall be suitable for directly buried cables.

25.10 Cable glands

- 25.10.1 Cables shall be terminated using cable glands suitable for the voltage grade of cables. Cable glands shall be heavy duty brass machine finished and tinned. Cable glands shall be supplied with neoprene seal and earth lugs suitable for the fault capacity of the armour of the installed cables. Cable glands shall be double compression, weatherproof type for armoured and unarmoured cables. For flame proof equipment cable glands shall be of flame proof type. Removable type gland plates shall be provided as per the requirement mentioned in specification above for CT & VT junction boxes.
- 25.10.2 Power Cable Glands shall be supplied with good quality tin plated brass earth tag and serrated washer of adequate thickness. Earth tag shall be connected to nearest earth point with adequate size of wire with ring type lug on both sides.

25.11 Cable lugs

- 25.11.1 Cable lugs shall be of aluminium for aluminium cables and tinned copper for copper cables. Thickness of tinning shall be not less than 10 microns Type of end connection shall be solder less crimping type.

- 25.11.2 Cable lugs for conductors of power cables shall be "heavy duty" long barrel type. The type & size of cable lugs for power cables shall be selected according to the number and sizes of strands of the cable.
- 25.11.3 Solder less crimping of terminals shall be done by using corrosion inhibiting compound. Cable lugs for control cable termination shall be insulated. These lugs shall be ring type. However, other types such as pin type/flat type /U Type are only permitted if it is technically not feasible.
- 25.11.4 Type of cable lugs shall be as follows:
- Power cables with aluminium conductor : Aluminium crimping type.
 - Power cables with copper conductor : Copper crimping type.
 - Control Cables : Copper ring type /Copper screw type
 - Special cables : pin type / maxi-termi type

25.12 Trefoil Cable Clamps (if required)

- Clamps required for single core cables carrying alternating current shall be suitable for holding three cables together in delta formation. Clamps shall be of FRP material.
- Clamps shall be of suitable sizes to firmly hold the cables of various outer diameters including tolerance in OD.
- Clamps should have been type tested for Short Circuit Withstand Test.
- For Trefoil clamps run spacing shall be 2000 mm and axial spacing shall be double the diameter of larger adjacent trefoils cable or 150 mm whichever is less. Supports shall also be provided at each bend.

25.13 Omega Cable clamps

- Omega clamps shall be of galvanized steel and shall be used to fasten the individual multi-core cables.

Clamps shall be of simple construction, made of 2 mm thick, 25 mm wide strip of omega shape and suitable for clamping on the rungs / perforated sheet of tray with the help of two bolts. The galvanized surfaces shall consist of a continuous and uniformly thick coating firmly adhering to the steel surface. The finished surface shall be clean and smooth and free from defects.

- Clamps shall be of different sizes for different outer diameters of cables. Omega cable clamps shall be used for individual cables above 35 mm outer diameter.
- Steel clamps shall be hot dip galvanized. Weight of zinc not less than 910 grams per sq. meter
- For cables of above 35 mm OD, cables shall be individually clamped at 5000 mm interval for Horizontal runs and shall be individually clamped at 1000 mm interval for Vertical runs. Supports shall also be provided at each bend.
- For cables of up to 35 mm OD, cables shall be collectively clamped at 5000 mm interval for Horizontal runs and shall be collectively clamped at 1000 mm interval for Vertical runs. Supports shall also be provided at each bend.
- For cables supported along structures/ceiling, clamp spacing shall be 750 mm.

Supports shall also be provided at each bend.

25.14 Strip Cable Clamps

- Strip clamps shall be of galvanized steel and shall be used to fasten the group of multi-core cables up to 35 mm diameter only on a full or part of the tray width. The galvanized surfaces shall consist of a continuous and uniformly thick coating firmly adhering to the steel surface. The finished surface shall be clean and smooth and free from defects.
- Clamps shall be of simple construction, made of 3 mm thick Steel, 25 mm wide strip to cover the entire width up to 300 mm wide tray and part of the tray for more than 300 mm wide trays. Strip shall have two right angle bends at each end for fixing on to the rung/ perforated sheet of tray with the help of two bolts.
- Clamps shall be of different sizes for different sizes of tray width. However, the maximum size of clamp shall be 300 mm and for cable trays of greater width, two clamps shall be used.
- Clamps shall be hot dip galvanized. Weight of zinc not less than 910 grams. per sq. meter

25.15 Self-locking Clamps

- Clamps shall be of FRP material. Clamps shall have self-locking feature when the cord is looped. Clamps shall be provided with manual lock release.
- Clamp cord shall not move in the backward position once it has been locked, unless the lock release is applied.
- Type test certificates to ascertain the strength of clamps shall be submitted for Owner's approval.
- Not more than four (4) cables shall be clamped together, wherever collective clamping is permitted.
- Clamp length shall be selected such that not more than 80% of lockable length is utilised for clamping
- Nylon self-locking tie strips for collective clamping (up to 35 mm OD max. group of 4 cables) shall be 4 mm having Tensile strength 30 kg.
- Nylon self-locking tie strips for individual multicore clamping (above 35 mm OD up to 55 mm OD) shall be 4 mm having Tensile strength 20 kg.
- Nylon self-locking tie strips for individual multicore clamping (above 55 mm OD) shall be 7 mm having Tensile strength 60 kg.

25.16 Tags

- Cables shall be provided with cable number tags for identification.
- Cable tags shall be of SS-304.
- Cable numbers shall be engraved type
- Tags shall be of durable quality of size 60 mm x 12 mm with a tie hole at each end.

- Samples of tags shall be approved by the Owner before delivery.
- Tags shall be provided with non-corrosive wire (Nylon tie) of sufficient strength for tagging.

25.17 Contactless Sanitizer Dispenser (CSD)

- 25.17.1 The dispenser shall be mist based, to optimize the consumption of sanitizer. Whereas in normal usage, we use 20-30 ml of sanitizer for one operation, this CSD does the same job by dispensing just 5-6 ml of sanitizer in mist form over a longer period of time.
- 25.17.2 The main components of the CSD are
- a) sanitizer container with a capacity of 5 liters
 - b) Solenoid valve of working voltage 24 V DC
 - c) Diaphragm pump of working pressure 5-6 bar
 - d) Mist atomizer of material polypropylene
 - e) Water proof non- contact ultrasonic sensor with minimum sensing distance of 2 cm and minimum hand distance of 20 cm
 - f) Switch mode power supply of output 24V DC, 2 Amp
 - g) Control circuit of type ESP8266 controller or equivalent.
- 25.17.3 The minimum technical requirements of the unit are mentioned below:
- I. Sanitizer Capacity of the unit: 5L
 - II. Mode of operation: Automatic Mist mode.
 - III. Usage : Contactless
 - IV. Weight : 5 kg (without sanitizer) approx..
 - V. Electrical Input : 230V AC, 5 Amp
 - VI. Power Consumption:
 - Idle Mode: < 3VA
 - When Spraying: 25 VA approx.
 - VII. Mounting style: Wall mount

25.18 Hand Dryer

- 25.18.1 The dryer shall be of stainless steel one –piece cover, Epoxy painted, 1.5 mm thick. It shall start automatically and go on with no interruption as long as the hands are kept in the detection range of the sensor. The appliance will stop 2 seconds after the hands are removed from the airflow or after 120 seconds of continuous use.

1. The Minimum technical requirements are.

Voltage	220- 240 V
Frequency	50Hz
Electrical Isolation	Class II
Consumption	1.2 - 12A
Motor power	250 W
Rpm	4,500
Heating element power	2,500 W
Weight	4.25 Kg

Cover thickness	1.5 mm
Drying time	29 sec.
Effective airflow	450 m ³ /h (7,500 L/min)
Air velocity	95 km/h
Air temperature (10 cm distance/21°C)	50°C
Sound pressure (at 2m)	65 dBA

25.19 Liquid soap dispensers

25.19.1 The liquid soap dispenser shall be touch free, wall- mounted to reduce cross- contamination and the spread of germs. The liquid level shall display in the display window located at the front part of the dispenser to help monitoring the liquid content. It does not support soaps that contain methanol, chlorine or solid or abrasive particles. It is recommended to use liquid soap with the following characteristics:

- Maximum alcohol content of 80%
- Density between 0.9 and 1.35 kg/ dm³
- Viscosity between 500 and 2500

cps The Minimum technical requirements are

Capacity	1.2 L
Cover	3.0 mm
Base plate thickness	2.8 mm
Inner Tank Thickness	1.5 mm
Net weight	0.7 Kg
Quantity dispensed per pump /pulsación	1.2 ml

It is recommended to avoid installation of dispenser near high reflective objects (mirrors, stainless steel washbasins, taps, etc.) in order to avoid faulty function of the presence sensor.

25.20 Safety Items

25.20.1 HT danger notice plate shall be of adequate size made of ACP sheet (Aluminum Composite sheet) at least 2mm thick and vitreous enameled white on both sides and with inscription in signal red colour on front side as required. The front size & colours shall be finalized during detail engineering.

25.20.2 Steel tool box shall contain the following good quality tools as a minimum:

- Spanner set
- Screw driver
- Rubber gloves
- Line tester
- Adjustable spanner

25.20.3 Fire bucket set shall comprise 3 numbers buckets of 9 litres capacity with hooks for holding the buckets, painting with red paint and lettering 'Fire' on each bucket and filling them with sand.

25.20.4 Shock treatment chart shall be printed in at least three languages i.e. Hindi, English and local language. The chart shall be fitted in wooden frame with glass on front side and hard board at back side. The chart shall be displayed in all electrical equipment room.

- 25.20.5 Big size SLD of Plant, auxiliary system and earthing layout shall be printed in English and shall be framed and displayed at strategic locations as suggested / asked by Owner / BSUL.
- 25.20.6 First aid box shall include first aid leaflet issued by Chief Advisor of Factories, wound dressing, burn dressing, large absorbent cotton wool, dressing scissors, antiseptic solution, liquid iodine, ointment for burns etc.
- 25.20.7 Three numbers discharge rods and three numbers operating rods of suitable length suitable for use in the Substation shall be provided.
- 25.20.8 Qualified Safety personnel shall be deputed by the contractor during erection, testing & commissioning activities at site. Adequate nos. of Safety helmet, shoes, gloves, goggles shall be made available by contractor for his persons including labours during site activities.
- 25.20.9 Safety ribbon of danger encrypted on it (as per ISO/Indian standards) shall be used during execution activities.
- 25.20.10 Contractor shall also make, supply and install the Lock Out Tag Out (LOTO) system requirements like boards etc. as per the instruction manual / instruction provided by the Owner / BSUL. LOTO System shall consist of the following:
- 1) Nylon Lockout Hasp, Heavy Duty-nonconductive type to accommodate upto 6 nos of locks. Hasp shall withstand up to 1000 pounds and temperature upto 135 deg Celsius. Hasp shall be chemical resistant type.
 - 2) Nylon Shackle Safety Padlocks of Light weight, non-sparking body, fiberglass reinforced nylon body with non-conductive nylon shackle of red, yellow, blue, and green colours.
- Steel Padlock control center with white silk-screened graphics
- 25.20.11 Contractor shall also supply Work Permit registers as per instruction provided by the Owner/BSUL. Work Permits shall be provided for the following:
- 1) Equipment Work Permit
 - 2) Excavation Work Permit
 - 3) Height Work Permit
 - 4) Hot Work Permit
 - 5) High Voltage Work Permit
 - 6) Confined Space Work Permit
- 3) Nylon Lockout Hasp, Heavy Duty-nonconductive type to accommodate upto 6 nos of locks. Hasp shall withstand up to 1000 pounds and temperature upto 135 deg Celsius. Hasp shall be chemical resistant type.
 - 4) Nylon Shackle Safety Padlocks of Light weight, non-sparking body, fiberglass reinforced nylon body with non-conductive nylon shackle of red, yellow, blue, and green colours.
 - 5) Steel Padlock control center with white silk-screened graphics

25.21 Insulating Mats

- 25.21.1 Electrical Insulation Mats shall be as per latest amendments of IS 15652. It shall be dotted anti-skid design, fire retardant, high tensile and elongation properties, excellent mechanical properties to withstand load of breaker trolley etc., no adverse effect of acid, alkali, diesel and transformer oil etc. Electrical insulation mats shall be provided both in front and back (Rear) side of the Electrical panels

especially.

25.21.2 Color shade shall be Blue (exact shade will be provided during detail engineering).

25.22 Relay Test Block and Plug

25.22.1 Relay Test Block circuit shall withstand 20A continuously, 150A for 10s and 500A for 1s.

25.22.2 Test Plug circuit shall withstand 20A continuously, 50A for 10s, 100A for 3s and 150A for 1s. Relay test block and plugs shall be suitably rated for the required voltage. Test block and plugs shall be EMC compliant.

25.23 LED Display Board

25.23.1 One (1) LED display board screen (Multi color) shall conform to IP67 (minimum) degree of protection with a minimum dimension of 4 meters x 3 meters for display of Surveillance Details. The display board shall be interfaced with the PSS for making changes in the information displayed from the Surveillance Room for which the bidder shall provide appropriate software, cables, hardware ,etc. The sign board shall be mounted on SS-316 structures.

25.24 Fire Stop Cable Sealing System

25.24.1 Cable entry to Surveillance Room, Electrical Battery Room, Server Room, Conference Room shall be of Modular Multi-diameter type of cable sealing system with minimum 20% spares for each type of entry & cable size. Conventional cable sealing system shall be adopted for other buildings/room with minimum 20% spares for each type of entry & cable size

25.25 Painting & Galvanization

25.25.1 Coating shall be uniform, adherent, smooth, reasonably bright, continuous, and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters.

25.25.2 Painting shall be made as per requirements for CORROSION zone for outdoor and C4 zone for indoor equipment / material, structures, supports etc. as depicted in ISO 12944.

25.25.3 Galvanization shall be with minimum zinc deposition of 910 gram/sq.m. Requirements and recommendations for high saline zone as per ISO 12944 shall be considered for painting & galvanization of all equipment / materials / structures etc. in general unless otherwise mentioned for PSS plant.

25.26 TESTS

Materials and equipment offered shall be of type tested and proven type. Type test certificates shall be furnished. Routine tests and acceptance tests shall be carried out as per applicable standards.

25.27 Drawings & Documents

The following drawings and documents shall be submitted for approval during detail engineering stage.

- General arrangement drawings
- Technical data sheet
- Test reports

- Installation details for junction boxes
- Sub-vendor list
- Manufacturing quality plan
- Field quality plan

SAFETY MANUAL

CHAPTER I GENERAL

1.1 GENERAL:

The Engineers at site shall at all times exercise reasonable and proper safety precautions for the safety of the people at all works under their control, in accordance with instructions contained in this Manual. They shall also ensure strict compliance of the same by their subordinates. Also, they shall see that the contractors executing works under their control adopt stipulated safety measures and adequately protect their workers.

In addition to instructions contained in this manual the safety regulations contained in the below mentioned IS codes shall also apply wherever the provisions in the IS codes are exhaustive in nature:

I.S. SAFETY CODES:

1. IS 3764 1966,1992 Excavation work
2. IS 4756 1978 Tunnelling Work (first revision)
3. IS 7293 1974 Working with Construction Machinery
4. IS 7969 1975 Handling & Storage of building materials
5. IS 4081 1967,1986 Blasting and related drilling operations.
6. IS 3696 1966,1987 Scaffolds & ladders (Pt. I (Pt. I) Scaffolds)
7. IS 3696 1966,1991 Scaffolds & ladders (Pt. II (Pt. II) ladders)
8. IS 4138 1977 Working in compressed air (Ist revision)
9. IS 818 1968 Safety and health protection in electric and gas welding and cutting operations.
10. IS 4912 1978 Safety requirements for floor and wall openings Railings and toe Boards.
11. IS 5121 1969 Piling & other Deep foundations
12. IS 4130 1976,1991 Demolition of Buildings (Ist revision)
13. IS 5916 1970 Construction involving use of hot bituminous materials.
14. IS 3016 1965 Fire protection in welding and cutting operations.

1.2 ENFORCEMENT OF SAFETY REGULATIONS:

1.2.1 Group General Managers/General Managers, Group Deputy General Managers/ Deputy General Managers, Group Senior Managers/ Senior Managers, Managers, Deputy & assistant Managers, Supervisors and all other officials in charge of execution of work at the various organisational levels in the project shall ensure strict enforcement of safety regulations in the execution of works.

1.2.2 To assist the executive and supervisory staff of the project in spelling out the safety programmes and regulations prescribed in the Manual, a separate safety unit should be included in the project staff. This unit should consist of a Safety Officer with the qualification and experience, not less than those mentioned in the applicable The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules. The number of Safety Officers shall not be less than one Safety Officer for each 1000 work force [Including of Contractors] or part thereof in compliance with the Central Electricity Authority (Safety Requirements for Construction, Operation and Maintenance of Electric Plants and Electric Lines) Regulations, 2011. The safety officer will be directly responsible to the Group General Manager/General Manager or other Engineer-in-Charge of the project in keeping him informed of the compliance or otherwise of all safety regulations and standards by the various executives, supervisory staff and contracting firms and assist him in maintaining safe standards of working.

NHPC project/power station head shall nominate the safety officer having Degree in any branch of Engg. along with 3 Years' experience of working in the project/power station in supervisory capacity or Diploma in any branch of Engg. with 6 Years experience of working in the project/power station in supervisory capacity in case of non-availability of safety officer with above mentioned criteria as mentioned in Central /State Rules.

1.2.3 The detailed duties of the safety staff shall be as under:

- a) To look into all procedures and practices and examine temporary structures, the failure of any of which may result in an accident.
- b) To go around the works regularly and advise the contractors and the department as to the

measures to be taken to ensure safety of the works whether under the contractors or under the department.	
c) To see that the rules and regulations laid down in the safety manual are observed. Non-compliance with these regulations if any, should be brought to the notice of the Safety Engineer. d) To develop and execute programmes for the training of supervisory personnel in the application and observance of safety practices. e) To receive and analyse reports of all accidents and fires and initiate corrective actions warranted by the situations. f) To conduct safety education and awareness/publicity. g) To recommend revisions or additions to the safety manual on safety measures in the light of project experience. h) To prepare safety posters, signs, displays, leaflets, bulletins, etc., and display them on neat attractive bulletin boards. Cartoons may also be displayed. i) Suggestions from the workers may also be obtained by means of suggestion boxes which may be kept at various places. j) Make certain that all Central Government, State Government or local laws and ordinance are complied with.	Construction, Operation and Maintenance of Electrical Plants and Electric Lines) Regulations 2011 and any other statutory requirements if applicable, like the Factories Act/ State Factories Rules, ESI Act, PF Act, Workmen's Compensation Act, other applicable rules and provisions.
1.2.4 A Project Safety Committee shall be constituted under the Chairmanship of Group General Manager/ General Manager of the Project, and shall have members from amongst the Senior Officers, Safety Engineer and representative of the contractor. The number of the members may vary and shall be decided by the Group General Manager/ General Manager according to the magnitude of the work and jobs involved. This Committee would meet once in a month, generally supervise the Safety arrangements, advise and give suggestions to the Safety Engineer, and consider the reports of the safety engineer.	1.3.2 Additionally, the provisions of the NHPC Safety Rules for Construction/ Safety Provisions under NHPC Safety Manual – as amended on dated April 2018 shall also be complied with by the contractor/ agency. In case of any unconformity between statutory requirements and the Safety Rules of the NHPC, the latter shall be binding on the Contractor unless the statutory provisions are more stringent. 1.3.3 The Contractor shall also comply with all directions given in writing by the Engineer In-charge or NHPC Safety Officer or their nominated representative with specific regard to Safety of the workers. 1.3.4 The Contractor/ Agency shall frame and implement its Safety Policy, which shall contain all the provisions as mentioned in the statute and also as mentioned in NHPC Safety Policy, if it is not in contravention with the statutory provisions. 1.3.5 Before Start of work by the Contractor, he shall submit following documents to the Engineer In charge and Safety Officer i. Safety Plan of the Contractor for his own as well as his sub- contractors; ii. Methodology of Hazard identification and control measures thereof; iii. Methodology to be adopted by him for providing work related training (For all Contract workers), including the hazards involved in the work allocated to the worker and how the work shall be done by the contract labour to ensure safety of his own as well as others working there. iv. Names of Safety Officers, Safety supervisors and supervisors as well as the specific working area, to be supervised by them, for safety at the workplaces. v. Methodology (Including responsibility) of accident reporting to NHPC authorities and statutory authorities, conduct of enquiries, and implementation of corrective measures.
1.3 CONTRACTORS' SPECIAL RESPONSIBILITIES:	
1.3.1 The contractor/ agency shall comply with all the requirements of "The Building and Other Construction Workers (Regulation of Employment & Conditions of Service) Act," 1996/ Central Rule 1998, the Central Electricity Authority (Safety Requirements for	1.3.6 The Contractor shall notify the names of Competent Persons, responsible for inspection of following equipment and facilities.

- i. Name of Electrical Safety Officer to tests and Inspect all electrical equipment, installation and Safety Measures;
 - ii. Tests and Inspections of all Scaffoldings and platforms for working at height including its strength adequate handrails, Toe Boards etc.;
 - iii. Tests and Inspections of all Personal Protective Equipment,
 - iv. prevention of unauthorized entry or working by any person, including his own, into their workplaces,
 - v. Ensuring PTW for his place of work.
- 1.3.7 Before Start of work by the Contractor/ Agency, the Contractor shall show the Personal Protective equipment, lifting equipment, and other safety related items, brought by him/ them to NHPC Safety Officer and Engineer In charge or his authorized representative for inspection, who will inspect, if these equipment meet legal requirements. Only after inspection by them and clearance from them, in writing, above referred items shall be used or issued by the Contractor. However, such clearance shall be applicable only for bringing these items and NHPC shall not be a party, if these items/ equipment fail legal requirements, due to any supervisory problems, including unsafe handling or failure, due to whatever causes.
- 1.3.8 The Contractor/ Agency will notify well in advance to the Engineer In-charge and NHPC Safety Officer of his intention to bring to the Site, any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. NHPC shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contract shall strictly adhere to and comply with such instructions. The Engineer In-charge and NHPC Safety Officer shall have the right at his sole discretion to inspect any such container or such construction plant/ equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use.
- 1.3.9 The Contractor/ Agency shall take all measures required to ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to the Employer or to others, working at the Site.
- 1.3.10 The Contractors/ Agencies shall get Safety Audit of their construction activities atleast once in every 12 months period, through competent Safety Auditors.
- 1.3.11 However, Director General Factory Advise Services & Labour Institute (DGFASLI), all Regional Labour Institutes (RLI), National Safety Council (NSC) and all States Safety Councils can be considered for carrying out Safety Audit of Power Stations/ Projects.
- 1.3.12 All equipment used in construction and erection by the contractor shall meet BIS/ International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation manual. The contractor should also follow Guidelines/ Rules of the Employer in this regard.
- 1.3.13 The Engineer In-charge and NHPC Safety Officer or their nominated representative shall have full power to demand any document/ take photos, which may affect Safety and health at the contractor's work place, and the contractor will provide it without any pre-condition.
- 1.3.14 The Contractor shall provide safe working conditions to all workmen and employees at his workplace including safe means of access, railings, stairs, and ladders, scaffolding, work platforms, toe boards etc.
- 1.3.15 Before Start of the contract, and subsequently within every 12 months, the Contractor shall provide appropriate Safety Training to all his workers, of at least 10 working hours as mentioned in the Central Electricity Authority (Safety Requirements for Construction, Operation and Maintenance of Electrical Plants and Electric Lines) Regulations 2011.
- 1.3.16 Whenever any training program is organized by NHPC for the contractor's establishment, the contractor shall send his workers to attend the programme.
- 1.3.17 The contractor shall arrange to get the certificate of training issued from training institution, to all the workmen, trained by them, which shall mention the date of training and its subject. The contractor shall endorse the training on the identity card issued to the workmen.
- 1.3.18 Adequate supervision shall be provided by the contractor at all times of work undertaken by the workers.
- 1.3.19 When NHPC Conducts any inquiry to find facts of any accident, violations of Statutory Provisions/ NHPC Rules and asks the

- contractor to send his workers in the enquiry, the Contractor shall send his workers for depositing in this Inquiry.
- 1.3.20 The Contractor shall follow provision of Permit to Work system for working at height, implemented by NHPC. Wherever there is probability of fall of worker to level of more than 8 Ft, to prevent his fall, the contractor shall provide safety net below such area. Such Safety nets shall be provided wherever the possibility of fall of material also exists. The Contractor shall also provide Fall Arresting system/ device (Fall Arrestor), when required and shall ensure its use.
 - 1.3.21 The contractor shall make all medical facilities, including ambulance room for first aid and provide ambulance for shifting and treatment of sick and injured as mentioned in "The Building and Other Construction Workers (Regulation of Employment & Conditions of Service) Act/ rules.
 - 1.3.22 The register of medical examinations of the workers, employed in hazardous areas, conducted as per statutory provisions and injury (including near miss injury) register, shall be maintained by the Contractor. It will be presented to Engineer In-charge and NHPC Safety Officer as well as Statutory authorities on demand.
 - 1.3.23 Emergency Action Plan prepared by the agency, in compliance with statutory provisions, shall be submitted to Engineer In-charge and NHPC Safety Officer, for their approval. If any conditions are suggested by Engineer In-charge, NHPC Safety Officer, or their nominated representative the Emergency action plan shall be revised by the Contractor on the basis of suggestions so received.
 - 1.3.24 Mock Drill shall be organized by the Contractor as per Schedule and frequency of DMP of Project in consultation with NHPC Safety Officer or their nominated representative.
 - 1.3.25 Only double insulated wire/ cable of power tools shall be used at the construction place.
 - 1.3.26 The contractor shall ensure that all electrical installations or equipment including temporary electrical installations at the construction works are provided with earth leakage circuit breakers.
 - 1.3.27 For Single phase connection, the contractor shall use 3 core cable with 3rd wire connected to earth. For three phase connection, the contractor shall use four core cable with 4th wire connected to earth.
 - 1.3.28 In no case, single core wires shall be used in the construction area.
 - 1.3.29 The wires shall not be laid on the ground or any other surface, where there is possibility of damage to its insulation. It shall be supported on insulated poles above ground, to prevent possible damage to its insulation.
 - 1.3.30 No electrical repair work shall be carried out on any live equipment. The Engineer In-Charge must declare the equipment safe and a permit to work shall be issued by the NHPC/ contractor as the case may be to carry out any repair/ maintenance work. While working on electric lines/ equipment whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the contractor to electricians/ workmen/ Officers.
 - 1.3.31 No electrical addition/ alteration work shall be carried out by any person, who does not have a qualification laid down in Indian Electricity Act or rules framed there under. The Repair will be done after disconnecting the equipment. The Contractor's Engineer shall first declare the equipment safe and a permit to work shall be obtained through the NHPC Engineer before carrying out any repair/ maintenance work. While working on electric lines/ equipment whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the contractor to electricians/ workmen/ Officers.
 - 1.3.32 The register of all, inspections and examinations and tests like of scaffoldings, excavations, measurement of electrical earth resistance, lifting tools and tackles, pressure vessels etc shall be properly maintained by the Contractor and will be promptly produced as and when desired by Statutory Authorities, the Engineer In-Charge and Head of NHPC Safety Officer or by the person authorized by them.
 - 1.3.33 The contractor, employing more than 150 workmen, directly or through his agencies, whether temporary, casual, probationary, regular or permanent shall employ at least one full time safety officer on his roll, within two weeks of start of work, having qualifications as mentioned in statutory provisions, exclusively to supervise safety aspects of the equipment and workmen, who will coordinate with the NHPC Safety Officer with qualification and experience as laid down in the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules 1998. In case the work is being carried out through subcontractor, the employees/ workmen of the sub-contractor shall also be considered as the contractor's employees/workmen for the above purpose.
 - 1.3.34 When more than 150 workers are employed, the Contractor shall additionally appoint on his roll, one safety officer for each 200 workers appointed by him or his agencies.

- 1.3.35 The name and address of such Safety Officer of the Contractor will be informed in writing to the Engineer In Charge with a copy to the NHPC Safety Officer, within 3 days of their employment.
- 1.3.36 In case any contractors deploy less than 150 workmen each, one or more contractors shall jointly employ statutory Qualified Safety Officer and they will share the expenditure towards employment of this Safety Officer proportionate to the employment.
- 1.3.37 In case, the contractor fails to employ required number of Qualified Safety Officer, NHPC Safety Officer and Engineer In charge or his authorized representative shall have power to stop the work till he employs the safety officer.
- 1.3.38 The NHPC officers shall conduct the Safety Inspections/ Audit on their own, or through 3rd Party also and the Contractor shall provide full co-operation/ information to them. He shall be informed of the violations of statutory provisions/ NHPC rules/ NHPC Manual in writing. The Contractor is to ensure corrective action against the communicated violations promptly.
- 1.3.39 In case any injury occurs during the construction work or other associated activities undertaken by the Contractor, it shall be the responsibility of the Contractor to promptly inform the same to the Engineer In-charge, NHPC Safety Officer in the prescribed form (Which can be collected by the Contractor from the NHPC Safety Officer), and also to all the statutory authorities, as applicable.
- 1.3.40 The Engineer In-charge as well as NHPC Safety Officer or their nominated representative shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause injury and endanger the safety of the persons and/ or property, and/ or equipment. In such cases, the contractor shall be informed in writing, and the contractor shall immediately stop the work, and comply to remove shortcomings to prevent possibility of any accident, promptly.
- 1.3.41 The Contractor shall not be entitled for any damages/ compensation for stoppage of work under Clause 1.3.44 or any other safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and will not be the ground for waiver of deductions made by NHPC.
- 1.3.42 If the contractor does not provide safety equipment to his workers or fails to discharge of his other responsibilities, statutory or otherwise, as mentioned above, NHPC may provide the same and recover the expenditure along with overhead cost etc. However, this does not absolve the contractor from his responsibility as mentioned in the contract or Statutory Provisions.
- 1.3.43 If any contractor worker, found working without using the required safety equipment like safety helmet, safety shoes, safety belts etc. or without anchoring the safety belts while working at height, the Engineer In-charge/ NHPC Safety Officer or their nominated representative shall have the liberty to stop the work at those particular locations and inform the Contractor accordingly.
- 1.3.44 If the Contractor does not follow the Statutory provisions, or the provisions made in conditions of contract, the Engineer In charge or Safety Officer can fine to the Contractor @ Rs 500/- per day, till compliance is made by the contractor.
- 1.3.45 The contractors shall at all times exercise reasonable and proper precautions for the safety of the people on the works and shall comply with the provisions of current safety laws, building and construction codes of the State Governments as may be applicable. All machinery and equipment and other sources of physical hazards shall be guarded in accordance with the requirements of this manual and regulations or laws of the State Governments of the Government of India.
- 1.3.46 The contractor shall provide all necessary fencing and lights to protect the public from accidents and shall be bound to bear all the expenses of defence of every suit, action & other proceedings at Law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action & proceedings to any such persons or which may with the consent of the contractor be paid to compromise any claim by any person.
- 1.4 IMPORTANT SAFETY RULES:
- i) Each employee shall be provided initial indoctrination regarding safety by the contractor so as to enable him to conduct his work in a safe manner.
 - ii) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazards incident thereto, both to himself and his fellow employees.
 - iii) Under no circumstances shall an employee hurry or take unnecessary chances when working under hazardous conditions.
 - iv) Employees must not leave naked fires unattended. Smoking shall not be permitted

around fire prone areas and adequate fire fighting equipment shall be provided at crucial locations.

- v) Employees under the influence of any intoxicating beverage, even to the slightest degree should not be permitted to remain at work.
- vi) There shall be a suitable arrangement at every worksite for rendering prompt and sufficient first aid to the injured under the guidance of a Medical officer.
- vii) The staircases and passageways, shall be adequately lighted.
- viii) The employees when working around moving machinery, must not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.
- ix) The employees must use the standard protection equipment intended for each job. Each piece of equipment shall be inspected and after it is used.

1.5 ACCIDENT REPORTS:

PROCEDURE OF REPORTING IN CASE OF ACCIDENTS CAUSING INJURIES/ FATALITIES

- 1.5.1 Monthly reports on prescribed proforma of all accidents shall be promptly submitted to the Safety Engineer of the Corporation, with a copy to the Engineer-in-Charge giving such data as may be prescribed by the contracting officer.
- 1.5.2 The executive of the concerned Section where the accident has occurred shall immediately inform the accident/ injury to Head of Station, Factory Manager (Appointed by occupier), Medical Officer, Head of HR & Safety Officer on Form-1. First of all he shall inform of this accident on phone to them.
- 1.5.3 The Safety Officer will follow up for reporting of such accidents causing injuries/ fatalities to Statutory Authorities as required. He shall submit the details received from HOD in the prescribed forms, to Factory Manager, who will sign and send it to statutory authorities.
- 1.5.4 In case of injury to Contractor's employee, the contractor shall immediately inform on Form-2, the details of accident/ dangerous occurrences to NHPC Engineer-In-charge, Head of HR, Medical Officer and Head of project Safety by

telephone/ Mobile phone along with full description of accident and send the victim to Local or NHPC Hospital/ Dispensary.

- 1.5.5 Subsequently the concerned contractor will prepare a detailed report of accident within 4 Hrs of the accident in Forms, as mentioned in State Rules

PROCEDURE IN CASE OF DANGEROUS OCCURRENCES (D.O.)

As prescribed under the relevant rules, Dangerous Occurrences are also to be reported. Following are generally classified as Dangerous Occurrences:

- bursting of a plant used for containing or supplying steam under pressure greater than atmospheric pressure;
- Explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (Including air) or any liquid or solid resulting from the compression of gas;
- Explosion, fire, bursting out, leakage or escape of any molten metal or hot liquor, gas;
- Collapse or Serious accident of any plant, machinery, hoist, lift, lifting machine, lifting tackle, and the overturning of a crane; and
- Collapse or subsidence of any floor, gallery, roof, bridge, tunnel, chimney wall, building or any other structure.

In case of above referred dangerous occurrences, the same will be informed by Head of the Deptt. on telephone to Safety Officer, Head of HR, Factory Manager and Head of Station (Also Occupier) immediately, and on Form-3 and statutory required format, within four hour of occurrence.

The Safety Officer will follow up for reporting of such dangerous occurrences to Statutory Authorities as required. He shall submit the details received from Section in-charge in the prescribed forms, to Factory Manager, who will sign and send it to statutory authorities.

PROCEDURE FOR REPORTING NEAR- MISS ACCIDENTS

- i) All near miss accidents are to be reported to Head of project Safety by the Head of the Department immediately or within 24 hrs. as per Form-4.
- ii) Head of project Safety should get investigated all near miss accidents and circulate the enquiry report along with remedial measures with a copy to Corporate Safety Head

1.5.6 The following sample forms (specimens attached at the end of this Chapter) may be used for reporting accidents and keeping relevant statistics:

INJURY REPORT-PRELIMINARY

Procedure for Reporting of Accident

NHPC Limited, ... Unit

Form-1 (For Injuries to Departmental employee)

WORK ACCIDENT

Date: _____

- The Head of Station,
- Factory Manager,
- Head of Medical,
- Safety Officer

_____ Unit

Shri/ Smt. Employee No.

.....

Designation of.....

.....Department/ Section has met with an

accident. He is being referred to Doctor/

.....Hospital for further treatment.

The information is submitted for necessary action please.

Name and Signature of
Head of the Section

Procedure for Reporting of Accident to the Contract Labour

NHPC Limited, ... Unit

Form-2 (When injury occurs to Contractors Workers)

WORK ACCIDENT

Date: _____

The Head of the Department,
Head of HR,
Head of Medical,
Safety Officer

_____ Unit

Shri/ Smt. Designation

..... Employed by us (Name of

contractor).....

Working for

Department/Section has met with an accident. He is

being referred to Doctor/..... Hospital for further treatment.

The information is submitted for necessary action please.

Name and Signature of
Head of Contractors Organization

Procedure for Reporting of Dangerous Occurrences (In no injury case)

NHPC Limited, ... Unit

Form-3 (In case of Dangerous Occurrence)

Date: _____

The Head of Station,
Factory Manager,
Head of Medical,
Safety Officer

_____ Unit

A Dangerous Incidence is reported in.....

..... Department

Section, which occurred on at hours,

Details of which are given below:

Details of dangerous Occurrence:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Name and Signature of
Head of Department

Procedure for Reporting of NEAR MISS INCIDENCE

NHPC Limited, ... Unit

Form-4 (In case of near miss incidence)

To,

The Safety Officer,

-----Station/ Project

1. Name of the Department
2. Name of the location/ place, where the incident occurred
3. Date and Time of the incidence

4. Name(s) & Designation(s) of the person(s) escaped the incidence
5. Names of the persons who witnessed/ reported the incidence
6. Cause of the incidence
7. Whether the incidence took place due to any unsafe actions, if so, give details
8. Whether the incidence took place due to any unsafe conditions, if so, give details
9. Immediate actions taken by the Department to prevent recurrence of similar incidence
10. Whether any similar incidence took place in the past in the project/ department, if so, give the details of the accident e.g. date, place along with brief description
11. What were the direct/ indirect losses due to the incidence
12. Suggestions to prevent such incidence in future

Date:

Name and signature of Head of the Department
Department.....

CHAPTER 2

EXCAVATIONS

2.1 OPEN EXCAVATION-EARTH & ROCK 2.1.1 The serious hazards of excavation jobs are falls and falling objects. Accident prevention measures should be adopted and effectively carried out on each job. 2.1.2 The sides of every excavation, where there is a danger of fall or dislodgement of earth, rock or other material forming the side of or adjacent to any excavation shall be securely supported by adequately braced timber of suitable quality or other material unless the sides of the excavation are sloping to a safe angle. 2.1.3 No excavation of earthwork below the level of any foundation of a building or structure shall be commenced or, continued unless adequate steps are taken to prevent danger to any person employed, from collapse of the structure or fall of any part thereof. 2.1.4 In every excavation work along sloping ground, sides and slopes of excavation shall be maintained in a safe condition by scaling, benching or barricading. Loose earth and loose rock shall be continually sealed down. To ensure safety of workers engaged on such work, each worker shall be provided with a hard hat and a safety belt attached to a safety line. On steep slopes, workers shall not be permitted to work one above the other. All scaling work shall be done under the direct supervision of an experienced foreman. 2.1.5 Excavation, if over 1.2 m in depth, unless in solid rock or shale, shall be either shored, sheeted and braced or sloped to the angle of repose of the material when saturated. All shoring and bracing shall extend to bottom of excavation where necessary. 2.1.6 To hold banks of loose and unstable materials from sliding adequate shoring shall be used and under cutting of banks shall not be permitted. The bracing and shoring of trenches shall be carried out along with the excavation. 2.1.7 Additional precautions by way of shoring and bracing shall be taken to prevent slides, slips or caveings when excavations or trenches are made in locations subject to vibrations from rail-road or highway traffic, or the operations of machinery or any other source of vibration. The heavy construction Machinery shall not be taken within a distance equal to the depth of the trench if the depth is less than 6m or 6 meters if the depth is more than 6m.	2.1.8 Materials used for bracing, shoring etc. shall be in good serviceable condition and timber shall be sound and free from large or loose knots. 2.1.9 Excavated or other material shall not be stacked with in 1/3rd of depth of the pit or 1m whichever is more, away from the edge of any excavation and shall be stored and retained so as to prevent it from falling or sliding back into the excavation and to prevent excessive pressure upon the sides of the excavation. 2.1.10 In all trenches 1.5m or more in depth, ladders extending from the floor of trench excavation to at least 1m above top of excavation shall be provided and so located as to provide means of exit without more than 15m of lateral travel. 2.1.11 There should be adequate lighting around the area of an excavation, particularly at the access points and openings in barriers. 2.1.12 During hours of darkness all public sidewalks be adequately illuminated and warning lights about the excavation shall be provided to ensure safety of pedestrians and vehicular traffic. 2.1.13 At all approaches and exits of the sites of excavations danger and warning signal shall be placed. To emphasize the danger, a flagman with a red flag shall also be posted to warn the public or approaching trucks and to direct trucks in and out of the site of excavation. 2.1.14 Every accessible part of an excavation pit or opening in the ground into which a person is liable to fall vertically from a height of 2m or more a suitable barrier about one meter high shall be provided. 2.1.15 INSPECTION & EXAMINATION; a) No person shall work in any excavation, shaft, earthwork or tunnel unless all timbering and plant used therein are inspected by a competent person before work is started and also after explosives have been used in or near the excavation, shaft, earthwork or tunnel. b) When open excavations with steep side slopes are carried out by means of blasting, after every blasting operation, the side slopes of excavations shall be carefully examined by a competent person to prevent rock falls. Work inside the excavations shall not commence until all loose rock on the sides is first removed. All workers

- engaged in such excavations shall use hard hats.
- 2.1.16 No material or load shall be placed or stacked near the edge of any excavation, shaft, pits or opening in the ground which may endanger persons works below.
- 2.1.17 Adequate measures shall be taken to prevent workers and spectators from approaching the dangerous areas. Visitors shall not be allowed on the scene of excavations unless they are accompanied by a supervisor.
- 2.2 TUNNEL & SHAFT EXCAVATION:
- 2.2.1 Frequent careful inspection of tunnel walls and roof and through scaling or removal of loose rock are necessary to prevent rock falls. Ample illumination, good housekeeping and safe walkways are important factors in the prevention of accidents. All tunnel workers shall wear hard hats and hard toes shoes.
- 2.2.2 In every excavation of shaft and tunnel, sufficient safe means of access shall, be provided to every place at which any person has at any time to work.
- 2.2.3 In tunnelling, the drilling rigs shall be carefully designed, built and maintained. High drill rigs shall be provided with suitable railings around the top decks. All drilling shall be done wet. All the safety precautions for drilling or for the use of drills as given in chapters 3 & 5 shall be taken.
- 2.2.4 Care shall be taken in handling and use of explosives as specified in this Manual (Chapter 3). The loading of a round shall be completed preferably by the crew starting the work. Firing of round shall be the responsibility of the licentiate blaster and shall be done under his strict supervision.
- 2.2.5 After blasting inside a tunnel or shaft, scaling and removal of rock or loose material shall not commence unless the roof and walls of the tunnel and sides of a the shaft are carefully inspected by a competent person and loose rock from the roof and sides is first removed or unstable material is properly supported by shoring to prevent rock fall. When tunnelling with "Heading & Benching" method the heading supports shall be secured by anchoring before cutting the bench.
- 2.2.6 Dump cars shall be kept in good condition and shall be equipped with safety couplers. The use of rolling equipment with link couplers shall not be permitted. Rocker or cradle type dump cars shall be provided with a positive type lock to prevent accidental dumping. Dump cars shall not be overloaded.
- 2.2.7 a) Motive power, other than electric, shall not be used without prior authorisation from the project head. No petrol engines shall be used underground. Diesel locomotives shall not be used underground unless equipped with a filter that will remove all carbon monoxide and oxides of nitrogen. Such filters shall be inspected in each shift by the master mechanic and more frequently by the locomotive operator.
- b) Every locomotive shall have headlights on each end. It shall be equipped with whistles or horn with a tone of sufficient volume to be heard by men along the track even when the air drills are working. There shall always be a flag man with loco and mine cars while mucking is being done.
- 2.2.8 The tracks shall be properly laid using rails of sufficient weight and shall be kept in safe operating conditions.
- 2.2.9 The ventilation system shall be adequate to maintain circulation of air in all parts of tunnels and shafts and following conditions shall be taken care of:
- a) Air shall be considered unfit for workmen to breathe if it contains any of the following:
- i) Less than 19.5 per cent oxygen by volume.
 - ii) More than 0.5 per cent carbon dioxide by volume.
 - iii) More than 0.005 per cent carbon monoxide by volume.
 - iv) More than 0.001 per cent hydrogen sulphide by volume.
 - v) More than 0.0005 per cent oxides of nitrogen.
 - vi) More than 0.5% of methane at any place in the tunnel.
 - vii) More than 0.0005 % of aldehyde.
- Any other poisonous gas in harmful amounts.
- b) In addition to the requirements given above, 2 cum of air per minute shall be furnished for each brake horse power of diesel locomotive used in the tunnel.
- 2.2.10 Sufficient general lighting shall be provided in the tunnels & shafts so that the pedestrians

- should have not need to use hand torches for walking safely.
- 2.2.11 All electric wiring shall be extra-heavy insulated and of sufficient capacity supported on insulators of approved type and not looped on or tied to spikes, ventilating pipe, or other makeshift supports. All switches shall be of the safety type. Lines shall be located so as not to create any electricity or tripping hazard to workers.
 - 2.2.12 No inflammable materials or oil and grease shall be stored inside or near the tunnels or shafts and all combustible rubbish from the tunnel or shaft shall be promptly removed.
 - 2.2.13 The materials required to work in progress only should be kept inside the tunnel.
 - 2.2.14 The tunnel passage should always be kept clear to enable the workers to get out of the tunnel quickly in case there is any collapse or any other mishap inside the tunnel.
 - 2.2.15 All sources of ignition should be prohibited in areas where flammable liquids are temporarily stored, handled and processed. Receptacles containing flammable liquids should be stacked in such a manner as to permit free passage of air between them.
 - 2.2.16 All combustible materials like rubbish should be continuously removed from such areas where flammable liquids are stored, handled and processed. All spills of flammable liquids should be cleared up immediately. Containers of flammable liquid should be tightly capped.
 - 2.2.17 Fire extinguishers and fire-buckets provided appropriate to the hazard and should be properly maintained and used.
 - 2.2.18 Communication system like Walkie-talkie or two field magnet type telephone should be utilized properly to ensure a positive and quick method of communication between all controls locations inside tunnel and portal of the tunnels.
 - 2.2.19 Warning signals like, battery operated bells should be placed outside the tunnel and the position of the switch should be shifted with the progress of the tunneling work. The position of the operating switch although temporary should be so chosen as to ensure proper accessibility and easy identification.
 - 2.2.20 Red and green lights of adequate size and brightness should be provided at suitable intervals on straight lengths and curves, cross over points etc, to regulate the construction traffic.
 - 2.2.21 All the above communication and warning systems should be checked daily regarding proper serviceability.
 - 2.2.22 Buried or underground services: Before any digging is done, either by hand or with an excavator, one should remember that there may be underground services below the surface. In built-up areas, always assume that electrical cables, water services and sewers are

present. In some locations there may also be gas pipelines. Some of these services look alike, so when some buried services are found it is to be assumed as worst. Striking electric cables may cause death or severe injuries by electric shock or severe burns. Broken gas pipelines will leak and may cause a fire or explosion. Water and sewer pipelines if broken may create sudden risks by flooding an excavation or by causing its sides to collapse.

- 2.2.23 Electrical Cables: Every year workers digging on construction sites suffer severe burns when they accidentally hit live buried electrically cables. Always treat buried electrical cables as live. Before excavating, inquiry of the electricity authority, the local authority or the site owner if they have any plans of the layout of the cables in the area. Even if plans exist, remember that some cables may not be marked on the plan or may not be where the plan shows, for cables rarely follow an exact straight line.

Look around for the traffic signs, street lights and substations which are usually supplied by buried cables. Use a cable locator if you have one—remember that if cables are close together the locator may not be able to tell them apart. Some types of cables cannot be traced by locations. Once such thing is found notify the supervisor and fellow workers. The position of the cable should be marked with chalk, crayon or paint or, if the ground is too soft for this, with wooden pegs (Fig-5). Never use sharp spikes. Once the approximate position of the buried cable is known, use hand tools to expose it. Use spades and shovels rather than forks or pick-axes. Keep a careful watch for evidence of cables during digging works. Power tools should not be used within half a meter of a cable.

SHAFT EXCAVATION:

- 2.2.24 Head frames or shafts shall be open framework design and constructed from sound fire resisting materials. All sheaves should be of the proper diameter of the cable or hoist rope used shall be amply strong, properly mounted and frequently inspected. The head frames should be preferably of steel structure and properly designed with sufficient headroom and strong enough for possible overload and impact due to sudden drops.
- 2.2.25 Covered stairways a least 75cm. Wide shall be erected in all shafts except during the sinking period. If not possible to construct such a stairway a ladder shall be installed with landing at every 6 m of sufficient width, to permit men to pass. Where one or more drifts are to be

- driven from the shaft, landing shall also be provided at each drift in the man shaft. The distance between the centers of the rungs of ladder shall not exceed 35 cms and shall not vary more than 25mm in any one ladderway. The width of ladder inside of stringers shall not be less than 30cms. The rungs of a ladder shall in no case be less than 15cm from the wall or from any obstruction in the shaft or opening. Under no circumstances shall a ladder be installed including backwards from the vertical. Should it become necessary to offset a section of ladderway, the top of a section shall extend not less than 1 m above the bottom of the section above or a handhold shall be provided. The side rails of the top-most section shall extend at least 1m above the ground.
- a) Fixed ladders of standard construction shall be provided for access to cable sheaves on head frames located over tunnels shafts. A runway or platform equipped with guard rails and toe boards shall be provided next to cable sheaves.
 - b) Timbers and projections on which debris may lodge on ladder ways and stair ways in daily use shall be regularly cleaned of all loose rock and other debris.
- 2.2.26 All hoisting equipment including ropes and cables shall be thoroughly inspected at least once a week and maintained in good condition. A limit switch and a non-failing automatic brake shall be provided on the hoist to control speed.
- 2.2.27 Suitable standby power supply arrangements or alternate means of working hoist mechanically shall be provided. Hoists shall never be loaded in excess of the maximum safe loads. Much buckets shall not be heaped up and no one shall remain under a bucket while it is being hoisted. Hard hats and hard-toe shoes shall be worn by every one engaged in shaft excavation. When hauling tools that project above the rim of the bucket, the tools should be loaded in such a manner that neither the bucket nor the tools shall come in contact with the sidewalls of the shaft.
- 2.2.28 Where tunnels are drives from shaft and a communication system is required, the telephone system shall be established. Ready communication must be maintained between the surface shaft and underground stations.
- 2.2.29 The shaft shall be protected with a two-rail guardrail at least 1 m high, with two bolts to prevent them from falling into the shaft. The gate opening into the shaft shall be closed at all times except when necessary to enter and leave the shafts or to empty the bucket or send materials down the shaft. Preferably the gates should be automatic in operation.
- GASSY TUNNELS:
- 2.2.30 There must be a provision of automatic methane gas detector at face which is capable of giving warning when CH₄ (methane) exceeds more than 0.5% at the heading (MSA methane automatic detector 4 type).
- 2.2.31 Electrical equipment used inside the tunnel should be FLP construction.
- 2.2.32 Regular checking of methane gas by methane detector and proper recording of gas at every face in each shift is recommended.
- 2.2.33 A man shall be posted at each entry for checking of lighters, match-boxes etc. being taken inside by workers etc.
- 2.2.34 Tools and tackles made out of light alloys (such as Al and Mg) are not to be used inside the tunnels. They may cause sparks.
- 2.2.35 There must be a provision for approved type of safety lamps for each face to indicate the presence of black damp (i.e. Carbon dioxide formation at face).
- 2.2.36 When the tunnel heading is approaching some fault zone or sand dyke etc. care should be taken with respect to the heavy built-up of gas and bad roof.
- 2.2.37 Advance bore-holes of small size (37-42 mm) may be drilled at the tunnel face to give indication about the presence of gas and their strata condition. Their number may vary from 2 to 4 of 5 to 10 m long at an angle of 7' to 10' to the horizontal.
- 2.2.38 In case Methane is being tapped at a high pressure de-gassification by drilling long bore holes and applying high suction pressure 300 mm of Hg in the pipe line shall be done.
- 2.2.39 Shot firing should be minimised in a gassy heading. But should it be essential to do so, only permitted explosives with proper stemming material and approved FLP exploders shall be used.
- 2.2.40 Before shot firing the gas percentage at the face shall be checked and if the percentage of the gas found at the heading is more than 1% the blasting shall not be done.

- 2.2.41 Regular checking of gas at the faces shall be done before each shift.
- 2.2.42 After stoppage of ventilation, the gas percentage should be checked by some authorised person when the ventilation is restored. If the gas content is less than 0.5% then only the men may be allowed to resume work.
- 2.2.43 The use of diesel locomotive is generally not recommended inside the tunnel even if it is of FLP construction
- 2.2.44 The gas accumulation at the face shall be checked at the beginning of each shift and the presence of CO₂ shall be ascertained using flame safety lamp. If the condition is satisfactory then work-men may be allowed to approach the tunnel heading.
- 2.2.45 In case of tunnels where methane gas indicated there shall be a safety officer having qualification of Coal Mines Manager's Certificate of competency (at least 2nd class) to look after the proper ventilation aspect of the tunnel.
- 2.2.46 If the project is far away from any rescue station, some rescue apparatus, co-detectors etc. shall be procured which will be of help in case of emergency. Some project personnel should be trained to handle rescue apparatus as their training may be of much use in case of any gas explosion.
- 2.2.47 While fans are operating in series, it shall be ensured that all the fans in a duct line are working. In case of stoppage of any fan, there must be some signaling arrangement to indicate the failure.
- 2.2.48 If at any place the methane gas percentage exceeds 0.5% person should be withdrawn from the tunnel, electricity to be switched off and appropriate measures should be taken as described earlier.
- 2.2.49 The ventilation in gassy tunnels should be properly designed after analysis of the gases observed inside the tunnel.
- 2.2.50 There should be no breakage in pull duct line of the ventilation system.
- 2.2.51 At no cost, welding and cutting by gas should be allowed inside the gassy tunnel.
- 2.2.52 A regular analysis of the gases inside the tunnel should be got done with advance of the tunnel.

2.3 COFFER DAMS-CONSTRUCTION AND MAINTENANCE:

GENERAL:

- i) Every coffer dam or caisson and every part thereof shall be of good construction, suitable and sound material and of adequate strength. It shall be properly maintained. Its construction, additions or alterations and dismantling including all work connected therewith shall be supervised by a competent person.
- ii) A cofferdam or caisson shall, where necessary, be specially secured in position so as to prevent movement in a manner dangerous to persons employed.
- iii) In any cofferdam or caisson, there shall be adequate means for persons to reach places of safety in the event of any inrush of water.

INSPECTION AND EXAMINATION:

- iv) No person shall be employed in a cofferdam or caisson unless it has been inspected once a day by a competent person and also after explosives have been used in or near the cofferdam or caisson in a manner likely to affect its strength and stability. Necessary entry to the effect that the cofferdam or the caisson has been inspected shall be made in the register prescribed for the purpose.

ATTENDANCE AND EQUIPMENT:

- v) No person shall be employed as an under-water diver except for shallow depths where skin divers are employed unless:
 - a) A sufficient number of competent persons are employed in attendance upon him as to ensure his safety, and
 - b) There are provided and readily available, in good working order, sufficient and suitable diving plant and equipment, including air pumps, pressure gauges, and means of access to and from water and including at least one diving dress and one complete set of woolen clothing in excess of the number of divers under water at any one time and
 - c) Another diver above water provided with suitable equipment and plant is immediately available to the assistance of any diver under water in case of emergency.

TESTS AND EXAMINATION OF EQUIPMENT:

- vi) All diving equipment shall initially tested and thoroughly examined by a competent person and thereafter thoroughly examined by him after every three months, and record of such tests and examinations entered in a register maintained for the purpose
- vii) Air pump, airlines and diving helmets shall be thoroughly examined for any defect every time before they are put to use.

SIGNALLING:

- i) Reliable means of communications, such as bells or whistles should be maintained at all times between the bottom of the shaft and the surface and telephone used, whenever possible. Any code of signals used should be kept conspicuously exhibited near workplace or entrance. Water Handling: The methods given below should be followed for water handling in the tunnels:
- ii) A study of boring data and geological formations should be made to have an indication of locations, where water can be expected.
- iii) Water inflow may be reduced or even entirely stopped by grouting off the set seams. A wet area covering more than a single seam shall be sealed off by installing a suitable section of concrete lining.
- iv) In case of a steady flow of water from the roof or side of the tunnel the flow shall be deflected down the sides to sumps by metal shields.
- v) Adequate no. of pumps should be provided at site on the basis of the estimated pumping needs. Sumps should be kept clean. Suitable arrangement should be made to indicate the position of sumps in case tunnel invert is flooded.

MEDICAL EXAMINATIONS:

- viii) No person shall be employed under water as a diver unless he has within the previous four days been examined by a project doctor or by certifying surgeon or by a medical officer of the contractor or firm and certified by him as fit for diving.

2.4 DEMOLITION:

- vi) All demolition work shall be placed under the supervision of a competent person experienced in demolition work.
- vii) During demolition work all electrical cable and water, gas or steam pipes shall be disconnected except those which are used for the operations.
- viii) All steps shall be taken to prevent danger to persons employed from risk of fire or explosion due to gas, vapor or flooding due to water from watermain, sewers and culverts.
- ix) All practical steps shall be taken to avoid danger from collapse of the structure when any part of the framing is removed from a framed or partly framed structure which may endanger life of any person employed.
- x) Before demolition is commenced and also during the progress of the work, precautions shall, where necessary, be taken by adequate shoring or otherwise to prevent the accidental collapse of any part of the structure of any adjoining structure the collapse of which may endanger any person employed.
- xi) Warning signs and red lights should be placed wherever there is danger to public, and the structure under demolition should be adequately barricaded and roads leading to the site of demolition should be closed so that people are kept away from the hazardous area.

CHAPTER 3

EXPLOSIVES, DRILLING AND BLASTING

EXPLOSIVES:

3. GENERAL:

3.1 All operations involved in transportation, handling, storage and use of explosives shall be as per Indian Explosives Act and shall also conform with the provisions made hereunder.

3.2 SUPERVISION:

Explosive shall be handled by or under the supervision of competent persons who are fully experienced in the work and who have received adequate instructions as to the dangers connected therewith and the precautions to be observed.

Blasting operation by shot fire in areas other than mine-

- Blasting operation shall be carried out by a shot firer holding valid certificate issued by the Controller.
- A copy of the certificate shall be carried by the shot firer during blasting operations.
- The shot firer shall take all due precautions in handling or charging or blasting operations.

3.3 TRANSPORT AND HANDLING:

- i) Explosives shall not be transported to the site of operations except in suitable cases or containers which are so made as to prevent any spillage of explosives and any danger of sparks or other sources of ignition during conveyance. No explosive shall be removed from such cases or containers except when it is to be used forthwith for the purpose of work.
- ii) No explosives shall be transported in mechanically propelled vehicle unless such vehicle is locked and is of a type approved in writing by the Chief Inspector of explosives. The following rules should also be observed:
 - a) Vehicles must have springs under the body. Unsprung country carts should be not used. Tyre pressures shall be as per Indian Explosives Regulations.
 - b) Detonators and igniters must not be carried in the same vehicle with explosives.

- c) The speed of vehicle must not exceed 24 Kms per hour.
- d) Besides the driver, only one helper shall be accommodated in the vehicle. The vehicle carrying the explosives must not be transport workmen or other materials to workspots although there may be enough space for men or material.
- e) Drivers must not leave the vehicle unattended while transporting explosive.
- f) All vehicles transporting explosives shall be marked on both sides ,front and rear with placards reading "EXPLOSIVES" in red letters not less than four inches high on a white background. All explosive boxes shall bear explosives Lot No., Mfg. Date, expiry date etc. clearly on them.
- g) A motor vehicle carrying explosives should not be refilled except in emergencies and even then only when motor is stopped and other precautions taken to prevent accidents. Such vehicles should invariably have at least two fire extinguishers placed at convenient points.
- h) Vehicles transporting explosives shall never be taken into a garage, or repair shop, or parked in congested areas, or stored overnight or at any other time in a public garage or similar building.
- i) Explosives shall not be transported on a public highway during hours of darkness except in extreme emergency and even then only with the written approval of the project officials.
- j) Explosives shall not be transported in any form of trailer, nor shall any trailer be attached to a motor truck or vehicle hauling explosives.
- k) No transfer of explosives from one vehicle to another shall be made on any highway except in case of emergency.
- l) Persons employed in the transport or handling of explosives should not carry with them or in the vehicles,

matches, loaded fire arms, petrol or any flame producing devices.

- m) All explosives should be adequately protected against theft
- n) Smoking shall be prohibited during handling and transport of explosives.
- iii) Motor vehicles used for transporting explosives shall be carefully inspected daily to ensure that;
 - a) Filled and serviceable fire extinguishers are in position:
 - b) The electric wiring is well insulated and firmly secured;
 - c) Chassis, engine and body are clean and free from surplus oil and grease:
 - d) Fuel tank and feed lines are not leaking;
 - e) Lights, breakers and steering mechanism are in good working order; and
 - f) Vehicle is in proper condition in all respects for the safe transportation of explosives.
- iv) Boxes of explosives should not be handled roughly or allowed to fall.
- v) Containers of explosives shall be opened only by means non-sparking tools or instruments.
- vi) After the loading of a blast is completed, all excess explosives and detonators shall be removed to a safe location or returned at one to the storage magazine, observing the same rules as when being conveyed to the blasting area.
- vii) Containers for detonators shall always be used only for storing detonators.

3.4 STORAGE:

- i) The magazine should, at all times be kept scrupulously clean. High explosives like dynamite should be stored in a dry, clean, well-ventilated, bullet-proof and fire-proof building constructed in accordance with Indian Explosives Act, on an isolated site. The area around the magazine for a distance of 8m shall be kept clear of all

vegetation and combustible matter. There shall be a barbed wire fencing and security lights around the magazine and security guards shall be posted for 24 hours.

- ii) No unauthorised person is at any time to be admitted into the magazine.
- iii) The person in charge of the magazine is to take care the magazine is well securely locked.
- iv) The magazine on no account is to be opened during or on the approach of a thunderstorm and no person should remain in the vicinity of the magazine during such storm. Sufficient number of lighting conductors should be provided on top of the magazine.
- v) Magazine shoes, without nails, should be kept at all time in the magazine, and a wood tub or cement trough, about 30 cms high and 45 cms in diameter, filled with water should be fixed near the door of the magazine.
- vi) Person entering the magazine must put on the magazine shoes provided for the purpose, and be careful not to allow the magazine shoes to touch the ground outside the clean floor.
- vii) Persons with bare feet shall, before entering the magazine, dip their feet in water, and then step direct from the tub over the barrier (if there is one) on to the clean floor.
- viii) A brush or broom should be kept in the lobby of the magazine for cleaning the magazine on each occasion it is opened for the receipt, delivery or inspection of explosives.
- ix) Light should be obtained from an electric storage battery lantern. Electric lights from the supplying main, taken through conduit wiring and properly earthed may be obtained with the approval or Chief Inspector or Explosives.
- x) No matches should be allowed in magazine.
- xi) No person having articles of steel or iron on him is to be allowed to enter a magazine.
- xii) Oily cotton rags, cotton waste and articles liable to spontaneous ignition, should not be taken into a magazine.

- xiii) Workmen, sweepers, etc. should be examined before they enter the magazine to see that they have none of the article mentioned in rules (x), (xi), (xii) on their person. All other men entering a magazine should not also have such articles on their person.
 - xiv) No tools or implements other than those of copper, brass, gun metal or wood should be allowed inside the magazine. Tools should only be used with great gentleness and care.
 - xv) Boxes of explosives should not be thrown down or dragged along with floor and should be stacked on wooden trestles. Where there are white ants, the legs of the trestles should rest in shallow copper lead or brass bowls, containing water.
 - xvi) Packages containing explosives shall not be allowed to remain in the sun.
 - xvii) The order of storing should be such as to allow the oldest explosives to be used first. There should be sufficient space between the stacks.
 - xviii) Empty boxes should not be stored in the magazine not let any packing material lie loose.
 - xix) Blasting caps and electric blasting caps should never be stored in the same box, magazine or building with other explosives.
 - xx) The following should be hung up in the lobby of the magazine.
 - a) A copy of these rules;
 - b) A statement showing the stock in the magazine; and
 - c) Certificate showing the last date of testing of the lighting conductor.
 - xxi) All magazines which contain more than 115 kgs of high explosives such as Blasting Gelatine, Carbonates, Calcite Dynamite, Gelignite, Monobel Powder, Phoenix Powder, Roburite, Tonite and Ammonal etc should be impacted at least twice a year by the officer in charge thereof.
 - xxii) Adequate fire fighting equipment shall be provided in the magazine.
 - xxiii) Signboards reading "DANGER HIGH EXPLOSIVES" "PROTECTED AREA" "NO SMOKING" etc. shall be conspicuously displayed in front of the magazine.
 - xxiv) Proper CRP/Police Guard shall be posted to guard the magazine.
- 3.5 DRILLING:
- a) GENERAL:
- i) The position of all holes to be drilled must be marked out with white paint.
 - ii) All holes shall be of greater diameter than the diameter of the cartridges of explosives used.
 - iii) Loading and drilling shall not be carried out at the same time in the same area.
 - iv) Use of Cell Phones & Walkie-Talkies and Smoking & Creating Open Flames should be prohibited in the blasting area.
 - v) Every blaster should be aware about blasting tools and hazard and associated in their use:
 - vi) A tool made of wood suitable for charging and stemming shot holes
 - vii) Scraper made of brass or wood, suitable for cleaning out short holes;
 - viii) Where fuses are used, a knife for cutting off fuses and unless machine capped fuses are provided also a pair of suitable crimpers for crimping detonators
 - ix) Where detonators are used, a picker made of wood or a non-ferrous metal, for priming cartridges.
 - x) No attempt should be made to slit, drop, deform or abuse the primer.
 - xi) No drilling should be started until the previous holes in blasted area are flushed with water.
 - xii) Electrically Non-conductive shoes (having no metallic nails etc.) should be used while handling and using explosives.
 - xiii)
 - xiv) A drill, brick, or pore shall not be inserted in butts of old holes even if examination fails to disclose explosives.
 - xv) Drilling shall not be resumed after blasts have been fired until a thorough examination has been made to make sure that there are no unexploded charges which the drills may strike.
 - xvi) Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges.

- xvii) Rock drillers should be provided with approved, respirators in sillicious dusty atmosphere arising out of drilling operations. In addition to other Safety gears like, Safety Helmet, Goggles, Safety Shoes, Earplug, etc.
- b) LOADING:
- i) Bore holes must be cleared of all debris before a cartridge is inserted.
 - ii) In loading bore holes, tamping shall be done with a wooden mallet having no exposed metal parts.
 - iii) Primed cartridges shall be seated by even steady pressure only.
 - iv) All loaded holes or charges shall be checked and definitely located before firing.
 - v) When holes are sprung, ample time shall be left between spring shots for the holes to cool, and also between the last springing shot and the loading of the main charge.
 - vi) When practicable no more cartridges shall be primed than are required for a round of blasting.
 - vii) Detonators shall be inserted only in a hole in the end of a cartridges prepared specially for that purpose.
 - viii) Holes in cartridges shall be made with a sharpened wooden stick.
 - ix) All charges, before being fired, shall be covered with blasting mats where blasting is done in the vicinity of structures likely to be injured by flying debris.
 - x) Detonating cord shall be cut from supply reel before attaching to explosive or tamping in hole. Use of the short pieces of fuse shall be prohibited for detonation purposes.
 - xi) No welding shall be done inside the tunnel at the time of loading of the face, till the blast has been taken.
- c) WIRING:
- i) All electric caps in a blast shall be of the same manufacture.
 - ii) Each electric blasting cap shall be tested with an approved galvanometer before and after tamping in a hole to determine whether it will carry the current. All testing shall be done away from the tunnel face.
- iii) After testing the leg wires of electric blasting caps, they shall be short circuited by twisting the bare ends together and shall remain so twisted until ready to be connected into the circuit preparatory to connecting to the firing line.
 - iv) Unless the power supply is heavy, it is recommended that all electric blasting caps shall wired in series and firing line shall not be smaller than No.14B and S gauge copper wire.
 - v) The number of electric blasting caps used in a circuit shall not exceed the tested capacity of the blasting machine.
 - vi) The circuit, including all caps, shall be tested with a circuit tester or galvanometer, operating accurately, before being connected to the firing line.
 - vii) Cartridges shall not be primed nor boles loaded during the approach of a thunderstorm or while it is in progress. If a charge has been primed or holes loaded, every person should be ordered to a safe distance until the storm is over.
 - viii) Blasting circuit wires shall never touch another wires carrying electric current.
 - ix) Blasting operation control shall consist of two switches, a safety switch and a firing switch located at least 2 meters apart, the connection between the switches to be made by a "Plug in" jumper which may be permanently attached to the safety switch. The "plug in" jumper is so made that it cannot be plugged into or connected to the firing switch until the firing switch is unlooked and the jumper must be disconnected from the firing switch before the firing switch can be locked.
 - x) Both the safety switch and the firing switch shall be of the locking, double pole, double throw type which when opened and locked in downward position short circuit and ground the leading wires.
 - xi) Both the switches shall be locked immediately after firing the short and before any person is allowed to return to the area. Keys to the switches shall remain in the possession of the starter at all times.
- d) FUSE BLASTING:
- i) The length of fuse to be used in blasting shall in no case, be less than 75 cms but shall not

be less than that required by State blasting Law, if any. The maximum burning rate of the fuse should be such that it will allow sufficient time to all concerned persons to reach a safe place before the blast occurs; the burning rate, in any case, should not exceed 600mm/min.

Blasters or shot firers should be cautioned always to use sufficient lengths of fuse to permit them to reach a safe place before the first hole is fired. As per IS 4081-1986, recommended minimum fuse lengths and maximum burning rates for normal conditions are given below:

FUSE LENGTHS

Number of holes	Burning Rate 40 sec/foot	Burning Time
4-10	1.8 meter	4 minutes
11-12	2.15 meter	4 minutes 40 seconds

- ii) Not more than 12 holes shall be loaded and shot at one time if cap and fuse are used to detonate the charge.

MUDCAP BLASTING:

- iii) Mud cap blasting being inefficient and dangers should be avoided. To or more mud caps shall not be placed on one rock except when electrically detonated.

e) FIRING:

Shots shall, so far as practicable, be fired electrically and only apparatus especially designed for the purpose shall be used. No person should use explosives for blasting purposes unless he employs a qualified shot-firer holding a Shot-Firer's Permit granted under explosive rules.

- i) The charge should be fired, successively and not simultaneously.
- ii) Prior to the firing of a shot, all persons in the blasting area shall be warned of the blast and ordered to a safe distance from the area.
- iii) Competent flagmen, equipped with red flags and whistles shall be posted to stop traffic at access points, on each possible route of travel, to the vicinity of the blasting area. Blasting shall be done at fixed hours and the blasting times shall be displayed on a Notice Board.

- iv) Blasts shall not be fired until it is absolutely certain that every person has retreated to a safe distance.
- v) The person-in-charge of blasting shall be last one to leave the area to be blasted.
- vi) The signal to fire shall be given only by the person-in-charge of the blasting.
- vii) A loud pre-arranged, warning signal shall be given at a proper time before firing a blast and all clear signal shall be given when the blasting is over.
- viii) Definite places of shelter, natural or artificially constructed, shall be assigned to the crew. Workers should be made to go to these shelters rather than trust each other's judgement about a safe place.

f) INSPECTION AFTER BLASTING (MISFIRE DRILL):

- i) Immediately after a blast has been fired, the firing line shall be disconnected from the blasting machine or other source of power.
- ii) After a blast has been fired, a careful inspection should be made by the blaster to determine if all charges have been exploded. The blaster shall count the number of the exploding shots in blasting. Misfires in fuse blasting shall not be examined for at least 10 hours after its failure to explode. Electric blasting misfires shall not be examined for at least 15 minutes after failure to explode. Other persons shall not be allowed to return to the area of blast until and "All Clear" signal is given.
- iii) All wires shall be carefully traced and search made for any exploded cartridges by the person-in-charge of the blasting operation.
- iv) Loose pieces of rock and other debris shall be sealed down from the sides of the face of excavation and the area made safe before proceeding with the work.

MISFIRES:

- v) After notice of misfire all entrances to the misfire area should be barricaded or fenced so as to prevent inadvertent access, and no work other than that of locating or relieving the misfires should be done therein until the misfire has been located and relieved. In open excavation work it should be sufficient to mark the place of the misfire with a red flag.

- vi) Misfired holes should be placed in the charge of a competent person.
- vii) If broken wires, faulty connections, or short circuits are determined as the cause of a misfire, the proper repairs shall be made, the firing line reconnected, and the charge fired. This shall be done, however, only after a careful inspection has been made of burdens remaining in such holes and no hole shall be so fired when the burden has been dangerously weakened by other shots.
- viii) The charge of explosives from a misfired hole shall not be drilled, bored or picked out.
- ix) Misfired charges tamped with solid material shall be detonated by the following method:
 - a) Float out the stemming by use of a water or air jet from hose until hole has been opened to within 60 cm of charge;
 - b) Water shall be siphoned off or pumped out;
 - c) New charge shall be placed and detonated.

Whenever this method is not practicable, then a new hole not nearer than 60cms should be drilled, loaded and detonated. A careful search shall be made of unexploded material in the debris of the second stage.

3.1 TUNNEL AND SHAFT BLASTING:

- i) Only electric blasting shall be adopted for shaft and tunnel work.
- ii) A separate circuit independent of power and light circuits shall be used for blasting.

- iii) No electrically energised circuit shall be installed on the same side of the shaft or tunnel with the blasting circuits.
- iv) All electric lights or other energised circuits shall be disconnected for at least 200 ft. from the point of loading.
- v) All tracks, airlines and vent pipes shall be kept properly grounded.
- vi) For loading purposes the employees shall be equipped with permissible battery lamps.
- vii) Switches shall be as specified in para 3.5 C (ix). The safety switch and the firing switch shall be placed on opposite sides of the tunnel.
- viii) Only explosives, which produce less than 0.005 cum of poisonous gas-(carbon monoxide and hydrogen sulphide) per 1¹/₄" x 8" cartridge shall be used for shaft and tunnel work.
- ix) No fire, flame, smoking or open lights shall be allowed within 6 meters from any explosive except for the purpose of firing a charge.
- x) Adequate warning notices shall be given to all persons at the time of firing and it shall be the duty of every employer to provide adequate shelters or screens for protection of workers exposed to risk of injury from the explosion or from flying material.
- xi) There shall be kept by the employer or his agent a register of explosives in which particulars of all issues and returns, particulars or explosives used in each blasting operation and particulars of misfired shots shall be entered.

CHAPTER 4 CONSTRUCTION

4.1 SCAFFOLDS:

- 4.1.1 Scaffolds of proper type shall be provided for all work that cannot be done from the ground or from part of a permanent structure or from a ladder or other available means of support and safe means of access shall be provided to every place at which workers are required to work.
- 4.1.2 Every scaffold and every part thereof including supports shall be of good construction, of suitable and sound material and of adequate strength for the purpose of which it is used and it shall be properly maintained. Construction and dismantling of every scaffold shall be under the supervision of a competent person. Boards and planks used for the floors shall be of uniform thickness, butt jointed, closely laid, and securely fastened in place.
- 4.1.3 Every scaffold shall be securely supported or suspended and shall, where necessary be sufficiently and properly struted or braced to ensure stability. The use of cross braces or framework, as means of access to the working surface shall not be permitted.
- 4.1.4 All scaffolds or working platforms of any nature shall be securely fastened to the building or structure, or if independent of the building shall be braced or guyed to prevent sway.
- 4.1.5 In the construction of dams sufficient anchorage shall be provided in the dam itself at the time of construction. The projecting anchorage shall be cut off only on completion. It is safer to avoid support on the sloping runners. The points should be provided with bolts and nuts and not bent rods.
- 4.1.6 If bamboo scaffold is used, it should be of suitable quality, good condition free from protruding knots, stripped off to avoid injury during handling.
- 4.1.7 Metal scaffold should conform to National Standard.
- 4.1.8 Displacement of scaffold should be prevented by providing sole plate or base plate.
- 4.1.9 Ledgers of metal scaffolds are placed at vertical intervals with regard to safety and stability.
- 4.1.10 Suitable guardrail and toe board is to be provided to prevent fall of building workers, material, tools, from any platform provided on scaffold.

4.1.11 SUSPENDED SCAFFOLDS:

- i) Outriggers or other means of supports of suspended scaffolds shall be of adequate length and strength, (not more than 2m length unless specified by the Engineer-in-Charge) properly constructed, installed and securely fixed by anchor bolts or other equivalent means.
 - ii) Ropes chains, or other means of suspension shall be of good construction, sound material, adequate strength and free from patent defects, properly secured and should be inspected regularly for wear and tear. The ropes and chains shall have a factor of safety of 8.
 - iii) The platform shall not be less than 45 cms wide and points of suspension not more than 3 meters apart and so arranged or secured that at the working position the edge is as close as practicable to the working face when persons have to work in a sitting position.
 - iv) All rolling scaffolds shall be equipped with a positive locking device to prevent accidental movement of the scaffolds. These shall be periodically tested.
 - v) Suspended scaffolds shall be tested as frequently as may be necessary to ensure that minimum safety factors are maintained. The test will be made by raising the working surface 30 cms above the ground and loading it with at least three times the maximum weight that will be imposed upon it.
- 4.1.12 Skips, buckets, baskets and similar equipment shall only be used for work of short duration when use of suspended scaffold is unreasonable and shall be used under the supervision of a responsible person. The skip, bucket or basket shall be at least 75 cm deep.
- 4.1.13 Trestle scaffolds shall not be of more than three tiers and the working platform shall not be more than 4.5 meters above the ground or floor or other surface upon which the scaffold is erected, and no trestle scaffold shall be erected on a suspended scaffold.
- 4.1.14 Men shall not be allowed to work from scaffolds during storms or high winds.

- 4.1.15 If scaffolds are to be used to a great extent or for a long period of time, a regular plank stairway, wide enough to allow two people to pass, shall be erected. Such stairways shall have hand rails on both sides.
- 4.1.16 When work is being performed above a scaffold platform a protective overhead covering shall be provided for the men working on the scaffold.
- 4.1.17 Whenever workmen have to work or constantly pass under a scaffold on which men are working a screen or other protection shall be provided to catch any falling material. Such protection shall extend outside the scaffold properly in order to catch any material falling off the edges of scaffold platforms. 12 mm wire mesh netting of No. 18 gauge or better may be used for this purpose.
- 4.1.18 Side screens shall be provided on scaffolds erected along passageways or other thorough fares.
- 4.1.19 On high scaffolds a netting or equivalent guard shall be provided for the space between toe-boards and railings.
- 4.1.20 During dismantling of scaffolds necessary precautions shall be taken to prevent injury to persons due to fall of loose materials, bracings and other members of the scaffold shall not be removed prematurely while dismantling, the entire scaffold shall be maintained stable and rigid so as to avoid the danger of collapse. Nails from the planking and various members of the scaffold shall be carefully removed and all material carefully piled.
- 4.1.21 Training should be imparted to the person controlling the vertical movement of the Jhoola and should have appropriate physical strength to control & hold the weight or if possible winch system to be used. Medical test of the person working on suspended jhoolas has to be conducted and if found fit only be allowed to work at site.
- 4.1.22 A vertical lifeline has to be used for additional safety in addition to the Full body harness & roper grab
- BALLI STAGINGS:**
- 4.1.23 These stagings used upto a height of 12 meters shall be designed and erected with adequate bracings securely fastened under the supervision of an experienced and competent person and shall be regularly inspected and properly maintained.
- 4.2 PLATFORMS, GANGWAYS AND RUNS:**
- 4.2.1 All working platforms, gangways and runs from which workers are liable to fall more than 2 meters shall be:
- Of adequate width depending upon the type of work done and closely boarded, planked or plated. For platforms the width shall not be less than 60 cms. For gangways and runs the minimum width shall be 45 cms but when such gangways or runs are used for passage of materials the width shall not be less than 60 cms.
 - Provided with suitable guard rails of adequate strength to a height of 1 meter above the working surface and toe-boards of at least 20 cms in height to prevent fall of persons, materials or tools.
- 4.2.2 Every platform gangway run or stairs shall be kept free from any unnecessary obstruction, material or rubbish and from any projecting rails, and when they become slippery appropriate steps shall be taken by way of sanding, cleaning or otherwise to remedy the defect
- 4.2.3 Each supporting member used in the construction of runways, platforms, ramps and scaffolds shall be securely fastened and braced. The supporting member shall be placed on a firm, rigid, smooth foundation of nature that will prevent lateral displacement. The thrust-out members from which a scaffold is suspended shall be sufficiently strong and shall extend at least 30 cms outside the platform being suspended and have a stop block or bolt at the outer end.
- PLATFORMS:**
- 4.2.4 The minimum uniformly distributed design load per sq. meter of platforms shall be 300 kgs. In case of stone masonry it shall be 450 kg per sq. meter. Any concentrated load at any point in the span shall not exceed the designed uniformly distributed load. A factor of safety of 4 shall be adopted. Planking shall not be less than 30 mm thick.
- 4.2.5 A scaffold platform plank shall not project beyond its end-supports to a distance exceeding four times the thickness of the plank unless it is effectively secured to prevent tipping.
- 4.2.6 Cantilever of scaffold planks shall be avoided. Ledgers or putlogs should be erected to support the ends of such planks.

4.2.7	Where planks are butt jointed, two parallel putlogs must be used, not more than 10 cms apart, giving each plank sufficient support.	b) Wooden ladders should not be painted as paint covers up defects but linseed oil or clear varnish should be used.
4.2.8	The following minimum widths of platforms for various types of scaffolds are recommended:	4.3.2 The design of ladder should conform to IS 3696 (Part 2): 1991. Make shift ladders should not be permitted.
	a) Where platform is not more than 2 meters above the ground or solid floor:	4.3.3 Metal ladder should be either of steel complying with IS-1977:1975, or of aluminum alloy complying with the suitable grade of IS 617:1975.
	i) For painters, decorators and similar work men.....30 cms	4.3.4 The use of ladders for other than a means, of access should be eliminated as far as possible.
	ii) For other types (Men and Tools only).....50 cms	4.3.5 Whenever a platform is 1-5 meters or more above the ground, a ladder or stairway shall be provided, one for each successive platform. Safe access from and to ladders or stairs must be provided at all platforms.
	b) Where platform is more than 2 meters above the ground or solid floor;	4.3.6 Every ladder used for a vertical height of more than 9 meters shall be provided with an intermediate landing and vertical distance between two successive landing places shall not exceed 9 meters. All intermediate landings shall be provided with suitable guard rails to a height of at least 1 meters above the landing place.
	i) For men, tools & materials 120 cms	4.3.7 Where a ladder is used as a means of communication or as a working place the ladder shall rise, or adequate hand-hold shall be provided, to a height of at least 1 meters above the place of landing of the highest rung to be reached by the feet of any person working on the ladder, as the case may be, or if that is not possible to the greatest practicable height.
	ii) For men, tools, material & vehicles 150 cms	4.3.8 When using a ladder or a step ladder, the user should always face the ladder. The overall height of step ladders should not exceed 6 m. Ladders should be provided with an automatic locking device or spreader to hold it in an open position. The minimum width between side rails at top step, inside to inside, should be not less than 300 mm with a spread of 25 mm for each 300 mm of length of spread ladder.
	GANGWAYS AND RUNS:	
4.2.9	All planks forming a gangway or run shall be so fixed and supported as to prevent undue or unequal sagging.	
4.2.10	No gangway or run the slope of which exceeds 1 vertical to 1½ horizontal shall be used.	
4.2.11	Where the slope of a gangway or run renders additional foot-hold necessary, and in every case where the slope is more than 1 vertical to 4 horizontal, there shall be provided proper stepping laths which shall:	
	i) be placed at suitable intervals, and	
	ii) be of the full width of the gangway or run except that they may be interrupted over a width of not more than 10 cms to facilitate the movement of borrows.	
4.3	LADDERS:	
4.3.1	Every ladder and step-ladder shall be of good construction, sound material and adequate strength. These shall be inspected at least once a fortnight and observations recorded.	Extension Ladders :
	a) No ladder with defective or missing rung or with any rung which depends for its support solely on nails, spikes or other similar fixing shall be used.	▪ The overall length of the extension ladder should not exceed 18 m. ▪ The sliding section should not exceed two in number. ▪ Locks and guides should be of such design and construction as to make the extension ladder equal in strength to a ladder of equal length constructed of continuous slide rails. ▪ When using an extension the overlap of any two sections should be as follows

Closed length of less than 5 m – 1½ rungs
 5m – 6m-2½ rungs
 Over 6 m-3½ rungs

Built up Ladders (Fixed Ladder) :

- All surfaces of the ladder should be plane, free of splinters and edge of hand rails used should be beveled.
- Rung spacing should be uniform and not over 300 mm on centers. Rungs should be recessed at least 12 mm into rails/ stiles.
- When height exceeds 9m, landing platform to be provided.
- Top and bottom of built-up ladder should be securely fastened to the structure.
- The transportation of materials by ladders should be reduced to the minimum. Tools and materials should wherever practicable, be pulled up with a rope.

- 4.3.9 Ladders should not be placed in front of doors opening towards the ladders or against window sashes. Stepladders should be opened out fully before use. Two ladders should be spliced together to provide access to a greater height than when a single ladder is used.
- 4.3.10 When permanent or portable ladders are used, the upper ends shall extend 110 cms above the platform. Portable ladders shall be securely fastened at the bottom and top.
- 4.3.11 All ladders shall be periodically inspected. The stability of ladders should be tested before using it.
- 4.3.12 A ladder should not be placed upon a box, barrel or other movable insecure object.
- 4.3.13 Portable ladders should be in a safe position before being climbed. The slipping of a ladder at either end should be carefully guarded against, especially where the supporting surfaces are smooth or vibrating. If necessary, a person shall be stationed at the base of the ladder to prevent it from slipping.
- 4.3.14 OPENING, DANGEROUS CORNERS, BREAKS OR EDGES & SLOPPING SURFACES:
- 4.3.15 Every accessible opening through which any person is liable to fall a depth of more than 12 meters or to fall into any liquid or material so as to involve risk of drowning or of serious injury shall be provided with guard rails 1 meter above the edge and toe boards at least 20 cms high or a covering to prevent fall of persons, tools or materials through the opening.

4.3.16 Every dangerous corner, break or a edge or any structure which is accessible to any person shall be provided with guard rails of adequate strength and, if necessary, with the toe boards.

4.3.17 Any person employed on a sloping surface of a vertical fall of more than 2 meters shall be provided with suitable ladders or crawling boards properly secured and a suitable working platform fitted with suitable guard rails and in case it is impracticable or inappropriate to provide such ladders, crawling boards or working platforms, suitable safety belt of sound material and in good condition with a rope of adequate strength and length enabling the wearer to attach himself to a secure anchorage shall be supplied, or where the wearer cannot so attach himself, a second person shall attach or hold the rope in a secure manner.

4.4 FORM CONSTRUCTION AND CONCRETE PLACEMENT:

FORM CONSTRUCTIONS:

4.4.1 Safety hazards in form-work construction such as those due to poor housekeeping, leaving materials and tools where they may fall and cause injuries; the tops of forms used as walkways not equipped with standard guardrails and toe-boards on the open side, and failure to properly secure form of scaffolds can be reduced, if not eliminated, by carefully planning.

HANDLING FORMS:

4.4.2 All forms or form panels that are to be used or reused should have U-bolts, sufficient in number and size, to carry the weight of forms or form panels. All temporary bracing shall be securely fastened to prevent members from falling where panels are being moved.

RAISING:

- a) All Form-raising operations should be conducted in a safe and orderly manner and only experienced workmen should be allowed on this type of work. All form raisers shall use safety belts when required to go over the side unless scaffolds are in place on the form.
- b) 'A' frames shall be designed and maintained to withstand all loads imposed upon them. All head and tail jacks shall be maintained in good working order. Tail jack fasteners of sufficient length and size shall be securely anchored in the concrete.

STRIPPING;

- a) All form stripping shall be conducted in a safe and orderly manner and in accordance with the rules for good housekeeping. All stripped lumber shall be placed in piles or removed immediately from the work area. All protruding nails or superfluous bolts or studs used to fasten the shuttering shall be cut or bent down soon after the stripping.
- b) Boatswain's chairs, safety belts, and ropes shall be used where workmen are exposed to falling hazards of such stripping operations and shall be protected from falling objects.

CONCRETE PLACEMENT:

- 4.4.3 All employees placing concrete should wear hard hats and rubber boots with trouser legs outside. Shirt sleeves should be rolled down, gloves should be worn, and every reasonable precaution taken to keep cement and concrete off the skin. Provision should be made for concrete workers to take a shower before leaving the jobs at the end of their shift.
- a) The water in freshly mixed concrete contains lime and alkalis and may cause severe and painful damage to skin and eyes. Such contacts should be avoided by proper protective clothing, boots, gloves, goggles etc. If they should occur, the workman should immediately remove liquids of substances by washing in water.
- b) Cement and concrete when dumped or dropped splashes like water and this is another way the burning lime and alkalis can get into unprotected eyes.

- 4.4.4 Men in good physical condition should be employed to operate vibrators. Lowering of vibrators from one level to another by use of air hose or electric cable shall not be permitted.

- 4.4.5 When concrete is transported by means of chutes, the towers shall be of substantial construction, sound material and ample strength to carry the greatest load that could possibly occur. They shall be properly guyed and provided with safe access. At each level of the chute where men work, landing platforms shall be provided and the chute shall be properly guyed and the area below the spout shall be barricaded when practicable to keep people out of the areas where they might be injured by falling concrete.

CONCRETE BUCKETS:

- 4.5.6 Concrete buckets for use with cranes and cable ways shall be constructed without flanges or other projections that may collect concrete which might be dislodged and fall on workmen. Buckets shall have an air connection to operate the dumping mechanism. All concrete buckets that are dumped by control of a cableway operator shall be equipped with safety catches that must be manually released before the concrete can be dumped. No man shall ride a bucket for any purpose.

- 4.5.7 When it is necessary to drift a bucket to a place not accessible by the crane, the drifting shall be done by some mechanical means and not by men pushing or pulling the bucket. Drifting the bucket by swinging the crane shall be prohibited.

- 4.5.8 Only those workmen who are known to be careful and reliable should be employed as signalmen to direct the spotting of buckets. Signalmen should be so stationed in a safe place, that they can see the entire area where concrete is being placed. A man should be specially designated to watch the movement of the bucket and warn the crew and vibrator operators of the approaching bucket so that all workers may clear out of the area affected by the bucket.

- 4.5.8 a) Workman/inspectors shall not enter a bin containing cement sand, aggregates unless wearing a safety belt with life line attached and attended by another worker who will pay out and keep minimum slack in the line at all times.

MIXER:

- 4.5.9 All mixer gears, chains and rollers shall be guarded. If the mixer has a charging skip, it shall be guarded by bars on the sides to prevent any one walking under the skip. The cable and sheaves should be inspected daily when the mixer is in continuous daily operation. When it is necessary to get inside mixers for cleaning, repairs or inspection, the control switches shall be locked and notice to the effect pasted on it to prevent inadvertent starting of the mixer.

MIXING PLANT:

- 4.5.10 Mixing plants shall be adequately designed and precautions taken to protect workmen from falling objects. Walkways, platforms, stairways

and ramps shall be well built and protected. The operations of the plant shall be co-ordinated by signals or interlocking devices as may be necessary to ensure the safety of all workmen. An air exhaust system shall be installed to remove cement and other dusts from the inside of the plant. Respirators should be worn when necessary.

PUMP CRETE:

- 4.5.11 (a) The scaffolding supporting the pipe shall be designed to carry the pipe when filled with concrete plus 100 percent overload, plus the estimated weight of the maximum number of workmen that may use the scaffold at the same time while the pump is operating. A factor of safety of four shall then be used.
- b) The pipe line shall be anchored at all curves and near the end. The toggle and flange connections shall be inspected before each placement to ensure tight joints. Air release valves shall be installed at high points to release entrapped air. The use of these valves will assist in preventing line plugging which in turn reduce accident possibilities.
- c) The work of cleaning a pipe line must be carefully done. Experienced workmen should be employed. There is danger of injury to workmen and also possibility of wrecking the scaffold. If and when necessary to open a pipe to clear it of an obstruction, the work must be carefully done in order that workmen may not be injured by concrete blown out by air pressure in the pipe.
- d) All workmen, when working in the vicinity of a pump crete machine should be provided with goggles and be required to wear them.

SAND BLASTING:

- 4.5.12 If sand and air blast are used, the sand blaster shall wear the regulation sand blaster's hood. If sand and water blast are used, operators of the blast shall wear goggles and protective clothing, operators of sand blast machines shall use care in directing the blast so that no one is caught in the blast or the rebound. All employees whose work requires that they be in the vicinity of the sand blasting operations shall wear goggles and respirators if a dry sand blast be used.

RE-REINFORCEMENT:

- 4.5.13 Reinforcing steel shall be piled on wood sills, and segregated as to sizes and lengths. Wood stakes shall be used to separate the various piles. Lanes and driveways shall be kept clear.

- a) The main accident hazards in bending reinforcing steel are due to sharp burrs in cutting and the whipping of long flexible rods. Tripping hazards will be present unless the rules of good house keeping are observed. Employees on this work should wear heavy gloves or hand pads. A leather or heavy denim apron is desirable. The area about the bender shall be kept clear for a distance equal to the length of the longest bar.
- b) All persons placing reinforcement steel where a falling hazard is present shall use safety belts. The tie-off rope may be short with a hook on the end to engage the steel. The common practice of a carrying wire for ties in a coil over one shoulder and under the opposite arm introduces hazards that can be obviated by carrying the wire on a reel that is worn on the belt.

CEMENT HANDLING:

- 4.5.14 Workmen engaged in handling bulk cement in confined places should wear tight-fitting goggles, approved respirators and protective clothing that fits snugly around the neck, wrists and ankles.
- 4.5.15 Workmen should be instructed to ensure personal cleanliness to guard against cement dermatitis and should be advised to report any susceptibility cement burns, Hand cream or petroleum jelly shall be provided for the use and protection of men handling cement.

4.6 GROUTING, GUNTING & SHOTCRETING:

- 4.6.1 Many of the hazards of grouting, gunting and Shotcreting operations are common to other construction operations, and are, therefore, covered by the above provisions, however, some of the principal hazards particularly incident to grouting and gunting are as given below:

MACHINERY HAZARDS:

- 4.6.2 All openings of grout mixers shall be adequately guarded. All flywheels, and all other moving parts including compressors drive belts, shall likewise be fully guarded.

GROUT PIPE AND HOSES:

4.6.3	All pipes or hoses used to convey the grout shall be of sufficient strength conforming to standard specifications to withstand the maximum pressures that may be reached during the operation. Pumps shall not be operated at pressures in excess of their rated capacities, or the safe working strength of the conveying system. All hose couplings shall be of standard types, and makeshift wire connections shall not be used. Pipes or hose laid along ladder ways catwalks, or ramps, shall be located at one side of the travelway in order to prevent tripping hazards.	not to trap the rebound on cleaning men in the blast.
	TOOLS:	a) All scaffolds or platforms used in placing gunite shall be substantially built. No makeshift type of construction shall be permitted. b) All hoses and mixers shall be inspected daily and maintained in a safe working condition. c) All other workmen shall be excluded from the immediate working area.
4.6.4	Proper tools for the work to be done shall always be provided and maintained in good condition. Only wrenches with jaws in proper condition shall be used. In using a wrench it should always be so placed that the pull tends to force the jaws further on the nut, and the user should make sure that his footing is secure before applying force to be wrench.	4.7 STRUCTURAL STEEL ERECTION:
	SAFETY BOLTS:	4.7.1 Heavy members must be maneuvered into places, but the short time required to make the erection joint at any connection does not ordinarily justify the erection of a rigid scaffold. When scaffold and ladders for use of the welders, riveters or erectors are necessary, the safety rules and regulations laid down in the manual should be followed.
4.6.5	Men working in elevated position shall use suitable safety belts, boatswains chairs, or lines to guard against falling.	4.7.2 All employees working in places where they are exposed to falling hazards should use safety belts.
	GALLERY LIGHTING AND VENTILATION:	4.7.3 Wherever workmen are exposed to unusual falling hazards from which it is impracticable to protect them by temporary floors or scaffolds, a safety net should be suspended below the place where men are working. Such nets shall be of 10 cms mesh and shall be made of Manila rope of at least 20mm diameter, with an outside or border rope of 18mm diameter. The border shall be provided with loops so that the nets can be attached to the structure or to each other.
4.6.6	All galleries or shafts, where foundation grouting is in progress, shall be adequately lighted and ventilated and reasonably free from water. Workmen should be provided with pocket flashlights for use in case the light circuit fails. All unused shafts, vertical stairwells, or other openings in galleries shall be barricaded.	4.7.4 Hardhats should be worn by employees working on or around erection operation and should be worn with chin straps fastened.
	TELEPHONE SYSTEM:	4.7.5 Gloves of a suitable type should be worn by all employees when handling steel cables or other rough or sharp edged materials.
4.6.7	Wherever feasible, a telephone system should be used to provide positive and quick method of communication between all control locations or grout operations.	4.7.6 Goggles should be worn when grinding, chipping, scrapping, caulking, cutting and heating rivets.
	GUNITING/SHOTCRETING:	4.7.7 Good footwear should be worn by all employees and the soles should be kept free from mud and grease. Safety toe shoes should be worn at all times.
4.6.8	Only experienced men should be employed for guniting and Shotcreting, which is a special type of concrete work. The nozzle men and helper shall be provided with cup type safety goggles, and shall use them as protection against rebound material. The nozzle man should operate the nozzle so as to keep the rebounds at a minimum, and care must be taken	4.7.8 Workmen should stand in clear when derrick is sorting for shifting steel beams. The signal man

	and the operator should check to see that all men have cleared out before lifts are made.		wear clothing free from grease, gasoline, oil and other flammable materials.
4.7.9	Workmen should not stand, walk or work beneath suspended loads.	4.8.4	Oxygen and acetylene cylinders or container shall never be permitted in small spaces of compartments where welding operations are in progress.
4.7.10	When guiding a beam, it should be so held that the hands do not get jammed against other objects.	4.8.5	A helper shall always be at hand to shut off the gas in case of an accident when the welder is working in a space from where escape is difficult.
4.7.11	When lifting an object in a group, one person should be designated to give the signal for all to lift or set the object down in unison.	4.8.6	All welding operations should be carried out in a well-ventilated space. Where any considerable amount of welding is to be done, an exhaust system for carrying away the fumes should be installed. If brass, bronze or zinc is to be welded, a suitable respirator should be worn if exhaust system is not installed.
4.7.12	When lifting, legs should be bent, body kept straight and leg muscles used for the lift.	4.8.7	All torches, regulators, cylinders and other such equipment shall be of an approved design, regularly inspected and kept in good condition. Defective apparatus and equipment shall be removed services, replaced or repaired and re-inspected before again being placed in service. Repairs shall be made only by persons thoroughly familiar with such apparatus.
4.7.13	There shall be no riding on steel that is being hoisted, no riding on the overhauling weights, hooks, cables or slings, nor sliding down on ropes or cables.	4.8.8	Welders and helpers shall wear suitable eye-protective devices during welding and cutting operations. Eyes exposed to welding or flashes should be washed with Rose water for better relief.
4.7.14	Public or workers in other trades operating close to steel erectors should be safeguarded at all times. a) They should be cautioned and instructed on any exposure condition existing or that may arise and result in accident. b) They should be advised to wear hardhat when required to work close by. c) They should be instructed not to operate directly underneath scaffolds that are being used. d) Red flags, or warning signs should be strategically posted to assist in cautioning and instructing others.	4.8.9	To avoid fire hazards the following additional precautions should be observed on all oxy-acetylene cutting and welding: a) Keep hose, apparatus and cylinder valves free from grease, oil, dust and dirt. b) Keep cylinders away from stoves, furnaces and other sources of heat. c) Only 'Gas Lighter' be used to light the torch. d) Ensure that nobody smokes and carries the matchbox in compressed gas storage area. e) Ensure that hosepipe is periodically checked and changed. Inspect hoses before use; replace old, damaged or worn hose. f) Avoid use of oxy-acetylene flame in confined spaces.
4.7.15	When receiving or unloading steel on job site, adequate protection such as barricades, sign flags and watch-man should be provided to protect the public.		
4.8	WELDING AND CUTTING:		
4.8.1	All welding and cutting shall be done by workmen who are thoroughly trained in the work or by trainees under competent supervision. Shields shall be placed around the work to protect persons from glare.		
4.8.2	Welding and cutting shall be not done in the immediate proximity of flammable materials.		
4.8.3	Welders and helpers shall wear non-combustible helmets and gloves during welding operations they should be careful to keep out of the line of sparks and hot metal; and they should		

- g) Clean thoroughly with steam all containers that have been used for storage of flammable liquids, or wash with hot water and soda, and ventilate thoroughly before welding and cutting.
- h) When testing for leaks use only soap water and watch for bubbles.
- i) Ensure that there is no loose wiring in that area.
- j) Valve protection caps shall be in place when cylinders are not in use.
- k) All employees shall be made familiar with the location and proper use of fire extinguishers in their area of work.

GAS CYLINDERS:

Due care shall be taken while loading and unloading oxygen/acetylene gas cylinders.

- 4.8.10 Gas cylinders shall be kept up right in approved safe places where they cannot be knocked over, and well separated from radiators, furnaces and combustible materials. These safe places shall be painted with appropriate warning signs. Empty cylinders should be marked "EMPTY" and the valves closed. Loaded and empty cylinders should be kept in separate places. Compressed gas cylinders shall not be stored near an electrical source or where the cylinders may come in contact with electrical wiring.
- 4.8.11 Lines shall be bled, regulators removed and valve caps replaced before unsecured cylinders are moved.
- 4.8.12 Oxygen cylinders shall not be stored in close proximity to acetylene cylinders or other fuel gas inside the building and in no circumstances either oxygen or acetylene cylinders shall be stored under direct rays of sun or in places where excessive rise of temperature is likely to occur. Compressed gas cylinders shall not be exposed to temperatures exceeding 125o F (50o C)
- 4.8.13 Tempering with or attempting to repair safety devices or valves of gas cylinders shall be prohibited and if trouble is experienced in any cylinder, a report shall be sent to the supplier forthwith describing the character of the trouble and particulars of the cylinder.
- 4.8.14 When acetylene cylinders are coupled, approved flash arrestors shall be inserted between each cylinder and the coupler block or

between the coupler block and the regulator and only cylinder of approximately equal capacity shall be coupled.

- 4.8.15 Cylinders found to have leaky valves or fittings which the closing of the valve will not stop shall be taken into the open way from any source of ignition, and slowly drained of gas.
- 4.8.16 Electric magnets or direct slings shall not be used for handling cylinders and only special cradles shall be used.
- 4.8.17 Cylinders, apparatus and hose or piping connections shall be gas tight. Stand to one side and away from the front of pressure regulator gauge when opening cylinder valve.

HOSES AND TORCHES

- 4.8.18 The hose shall be specially designed for use on cutting and welding operations. Special care shall be taken to avoid interchange of oxygen and acetylene hoses, as the mixture of these gases is highly explosive. Some colored code should always be used on each gas-red for fuel gas and black for oxygen. Glycerine shall be used for lubricating valves.
- 4.8.19 Some manufactures dust the inside of the hoses with fine talc, new hoses shall, therefore, be thoroughly cleaned on the interior before attaching to the torch. Compressed air shall never be used to clean hoses as it may contain oil from the compressor. Oxygen shall be used to clean oxygen hoses and acetylene shall be used to clean acetylene hoses.
- 4.8.20 Torches that leak at any connection get hot, or flash black shall not be used. Copper or brass wire shall be used to clean the tips. Hardwood sticks may also be used.

GAS WELDING AND CUTTING OPERATIONS:

- 4.8.21 The gas cylinders shall not be used unless fitted with the following: high pressure gauge on cylinder, reducing valve with pressure regulator and safety relief device, low pressure gauge for indicating pressure on the torch. The fuel gas and oxygen cylinder shall have left hand and right hand threads respectively so, that they cannot be interchanged.
- 4.8.22 Cylinder valves shall be opened only with hand wheels or tools, specially designed for that purpose and left in place while cylinders are in use. Cylinder valves shall be closed when not in use.

- 4.8.23 Since an explosion may occur oxygen/acetylene gas cylinders and fittings shall be kept away from oily or greasy substance and shall not be handled with oily hands or gloves. A jet of oxygen shall not be directed at oil surfaces, greasy clothes, or within a fuel oil other storage tank or vessel.
- 4.8.24 Under no circumstances shall acetylene be used at a pressure exceeding 1.1 kg per sq. cm. Oxygen pressure should always be such that acetylene does not flow back into the oxygen cylinder, as oxy-acetylene mixture is highly explosives.
- 4.8.25 After attaching the regulator and before opening the cylinder valve, the operator should see that the adjusting screw of the regulator is released. Oxygen should not be permitted to enter the regulator suddenly. The cylinder valve should be opened slowly.
- 4.8.26 Under no circumstances should a cylinder used for storing one type of gas be used for storing another type. This is of paramount importance with such gases as oxygen on one hand and hydrogen or acetylene on the other. Mixing up of such gases would produce serious explosion risk.
- 4.8.27 Oil and grease ignite violently in presence of oxygen and may even lead to explosion in case oxygen is under pressure. Oxygen cylinders should be kept away from oil soaked debris, rags, etc.
- 4.8.28 Only the standard key should be used for opening the valves and the key should be free from any oil or grease. Leverage of keys or spanners should not be increased and no attempt should be made to get gas from cylinders with broken valves thereby rendering the cylinder useless.
- 4.8.29 Cylinder should not be used as rollers, work supports or jacks.
- 4.8.30 Cylinders should not be loaded loosely in a vehicle as these will come in contact with each other and be subjected to jolting and damage during vehicle movement.
- 4.8.31 Oxygen and acetylene hoses shall be tapped or clamped together at 1 meter intervals. Tape shall never be used to make repairs to hoses.
- 4.8.32 Oxygen or acetylene cylinders shall never be placed where they can be contacted by electric wires or with ground wires of electrical equipment. If electric arc welding is being done in the same vicinity, such precautions as necessary must be observed to make sure that the oxygen-acetylene gas equipment does not come in contact with electric arc welding equipment.
- 4.8.33 Closed tanks or containers shall never be welded until they are thoroughly cleaned, dried out and ventilated and it has been determined that they contain no explosive or harmful fumes.
- 4.8.34 No smoking shall be permitted by workmen or welders, while handling gas cylinders.

UNLOADING OF GAS CYLINDERS:

Gas cylinders should be handled with care. They should not be dropped or allowed to strike against each other, to ensure safety. The following method of unloading gas cylinders from road vehicles or railway wagon is recommended:

- a) Whenever possible, the cylinder shall be unloaded directly on a raised platform by rolling over a coir mattress.
- b) If a suitable raised platform is not available, each cylinder shall be slide down over a heavily reinforced 15 cm thick coir mattress of about 2m x 1m size taking care that the bottom end touches the mattress first and then it is rolled away over the mattress. Cylinders should not be dropped from a height.
- c) It should be ensured that the first cylinder has rolled away before the next one is slide down.
- d) Lifting magnet should not be used for loading and unloading.
- e) A fiber rope sling may be used to lift one cylinder but not more than one at a time, provided it is adequately strong and correctly adjusted to prevent slipping. Use of a chain sling is unsafe, as it is very likely to slip, over a cylinder.
- f) From the unloading platform to the storehouse or from storehouse to the plant, the cylinders should be transported by means of a handcart. Such a handcart should be provided with a chain or belt for securing the cylinders in proper position.
- g) If a cylinder is to be transported over a short distance and a suitable hand-cart is not available; it should be rolled over its bottom edge but never dragged.

ELECTRIC ARC WELDING AND CUTTING:

- 4.8.35 The flash from electric arc welding is much more severe than that from oxy-acetylene welding, therefore, the welder shall have adequate eye protection and all persons working in the immediate vicinity should wear suitable colored goggles unless the work is completely shielded.
- 4.8.36 Welding shall not be done in the presence of any person not amply protected from the flash. Persons should never look at an electric arc with the naked eye; to do so may cause serious eye injury.
- 4.8.37 Only heavy-duty electric cable with unbroken insulation shall be used, and all connections shall be water-proof. All connections shall be checked before welding is started, and frequent inspection shall be made during welding operations.
- 4.8.38 When it is necessary to couple several lengths of cable for use as a welding circuit and occasional coupling or uncoupling is necessary, insulated cable connectors shall be used on both the ground line and electrode holder line.
- 4.8.39 Frames of all electric welding machines operated from power circuits shall be effectively grounded.
- 4.8.40 When the operator has occasion to leave his work or stop work for any appreciable time, the power supply switch in the equipment should be opened and the unit shut down.

4.9 PAINTING:

- 4.9.1 Packages containing paints, varnishes, lacquers or other volatile painting materials shall be kept tightly closed when not in actual use, and shall be placed where they will not be exposed to excessive heat, sparks, flame, or direct rays of the sun.

FIRE HAZARD:

- 4.9.2 Most paint materials are highly combustible, and every precaution should be taken to eliminate danger from fire.
- (a) No attempt should be made to heat paint materials except by placing containers in air, or water at moderate temperature. Dirty wiping rags, paint scrapings and

paint saturated debris, which always involve the hazard of spontaneous combustion or ignition from other sources, should not be allowed to accumulate but should be collected and disposed of at frequent intervals.

- (b) Smoking, open flame, exposed heating elements, and other source of ignition of any kind should not be permitted in paint stores or area where spray painting is done.
- (c) Fire extinguishers of appropriate capacity shall always be at hand where flammable paint materials are being mixed, used or stored. Sandpails or extinguishers of the carbon dioxide and carbon tetrachloride type are generally effective.

PROTECTION FROM DUST AND FUMES:

- 4.9.3 Apart from its explosiveness, air laden with dust or fumes may cause suffocation or other respiratory injury and may also have toxic effects through the skin or alimentary system. In painting, the dust comes chiefly from operations preparatory to painting such as sand blasting, scaling, scraping and brushing. Injurious fumes are given off when volatile paint materials are being mixed or applied specially when they are sprayed. Dust and fume nuisance is most dangerous in constricted spaces. Coal tar paint fumes are particularly obnoxious.

- a) Workmen must be provided with an ample supply of fresh air. If natural circulation is not adequate, artificial ventilation shall be provided. Ventilation shall be sufficient to carry away harmful accumulations of dust and fumes or workmen shall wear approved type respirators.
- b) Spray-painting operations shall be so confined as not to contaminate the air where other men are working. Spray gun operators should be required to wear clothing, which fits snugly at the ankles, neck and wrists and should wear gloves, goggles and respirators.

HANDLING PAINT MATERIALS:

- 4.9.4 Serious harm may result if the skin is exposed to prolonged contact with paint materials. Injury may take the form of burns or toxic effects resulting from absorption into or through the skin. It is well to avoid the use of paint solvents for cleaning the skin. These materials are not only injurious themselves, but they also

carry poisonous ingredients of the paint into the pores of the skin. There are a number of protective creams which may be applied to the skin before exposure to paint substances, and which wash off easily in warm soapsuds, taking paint off with them. The use of protective creams by all painters is recommended. Food shall never be placed where it might be exposed to fumes or dust from paint. Painters should clean their hands before eating.

CREOSOTE

- 4.9.5 Creosote is a lumber preservative and is closely related to carbolic acid. Extreme care is required to prevent contact with the skin or eyes, as it will cause severe burns. Protective cream or jellies should be used on exposed skin surface when engaged in handling creosoted materials. Affected parts of the body should be washed immediately, and in most cases the services of a physician should be secured.

CHAPTER 5 PLANT AND MACHINERY

5.1 TOOLS

HAND TOOLS:

- 5.1.1 All hand tools shall be kept in good conditions and used only for the purpose for which designed.
- 5.1.2 Tools having mushroomed heads, spilt or defective handles, worn parts, or other defects that will impair their strength or render them unsafe for use, shall be removed from service and shall not be reissued until the necessary repairs have been made.
- 5.1.3 All sharp tools shall be kept in sheaths, shields, tool chests, or other containers when not in actual use, to protect the tools, the workers and other persons.
- 5.1.4 Tools shall not be left on scaffolds, ladders or overhead working spaces when not in use. When work is being performed overhead on scaffolds or ladders, containers shall be used to hold tools and prevent them from falling.
- 5.1.5 The practice of throwing tools from one location to another, from one employee to another or dropping them to lower levels, shall not be permitted. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes shall be used.

- 5.1.6 Sharp-edged or pointed tools shall be carried in workmen's pockets.

- 5.1.7 Only non-sparking tools shall be used in location where sources of ignition may cause a fire or explosion.

PNEUMATIC AND POWER TOOLS:

- 5.1.8 (a) Hand tools and portable power tools should be inspected frequently for worn-out parts and connections. The sudden cessation of operation or the 'Kicking' or 'bucking' or such a tool may cause a serious accident especially when the operator is at an elevation exposed to the danger of falling.
- (b) In using heavy tools, it is best to support them where possible from some detached object or support in order to safeguard the operator's feet.
- (c) Loose clothings with free ends should be worn by operators of portable electric drills, reamers, etc. Neither should gloves be worn. Smooth overalls should be worn with the jumper tucked in.
- (d) All tools should be laid flat when not in use. They should never be kept standing on the nozzle or cutting edge.

PNEUMATIC TOOLS:

- 5.1.9 Pneumatic tools shall be used only by employees familiar with and properly instructed in their use.
- 5.1.10 Pneumatic tools shall be kept in good operating condition thoroughly inspected at regular intervals and particular attention given to control and exhaust valves, hose connections, die clips on hammer, and the chucks of reamers and drills.
- 5.1.11 Safety clips or retainers shall be installed on pneumatic impact tools to prevent dies and tools from being accidentally expelled from the barrel.
- 5.1.12 Pressure shall be shut off and exhausted from the line before disconnecting the line from any tool or connection.
- 5.1.13 Safety lashing shall be provided at connection between tool and hose.
- 5.1.14 Air hose shall be suitable to safely withstand the pressure for which it is intended. Leaking or defective hose shall be removed from service.
- 5.1.15 Hose shall not be laid over ladders, steps, scaffolds or walkways in such a manner as to create a tripping hazard.
- 5.1.16 The use of compressed air for blowing direct from hands, face or clothing is prohibited.
- POWER TOOLS:
- 5.1.17 Power actuated tools shall be used only by persons who have been trained and instructed in their safe use.
- 5.1.18 Such supervision and safeguards as are necessary to prohibit their use by unauthorised persons shall be provided.
- 5.1.19 In electrically operated tools a three-conductor cord shall be used so that a ground wire may be taken off the tool. Even a slight electric shock may result in a sudden jump on the part of the operator resulting in a bad fall or a severe bump or fracture.
- 5.1.20 Connecting cord should have oil resistant rubber insulation. Protection against kinking should be provided by the use of the short coiled steel spring or rubber protecting tube securely fastened in place at the motor end. Care should be taken to see that strain on the wires is not transmitted to the connection at the terminal or binding post.
- (i) Never oil an electric motor to excess. This oil may prove harmful to cord insulation.
- (ii) When a motor is in storage, coil the cord in a free coil, not a around the motor.
- (iii) Inspect cord frequently.
- (iv) Do not lay cord on oily or chemically saturated floor while the tool is in use.
- (v) Never pull on the cord when it is kinked or pinched.
- (vi) Do not lower or lift the tools with the cord; use a small rope.
- (vii) Do not leave the cord where a car or truck might run over it.
- 5.1.21 Premature starting of the motor presents a major hazard. Wherever possible, select tools that are equipped with safety devices to guard against this danger.
- 5.1.22 The use of power actuated tools is prohibited in explosive or flammable atmospheres.
- JACKS:
- 5.1.23 Maximum working load shall be permanently marked on a jack and it shall be provided with a positive stop to prevent over travel unless this is impracticable in which case the jack shall carry a warning that a stop has not been provided. Every jack shall be thoroughly examined at suitable intervals depending upon service conditions.
- STORAGE BATTERY:
- 5.1.24 Care shall be exercised in handling acids.
- 5.1.25 When preparing electrolyte the acid must be added slowly to the water until the solution has the proper specific gravity. Never bring an open flame near or allow sparks to shower on a storage battery as the gases produced are explosive under certain conditions.
- 5.1.26 Ordinary baking soda will prevent skin and eye burns, if used with water immediately after contact with the acid or electrolyte. If soda is not available, a weak solution of ammonia or plain clear water can be used.
- 5.2 DRILLS:
- 5.2.1 All drilling equipment shall be kept in good working order. Safe handling and lifting methods should be used.

- 5.2.2 Drills shall be stopped before greasing the machinery or moving parts.
- 5.2.3 Crown blocks shall be mounted securely and should be inspected frequently for loose connections.
- 5.2.4 Drillers should be required to block all finished drill holes over 10 cms in diameter before moving to a new location.
- 5.2.5 When using compressed air drills as well as other compressed air driven equipment the hose connections should be made only after the pressure has been released.
- 5.2.6 Electrically operated drills and all other electrically driven equipment should be provided with specially insulated power transmission cables with water-proof connections.
- 5.2.7 The use of gas engine or petrol engine driven drills under ground shall be prohibited. If used on open air work the engine shall be kept in good operating condition, and the operator shall be trained in the use of the tool, including necessary precautions to avoid burns from the engine. The engine shall be stopped while filling the fuel tank.
- 5.3 ROPES, CHAINS AND SLINGS:
- 5.3.1 The use of ropes, cables and chains shall be in accordance with the safe usage recommended by the manufacturer.
- 5.3.2 No chain or rope shall be used unless:
- It is of good construction, sound material, adequate strength and free from patent defects.
 - Safe working load is plainly marked on it or an identification number is marked on it and the safe working load corresponding to this number is entered in a register maintained by the person-in-charge.
- 5.3.4 No chain shall be used which has been broken and mended with a bolt, nor shall the end of the chain be bolted to the chain to form a loop.
- 5.3.5 Chains shall never be knotted, nor shall they be shortened by twisting the chain.
- 5.3.6 Before any strain is put on the chain, it shall be inspected to see that all links are lined up so that the pull is through the long diameter of the link.
- 5.3.7 All chains except those mentioned below shall be annealed once a year (6 months for 12mm bar chains and below) when in continuous use. This work shall only be attempted by competent men having the proper facilities for such work. The particulars of annealing or heat treatment and tests shall be entered in the register maintained for the purpose. It is recommended that all chains be returned to the manufacturer for annealing. Chains that need not be annealed are:
- Bridle chains attached to derricks or masts;
 - Chains made of malleable cast iron;
 - Plate link chains;
 - Chains of Steel; and
 - Pitched chains.
- 5.3.8 Manila, sisal or hemp ropes are commonly used. For all normal use pure manila rope which is hard but pliant should be used. Sisal rope is 2 to 3 times as strong as manila rope, but its fibre are hard and stiff and have a tendency to splinter. Hemp ropes are as strong as manila ropes, but they are more soft.
- 5.3.9 The weight, breaking strength and safe working strength with a factor of safety of 8 of standard manila rope(3 strand) are given in the table below(The values are only suggestive):

T A B L E 5.1

Diameter (mm)	Weight per foot (kgs)	Strength(Kgs)	
		Breaking	Working
6	0.97	270	35
12	0.110	1200	150
18	0.250	2500	310
25	0.400	4080	510
32	0.625	6100	770
40	0.890	8400	1050
50	1.610	14060	1760
65	2.485	21090	2630
75	3.600	29030	3630

CHAINS:

- 5.3.3 All chains in continuous use shall be inspected once a month. Each chain shall be measured for length at each inspection. If a stretch of 2.7 cms in 1 meter is found, it shall be inspected for cracks. Any link that shows evidence of a crack or cross-section reduction by wear, nicks or cuts shall be removed. The reduced link section shall never be less than two-thirds of the original section.

When a table of strengths is not available an approximation of the working strength of rope may be obtained by squaring the numerator of the diameter in eights and multiplying by 13. This gives strengths somewhat lower than those given in the table (e.g. if the dia of rope is 3/4" the dia in eights will be 6/8" and working load will be found to $(6)^2 \times 13$ lbs or 468 lbs).

- 5.3.10 Fiber ropes should be regularly inspected for wear and tear while in use to make sure that they are in good condition.
- 5.3.11 Fiber ropes should be protected from abrasion by padding when drawn over square corners or sharp rough surfaces. Frozen rope or wet rope subjected to acids or excessive heat should not be used. Ropes having dark or pinkish brown coloration on them due to exposure to acids shall not be used.
- 5.3.12 Suitable care should be taken while uncoiling, using and storing the fiber ropes. Sheaves should have a diameter not less than 36 times the diameter of the rope.

WIRE ROPES

- 5.3.13 Wire ropes have almost superseded fiber ropes and chains for hoisting and haulage purposes.
- (a) Standard hoisting rope consists of 6 by 19 wire strands and a fiber core made of iron, cast steel mild plow steel, plow steel or special plow steel.
- (b) The breaking strength of standard wire hoisting rope is shown in the following tabulation (The values are only suggestive):

TABLE 5.2

Breaking Strength (Tons)

(*Factor of Safety=8 for working out safe working strengths)

Dia (mm)	Weight (kg/m)	Iron	Cast Steel	Mild Plow Steel	Plow Steel	Special Plow Steel
1	2	3	4	5	6	7
6	0.115	-	2.1	2.3	2.5	2.9
10	0.36	2.05	-	-	-	-
12.5	0.60	3.57	7.7	8.5	9.4	10.8
25	2.40	13.70	29.5	33.0	36.5	42.0
37.5	5.40	29.70	65	72.5	80.5	92.5
50	9.60	51.80	114	127.0	140.0	161.0

- (c) Extra flexible hoisting rope, for use with smaller sheaves and drums, such as are

usually found in derricks, consists of 8 by 19 wire stands and one fibre core. The breaking strength of this rope is approximately 87 per cent of the standard wire hoisting rope given in the preceding tabulation.

- (d) Special flexible hoisting rope consists of 6 by 37 wire stands and one fiber core. It is extremely flexible and is specially adapted to high-speed service on cranes or where sheaves are small. The breaking strength of special flexible hoisting rope is approximately the same as that of standard wire hoisting rope.
- 5.3.14 Wire rope or cables shall be inspected by a competent person at the time of installation and once each week thereafter when in use.
- 5.3.15 No wire shall be used in hoisting or lowering if in any length of 8 diameters the total number of visible broken wires exceeds 10 per cent of the total number of wires or the rope shows signs of excessive wear, corrosion or other defect which in the opinion of the person who inspects it renders it unfit for use.
- 5.3.16 Wire rope removed from service shall be plainly marked or identified as being unfit for further use on cranes, hoists or other load carrying service and stored separately.
- 5.3.17 Wire ropes should be carefully uncoiled; coiled or used to prevent kinking; kinked strands damage the rope permanently. Even slight burning of rope reduces its load capacity because of drying out of lubrication.
- 5.3.18 Thimbles of proper size should always be used when a loop is formed at the end of a wire rope.
- 5.3.19 Socketing, splicing and seizing of cables shall be performed by qualified persons.
- 5.3.20 Connections, fittings, fastenings, parts etc. used in connection with ropes and cables shall be of good quality and of proper size and strength and shall be installed in accordance with recommendations of the manufacturer.
- 5.3.21 Drum sheaves and pulleys shall be smooth and free from surface defect such as cracks, kinks, destrand etc. Drums, sheaves or pulleys having eccentric bores or cracked hubs, spokes or flanges shall be removed from service.
- 5.3.22 The ratio between rope diameter and sheave diameter should never be less than 27. Good practice favours a ratio of 45. Grooves of

sheaves or drums should be 2mm larger than nominal rope diameter.

- 5.3.23 Running lines of hoisting equipment located within 2 meters of the ground or working level shall be boxed off or otherwise guarded, the operating area restricted.
- 5.3.24 Hooks, shackles, rings and pad eyes, U Bolts and other fittings shall be of proper size and those showing excessive wear or that have been bent, twisted or otherwise damaged shall be removed from service.
- 5.3.25 Slings, their fittings and fastenings, when in use shall be inspecting daily by a qualified person for evidence of overloading, excessive wear or damage. Slings found to be defective shall be removed from service.
- 5.3.26 Slings shall be of proper construction and size for the load to be hoisted. Slings should not be attached to load as to provide an angle of less than 60° between sling leg and the horizontal. The efficiency varies with the angle of sling as follows:

TABLE 5.3

Angle (Degree)	Efficiency (Percent)	Angle (Degree)	Efficiency (Percent)
90	100	50	76
80	98	45	71
70	94	40	64
65	91	35	57
60	87	30	50
55	82	5	8.5

- 5.3.27 Single legged and reeved slings shall be avoided as far as possible except for small or unyielding loads under competent supervision.
- 5.3.28 Slinging should be done only by a crew trained for the purpose. Accidental over loading out of ignorance is frequently the cause of fatal injuries. For all normal practice 2 or 4 part sling should be used.
- 5.3.29 Suitable protection shall be provided between the sling and sharp unyielding surfaces of the load to be lifted.
- 5.3.30 The maintenance, repair and testing of slings shall be done only by qualified persons. Proper storage shall be provided for slings while not in use.

5.4 CONVEYORS AND CABLEWAYS

- 5.4.1 All conveyors shall be regularly inspected, repair and maintained.

BELT CONVEYORS:

- 5.4.2 Belt conveyors shall not be overloaded to the point where material fall off the belt. The walkway along the belts shall be kept free of materials. Where the walkway is one meter or more above the ground, a standard guard rail shall be installed.
- 5.4.3 Oilers shall never attempt to clean rollers while the belt is in motion. All oil and grease cups shall be so located that the oiler can service the cups without exposing himself to danger.
- 5.4.4 The following are the maximum allowable speeds of conveyor belts carrying sand, gravel and earth:

TABLE 5.4

Width of Belt Cms	SPEED (Mtrs per minute)
40 or less	80
40 to 60	130
60 or more	180

If the materials includes abrasive lumps such as crushed rock, the speed should be reduced by 15 meters per minute on narrow belts and by 30 meters per minute on wide belts of 60 cms or more in width.

- 5.4.5 Where trippers are used to control the discharge from belt, a device for throwing the propelling mechanism into neutral gear shall be installed at each end of the runway.
- 5.4.6 Whenever the belt crosses over a travelled way, either public or private, trays shall be installed to catch all spillage from the belt. The trays and their supports shall be of ample strength to support a heaped load of wet materials and estimated weight of the cleaning crew. The trays shall not be so allowed to fill and patrolmen shall be particularly alert to prevent any spillage on travel ways.
- 5.4.7 Crossovers or underpasses with proper safeguards shall be provided for passage over or under all conveyors as necessary. Crossing over or under conveyors except where safe passageways are provided is prohibited.
- 5.4.8 All conveyor systems shall be equipped with such emergency signal devices that will provide reasonable safe control at all times. A system of signals to indicate the stopping or starting of belt shall be installed.
- 5.4.9 On all conveyors where reversing or runaway presents a hazards "anti-runaway" or "backup"

	stops or other safeguards shall be installed to protect persons and property from injury and damage.		Unloading of buckets should be slow so that the cable does not surge. Heavy surges cause hoist rope to twine around main cable and get excessive grinds. Sometimes the rope slips out of the pulley in the fall blocks and strands get severely damaged.
5.4.10	Riding on conveyors shall be prohibited.		
5.4.11	Baffles shall be placed across belts installed on steep grades to prevent material from rolling or bouncing off. The baffles shall be placed at intervals of about 30 meters on level belts.	5.4.18	Hoist ropes must be replaced immediately on damage.
5.4.12	Where conveyors are operated in tunnels, pits and similar enclosures, ample room shall be provided to allow safe access way and operating space for all workmen. Tunnels, pits and similar enclosures shall be provided with adequate drainage, lighting, ventilation and emergency controls including escape ways where it is necessary for person to work in or enter such areas.	5.4.19	Carriers should be of such design that they do not slip.
5.4.13	All openings to hoppers, chutes, bins etc., shall be protected to prevent unauthorised entry or persons from stepping or falling into them.	5.4.20	Where any cableway passes above any place on a site of operation where persons employed habitually work or pass and are liable to be injured by objects falling from such cableway, appropriate screens shall be provided or other steps shall, so far as is reasonably practicable, be taken to protect such persons from being so injured.
	CABLEWAYS:	5.5	LIGHT EQUIPMENT
5.4.14	While all cables shall be carefully inspected everyday special care shall be taken in the inspection of the button line at the buttons, where all grease shall be removed and the cable examined for broken wires and abrasions. Button line failures generally occur at the buttons, due to the impact of the carriers, and abrasion caused by the rebound of the carriers when they strike the buttons. Rubber and steel ferrules should be installed on each end of the buttons as shock absorbers.		WORKING MACHINERY:
5.4.15	Breaking of cable occasionally results in fatalities or serious injuries. Button line failures are some times caused by jamming of the carriers when they are picked up by the carriage, thus putting more strain on the line than it was designed to withstand. On some cableway systems, one end of the button line is anchored to a counter weight, which maintains a constant predetermined tension in the line. Jamming of the carriers causes a lifting of the counterweight. A limit switch can be installed above the normal travel of the counterweight, which will sound an alarm in operator's booth.	5.5.1	Safe means shall be provided for the removal of sawdust, chips and shavings from all woodworking machinery.
5.4.16	In night operations, clearance lights shall be installed on high blocks or other high points under cableway to assist the operator in maintaining proper clearance over such points.	5.5.2	A mechanical or electrical power control shall be provided on each machine, in a protected position, to prevent accidental starting and to enable the operator to cut off the power without leaving his position at the point of operation.
5.4.17	Hoist rope failures are most serious. Regular inspection and recording of all repairs and performance is extremely necessary.	5.5.3	Circular rip-saws shall be provided with hood guard, splitter and anti-kick-back device. All circular saws shall be provided with hood guards.
		5.5.4	The peripheral length of circular saws and cutters beneath tables shall be guarded or sides of table enclosed.
		5.5.5	All planners and jointers shall be guarded and have cylindrical heads with throats in the cylinder.
		5.5.6	All swing cut off and radial saws or similar machines, which are drawn across a table shall be equipped with limit stops to prevent the cutting edge of the tool from extending beyond the edge of table.
		5.5.7	Band saw bladders shall be fully enclosed except at point of operation.
		5.5.8	The use of cracked, bent or otherwise defective parts such as saw blades, cutters and knives is prohibited.

- 5.5.9 A push stick, block or other safe means shall be used in all close operations on saws, jointers and other machines having high speed cutting edges.

GRINDING WHEELS:

- 5.5.10 All grinding wheels shall be protected by hoods.
- 5.5.11 New wheels must to inspected carefully to see that they have not been damaged in transit. Suspending the wheel and tapping it with a light wooden mallet will reveal any cracks.
- 5.5.12 New wheels should be carefully fitted on the spindles.
- 5.5.13 Wheels should be tested frequently for balance and if out of round shall be 'trued-up' by a competent workman. If after being 'trued-up', if a wheel is still out of balance, it shall be discarded for use as a power operated wheel.
- 5.5.14 Wheels used in wet grinding shall never be left standing in water as the water soaked portion may throw the wheel out of balance.
- 5.5.15 Wheels designed for hand operation shall never be used on power-operated grinders.
- 5.5.16 Grinding on the site of the wheel in hazardous and shall not be permitted.
- 5.5.17 Direct current motors shall not be used for operating grinding wheels unless equipped with some approved device to prevent over speeding if the shunt field circuit should be accidentally broken.
- 5.5.18 When any person is wholly or mainly employed on a grinding wheel and substantial quantities of dust are given off during grinding, such grinding shall not be performed without a hood or other appliance so constructed, arranged, placed and maintained as substantially to intercept the dust throw off and a duct of adequate size so arranged as to be capable of carrying away the dust by means of a fan or other efficient means.

METAL WORKING MACHINERY:

- 5.5.19 Lathes, punch presses, shapers, milling machines and other metalworking tools shall be fully shielded or guarded.
- 5.5.20 Point of operation guards shall never be made inoperative by plugging the switch buttons or otherwise interfering with the operation of the guards.

- 5.5.21 Chain hoists or other power lifting devices shall be provided to light heave objects to the operating table of the machine.

- 5.5.22 Cleaning the hands with cutting oil or compound is dangerous and should be prohibited as small particles of metal in the oil may penetrate the skin.

- 5.5.23 Operators shall never wear gloves, lose clothing, loose sleeves or ties.

- 5.5.24 Articles made of celluloid or other flammable material shall not be worn.

- 5.5.25 Every machine shall have a brush conveniently placed for the operator to brush shavings or bits or metal from the machine. The bare hand should never be used for this purpose.

- 5.5.26 Goggles suitable for the work shall be worn and safety shoes are recommended.

5.6 LIFTING APPLIANCES

GENERAL:

- 5.6.1 Every lifting appliance and every part thereof including all working gear and all plant or gear used for anchoring or fixing such appliances shall:

(a) be of good mechanical construction, sound material, adequate strength and free from patent defects;

(b) be properly maintained; and

(c) as far as construction permits, be inspected at least once every week by a competent person and a report of the result of inspection entered in a register maintained for the purpose.

- 5.6.2 Every lifting appliance or part thereof during the course of erection, working or dismantling shall be properly supported and all the fixing and anchoring arrangements shall be adequate and secure.

TRAVELLING:

- 5.6.3 When lifting appliances with travelling and slewing motions are used, there shall be 2 meters clear distance between any part of the appliance in its extreme position and any guardrails or fencing or other fixtures; provided that if it is impracticable to maintain this distance, all reasonable steps shall be taken to

- prevent the access of any person to such guardrail, fencing or fixture.
- 5.6.4 Where minimum clearance of 2 meters from nearby structures is not possible, suitable warnings like peal of gongs should be sounded before crane commences to move.
- 5.6.5 A minimum distance of 2 meters must be maintained between the boom and all power lines of feeds during the travelling operation of a mobile crane.
- 5.6.6 Under no circumstances an attempt should be made to raise electric wires by a person other than the employee of the Electricity Department.
- PLATFORMS AND CABINS:
- 5.6.7 Platforms for persons driving or operating the cranes or for signalers shall be provided with safe means of access and the floors of such platforms shall be close planked or plated and be of sufficient area for persons employed thereon.
- 5.6.8 The driver of every power driven lifting appliance shall be provided with a suitable cabin for protection from the weather and it should be so constructed as to afford ready and safe access to parts of the lifting appliance in the cabin which required periodic inspections and maintenance and it shall not be so placed that it prevents the driver from having clear and unrestricted view of all lifting operations outside the cabin.
- DRUMS AND PULLEYS:
- 5.6.9 Every chain or rope which terminates at the winding drums of a lifting appliances shall be properly secured thereto and at least two drums of such chains or rope shall remain on the drum in every operation.
- 5.6.10 Drums or pulleys of lifting appliances shall be of suitable diameter in relation to the sizes of chains or wire ropes used round them.
- BREAKES, CONTROLS AND SAFETY DEVICES:
- 5.6.11 Every crane, crab and winch shall be provided with an efficient brake, or brakes and dogs or pawls or other safety devices which will prevent the fall of the load when suspended, and by which load can be effectively controlled whilst being lowered.
- 5.6.12 While a load is suspended from a crane, hoist or derrick, the operator shall not leave his position at the control until the load has been lowered to the ground.
- 5.6.13 Side pulls shall not be made with cranes or derricks. The crane or derrick boom shall be directly over the load to be lifted.
- 5.6.14 Riding on loads, hooks, hammers, materials hoists, or buckets shall not be permitted. Loads, booms and buckets shall not be swung over the head of the workmen.
- CRANES WITH DERRICKING JIBS:
- 5.6.15 On every crane having a derricking jib there shall be provided and maintained an effective interlocking arrangement of sound construction between the derricking clutch and the pawl sustaining the derricking drum except where:
- (a) The hoisting drum and the derricking drum are independently driven;
 - (b) The mechanism driving the derricking drum is self-looking.
- STABILITY:
- 5.6.16 Mobile lifting appliances shall not be used or soft or uneven surface or on a slope in circumstances in which the stability of appliance is likely to be effected unless adequate precautions are taken to ensure its stability.
- 5.6.17 No fixed crane shall be used unless it is securely anchored or adequately weighted as to secure stability.
- 5.6.18 Every travelling jib crane on rails shall be provided with guards to remove any loose material from the track, which shall be provided with effective stops at the end.
- 5.6.19 When the stability of the crane is secured by means of removable weights a diagram or notice indicating the position and amount of such weights shall be fixed on the crane where it can readily be seen.
- COMPETENT PERSONS FOR OPERATION:
- 5.6.20 Lifting appliance shall not be operated except by a person trained and competent to operate that appliance except that for the purpose of training it shall be permissible for any person to operate the appliance provided such a person is under the direct supervision of a competent person. Operators shall have the following additional qualifications:

i) Be able to read and understand the signs, notices, operating instructions and signal code used.	
ii) Be not less than 21 years of age.	
iii) Must have had a physical examination within one year to determine that they have no deficiencies of eyesight or hearing or they are not subject to epilepsy, heart failure, or similar ailments that would be detrimental to safe operation of equipment.	ii) be fitted with an accurate indicator, clearly visible to driver, showing the radius of the jib at any time and the safe working load corresponding to the radius.
5.6.21 If the person operating a lifting appliance has no clear view of the load, there shall be appointed signalers to give signals to the operator.	5.6.29 No jib crane with fixed or derricking jib shall be used unless it is fitted with an automatic load indicator which gives an efficient sound signal when the load lifted is in excess of safe working load at that radius, provided that if the requirements of clauses 27 and 28 are complied with, fitting of an automatic load indicator shall not be required.
5.6.22 The crane operator should recognise signals from only one person designated as signalman.	
5.6.23 Every crane operator and rigger should be made familiar with the rules and regulations for crane operators and standard crane signals for the safe operation of the crane.	5.6.30 The lifting appliance, shear legs or derrick pole or mast or any part thereof shall not be loaded beyond the safe working load except for the purpose of testing when it may be loaded to such amount as may be decided by a competent person for carrying out such tests.
TESTING AND EXAMINATION:	SCOTCH GUY OR TOWER DERRICK CRANES:
5.6.24 All lifting appliance thoroughly examined by a competent person at least once in every period of twelve months, or at such intervals as the Chief Inspector may specify in writing and a register shall be kept containing the prescribed particulars of every such examination.	5.6.31 No scotch derrick, guy derrick or tower derrick shall be used in any work unless:
5.6.25 Any lifting appliance, to which any substantial alteration has been carried out, shall not be taken into use unless it is tested and thoroughly examined by a competent person.	a) It is of good construction, sound material, adequate strength and free from any defect that will endanger life of any worker.
5.6.26 Results of all tests and thorough examinations shall be entered in a register to be maintained by the occupier.	b) All parts including anchorage have been thoroughly examined before erection and thoroughly examined and tested after erection by a competent person and results of such examination and test are entered in a register maintained for the purpose by the occupier; test load shall be 25 per cent above the maximum load to be lifted.
MARKING OF SAFE WORKING LOADS:	5.6.32 Maximum load to be lifted by the crane shall be marked on the crane in a position where it can readily be seen by the crane driver.
5.6.27 The safe working load or safe working loads and a means of identification shall be plainly marked:	5.6.33 The jib of a scotch derrick crane shall be erected between the back stays of the crane.
i) upon every crane, crab and winch, and; ii) upon every pulley block, gin wheel, shear legs or derrick pole or mast used in the raising or lowering of any load.	5.6.34 No load which lies in the angle between the back stays of a scotch derrick crane shall be moved by the crane.
5.6.28 Every crane fitted with a derricking jib shall:	5.6.35 No crane shall be used for lifting a load, which is in excess of maximum load marked on the crane.
i) have plainly marked upon it the safe working loads at various radii of the jib and the	5.6.36 In Scotch and Tower Derrick cranes, appropriate measures shall be taken to prevent foot of king post being lifted out of the socket

- while it is in use, and in Guy Derrick crane, guys shall be suitably spaced to ensure stability of the crane.
- 5.6.37 The crane operators should test the brake for full load capacity, at least one a week while the crane is in use. Such testing every day, before the work is started, is recommended.
- 5.7 RAIL TRACKS, LOCOMOTIVES AND HAULAGE TRUCKS:
- RAIL TRACKS AND LOCOMOTIVES:
- 5.7.1 Every rail track shall rest on a firm and even foundation and at each end it shall be provided with adequate stop blocks or buffers.
- 5.7.2 In any line of rails on which locomotive truck or wagon moves, there shall be adequate clearance so that persons are not liable to be crushed or trapped between walls, fixed structures, fencing or stack of materials, and a passing locomotive truck or wagon or any part of load thereon and where such clearance is not reasonably practicable, suitable recesses at a distance of not less than 6 meters along the line shall be provided and effective arrangements for warning any person of the danger, of being liable to be crushed or trapped, shall be made.
- 5.7.3 Every locomotive truck or wagon shall be fitted with effective brakes and a sufficient number of suitable springs or scotches shall be provided for the use of persons employed on the movement of trucks or wagons which shall be in good conditions and used whenever necessary.
- 5.7.4 Where any person is likely to be endangered by the movement of locomotive truck or wagon:
- The locomotive shall be fitted an effective warning device;
 - The person in charge of movement of locomotive truck or wagon shall see that adequate warning is given before the locomotive truck or wagon is moved; and
 - When the locomotive truck or wagon is approaching any crossing, blind spot or any place where the driver of the locomotive is unable to see clearly a sufficient length of the track, the driver shall give adequate warning by means of a suitable sound signal.
- 5.7.5 Except where adequate handholds and footholds are provided, no person shall be required or permitted to ride on a buffer or on a running board or in any locomotive truck or wagon.
- 5.7.6 No person shall be required or permitted to remain on any vehicle or on any truck or wagon during the loading of loose material by means of grab, excavator or similar appliance if he is endangered by so remaining.
- 5.7.7 Where hauling locos have to work to dangerous limits, the travel of the loco beyond the safety limit should be arrested by stops of adequate height and strength.
- HAULAGE TRUCKS:
- 5.7.8 Vehicles shall be maintained in good mechanical condition. Special attention should be given to brakes, horns, tyres, gears, steering mechanism and signaling devices. Drivers of motors vehicles should be on the alert to observe defects and report them to take further appropriate action for their correction. Drivers shall operate vehicles with regard to proper protection of the mechanism hereof.
- 5.7.9 Maintain your vehicle to keep auto emission under control.
- 5.7.10 Constant attention, concentration and alertness shall be exercised by the driver while operating a motor vehicle. Driving will not be undertaken under fatigue, or drowsiness and drunkenness as they impair driving ability to a high degree until the condition causing the impairment has been relieved.
- 5.7.11 Every vehicle should carry notices of warning pasted in at a conspicuous place, containing the following instructions:
- Persons travelling the vehicles, on duty, should sit at a safe place in it.
 - They should not stand in the vehicle or sit on the top of side planks of the body.
 - No person should get down from or get into the vehicle when it is in motion.
- 5.7.12 The log book of every vehicle should have a fly leaf containing the following instructions to the driver and the crew:
- No person should be allowed to enter in the vehicle or travel in it except under written orders of the concerned Executive Engineer or any other officer in charge or his subordinate duly authorised in this behalf. Any infringement of this rule shall render the driver and the cleaner liable for punishment.

ii) They should be prohibited from standing in the vehicle or sitting on the top of the side planks of the body.	5.8	BOILERS AND COMPRESSORS:
iii) No person should be allowed to get down from or get into the vehicle while it is in motion.	5.8.1	BOILERS: All steam boilers shall comply with provision of Boiler Regulations.
iv) The cleaner should act as the conductor of a transport bus and should look after the safety of the crew and others travelling in it.	5.8.2	UNFIRED PRESSURE VESSELS: Other pressure vessels shall comply with the provisions of rules framed under section 31 of Factories Act, 1948.
5.7.13 No driver of a truck shall back up a truck unless assisted by a signal man who shall have a clear view of the driver and the area behind the truck during each backing up operation.	5.8.3	AIR COMPRESSORS: Air Compressors should not be operated at speeds greater than those listed by the manufacturer, as explosions of compressors are sometimes due to excessive speeds.
5.7.14 As far as possible, loaded trucks should not be backed on gradients. Stumbling blocks must always be put in place to prevent the truck from moving down a gradient.	5.8.4	Compressors should be securely anchored to firm foundation as the sudden and frequent variations in load cause considerable vibration and impose severe shocks upon the equipment.
5.7.15 In slopes it should be ensured that every heavily loaded trailers are not used behind light hauling units.	5.8.5	At a pressure of 8 kgs per square cms as the temperature in an air cylinder may reach 200 degrees C., which is sufficient to volatilise. The lubricating oil shall, therefore, have high flash points.
5.7.16 The driver should not drive too fast, should avoid distractions and drive defensively. The driver should not attempt to overtake another vehicle unless he can plainly see far enough ahead to be sure he can pass safely; proper horn signal should be given before passing.	5.8.6	Every air compressor shall be equipped with an automatic mechanism so arranged that the compressor will automatically stop its air compressing operation before the discharge pressure exceeds the maximum safe working pressure allowable on the weakest portion of the system to which the compressor is attached.
5.7.17 Before crossing rail-road track, the driver should reduce speed, look in both directions along track and proceed across track only if it is safe to do so.	5.8.7	AIR RECEIVERS: Under no circumstances should a receiver be installed without a pressure gauge, and a relief or safety valve so proportioned and adjusted that the pressure will never exceed the maximum allowable working pressure of the tank by more than six percent.
5.7.18 Material shall not be loaded in a truck so as to project horizontally beyond the sides of the body and any material projecting beyond the front or rear shall be indicated by a red flag during the day and a red light during the night.	5.8.8	A drain pipe should be installed at the lowest point of every compressed air tank or receiver.
5.7.19 Workmen shall not be transported standing in the truck with their heads above the cab where they are liable to be injured by low hanging wires, tree branches etc.	5.8.9	No stop valve should be placed in the air line between the compressor and the air receiver unless spring loaded safety valves are installed between the compressor and the stop valve.
5.7.20 Loaded haulage trucks shall not be allowed to carry labourers on the top of their load.	5.8.10	Gauge and valves shall be regularly inspected.
5.7.21 Where any vehicle is used for tipping material into any excavation or pit or over the edge of any embankment or earthwork, adequate measures, such as the provision of suitable blocks, shall be taken where necessary so as to prevent such vehicle from overrunning the edge of such excavation, pit, embankment or earthwork.	5.8.11	Ensure that there is no oil leakage from the compressors. In case of oil leakage, arrest it

	immediately & keeps the oil in a tray for reuse. Check and maintain oil level as per the marking provided at the machine.	5.9.6	Getting off or on any equipment while it is in motion is prohibited.
5.8.12	Use ear plugs/ muffs in the compressor area, when it is in operation.	5.9.7	Machinery or equipment requiring an operator shall not be permitted to run unattended. Where practicable, equipment left unattended shall be locked to prevent starting by unauthorised persons.
5.8.13	Check and arrest any air leakage from valves, flanges, pressure gauges etc., check for any pinholes and drop in desired air pressure. In case any deviation is found, get it corrected immediately.	5.9.8	Machinery and equipment shall not be operated in a position where any part of the machine, suspended loads or lines can be brought closer than 3 meters from exposed high voltage lines unless the current has been shut off and positive means taken to prevent the lines from being energized. A notice of this requirement shall be posted at operator's position.
5.8.14	Air receiver shall be drained and cleaned of oil and water every six months or more often if so specified by State laws.	5.9.9	When rubber-tyred vehicles equipped with boom or ginpoles are being operated in the vicinity of power lines, a chain shall be attached to the metal frame with the loose end dragging on the ground.
5.8.15	Drain moisture from the Air reservoir once in a day.	5.9.10	Machinery or equipment shall not be operated in a manner that will endanger person or property nor shall the safe operating speeds or loads be exceeded.
5.8.16	The manhole or hand hole shall be opened every six months and the inside of the receiver checked.	5.9.11	An operator shall not be permitted to operate any machinery or equipment for more than 8 hours in any one day without a consecutive 8 hours interval of rest.
5.8.17	When operating under dusty conditions, the relief valve shall be checked at least every month.	5.9.12	Operators and all workmen in the immediate vicinity shall avoid use of loose clothing, large open sleeves, bulky trousers etc.
5.9	HEAVY MACHINERY:	5.9.13	No person shall take rest or sleep near a parked machine.
	INSPECTION:	5.9.14	While going from one place to another, it shall be ensured that the culverts, etc. to be crossed are strong enough to take the heavy load passing over.
5.9.1	Before any machinery or mechanised equipment is put into use on the job, it shall be inspected by a competent person and determined to be in safe operating condition. Continued periodic inspection shall be made at such intervals as necessary to ensure its safe operating condition and proper maintenance.		GUARDING, SAFETY DEVICES:
5.9.2	Any machinery or equipment found to be in an unsafe operating condition shall be tagged at the operator's position, labelled "Out of order" "Do not Use", and its use prohibited until unsafe conditions have been rectified.	5.9.15	(i) Every moving part of prime mover, headrace and tailrace of every water wheel and water turbine and stockbar which projects beyond the head stock of a lathe shall be securely fenced.
5.9.3	Inspections or determinations shall be made to ensure that clearance and load capacities are safe for the passage or placing of any machinery or equipment, before permitting passage or placement.		(ii) Unless they are in such position of such construction as to be safe to every person as they would be if they were securely fenced, every part of an electric generator, a motor or rotary converter; and every part of transmission machinery and every
	OPERATIONS:		
5.9.4	Machinery and mechanised equipment shall be operated only by qualified and authorised personnel.		
5.9.5	Riding on equipment by unauthorised personnel is prohibited.		

dangerous part of any other machinery shall be securely fenced.

- (iii) The fencing to be provided in (i) & (ii) shall be of substantial construction regardless of whether the machinery they are guarding are in use or not.
- 5.9.16 All hot surfaces of equipment, including exhaust pipes, or other lines which may be subject to high temperatures, exposed to contact by persons or which create a fire hazard, shall be suitably guarded or insulated.
- 5.9.17 Fuel tanks shall be located in a manner which will not allow spills or overflows to run into engine, exhaust or electrical equipments.
- 5.9.18 No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for the purpose of making immediate repairs, lubrication or adjustments and only after the power has been shut off. All guards and devices shall be replaced immediately after completion or repairs and adjustments.
- 5.9.19 Suitable protection against the elements, falling or flying objects, swinging loads, and similar hazards shall be provided where appropriate for operation of all machinery or equipment. All glass used shall be "Safety Glass".
- 5.9.20 A warning device or services of a signaller shall be provided where there is danger to persons from moving equipment, swinging loads, buckets boom etc.
- 5.9.21 All machinery or equipment not equipped to prevent over-loading or excessive speed shall have safe load capacities and/or operating speed pasted at the operators position.
- 5.9.22 Stationary machinery and equipment shall be placed on a firm foundation and properly secured in place before being operated.

REPAIRS AND MAINTENANCE:

- 5.9.23 Except for testing, trial or adjustment which must necessarily be done while the machinery is in motion, all machinery and equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being made.
- 5.9.24 Any guard or safety device removed or ineffective shall be replaced or resorted to safe operating condition immediately after completion of work, which required its removal.

5.9.25 All repairs on machinery, equipment, or parts thereof which are suspended or held apart by use of slings, hoists, or jacks, shall also be substantially blocked or cribbed before men are permitted to work underneath or between them.

5.9.26 Heavy machinery, equipment, or parts thereof which are suspended or held apart by use of slings, hoists or jacks, shall also be substantially blocked or cribbed before men are permitted to work underneath or between them.

EXCAVATORS-SHOVELS, DRAGLINES ETC:

- 5.9.27 Before starting the machine, a thorough visual inspection shall be made. All cable clamps, etc. shall be checked for excessive wear. The oiler should be off the rig before starting the engine. An operator should know where his oiler is at all times.
- 5.9.28 All persons must be kept beyond the range of cap swing. No one except operating personnel shall be permitted on the equipment while it is operating.
- 5.9.29 Operators and helpers should not indulge in unnecessary conversation while the equipment is in operation.
- 5.9.30 Walkways in or about the cab of any dragline or shovel shall be kept free of loose tools, grease containers, or other materials that might fall and present a tripping or falling hazard.
- 5.9.31 Operator, when loading materials into trucks, shall exercise such precautions as necessary to prevent injury to the truck driver or damage to the truck. If the truck is not provided with a substantial cab or shield, the driver should leave his seat while the truck is being loaded. Preferably the truck shall be loaded over the sides or rear and not over the truck cab.
- 5.9.32 Shovel dippers and dragline buckets should be lowered to the ground when the operator leaves the machine or during greasing operations.
- 5.9.33 Power shall be disconnected when repairs are made to electric shovels, draglines etc. Trailing cables must be kept off the ground, and should be handled only with insulated hooks. The framework of a shovel shall be grounded.
- 5.9.34 When being operated in soft or unstable ground, draglines and power shovels shall be supported by mats, heavy planks, or poles so as to distribute the load and prevent any danger of overturning.

- 5.9.35 No smoking shall be allowed during refueling and engines must not be running while being refueled. Open lights, flames, or sparks must be eliminated. Lights on the equipment shall be of an approved vapor proof type. Fuel which is carried to the machine by hand must be transported in an approved type of safety can. The type of safety can to be used, should be approved by the Chief Engineer-in-Charge of the Project.

DUMPERS:

- 5.9.36 Dump trucks shall be maintained in first class working condition and regularly checked and inspected. Brakes shall be kept in efficient working condition. Trip and winding mechanism shall be daily examined and adjusted.
- 5.9.37 Dump truck used for hauling rock or overburden, which is loaded by shovels etc. should be equipped with safe overhead protection for the cab. Dump trucks shall not be moved backwards unless the driver has a clear view of the area behind the truck or has the assistance of a "spotter" or "pitman."
- 5.9.38 No person shall be allowed to work on a truck with the body in a raised position until after the truck body has been securely blocked in position.
- 5.9.39 While dumping by rear or side dumpers the workers shall stand clear of the vehicle and if sticky or heavy material is being dumped, dump hooks shall be used or the car clamped so that it cannot overturn.

TRACTORS AND BULLDOZERS:

- 5.9.40 Before starting the machine, a thorough visual inspection shall be made in order to minimise accidents. Check cables and cable clamps etc. for excessive wear. Check the position of other workmen before starting the machine. Use extreme caution when coupling to draw bar.
- 5.9.41 Only one person, the operator, should ride on a tractor the only exception being when the operator is teaching a student to drive and this should be done on a relatively smooth ground.
- 5.9.42 Tractors should never be left unattended with the engine running and brakes not set. When it is necessary to park tractors on slopping ground, they shall be securely blocked and the brakes set.
- 5.9.43 Operators of bulldozers should not drive with the blade raised so high that vision ahead is

obscured and when the operator leaves the machine, the blade shall be lowered to the ground.

MOTOR GRADER:

- 5.9.44 The prestarting inspection should be performed by checking foot and hand brakes.
- 5.9.45 When operating near obstructions, use low gear. The speed when travelling to or from the job site should not be excessive. When operating on a public highway, the blade tips should be flagged. Keep a sharp lookout at all times for other vehicles, cattle and pedestrians.
- 5.9.46 When Parking the machine, the blade should be turned inside the frame and lowered to the ground, set the hand-brake, and block the wheels if on an incline. The transmission may be left in low gear after the engine has been shut off, if additional braking force is needed.

PILE DRIVERS:

- 5.9.47 All plant, equipment and devices used in connection with pile driving work shall be constructed, installed, inspected, maintained and operated so as to prevent danger.
- 5.9.48 Every pile driver shall be firmly supported on heavy wood sills or substantial cribbing and shall be securely and safety guyed at all times and when steam or air hammers used, the hose shall be securely lashed to the hammer to prevent it from shipping, should a connection break.
- 5.9.49 While inserting the piles, the hammer shall be blocked in the leads and when a pile driver is not in use, the hammer shall be scotched at the bottom of the leads by means of a scotch.
- 5.9.50 Only pile driving crew members and authorised person shall be permitted in the actual work areas during driving operation.
- 5.9.51 Dogs on pile driver hoist drums, the automatically disengage either by relieving the load or rotating the drum shall be prohibited.
- 5.9.52 A safety lashing shall be provided for all hose connections to pile driver hammers, pile ejectors, or jet pipes.
- 5.9.53 Hanging or swinging leads of pile drivers shall have fixed ladders. Employees shall be prohibited from remaining on leads or ladders while pile is being driven.

- 5.9.54 Fixed pile driver leads shall be provided with decked landings having guard rails and toe boards. Fixed leaders or stairs shall be provided for access to landings and headblocks.
- 5.9.55 Landing or leads shall not be used for storage of any kind.
- 5.9.56 Pile driver leads shall be provided with stop blocks to prevent the hammer from being raised against headblock.
- 5.9.57 Pile hammers shall be lowered to bottom of leads while pile driver is being moved.
- 5.9.58 Suitable guys, outriggers, thrustouts, counter-balances or rail clamps, shall be provided as necessary to maintain stability of pile driver rigs.
- 5.9.59 Taglines shall be used for controlling 'unguided piles' and 'flying hammer.'
- 5.9.60 Hoisting of steel piling shall be done by use of a closed shackle or other positive mean of attachment that will prevent accidental disengagement.
- 5.9.61 When steam driven hammers are used, the boiler shall comply with all requirements of boiler code. The steam hose and connection shall be inspected frequently and the hose shall be lashed in place, so far as practicable, to minimise the danger of men being scalded in case of a broken connection. All steam lines shall be controlled by shut off valves located within easy reach of the operators.

CHAPTER 6

MISCELLANEOUS

6.1 STORAGE OF MATERIALS:

- 6.1.1 All materials in bags, containers or bundles stored in tiers shall be stacked, blocked, interlocked, and limited in height so that it is stable and otherwise secured against sliding or collapse.
- 6.1.2 Inflammable liquids and grease shall be stored in a 'NO SMOKING' area and properly separated from other stored materials.
- 6.1.3 Used lumber shall have all nails withdrawn before it is stacked for storage.
- 6.1.4 In withdrawing sand, gravel, and crushed stone from frozen stockpiles, no overhanging shall exist at any time.
- 6.1.5 Materials dumped against walls or partitions shall not be stored to a height that will endanger the stability or exceed the resting strength of such walls and partitions.
- 6.1.6 Persons working in hoppers or on high piles of loose material shall be equipped with life lines and safety belts.

6.2 ATMOSPHERE IN CONFINED PLACES:

- 6.2.1 In every working place where persons are required to work in a confined place, adequate ventilation by the circulation of fresh air shall be provided and no person shall be allowed to enter any place where there is reason to apprehend that the atmosphere is poisonous or asphyxiating unless the person wears a suitable breathing apparatus and is equipped with life line held by a person stationed for the purpose in safe place.
- 6.2.2 When workers are employed in sewers and manholes which are in use, it shall be ensured that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into the manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accidents to the public.
- 6.2.3 There shall also be provided in a suitable position and readily available sufficient and appropriate rescue apparatus including:
 - i) Suitable breathing apparatus;
 - ii) Suitable reviving apparatus; and
 - iii) Suitable safety belts of sound material with ropes of adequate length and strength.

All such equipment and apparatus shall be in charge of a competent person conversant with their use and he shall be available at all time while any person is working in the confined place. All such equipment shall be properly maintained, tested and examined at intervals of not more than one month.

6.3 PREVENTION FROM DROWNING:

- 6.3.1 Where adjacent to the site of any operation there is water, into which a person employed, in the course of his employment, is liable to fall with risk of drowning, suitable rescue equipment shall be provided and maintained in an efficient state and steps shall be taken for the prompt rescue of any such person in danger of drowning.
- 6.3.2 The rescue equipment shall include life saving skiffs properly maintained with life vests and life buoys of approved type with 16 meters of 10mm rope attached.

- 6.3.3 Life preservers, vests or belts shall be worn by all persons while working:
- (a) On floating pipeline, pontoons, rafts, float stages etc;
 - (b) On open deck-floating plant not equipped with bulwarks, guardrails or other life lines;
 - (c) On structures extending over or adjacent to water except where proper guardrail or safety belts and life lines are provided;
 - (d) Working alone at night where there are potential drowning hazards regardless of other safeguards provided and;
 - (e) In skiffs, small boats or launches except when inside of enclosed cabin or cockpit.
- 6.3.4 Life preservers or working vests shall have a buoyancy of at least 7.5 kgs. When new and shall be removed from service when buoyancy decreases below 5.75 kgs.
- 6.3.5 Walkways and structures extending over or immediately adjacent to water shall be provided with ring buoys of 7.5 kgs buoyancy at intervals of not more than 60 meters.

6.4 FIRE PREVENTION AND PROTECTION:

FIRE PREVENTION:

- 6.4.1 All construction areas and storage yards should be kept clean and well arranged.
- 6.4.2 A clear space of 15 meters around the outer boundary of sawmill and lumber storage area may be provided. All lumber should be stored in sections with firebreaks with a distance of 15 meters between consecutive sections.
- 6.4.3 All combustible waste material, wood scalings, soiled rags etc. shall be removed daily and burden in suitable burning areas. The saw mill and lumber yard shall be kept free from accumulation of combustible debris.
- 6.4.4 Fires, welding, flame cutting shall in general not permitted in combustible areas. Fires and open flame devices shall not be left unattended.
- 6.4.5 Smoking shall be prohibited in all flammable material storages viz. carpentry, paint shops garages, services stations etc. "No smoking" signs should be posted on all such areas.
- 6.4.6 Accumulations of flammable liquids on floors, walks etc. should be prohibited. All spills of flammable liquids shall be cleaned up immediately.
- 6.4.7 Smoke pipes from Diesel Engines passing through roof of combustible material e.g. in compressor stations at dam site and quarry shall be insulated by asbestos. All joints of smoke pipe should be riveted, welded or otherwise securely fastened together and supported to prevent accidental displacement or separation. The joints should not be leaky.
- 6.4.8 Flammable liquids, lubricants etc. should be handled and transported in safety containers and drums which can be kept tightly capped.
- 6.4.9 Petrol or other flammable liquids with a flash point below 100°F shall not be used for cleaning purposes.
- 6.4.10 Oxygen cylinders shall not be stored with combustible materials.
- 6.4.11 All electric installations should be properly earthed. Repairs should not be made on electrical circuits until the circuit has de-energized.

FIRE FIGHTING ARRANGEMENTS;

- 6.4.12 Fire extinguishers and fire buckets, painted red, shall be provided at all fire hazardous locations viz. Batching and Mixing Plant, which Houses, Workshops. Store yards, Saw-Mill, Switch Gear Room, Compressor Stations, Office establishments etc. The extinguishers shall be inspected serviced and maintained in accordance with manufacturer's instructions. The inspections shall be evidenced by notations on tag attached to the extinguisher.
- 6.4.13 Where building and establishments are located in or near cities or towns, definite arrangements shall be made to ensure protection by the established municipal fire department In more isolated locations, it will be necessary to provide for and install complete fire fighting facilities including provision for fire tenders commensurate with the number, size and importance of buildings, equipments, or supplies to be protected.
- 6.4.14 Full reliance should never be placed on portable hand extinguishers as all of these have a very limited capacity. Water, in ample amounts and under adequate pressure, should always be available for fire fighting.
- 6.4.15 Where a group of buildings are located beyond the range of protection from a public water supply, the installation of water system for private fire protection may be warranted. The following design factors should be considered in the planning of a private water supply. The standard fire stream is recognised as 1155 liters per minute. Multiple streams of 1155 liters must be provided for protection of important groups of buildings. While the daily domestic consumption is basis used in the design of a domestic type of water system, additional capacities should be provided for use during fire emergencies. For example, two standard fire streams (2310 liters per minute) discharged for 1/2 hour amount to 69,300 liters of water. Therefore, additional water storage for fire use must be provided. A loop system of hydrants from two directions with a reduction of friction losses and a resultant higher water pressure for fire-fighting purposes. No underground pipes that are a part of the system should be smaller than 15 cms in diameter and valves should be provided for shutting of the domestic connection outside of all building served. Hydrants should not be over 120m apart and so located that not less than two hose streams concentrate on any building. Hydrants in cold climate should be designed and installed to prevent freezing. Two 60mm outlets with standard 5 hose thread should be used for all private hydrants. It is good practice to provide hose houses at hydrants in a private water supply system. The houses should be equipped with a minimum of 60 meters of 60mm hose and accessories, including axes, spanner, wrench and other tools.
- 6.4.16 Excavation facilities and fire exit may be provided at all locations featuring the hazards.
- 6.4.17 Siren or other suitable fire alarm arrangement shall be made on all projects. Warning signs may be posted at all locations featuring fire hazards.
- 6.4.18 All staff shall be conversant with the use of all types of fire extinguishing apparatuses.
- 6.4.19 Demonstrations and training in fire fighting shall be conducted at sufficient intervals to ensure that sufficient personnel are familiar with and are cable of operating fire fighting equipment.
- 6.5 FIRST AID AND MEDICAL CARE:
- 6.5.1 At every work site suitable arrangement for rendering prompt and efficient first aid to injured persons shall be maintained under the guidance of the Medical Officer in charge of the project.
- 6.5.2 First aid appliances including an adequate supply of sterilised dressings and sterilised cotton wool shall be maintained in a readily accessible place. The appliances shall be kept in good order and they shall be placed under the charge of a responsible person who shall be readily available during working hours. The minimum requirements of the first aid kit shall be as under:
- 10 cms compressed bandage - 12 Nos.
- 5 cms compressed bandage - 12 nos.
- 2.5 cms adhesive plaster - 1 reel

1 meter triangular bandage	- 3 Nos.
Spirit Ammonia Aromatic	- 1 bottle (4 ounces)
Tannic acid jelly	- 1 tube
Tincture iodine	- 1 bottle (2 ounces)
Tourniquet	- 1 No.
Forceps	- 1 No.

When purchasing first aid kits, dust proof containers should be specified.

- 6.5.3 Where work sites are remote from regular hospitals an indoor ward in charge of a Medical Officer with such nursing staff as may be necessary shall be provided with one bed for every 250 workers.
- 6.5.4 Adequate identification and directional markers shall be provided to readily denote location of all first aid stations and hospitals.
- 6.5.5 An ambulance shall be provided to transport seriously injured persons to the hospital.
- 6.5.6 Small crews working at a distance from the project headquarters or from the main body of workmen shall be equipped with standard first-aid kits and at least one man in each crew shall have had first aid training.
- 6.5.7 Adequate lighting, heat, water and ventilation shall be provided in the first aid station and/or hospital.
- 6.5.8 The Medical Officer in charge of the project should be responsible for issuing special instruction indicating certain 'do's and 'don'ts' on subjects like sunstroke, heat exhaustion, sanitation, out-break of epidemics etc.
- 6.6 PERSONAL PROTECTIVE EQUIPMENT:
- 6.6.1 The following safety equipment shall be provided to workers as required and their use enforced:

Rubber boots; hard toe safety boots; hard hats; safety belts; goggles for stone or metal grinders, stone chippers, gas welding aprons; respirator shields; manila ropes and slings for life lines; gloves; flashlights; battery lamps, magazine shoes; safety nets; boatswains chairs; helmets, life and ring buoys.
- 6.6.2 Items of personal wear shall be maintained in serviceable condition and shall, before being reissued to other employees or returned to stores be cleaned, sterilised, inspected and repaired, if necessary.
- 6.6.3 Loose and frayed clothing, hand rings loose watch chains etc. shall not be worn around moving machinery or other sources of entanglement.
- 6.6.4 The use of personal safety equipment as occasioned by the type of work being performed has been indicated in relevant places of this Manual.
- 6.7 MISCELLANEOUS

SECURITY OF LOADS

- 6.7.1 Every receptacle used for raising or lowering stone, bricks, tiles, slates, or other objects shall be so enclosed, constructed or designed as to prevent the accidental fall of such objects.
- 6.7.2 All gears, tools, goods or loose material shall be properly loaded into the bucket or receptacle in which they are being raised or lowered and if necessary, properly secured or effective precautions shall be taken by enclosure or otherwise to prevent their fall.

PROJECTING NAILS:

- 6.7.3 No timber or material with projecting nails shall be used in any work in which they are a source of danger to such persons.

DANGER FROM COLLAPSE OF STRUCTURE:

- 6.7.4 When any work is carried on which is likely to affect the security or stability of a building or structure or any part thereof and endanger any persons employed, all practicable precautions shall be taken by shoring or otherwise to prevent collapse of the building or structure or fall of any part thereof and thus remove the cause of danger to such structures and the persons employed.

HANDLING OF CORROSIVE MATERIALS:

- 6.7.5 For persons engaged in handling of corrosive materials adequate equipment shall be provided.
- 6.7.6 Where in connection with any grinding, cleaning, spraying or manipulation of any material there is given off any dust or fume of such character and to such extent as is likely to be injurious to the health of persons employed, all practical measures shall be taken by securing adequate ventilation or by the provisions and use of suitable respirators or otherwise to prevent inhalation of such dust and fume.

LEAD COMPOUNDS AND OTHER POISONOUS SUBSTANCES;

- 6.7.7 Men below the age of 18 years and women shall not be employed on the work of painting with products containing lead in any form. Wherever men above age of eighteen years reemployed on the work of lead painting, the following precautions shall be taken:
- (a) No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
 - (b) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
 - (c) Overalls shall be supplied to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
 - (d) While lead, sulphate of lead, or product containing these pigments shall not in painting operation, except in the form of pastes or paints ready for use.
 - (e) Cases of lead poisoning, and suspected lead poisoning shall be immediately notified, and shall be subsequently verified by a member appointed by the competent authority of project.
 - (f) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

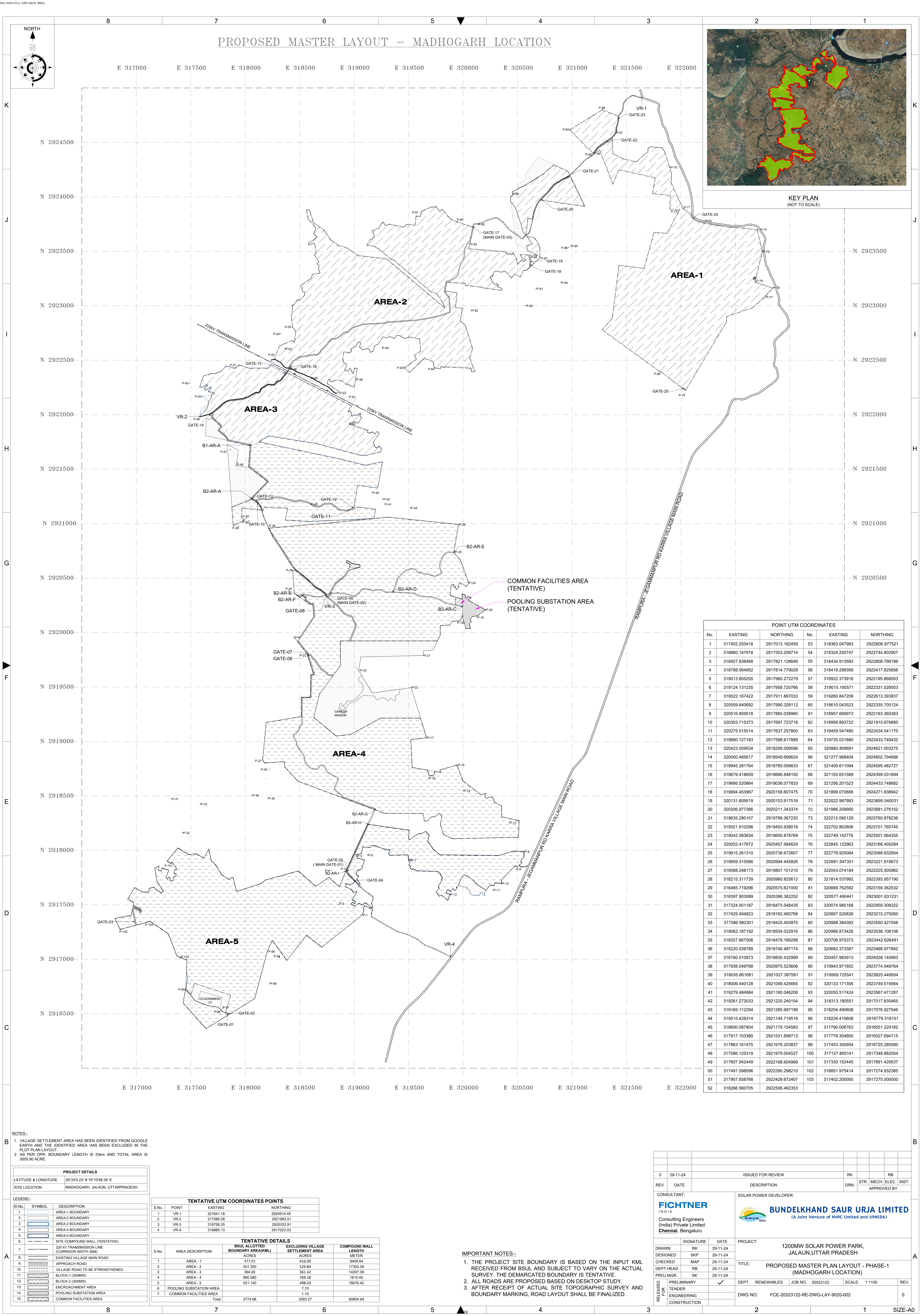
- 6.7.8 Lead compounds shall not be used in the form of a spray in the interior painting of the structures.

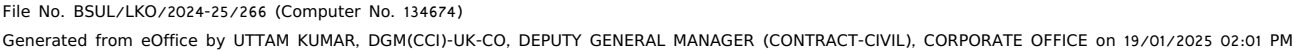
- 6.7.9 Road work:
Workers employed on mixing asphalt materials shall be provided with protective footwear and protective goggles.

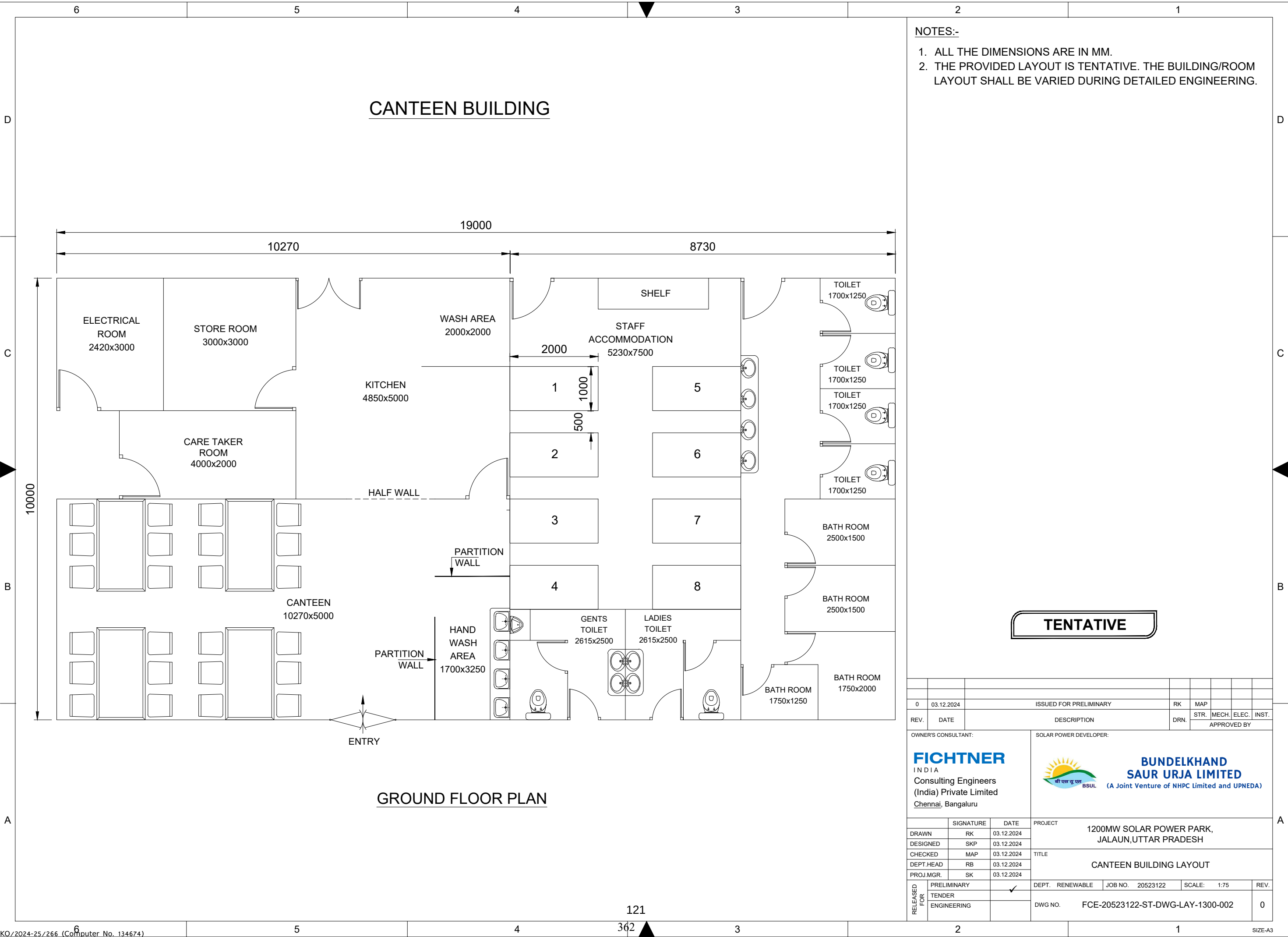
Stonebreakers shall be provided with protective goggles and protective clothing and seated at sufficient safe distance from each other.

SECTION-IX

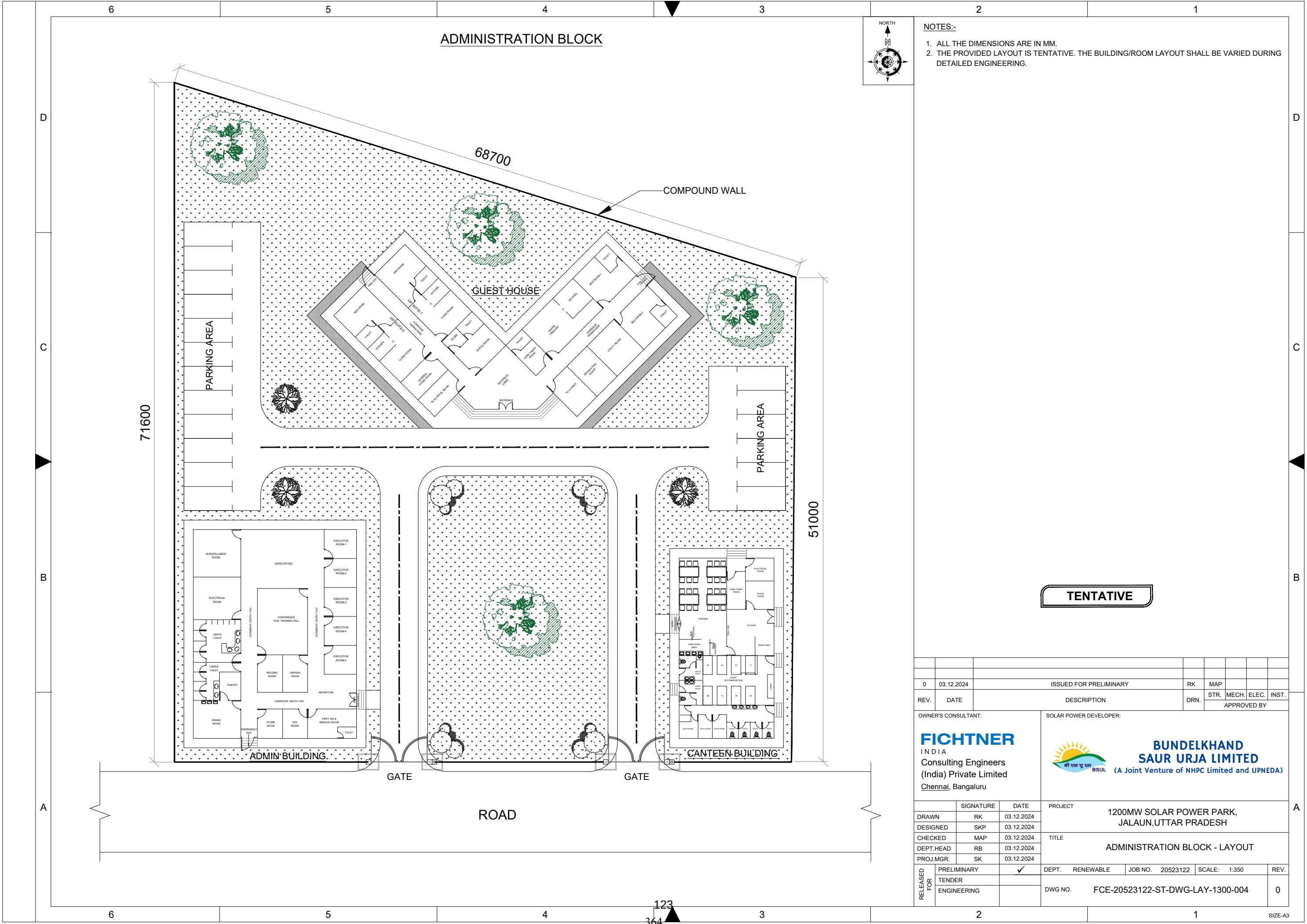
DRAWINGS

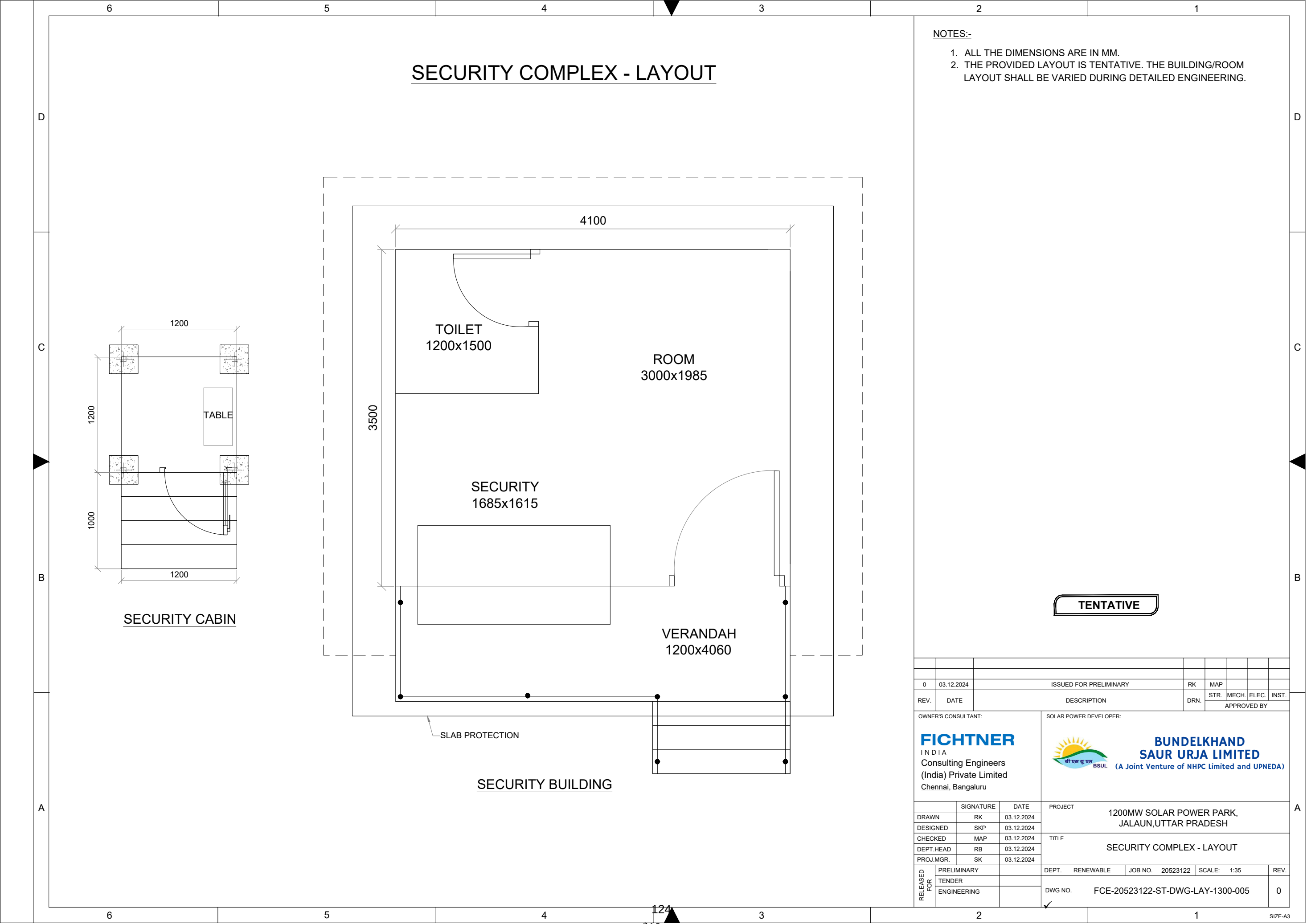










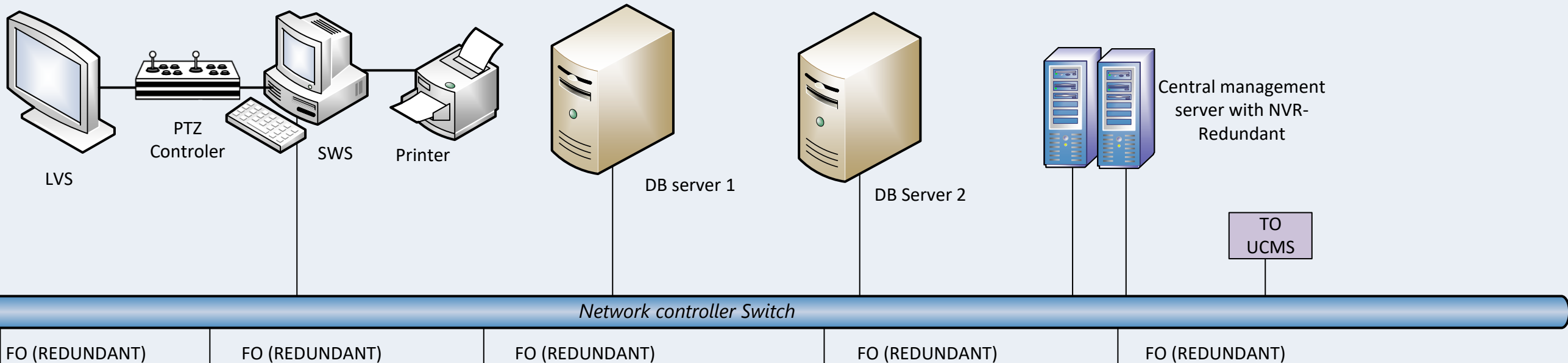




- SIZE-A1

Surveillance Room

COMMON INFRASTRUCTURE SCOPE



ABBREVIATIONS:

- DB - DATABASE SERVER
- FO - FIBRE OPTICS
- LVS - LARGE VIDEO SCREEN (VIDEO WALL)
- NVR - NETWORK VIDEO RECORDER
- PSS - POOLING SUBSTATION
- PTZ - PAN,TILT,ZOOM
- SWS - SURVEILLANCE WORK STATION
- UCMS - UNIFIED CONTROL AND MONITORING SYSTEM

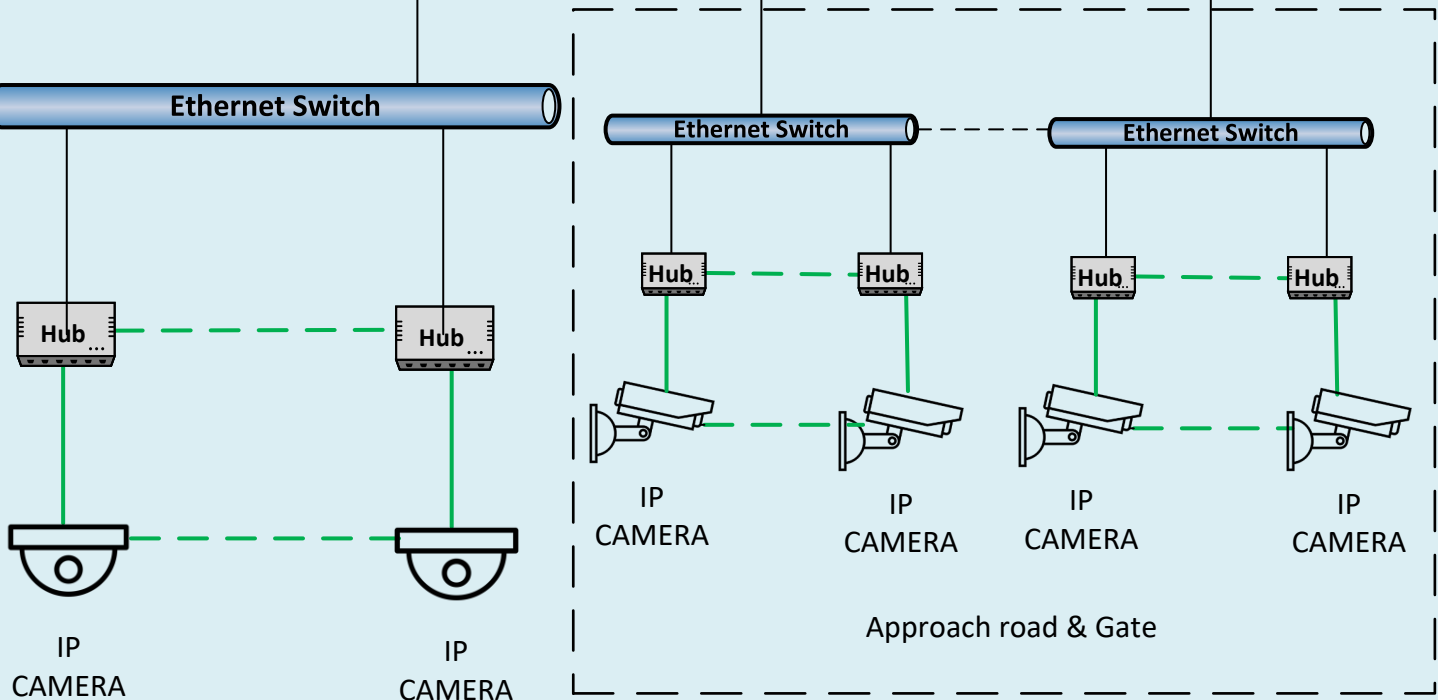
LEGEND:

- CAT 6 UTP
- ETHERNET CABLE / FO
- SOLAR PARK COMMON INFRASTRUCTURE SCOPE
- PSS PACKAGE SCOPE
- SOLAR PV BLOCK PACKAGE SCOPE

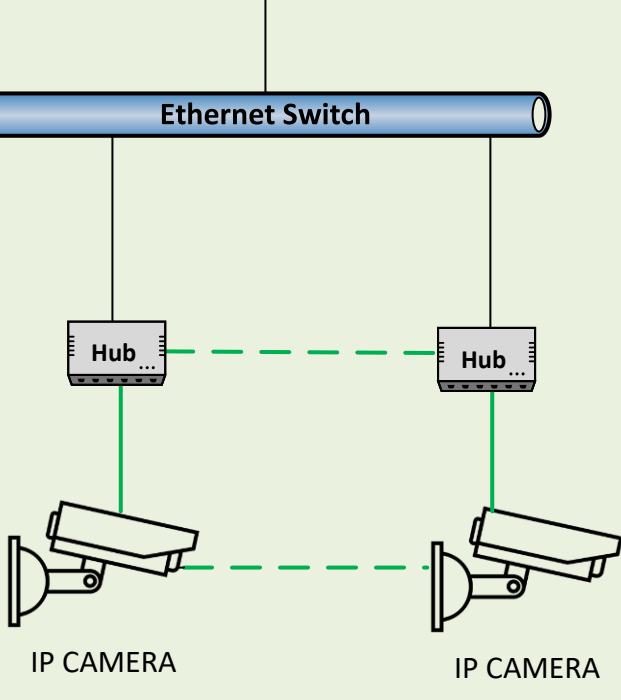
NOTE:

- All the connections shown shall be redundant.
- Solar PV contractor and PSS contractor Scope shall be up to FO termination at network control switch ,located at Admin Building.
- The hub shall be manageable sub Ethernet switch or optical distribution frame, based on the communication cable.

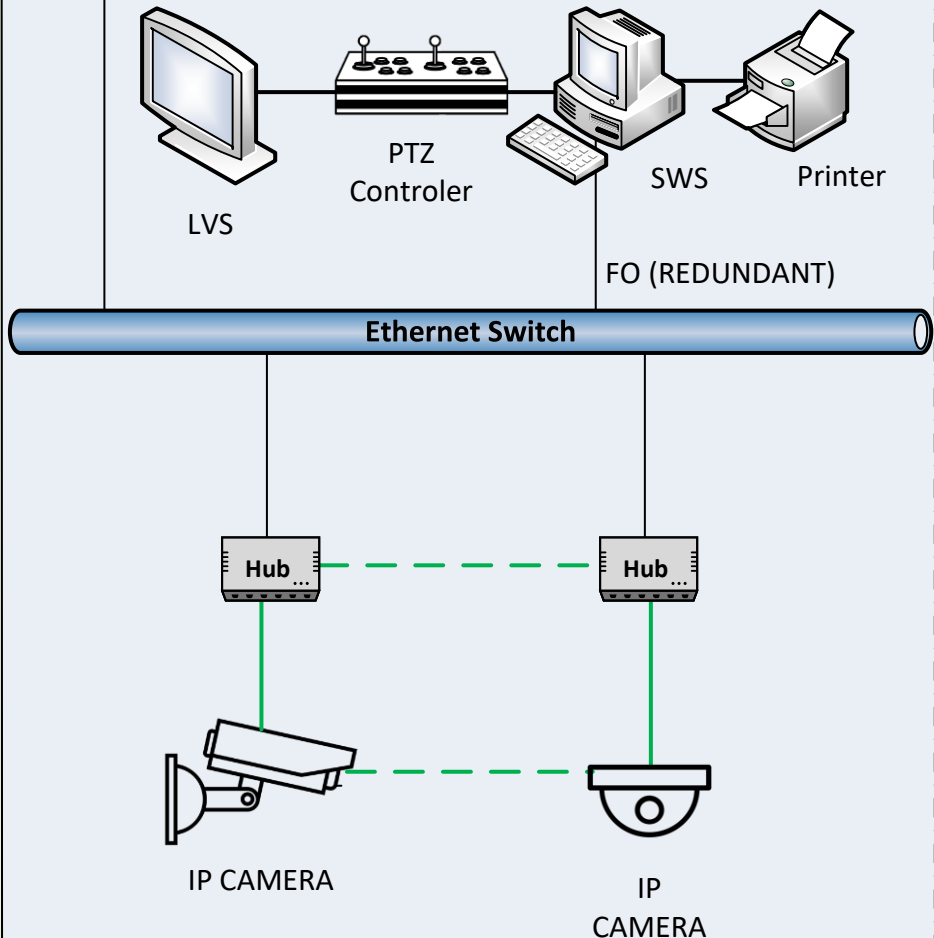
Administration Block



Solar PV Block



PSS



TENTATIVE

0	03-12-2024	ISSUED FOR REVIEW		PAS			SK	
REV	DATE	DESCRIPTION		DRN.	STR	MECH	ELEC.	INST.
OWNER'S CONSULTANT				APPROVED BY				
OWNER'S CONSULTANT		OWNER						
FICHTNER Consulting Engineers India Pvt. Ltd				BUNDELKHAND SAUR URJA LIMITED (A Joint Venture of NHPC Limited and UPNEDA)				
		SIGN	DATE	PROJECT				
DRAWN		PAS	04.12.2024	1200MW JALAUN SOLAR PARK				
DESIGNED		DB	04.12.2024	TITLE				
CHECKED		SKP	04.12.2024					
DEPT. HEAD		RB	04.12.2024					
PROJ. MGR		SK	04.12.2024	SURVEILLANCE SYSTEM-SCHEME DIAGRAM				
RELEASED FOR	PRELIMINARY		✓	DEPT	20520122	SCALE: NTS		REV.
	TENDER			DWG. NO.		FCE-20523122-RE-DWG-SCH-9280-001		0
	ENGINEERING							
	CONSTRUCTION			SHEET 01 OF 01				

