Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P."
Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)
   (ii) Technical Conditions of Contract (TCC)

2. **Financial Bid**

   (i) Letter of Financial Proposal
   (ii) Bill of Quantities (BOQ)

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

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Part/Section	Details
	Technical Bid
Part 1	**The Other Conditions of Contract (OCC)**
Section 1	Technical Bid Submission Form
Section 2	Disclaimer
Section 3	Instructions to the Bidders
Section 4	General Condition of Contract (GCC)
Section 5	Special Conditions of Contract (SCC)
Section 6	Contract Forms for information and due acceptance.
Section 6.1	Form of Articles of Agreement
Section 6.2	Form of Performance Bank Guarantee
Section 7	Contract forms for evaluation.
Section 7.1	Form for technical Capability (Annex- A&B)
Section 7.2	Personal Capability
Section 7.3	Technical Capability
Section 8	Contact Details Form
Section 9	Check List
Part 2	**The Other Conditions of Contract (OCC)**
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Section 11	Drawings
Section 12	Forms for Technical & Commercial Queries
	Financial Bid
Section 13	Financial Bid submission form
Section 14	Bill of Quantities (BOQ) - BOQ civil works - BOQ Utility works

NATIONAL AUTOMOTIVE TEST TRACKS

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"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P."

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE- OTHER CONDITIONS OF CONTRACT (OCC)

This Tender Contains:

1. The **Other Conditions of Contract (OCC)** in the following parts:

Section 1- Technical Bid Submission Form

Section 2- Disclaimer

Section 3- Instructions to the Bidders

Section 4 - General conditions of contract

Section 5 - Special Conditions of Contract (SCC)

Section 6- Contract Forms for information and due acceptance.

6.1 Form of Articles of Agreement

6.2 Form of Performance Bank Guarantee

Section 7- Contract forms for evaluation.

7.1 Form for technical Capability

7.2 Personnel Capability

7.3 Technical Capability

Section 8- Contact Details Form

Section 9- Check List

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur)

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Section-1- TECHNICAL PROPOSAL SUBMISSION FORM

LETTER OF BID

[*Location, Date*]

To,

The Head Procurement & Stores

NATIONAL AUTOMOTIVE TEST TRACKS (NATRAX)

Agra – Mumbai Highway (NH – 52),

Next to Pithampur Flyover,

Post- Khandwa (Near Pithampur) Dist. Dhar (M.P.) – 454774

Tel: +91-9893892310;

Ref: Tender No. ----------

We, the undersigned, declare that: "We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders. We offer to execute in conformity with the Bidding Documents/complete tender document of the following Works: **"Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P under tender no–** NATRAX/PROC/C&I/25/110R,.the Bid shall be valid for a period of **180 days** from the actual date of submission of bid, in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

(a) If our bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents;

(b) We are not associated nor have been associated in the past, directly or indirectly, with a consultant, or any other entity that has prepared the design, specifications and other documents for this Invitation for Bids.

(c) We also declare that the Government of India or any Govt. bodies has not declared us, and any of our Sub contractors or Consultants for any part of the Contract ineligible or black listed on charges of engaging in corrupt, fraudulent, collusive or coercive practices or any failure/lapses of serious nature.

(d) We understand that you are not bound to accept the highest ranked bid or any other bid that you may receive.

Yours sincerely,

Authorized Signature [In full]:

Name and Title of Signatory:

Name of Firm:

Address: .

[Note1: Authorized person signing shall attach to this document a proof of authorization for signing on behalf of the Bidder Company]

[Note2: To be signed in blue ink]

[Note3] To be executed on Bidder's letter Head.

Tender Document

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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P ."

Tender No. – NATRAX/PROC/C&I/25/110R

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This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 2

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section-2- DISCLAIMER

1.1. NATRAX is an Automotive Testing & Certification Centre under NATIONAL AUTOMOTIVE BOARD (NAB). NATRAX has been set up on approx. 3000 acres of land for comprehensive Testing & evaluation of all type of automobiles near Pithampur, Dist. Dhar (Madhya Pradesh, India).

1.2. This Bidding Document ("Bidding Document") has been prepared by (NATRAX/ Employer") for the purpose of providing certain information to the entities, who have been participated in this open tender, through a competitive bidding process for the selection of a bidder for "TENDER DOCUMENT FOR Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P, under Tender No. – NATRAX/PROC/C&I/25/110.

1.3. The information contained in the Bidding Document is being provided for the limited purposes of enabling the bidders to prepare and submit a bid and for no other purpose. Under no circumstances shall NATRAX, or its respective advisers, consultants, contractors, servants and/or agents incur any liability arising out of or in respect of the issue of this Bidding Document or the selection procedure.

1.4. This Bidding Document is being made available by NATRAX to the bidders on the terms set out in this Bidding Document. The transfer, possession or use of this Bidding Document in any manner contrary to any applicable law is expressly prohibited. The bidders shall inform themselves concerning and shall observe any applicable legal requirements.

1.5. This Bidding Document is a summary of available information and no reliance shall be placed on any information or statements contained herein, and no representation or warranty, expressed or implied, is or will be made in relation to such information and no liability is or will be accepted by NATRAX, its respective advisers, consultants, contractors, servants and/or its advisers in relation to the accuracy, adequacy or completeness of such information or statements made, nor shall it be assumed that such information or statements will remain unchanged.

1.6. The information does not purport to be comprehensive or to have been independently verified. Nothing in this Bidding Document shall be construed as legal, financial or tax advice. NATRAX will not be liable for any costs, expenses, however so incurred by the bidders in connection with the preparation of their bids.

1.7. NATRAX reserves the right to amend this Bidding Document and any information contained herein at any time by a notice, in writing, to the bidders.

1.8. Nothing in this Bidding Document is, nor shall be relied upon as, a promise or representation as to NATRAX's ultimate decision in the selection of the successful

bidder as to undertake the work ("Contractor"). NATRAX expects to shortlist the successful bidder (s) in accordance with this Bidding Document on the basis of the bids submitted. The bidder(s) shall not, therefore, assume that they will have the opportunity to revise their bids following submission and before short-listing, except as provided in this Bidding Document. However, NATRAX reserves the right to change the basis of or the procedures (including the timetable) relating to the bidding process, reject any, or all, of the bids, not to invite a bidder to proceed further, not furnish a bidder with additional information nor otherwise to negotiate with a bidder in respect of the works or the selection of the Contractor at any time. NATRAX does not undertake to accept the lowest or indeed any bid.

1.9. No person other than **[HEAD -PROCUREMENT & STORE]** has been authorised by NATRAX to give any information or to make any representation not contained in this Bidding Document and, if given or made, any such information or representation shall not be relied upon as having been so authorised.

1.10. Nothing contained in this Bidding Document is, or shall be relied upon as, a representation of fact or promise as to the future. Any summaries or descriptions of documents or contractual arrangements contained in any part of this Bidding Document are only indicative and cannot be and are not intended to be comprehensive, nor any substitute for the underlying documentation (whether existing or to be concluded in the future), and are in all respects qualified in their entirety by reference to them.

1.11. NATRAX, its respective advisers, consultants, contractors, servants and/or agents do not accept any responsibility for the legality, validity, effectiveness, adequacy or enforceability of any documentation executed, or which may be executed, in relation to the selection and appointment of a Contractor. No legal or other obligation shall arise between any bidder and NATRAX unless and until a binding contract ("Contract") has been formally executed by NATRAX and the Contractor and any conditions precedent to the effectiveness of the Contract have been fulfilled. NATRAX shall not be obliged to appoint any of the bidders to undertake the performance, execution and implementation of the work and NATRAX reserves the right not to proceed with the selection procedure and to withdraw from the selection procedure, or any part thereof, at any time.

1.12. Nothing in this Bidding Document shall constitute the basis of the contract or the selection of the contractor nor shall such documentation/ information be used in construing any such Contract. Each bidder must rely on the terms and conditions contained in any contract, when, and if, finally executed, subject to such limitations and restrictions which may be specified in such contract. Reference is drawn to the Special Conditions of Contract (SCC) which shall form a part of the Contract.

1.13. The bidder(s) are prohibited from any form of collusion or arrangement (directly or through their respective advisors or consultants) in an attempt to influence the award process. Giving or offering of any gift, bribe or inducement or any attempt to any such act on behalf of a bidder towards any officer/ employee of NATRAX or to any other person in a position to influence the decision of NATRAX for showing any favour in relation to this selection process or any other contract, shall render such bidder to such liability/penalty as NATRAX may deem proper, including but not limited to rejection of the bid of the bidder.

1.14. The laws of the Republic of India shall be applicable to this Bidding Document. The Courts at **Indore (Madhya Pradesh)** shall have exclusive jurisdiction in relation to any disputes arising from this Bidding Document.

1.15. This Bidding Document is confidential and personal to each bidder. The bidders shall not disclose any of Confidential Information given in the tender document to any person or body corporate except to the extent permitted under this Bidding Document. The bidders shall promptly return this Bidding Document to NATRAX upon request or as specified in this Bidding Document. Any failure to furnish or comply with the terms of the Letter of Undertaking shall entitle NATRAX to disqualify the relevant bidder.

1.16. Each bidder's acceptance of delivery of this Bidding Document constitutes its agreement to, and acceptance of, the terms set forth in this Disclaimer.

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National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section-3- INSTRUCTIONS TO THE BIDDERS (ITB)

3.1. GENERAL INSTRUCTIONS

3.1.1. National Automotive Test Tracks (NATRAX) "Employer", is an Automotive Testing & Certification Centre under National Automotive Board (NAB). NATRAX has been set up on approx. 3000 acres of land for comprehensive Testing & evaluation of all type of automobiles near Pithampur, Dist. Dhar (Madhya Pradesh, India).

NATRAX herewith invites sealed Bids in **two packet system** under open (National) tendering, from the reputed Civil works Contractors, experienced in construction of, Road works and who meet the minimum eligibility criteria as setout/mentioned below for the works, "**Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P"**

3.1.2. Those who meet the minimum eligibility criteria as mentioned in this section (and also in NIT) may only be eligible to become successful in the bidding process (technical). **The bidder in the form of Propritors & JV/Consortium is not permitted.**

3.1.3. The details of the tender are as mentioned below.

Description of works	Period of Completion	Estimated Cost	EMD Amount	Date of Prebid meeting	Date for submission of Bids	Date of opening of Bid
Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P	As per NIT Above					

3.1.4. The term "Employer", mentioned in any part of this tender documents means, NATRAX. For all the purpose of bidding, selection process and clarifications, the Employer is represented by **Head- Procurement & stores.**

3.1.5. While all efforts have been made to avoid errors in the drafting of the tender documents, the Bidder is advised to check the same carefully. No claim on account of any errors detected in the tender documents shall be entertained.

3.1.6. The Employer desires that the bidders, suppliers, and contractors under the Project, observe the highest standard of ethics during the performance, procurement and execution of such contracts. In pursuance of this requirement, the Employer:

Defines, for the purposes of this provision, the terms set forth below:

(i) *"Corrupt Practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;*

(ii) *"Fraudulent Practice" means any act of submission of forged documentation, or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation, or to succeed in a competitive bidding process;*

(iii) *"Coercive Practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;*

(iv) *"Collusive Practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.*

(a) Will reject the award of Contract, even at a later stage, if it determines that the bidder recommended/ selected for award/awarded has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices in competing for the Contract;

(b) Will sanction a party or its successors, including declaring ineligible, either indefinitely or for a stated period of time, to participate in any further bidding/ procurement proceedings under the Project, if it at any time determines that the party has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices in competing for, or in executing, the contract; and

(c) Will have the right to require the bidders, or its suppliers, contractors and consultants to permit the Employer to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by the Employer at the cost of the bidders.

(d) The Bidder must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a bid and for entering into a contract, must examine the Drawings, must inspect the sites of the work, acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto. The Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

3.1.7. Each page of the Tender documents should be stamped and signed by the person or persons submitting the Tender in token of his/their having acquainted himself/ themselves and accepted the entire tender documents including various conditions of contract. Any Bid with any of the documents not so signed is liable to be rejected at the discretion of NATRAX. The signatures shall be in blue ink.

3.1.8. The tender prepared by the Bidder and all correspondence and documents relating to the tender exchanged between the Bidder and NATRAX shall be in the English language.

3.1.9. The bidder shall attach the copy of the authorization letter/power of Attorney as the proof of authorization for signing on behalf of the Bidder.

3.1.10. The contract shall be governed by NATRAX's General Conditions for Contract (GCC), Special Conditions for Contract (SCC), Technical Conditions for Contract (TCC) and all other relevant conditions & documents on the tender documents.

3.1.11. The Bidders are expected to carefully examine all the contents of the tender documents including instructions, conditions, terms, specifications, drawings and get clarifications, if required, from NATRAX and take them fully into account before submitting their offer. Failure to comply with the requirements as detailed in these documents shall be at the Bidder's own risk. Bidders which are not responsive to the requirements of the tender documents **will be rejected.**

3.1.12. All Bidders are hereby explicitly informed that conditional offers or offers with deviations from the conditions of Contract, the bids not meeting the minimum eligibility criteria, Technical Bids, not accompanied with EMD of requsite amount in acceptable format, Bids in altered/modified formats, or in deviation with any other requirements, stipulated in the tender documents are **liable to be rejected**.

3.1.13. The Bid submitted on behalf of a Firm shall be signed by all the Partners of the Firm or by a Partner who has the necessary authority on behalf of the Firm to enter into the proposed contract. Otherwise, **the bid is liable to be rejected by the NATRAX**.

3.1.14. The bidders are expected to meet the minimum eligibility criteria as given in the Notice Inviting Tender to participate in this tender. **NATRAX will reject the Bids that do not meet the minimum eligibility criteria as laid down, based on their submission along with the tender documents, even after the bid opening process is concluded.**

3.1.15. The 'contact details form' need to be filled, signed and submitted to NATRAX along with bid or atleast within 5 days of BEFORE tender submission. NATRAX will use such details to communicate via e-mail with the bidder for issuing addenda/corrigendum, including the change of key tendering dates, revisions etc. NATRAX will not be responsible for non receipt of any such communication to the bidders, who have not submitted the contact details form.

3.1.16. The tender is issued to all bidders as soft copy through email/or can be downloaded from the web links. The bidders shall not tamper or modify any part of the tender documents in any manner, other than certain forms/BOQ, allowed as per conditions of tender. In case of any discrepancy between editable/PDF formats, PDF formats will supersede. In case in part of the bid is found to be tampered or modified, the bids are liable to be rejected and the full earnest Deposit will be forfieted and liable to be banned from from doing any business with NATRAX.

3.1.17. Bidder in the form of JV/consortium is not permitted.

3.1.18. Preference shall be given to bidders as per Order No. P-45021/2/2017-PP (BE-II) dated 4th June 2020, issued by Department for Promotion of Industry and Internal Trade, Government of India subject to submission of necessary documents in this regard by the bidders.

3.2. MINIMUM ELIGIBILITY CRITERIA

The qualification will be based on Bidder's meeting all the following minimum **pass/fail** criteria regarding their particular experience, financial position, personnel and equipment capabilities and other relevant information as demonstrated by the Bidders responses in the forms attached. **The qualifications, capacity and resources of proposed sub-contractors will not be taken into account in determining the Bidders compliance with the qualifying criteria.**

The bidder whose bid meet the following minimum eligibility criteria would only be considered as responsive and evaluated by NATRAX.

3.2.1. MINIMUM ELIGIBILITY CRITERIA

i. ***Legal Valid Entity****: AS PER NIT.*

ii. ***Financial Capacity****: AS PER NIT.*
Documentary evidence in the form of certified Audited Balance Sheets of relevant periods or a certificate from the Chartered Accountant / Cost Accountant indicating the turnover details for the relevant period shall be uploaded with the bid. In both the cases the UDIN number is mandatory.
In case the date of constitution / incorporation of the bidder is less than 3-year-old, the average turnover in respect of the completed financial years after the date of constitution shall be taken into account for this criterion. Relevant proof for supporting the above shall be submitted or certificate from CA will be required as suggested this tender document.

iii. ***Technical Capability:*** *AS PER NIT.*

For the purpose of assessment of technical capability, the latest cutoff date of work is ***30 days prior to last date of submission of Bid Document.***

As the proof for having fully adhered to the minimum eligibility criteria at para (iii), NATRAX shall accept the self-attested completion certificates issued by Govt. Depts/Autonomous bodies/PSUs/reputed private firms/automobile manufacturers/Pvt. Ltd. Firms (at the discretion of NATRAX) only. In case of submission of certificates from the private firms, the 26AS/TDS certificate in support of the certificate issued by the private firms shall also be submitted. Any document other than the above will not be accepted by NATRAX.

3.3. SITE VISIT

3.3.1. The Bidders are advised to visit and examine the Site of Works and its surroundings, with prior notice to NATRAX, at his/their cost and obtain for himself / themselves on his/their own responsibility, all information that may be necessary for preparing the tender and entering into a Contract. The Bidder shall be deemed to have inspected the Site and its surroundings before hand and taken into account all relevant factors pertaining to the site in the preparation and submission of the Tender.

3.3.2. The bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder, its personnel, and agents, will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury,

loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

3.3.3. Address of the Site: National Automotive Test Tracks (NATRAX), NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,Post Khandwa (Near Pithampur),Dist. Dhar (M.P.)-454774

3.4. SPECIFIC INSTRUCTIONS ON WORKS

3.4.1. The detailed scope of works are described under Technical Conditions of Contract (TCC), along with the detailed specifications, drawings, bill of quantities etc.

3.4.2. The successful bidder has to start the works simultaneously so as to complete the works within the specified completion period.

3.4.3. The sub-contractor, if any proposed by the sussessful bidder, after award of work, should have adequate experience, own/established access to required man power, machineries and construction equipmenmts and the contractor shall get prior approval from NATRAX before the start of the work.

3.4.4. The work shall be carried out strictly in accordance with the specifications given in the tender and also in compliance of the requirements of the Authorities concerned and deviation on any account will not be permitted.

3.4.5. The Bidder shall carry out all the works strictly in accordance with Drawings, details, specifications, standard engineering practices and instructions of NATRAX or NATRAX's authorized representative. In case the changes that have been made in the design by NATRAX during execution, the Bidder shall have to carry out the same within the provisions of contract and mutually agreed terms and conditions.

3.4.6. The successful Bidder must co-operate with the other contractors/suppliers and repersentatives appointed by NATRAX to ensure that the work proceeds smoothly with the least possible delay and to the satisfaction of NATRAX.

3.4.7. The successful Bidder is bound to carry out the works, that consists of any minor/sub items, necessary for the completion of the works as covered in this tender to achieve end results and conventionally included in works, even though such minor/sub items are not included in the Bill of quantities and drawings, are deemed to be priced in the other items/works. No separate claim on this account shall be entertained, unless it is explicitely brought to the notice of NATRAX in writting befor the start of such item works and accepted by NATRAX.

3.4.8. The works under this tender will be governed by item rate contract.

3.4.9. In case the work is awarded in parts by splitting the contract among the bidders and the other works such as services/ utilities which may be done simultaneously by NATRAX's other specialized agencies, then the works to be carried out in co-ordination with such agencies for integration of works by overlapping various activities.

3.5. TIME SCHEDULE FOR COMPLETION OF WORKS

3.5.1. Time is the essence of the contract. The work is to be completed within the stipulated time i.e. [time as mentioned in NIT] (including rainy season) from the date of issue of **'Notice to Proceed'** to the successful Bidder. Bidder to submit realstic work program.

3.5.2. Time allowed for carrying out the works as mentioned in the tender documents shall be strictly observed by Bidder and it shall be reckoned from the date of issue of **'Notice to Proceed'. In the event of urgency this may also be consider from the date of Acceptance of LoA if the same is desired by NATRAX.**

3.6. EARNEST MONEY DEPOSIT (BID SECURITY AMOUNT)

3.6.1. The bids should be accompanied by an Earnest Money Deposit as specified in the form of Bank Guarantee / Banker's Cheque / Demand Draft /Fixed Deposit , drawn in favour of ***National Automotive Test Tracks, payable at Pithampur valid for 6 months,*** *from any of the scheduled bank in India*. The BG issued by any scheduled bank in India in bank's own approved format is acceptable to NATRAX.

3.6.2. A tender which is not accompanied by such Earnest Money Deposit will be rejected.

3.6.3. NATRAX reserves the right of forfeiture of Earnest Money Deposit in case, the bidder:

a) Does not reply to any queries raised by NATRAX, within the stipulated period that may be raised after opening of the technical or financial bids.

b) After opening the financial bids, revokes his technical/financial offer or alters any of the quoted rates/conditions of tender.

c) Does not accept the corrections made by NATRAX to its Bid Price, pursuant to examination of financial proposal and correction of arithmetical errors.

d) Has not accepted '**Letter of Acceptance**' within the stipulated time.

e) Fails to provide/ furnish the Performance Bank Guarantee within stipulated period as mentioned in the Letter of Acceptance.

3.6.4. In case of forfeiture of EMD, the Bidder shall be debarred from the bidding, incase of Re-invitation of bids and all forthcoming tenders of NATRAX.

3.7. PRE-BID MEETING

3.7.1. The bidder or his official representative is invited to attend a pre-bid meeting, which, if convened, will take place at the NATRAX Site, **National Automotive Test Tracks (NATRAX),NH-52, Old Agra- Mumbai Highway,Near to Pithampur Flyover,Post Khandwa (Near Pithampur),Dist. Dhar (M.P.)-454774**

3.7.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

3.7.3. The bidder is requested, to submit any questions in writing, e-mail, to reach the Employer at least 24 hours prior to the prebid meeting.

3.7.4. Minutes of the meeting, including the text of the questions raised and the responses given, together with any responses prepared after the meeting, will be issued without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in Sub-Clause which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum, and not through the minutes of the pre-bid meeting.

3.7.5. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

3.8. AMENDMENT TO THE TENDER DOCUMENT

3.8.1. Any amendment to the tender document may be issued to the bidders through addendum/ corrigendum, prior to date of opening of the tenders, to intimate the bidders regarding revisions/changes/modifications to tender documents, changes in the key tendering dates, clarifications on queries raised by the bidders etc. All such communications to the bidder would be in the form of soft copy and may sent to the bidder's E-mail ID as mentioned in the 'contact details form', submitted by the bidder within 3 days after the collection of tender documents or e-published on NATRAX/or CPPP procurement portals (if required).

3.8.2. In order to afford prospective bidders, reasonable time for preparing their tenders after taking into account such amendments, NATRAX may, at its discretion, extend the deadline for submission of tenders.

3.8.3. Addendum/corrigendum shall be an integral part of the tender and required to be complied as per 'Instructions for preparation of bids'.

3.8.4. A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by e-mail/Fax at the Employer's address indicated in the Tender document. The Employer will respond to any request for clarification, which he receives earlier than 3 days prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the inquiry but without identifying its source. NATRAX will not be held responsible for non receipt of any such communication to the bidders, who have not submitted the contact details form within 3 days of receipt of tender document.

3.9. VALIDITY OF BIDS

3.9.1. Bids shall remain valid and open for acceptance for a period of **120 days** from the last date of opening of Technical Bids.

3.9.2. If a bidder withdraws or revokes his offer or revises the quoted rate or condition for any item within the aforesaid period, his Earnest Money Deposit is liable to be

forfeited.

3.9.3. In case NATRAX calls the bidder for negotiations then this shall not amount to cancellation or withdrawal of original offer which shall be binding on the bidder.

3.9.4. Any Bid having validity lower than that specified above shall be rejected by NATRAX as being non responsive. However, NATRAX may request the Bidders in writing to extend the Bid unconditionally beyond the Bid validity period up to an additional period of sixty (60) days without any modification and with out giving any reason thereof on exceptional cases. Conditional extension of bid validity shall not be accepted and NATRAX reserves right to reject such bid/s and proceed with the bidding process with the remaining bidders.

3.10. INSTRUCTIONS FOR PREPARATION OF BIDS

A. CONTENTS OF THE BIDDING DOCUMENT

(I) THE TECHNICAL BID CONTAINS THE FOLLOWING SECTIONS:

Other Conditions of Contract (OCC)

Section 1- Technical Bid Submission Form

Section 2- Disclaimer

Section 3- Instructions to the Bidders

Section 4 -General Condition of Contract

Section 5-Special Conditions of Contract (SCC)

Section 6- Contract Forms for information and due acceptance.

6.1 Form of Articles of Agreement

6.2Form of Performance Bank Guarantee

Section 7- Contract forms for evaluation.

7.1 Form for Financial capacity

7.2 Form for technical Capability

Section 8- Contact Details Form

Section 9- Check List

The Technical Conditions of Contract (TCC):

Section 10 - Detailed Technical Specifications.

Part I- TCC Civil works

TCC Civil works

TCC Plumbing works

TCC Fbrication & MS Works

Part II- TCC Utility works

TCC Electrical works

TCC HVAC

TCC Fire fighting & Fire Alarm System

Section 11- Drawings.

Section 12- Forms for Technical & Commercial Queries

THE FINANCIAL BID CONTAINS THE FOLLOWING SECTIONS:

Section 13- Financial Bid Submission Form

Section 14- BOQ (Bill of Quantities for Financial Quotes)

Part I (Civil works)

Part II (Utility works)

B. PREPARATION FOR TECHNICAL BID (To be packed in a separate envelope)

3.10.1. The Tender Documents are issued to the bidders in the form of soft copy (through email/from the weblinks) and the Bidders shall take printouts of all the documents (including all drawings)in paper size A4, (prints on dual side, colour/B&W are accepted) and shall bound in proper manner, in the order of Section Nos. and the pages shall be serially numbered. All pages need to be stamped and signed.

Wherever editable format is used, (Technical bid submission form) it shall be inserted duly filled and signed at appropriate places. Bidders shall not change/tamper any content of the formts, font size or orientation in any of the editable/PDF formats.

3.10.2. The addenda (corrigendum) issued by NATRAX shall also be signed and submitted in paper size A-4.

3.10.3. The Technical Bid shall also contain the additional documents required to be submitted as per the **MEC at clause 1.2**, (as above) for the purpose of evaluation of Bids and it shall be bound separately with all pages numbered serially. **The Bidder may avoid unwanted documentations, which are not sought as the part of tender.**

C. PREPARATION FOR FINANCIAL BID (To be packed in a separate envelope)

3.10.4. The financial Bid submission form (issued in editable format) shall be prepared duly filling (only) the required information, stamped and signed at appropriate places. Bidders shall not edit/change/tamper any of the content of the formt, font size or orientation, other than the information which are the required to be filled, under the provisions of tender.

3.10.5. The financial bid (BOQ) shall be prepared separately in paper size A3 and shall be bound properly with each page serially numbered. Incase of any

revision/change/modification on financial bid format, only on the latest format shall be used for preparation of the financial bid. Submissions on old/previous formats are liable to be rejected.

3.10.6. The prices shall be quoted in Indian Rupees only. The bidder must quote their price strictly as per the items as described in the BOQ and shall be inclusive of all taxes and duties.

3.10.7. **The quoted rates shall preferably be a round figure, without any fraction and if unavoidable, in the opinion of the Bidder, it shall be limited to maximum of 2 (two) decimals**. Anything beyond atwo decimals will not be considered.

3.10.8. The financial Bid (BOQs) are issued as soft copy in pdf formats, where the bidder need to fill his rate in figures and words and total amount in Figures in the respective columns. The Bidder shall use its own methods for arithmetical calculation of bid prices. Bidder shall either enter the prices in figures and words directly OR may fill the coloumns for the prices in figures and words by hand writing with pen, (blue Ink) in a clear and legible manner. RATE IN WORDS SHALL PREVIAL INCASE OF DISCREPEANCIES ARISES BETWEEN THE RATE IN FIGURES AND RATE IN WORDS.

3.10.9. Any corrections / over-writing made by the bidder in his own hand written entries shall be stamped and signed by them againt the respective entries.

3.10.10. The items which are not specifically detailed in the BOQ item description, but are part of the item as per standard engineering practices, are deemed to be included in the respective price and no separate / additional amount in price will be permitted for the same. The bidder shall also consider the tender clause at 4.7 of GCC to finalise their bid price.

3.10.11. The Bidders are required to submit their Bid in **a single sealed envelope** containing **two separate** packets and the outer envelop shall be superscribed **"Bid for Tender No. NATRAX/PROC/C&I/25/110R.", with the Name and address of the Bidder.**

The said outer envelope shall contain the following **sealed envelops**:

(a) **Financial Bid,** as given in the Tender or its latest revision issued by NATRAX, **in a separate sealed envelope**, superscribed **"Financial Bid for Tender No. NATRAX/PROC/C&I/25/110R", with the Name and address of the Bidder.**

(b) **Technical Bid**, as given in the Tender, along with all required additional information, documents in support of the minimum eligibility criteria, the addenda/corrigendum if any issued by NATRAX and Valid EMD of requisite amount, **in a separate sealed envelope**, superscribed **"Technical Bid for Tender No. NATRAX/PROC/C&I/25/110R",with the Name and address of the Bidder.**

3.11. INSTRUCTIONS FOR SUBMISSION OF BIDS

3.11.1. The Bids shall be submitted within the stipulated time period **at NATRAX HQ, National Automotive Test Tracks (NATRAX),NH-52, Old Agra- Mumbai Highway,Near to Pithampur Flyover,Post Khandwa (Near Pithampur),Dist. Dhar (M.P.)-454774**.

3.11.2. Bids sent telegraphically or through other means of transmission (telefax, e-mail etc.) which cannot be delivered in a sealed envelope shall be treated as non-responsive, invalid and shall be rejected.

3.11.3. **The Bids will be opened as scheduled at NATRAX HQ, National Automotive Test Tracks (NATRAX),NH-52, Old Agra- Mumbai Highway,Near to Pithampur Flyover,Post Khandwa (Near Pithampur),Dist. Dhar (M.P.)-454774** in the presence of Bidders or their duly authorised representatives who choose to remain present at the time of opening the tender.

3.11.4. No Bid will be accepted after the aforesaid date and time. However on exceptional cases NATRAX reserves right to extend the time/last date of submission of bids to a next convenient time/date, before opening of the Technical bids.

3.12. WITHDRAWAL OF BID

3.12.1. No Bidder is permitted to withdraw their already submitted bid after the the last date/time of submission of bids. Incase of bids send by courier/post etc. can be withdrawn before the closure of last date /time for submission of bids, on written request from the bidder.

3.13. Bidders interested in submitting bids through ONLINE mode can submit their bid in following manner;

i. **Technical bid:** The password protected file/folder should contain below;
- Scan copy of EMD (Bidders seeking exemption from EMD should submit copy of MSME/NISC certificate), (ORIGINAL EMD SHOULD BE SUBMITTED WITHIN 5 DAYS FROM DATE OF BID TECHNICAL OPENING)
- Bidders information (contact details form),
- Check list,
- Completely sealed and signed tender documents duly page numbered),
- All documents related to the minimum eligibility criteria /technical qualifications (including manpower, machniery etc.,)

All above files may be converted into one pdf format file or different pdf files and all the pdf file should be protected with password. ***The file/folder shall contain scan copy of EMD and the ORIGINAL EMD is should reach us on or after atleast 5 days from the date of technical bid opening date.***

ii. **Financial bid:** The cover letter along with financial bid with duly filled rates to be submitted in one single folder. The file/folder shall be converted into pdf format file and the pdf file should be protected with password.

IMPORTANT :
- **PASSWORD SHOULD BE SHARED ONLY ON RECEIPT OF WRITTEN**

COMMUNICATIONS FROM BELOW EMAIL ID'S ONLY.

- **PASSWORD FOR TECHNICAL BID AND FINANCIAL BID SHALL BE SOUGHT SEPERATELY FROM BELOW EMAILS ID'S**

a.prabhakar@natrip.in, anuj.kumar@natrip.in, je.procurement@natrax.in, natraxpithampur@gmail.com

3.14. BID OPENING PROCEDURE

3.14.1. The bids shall be opened in the presence of bidders or their duly authorized representatives at the time mentioned in the tender/corrigendum, in the presence of the members of the NATRAX's Tender opening committee.

3.14.2. **A letter of authorization shall be submitted to NATRAX, by the Bidder's representative before the opening of Bids**.

3.14.3. Absence of bidders or their duly authorized representatives shall not impair the legality of the bid opening process.

3.14.4. All bidders or their duly authorized representatives shall be required to sign the main bid envelopes by way of confirmation of sealed bid status at the time of opening of bids.

3.14.5. After identification signing, the committee member/representative shall open the main bid envelope.

A. [TECHNICAL BID]

3.14.6. The technical bid envelope shall be then opened and the EMD shall be verified for specified value and validity. This will not give any right to the bidder to claim that he is successful in the bidding process. The Financial bid envelops shall be required to sign by all the authorized representatives and the same will be kept under the custody of NATRAX. The technical Bids will be evaluated later to ensure that the bidder meets the minimum eligibility criteria as specified in the Instruction to the bidders (and NIT).

3.14.7. Refusal to sign on any of the bid envelopes by any of the bidder or his duly authorized representative may disqualify him from the process at the discretion of members of the tender opening committee present at the time of opening of the Bids.

3.14.8. The bids shall be declared to be 'Valid' or 'Invalid' at the conclusion of preliminary scrutiny process, at the discretion of the members of the tender opening committee present on the spot. The decision on declaring the bid is also subject to the submission of valid EMD of requisite amount and prima facie appearance of the bidding documents on totality.

3.14.9. Bids declared invalid shall be returned on the spot to the respective bidders. In case, the Bidder or it representative whose Bid has been declared invalid is not present

at the time of opening of the Bids, the Bid shall be returned to the Bidder duly intimating him to collect the same from NATRAX.

3.14.10. The conditional acceptance of any bid that does not meet the above preliminary acceptance criteria shall solely rest with NATRAX, in case of submission of substantially responsive bid in the opinion of NATRAX, supported with adequate documental evidence/cerfication of bidder in writting.

3.14.11. Refusal to any of the decision of NATRAX by any of the bidder or his duly authorized representative may disqualify him from the bidding process at the discretion of members of the tender opening committee present at the time of opening of the Bids.

3.14.12. Decision of NATRAX shall be final and No correspondence or claim whatsoever from such/any Bidders shall be entertained or responded by NATRAX.

3.15. CLARIFICATIONS ON TECHNICAL BID EVALUATION

3.15.1. The technical bids shall be evaluated based on the available documents submitted by the bidder. To assist in the examination, evaluation and comparison of the bids, and qualification of the bidders, the Employer may, at its discretion, ask any bidder for a clarification of its bid. Any clarification submitted by a bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing.

3.15.2. No change in the substance of the bid shall be sought, offered, or permitted and No additional/fresh information shall be sought by NATRAX, if considered/rectified, it would unfairly affect the competitive position of other bidders presenting substantially responsive bids.

3.15.3. If a bidder does not provide clarifications of its bid by the date and time set in the Employer's request for clarification, its bid may be rejected.

3.15.4. NATRAX also reserves right to seek confirmation/clarification from the issuer agency, on the supporting documents submitted by the bidder.

3.15.5. If the bidder is qualified in the technical bid evaluation and in case of omission of any documents in the bid, other than the documents, NATRAX may, at its discretion, ask the bidder in writting, to submit the same before opening of the financial bids, to consolidate their technical offer.

3.16. TECHNICAL BID EVALUATION (SEGREGATED TYPE)

3.16.1. NATRAX shall follow the **segregated bid evaluation system**, where the technical bids and the financial bids are evaluated separately, without integrating their merits in the technical/financial evaluation stages.

3.16.2. The technical bid evaluation is done based on the following criteria:

i. The responsiveness of the bid, i.e; receipts of duly filled, signed and accepted bid documents in complete, including addenda and Authorisation letter/Power of Attorney.

ii. Receipt of valid EMD with requisite amount in acceptable format.

iii. Documents in proof of meeting the minimum eligibility criteria.

iv. Any other documents as required to support the responsiveness of the bidder, as per tender.

3.16.3. A substantially responsive bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that, if accepted, it would affect in any substantial way, the scope, quality, or performance of the Works (specified in the Contract) or limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the bidder's obligations under the proposed Contract.

3.16.4. During the evaluation of bids, the following definitions shall apply:

i. "Deviation" is a departure from the requirements specified in the Bidding Document;

ii. "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and

iii. "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

3.16.5. If a bid is not responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission. No further evaluation of Technical Proposals will be carried out of those bidders whose Technical proposal is determined to be non-responsive and their Financial Proposals will be returned unopened.

3.16.6. The bidder, whose bid is found to be responsive in the evaluation stage, is only be considered as qualified and the result of the technical evaluation shall be **PASS/FAIL**.

3.16.7. The bidder who qualified in the technical evaluation stage shall only be called for opening of financial bids. NATRAX shall intimate the bidders, the time/ vennue for the financial Bid opening in written communication.

3.17. FINANCIAL BID OPENING PROCEDURE

3.17.1. The Financial Bids of all the qualified Bidders shall be opened on the appointed date and time in presence of the qualified bidders/their authorized representatives, who choose to be present at the time of opening of the financial bids.

3.17.2. All the qualified bidders/their authorized representatives present at the time of opening of the Financial Bids shall be asked to sign on all the sealed envelopes containing the Financial Bid.

3.17.3. Any bidder objecting to the same shall be disqualified and his financial bid shall be returned on the spot.

3.17.4. Financial Bids of the qualified Bidders shall be opened in the presence of bidders or their authorized representatives.

3.17.5. Absence of bidders or their authorized representatives shall not legally impair the process.

3.17.6. The financial bid price, as indicated in the financial bid submission form of each bidder shall be read out on the spot, however, it shall be clearly stated that the final financial bid prices would be arrived at after detailed scrutiny/correction of arithmetical error in the financial bid.

3.17.7. Each qualified Bidder or their authorized representative shall be required to sign on the Bid price declaration sheet, against their respective price declared and also on the financial bid submission forms of all the bids. Any Bidder objecting to the same shall be disqualified.

3.17.8. Mere becoming the lowest bidder, prior to financial bid scrutiny will not give any right to the Lowest bidder to claim that he is successful in the bidding process.

3.18. FINANCIAL BID EVALUATION

3.18.1. The responsiveness of the bid shall be assessed based on the submission, on the latest financial format in case revised by addenda. For the evaluation of the Financial Bids, the eventual Bid prices shall be ascertained after considering all the terms and conditions associated with the Bid price specified in the Financial Bid document (such as unit, qty, rate and total) and after detailed scrutiny of the financial bid.

3.18.2. For evaluation of bid prices, NATRAX shall consider the item rate up to the fraction of 2 decimals only.

Procedure for Arithmetical correction

3.18.3. NATRAX reserves the right to include or exclude any component of the financial bid or the price quoted by the Bidder, and/or, load the bid price as per its discretion to bring the bids at a common platform and to ensure level playing of bids to work out the Bid Price for evaluation and comparison of bid prices.

3.18.4. If there is a discrepancy between the sub total/s and the total price that is obtained by multiplying the unit price and quantity/adding the sub total/s, the sub total/s shall prevail and the total price shall be corrected, unless in the opinion of the Employer that there is an obvious misplacement of the decimal point in the sub total price, in which case the total price as quoted shall govern and the sub total/s shall be corrected;

3.18.5. If there is an error in a total, corresponding to the addition or subtraction of sub totals, the subtotals shall prevail and the total shall be corrected; and

3.18.6. If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail.

3.18.7. The amount stated in the Letter of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount of bid, its bid will be rejected, and the bid security shall be forfeited.

3.18.8. If a discount is offered in a financial proposal, such discount will be applied on prorata basis against each item of the financial form except the price part/s not considered for the"Total price".

3.18.9. In case an additional component is loaded by the bidder on its bid price, after totaling the prices of schedules, such sum shall be applied on prorata basis on all the items to work out the item rates.

3.19. DETERMINATION OF THE SUCCESSFUL BIDDER

3.19.1. The Bidder meeting the minimum eligibility criteria with the lowest bid price, subject to arithmetical correction, shall be deemed as the successful Bidder.

3.19.2. In the event of more than one bidder with the lowest price bids (say equal), the bidder with the highest 'cumulative annual turn over of the last 3 F.Ys' would be deemed as 'Successful Bidder' with respect to the submission of proof of documents as required by the client/submitted by the bidders.

3.20. CONTRACT NEGOTIATIONS

3.20.1. If the bid is seriously unbalanced, front loaded or substantially below updated cost estimates in the opinion of the Employer**, the Employer require the bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices** with the construction methods and the works schedule proposed.

3.20.2. In such cases, Contract Negotiations shall be carried out with the successful bidder before the issue of Letter of Acceptance. In case the bid is front loaded as mentioned above, NATRAX shall negotiate the price and may accept if the bidder offers a discount as 'lump sum price' on total bid price/sub total or discount on specific item rates. No hike on the already quoted item rate shall be accepted during negotiation.

3.20.3. Incase the contract negotiation is failed in the opinion of the NATRAX, NATRAX shall intimate the same to the bidder in writting.

3.20.4. NATRAX does not undertake to accept the extreme lowest or indeed any bid.

3.20.5. In case required by NATRAX, contract negotiations on other commercial terms and technical related Issues can also be done with the bidders, but no material deviation from the conditions of tender shall be sought or agreed.

3.21. NOTIFICATION OF AWARD BY ISSUANCE OF 'LETTER OF ACCEPTANCE'

3.21.1. Prior to the expiry of the period of Bid validity prescribed, NATRAX shall issue to the successful Bidder the "Letter of Acceptance" (LoA) in duplicate, who will return

one copy to NATRAX duly acknowledged, accepted and signed by the authorized signatory, within **Three (3) days** of receipt of the same by him.

3.21.2. The issuance of the Letter of Acceptance to the bidder shall constitute an integral part and it will be a binding to the contract. Upon the issuance of the LoA, NATRAX shall encash/redeem/request to extend the EMD amount/validity, as per the conditions of contract.

3.21.3. The time taken between the date of issue of LoA and Notice to Proceed shall not prevent the contractor to mobilize the man power/equipments at site.

3.22. PERFORMANCE BANK GUARANTEE (PERFORMANCE SECURITY)

3.22.1. The Successful Bidder within **Fifteen (15) days** of the acceptance of the LoA, shall execute a Performance Bank Guarantee as per contract, from a scheduled Bank, for an amount equivalent to the **05% (Five) of the accepted Contract Value,** which shall be kept valid for the entire period of work, i.e. till the completion of 60 days after the date of issue of the 'Defect rectification certificate'. Incase, if bid received is very low than the estimated cost, than NATRAX reserves the right to demand additional performance security upto 5%.

3.22.2. The Performance Bank Guarantee of the successful Bidder will be invoked and forfeited (fully/partially) if he fails to comply with any of the conditions of contract.

3.23. ISSUANCE OF 'NOTICE TO PROCEED'

After the acceptance of the LoA, NATRAX shall issue the 'Notice to procceed' authorising him to take possession of the allocated project site for pre-construction activities. In the meantime with 15 days the successful bidder SHOULD submit performance security of requisite amount as per LOA. Subsequently NATRAX shall issue relevant Technical inputs/GFC drawings/drawings etc. to commence the construction activities. The time for completion of works as mentioned in the tender will be counted from date issue of NTP. Refer clause 3 of the GCC for details.

3.23.1. NATRAX shall not entertain any claim, whatsoever, on account of time between the above two NTPs, if sought by by the contractor.

3.24. SIGNING OF CONTRACT AGREEMENT

3.24.1. The successful Bidder shall enter into contract and shall execute and sign the Contract Agreement in accordance with the Articles of Agreement, within seven **(7) days** from the receipt of performance security by NATRAX. But the written acceptance by NATRAX of a Bid (LOA) will constitute a binding to Contract between NATRAX and the person so tendering, whether such formal agreement is not subsequently executed.

3.24.2. NATRAX shall prepare the draft Articles of Agreement in the Proforma included in this Document, duly incorporating all the terms of agreement between the two

parties and send the same in duplicate to the successful Bidder for their concurrence within **five (5) days** of the date of receipt of 'performance security'.

3.24.3. The successful Bidder shall return the duly concurred copies of the draft Articles of Agreement within **two (2) days** of receipt of the draft Articles of Agreement from NATRAX. NATRAX shall prepare two copies of Articles of Agreement in a correct amount of stamp paper, duly adjudicated by the registrar of Stamps, of the State of Madhya Pradesh, where the contract agreement is proposed to be executed and the parties shall execute the contract agreement at the NATRAX, duly signed by the authorized signatories of both the parties. The authorised signature of the bidder shall be the same person who has signed on the bidding documents on behalf of the bidder, unless the change in the authorised person is notified by the Bidder in writting and a power of attorney is submiteed by the bidder in this regard.

3.24.4. Further, the authorised person of NATRAX shall sign on all pages of the bidding documents submitted by the successful bidder and execute the complete set of contract agreement. One copy of the executed Articles of Agreement along with the complete set of contract documents shall be issued to the Contractor, within 10 days of excution of contract agreement.

3.25. RETURNING OF EARNEST MONEY DEPOSIT (BID SECURITY AMOUNT)

3.25.1. The Earnest Money Deposit of the unsuccessful bidders in the ***technical Bid evaluation stage*** shall be returned along with their up-opened financial bids within 7 days after opening of the eligible financial Bids.

3.25.2. The Earnest money Deposit of the unsuccessful bidders in the ***financial bid evaluation stage*** shall be returned within 7 days, on award of contract to the Successful bidder.

3.25.3. The Earnest money deposit of all the bidders shall be returned along with their un-opened financial bids, in case of cancellation of Tender after the opening of Bids and prior to opening of financial bids.

3.25.4. The Earnest money deposit of the Successful Bidder will be returned, upon the receipt of the PBG.

3.26. NATRAX's RIGHT TO ACCEPT /REJECT ANY OR ALL BIDDERS AND DIVIDE THE CONTRACTS

NATRAX reserves the right to accept / reject or modify any tender, and to annul the tender process and reject all tenders, at any time prior to award of Contract without assigning any reasons, or to divide the Contract between/amongst Bidders without thereby incurring any liability to the affected Bidder or Bidders or any obligations to inform the affected Bidder or Bidders of the grounds for NATRAX's action. The Bidders shall not have any cause of action or claim against NATRAX for rejection of their proposals.

3.27. PROCESS TO BE CONFIDENTIAL

3.27.1. Except the public opening of Bids, information relating to the examination, clarification, evaluation and comparison of bids and recommendations concerning the award of Contract shall not be disclosed to Bidders or other persons not officially concerned with such process.

3.27.2. Any effort by a Bidder to influence NATRAX or any of its functionaries in the process of examination, clarification, evaluation and comparison of tenders and in decisions concerning award of contract, may result in the rejection of the Bid

3.27.3. Sucessful bidder should sign an integrity pact agreement.

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P"

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 4

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section-4- General Conditions of Contract [GCC]

NATIONAL AUTOMOTIVE TEST TRACKS

GENERAL CONDITIONS OF CONTRACT

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1. Definitions and interpretations

1.1 Definitions

In these Conditions of Contract ("**Conditions**") the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively ascribed to them:

"Additional Cost" means the additional capital expenditure and/or the additional operating cost or additional taxes or all as the case may be, which the Contractor has or would be required to incur and which has arisen as a result of Change of Scope.
"Advance Payment" means a sum equal to the amount named in Special Conditions of Contract and paid to the Contractor by NATRAX by way of a mobilisation/advance payment in accordance with **Clause** 26.11.1 **[**Advance Payment**]**.

"Advance Payment Guarantee" means any or all of the guarantees to be procured in accordance with **Clause** 26.11 **[**Advance Payment**]**.

"Affected Party" means a Party whose performance of its obligations under the Contract is prevented, hindered or delayed in whole or in part by reason of Force Majeure.

"Applicable Clearances" means any clearance, permit, authorisation, consent, licence (including without limitation, any import or export licences), lease, ruling, exemption, filing, agreements, or approval, required to be obtained and maintained by NATRAX and/or the Contractor from time to time, in order to implement the Project Facility and/or to design and Execute the Works in accordance with the Contract.

"Applicable Laws" means all laws in force and effect as of the date hereof and which may be promulgated or brought into force and effect hereinafter in India including any revisions, amendments or re-enactments including without limitation rules, regulations and notifications made there under and judgments, decrees, injunctions, writs, orders and notifications issued by any court of record or any appropriate authorities, as may be in force and effect during the subsistence of the Contract.

"Arbitration Act" means the Arbitration and Conciliation Act, 1996 and shall include any amendment to or any re-enactment thereof as in force from time to time.

"As-built Documents" means all as-built documents and information of the completed Project Facilities.

"Audit Period" shall have the meaning given under **Clause** 30.6.4 **[**Audit Rights**]**.

"Background Information" means all and any materials, data, documents, drawings, plans, surveys, reports or other information of whatsoever nature and howsoever prepared/stored relating in any way to the Project Facility made available by NATRAX and/or its agents in connection with the Contract and/or discussions which preceded such

negotiations and preparations, including all such materials, data, documents, drawings, plans, agreements or other information provided in connection with those processes.

"Business Day" means a day other than a Sunday or a public holiday on which banks are open for domestic business in the city of New Delhi.

"Certificate of Payment" means the certificate referred to as such in **Clause** 26.3 **[**Certificate of Payment**]**.

"Change" means any change to Technical Specifications and Drawings, which is instructed or approved as a Change under **Clause** 23 **[**Changes**]**.

"Change Notice" shall have the meaning ascribed to it in **Clause** 23.2.1(i) **[**Procedure for Changes**]**.

"Change Notice Response" shall have the meaning ascribed to it in **Clause** 23.2.2 **[**Procedure for Changes**]**.

"Change Order" shall have the meaning ascribed to it in **Clause** 23.2.4 **[**Procedure for Changes**]**.

"Completion Certificate" has the meaning ascribed to it in **Clause** 21.4 **[**Application for and issue of the Completion Certificate**]**.

"Completion of the Works" means the achievement of the criteria set out in **Clause** 21.3.1 **[**Completion of the Works**]** and "Complete""Completed""Completion" and "Completing" shall be construed accordingly and as certified by the Completion Certificate.

"Confidential Information" means the Contract and everything contained therein, all documentation, data, particulars of the Works and/or the Project Facility and/or the Project and technical or commercial information made by (or on behalf of) NATRAX or obtained directly or indirectly from NATRAX Representative by the Contractor or which is generated by the Contractor or any subcontractor or any information or data that the Contractor receives or has access to as a result of the Contract, other than information:

(a) which is generally available in the public domain other than by any unauthorised actions or fault of the Contractor; or

(b) which is in the possession of the Contractor with a right to disclose; or
(c) Proprietary Information.

"Contract" means the Contract Agreement, these Conditions, Special Conditions of Contract, Technical Specifications and Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement and initialled by NATRAX and the Contractor and includes any amendment thereto made in accordance with the provisions hereof.

"Contract Agreement" means the agreement entered into or to be entered into by the Parties and forming part of the Contract.

"Contract Price" means the Contract Sum subject to such additions thereto or deductions there from as made in accordance with the Contract.

"Contract Sum" means the sum stated in Special Conditions of Contract and as payable to the Contractor for the design and Execution of the Works in accordance with the provisions of the Contract.

"Contractor" shall mean the person specified in the Contract Agreement as the Contractor.

"Contractor's Documents" means those documents to be prepared by the Contractor under the Contract including without limitation, such technical documents specified in Technical Specifications and Drawings and such data, drawings, designs, design information, detailed drawings and designs, descriptions, calculations, schedules, specifications, plans, samples, patterns, models, mock-ups, computer software drawings, inspection and test plans, manuals, programmes test data and all other information and documents including all eye readable or computer or other machine readable data relating to the design or Execution of the Works or otherwise to performance of the Contract.

"Contractor's Equipment" means all or any apparatus, machinery, equipment, vehicles, materials, plant, tools and all other things required for the Execution of the Works and the remedying of any defects to be provided by the Contractor but Contractor's Equipment excludes Temporary Works, Equipment and any other things intended to form or forming part of the Permanent Works.

"Contractor's Health, Safety, Security and Environmental Plan" means that plan referred to in **Clause** 11.2 **[**Contractor's Health, Safety, Security and Environment Plan**]**.

"Contractor's Insurances" means the insurance policies to be purchased and maintained in full by the Contractor, in respect of the risks set out in the contract.

"Date of Completion of the Works" means the date certified as such in the Completion Certificate in accordance with **Clause** 21.3 **[**Completion of Works**]**.

"Day work Schedule" means the day work schedule which is prepared and priced by the Contractor in respect of the Works and included in Schedule B **[**Schedule of Prices**]**.

"Default Interest Rate" shall be the interest rate per annum set out in Special Conditions of Contract.

"Defects Rectification Certificate" means the certificate to be issued in accordance with **Clause** 22.2 **[**Defects Rectification Certificate**]**.

"Defects Rectification Period" means the period stated in Special Conditions of Contract.

"Delay Event" means any event set out at **Clause** 19.4 **[**Delay Events**]**.

"Design Requirements" means the design requirement of the Project/Project Facility set forth in the Technical Specifications and Drawings.

"Detailed Project Implementation Report" means the Detailed Project Implementation Report prepared by consultants of NATRAX and setting out the manner of procurement of the Works for the Project Facility and the completion of the Project.

"Dispute" shall have the meaning ascribed thereto in **Clause** 31.1 **[**Amicable Resolution and Mediation**]**.

"Dispute Resolution Procedure" means the procedure for resolution of Disputes set forth in **Clause** 31 **[**Dispute Resolution Procedure**]**.

"Drawing or Drawings" means all of the drawings, designs, calculations and documents pertaining to the Project in accordance with the Design Requirements.
"Effective Date" means the date of execution of the Contract by the Parties.

"Emergency" means any condition or situation that will or is likely to endanger safety as per Good Industry Practice on or about the Project Site and/or the Permanent Works including safety of users thereof or which poses or is likely to pose an immediate threat of material damage to any part of the Project Site and/or the Permanent Works.

"Encumbrance" means any encumbrance such as mortgage, charge, pledge, lien, hypothecation, security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations and shall include without limitation any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project Facility and/or the Works, physical encumbrances and encroachments on the Project Site and/or the Permanent Works.

"Execution of the Works" means the construction, procurement and supply of materials for construction, testing and completion of the Works and the correction of defects in the Works and all works and things required to be undertaken pursuant to the Contract and "Executed", "Execute" and "Execution" shall be construed accordingly.

"Execution Period" means the period beginning from the date of issue of the Notice to Proceed and ending on the Date of Completion of the Works.

"Final Design" means any design in accordance with which the Contractor may proceed pursuant to **Clause** 6.3.12 **[**Contractor's Documents**]** with the commencement of the Execution of the relevant part of the Works.

"Final Request for Payment" shall have th meaning ascribed to it in **Clause** 26.5.1 **[**Final Payment**]**.

"Force Majeure" shall have the meaning ascribed thereto in **Clause** 31.6 **[**Force Majeure**]**

"Force Majeure Period" means, the period commencing from the date of occurrence of a Force Majeure and ending on the date on which the Affected Party, acting in accordance with the Good Industry Practice, resumes or should have resumed such of its obligations the performance of which was excused in accordance with the Contract.

"GoI" means the Government of India and includes any agency, authority (including any regulatory authority) department, inspectorate, ministry or statutory person (whether autonomous or not) under the control and direction of the Government of India.

"Good Industry Practice" means the exercise of the highest degree of skill, diligence, prudence and foresight in compliance with the undertakings and obligations under the Contract which would be expected from a skilled and experienced person engaged in the planning, design, execution, testing, implementation, operation and maintenance or supervision or monitoring thereof or any of them of works of the type, nature and scope similar to that of the Works.

"Goods" means Contractor's Equipment, Materials and Temporary Works, or any of them as appropriate.

"Gross Certifiable Amount" has the meaning ascribed to it in **Clause** 26.3.1 **[**Certificates of Payment**]**.

"Guarantee Period" shall have the meaning ascribed to it in **Clause** 6.5.1 **[**Contractor's Guarantee**]** and which shall be specified in the Special Conditions of Contract.

"Initial Programme" shall have the meaning ascribed to it at **Clause** 9.1.2 **[**The Programme**]**.

"Intellectual Property" means copyright, all rights conferred under statute, common law or equity in relation to inventions (including patents), registered and unregistered trademarks and service marks, registered and unregistered designs, circuit layouts, confidential information, proprietary information and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields.

"Key Personnel" shall have the meaning ascribed thereto in **Clause** 16.5.3 [Key Personnel].

"Latent Defect" means any work or repair, amendment, reconstruction, rectification, defect, imperfection or other fault which only becomes apparent to NATRAX following the expiry of the Defects Rectification Period and which is due to the use of materials or workmanship not in accordance with the Contract or the neglect or failure of the Contractor to comply with any of its obligations, express or implied, under the Contract.

"Latent Defects Rectification Period" means the period stated in the Special Condition of Contract calculated from the date of issue of the Completion Certificate.

"Liquidated Damages" means those damages provided by Special Conditions of Contract to be paid or allowed by the Contractor to NATRAX as compensation for delay pursuant to **Clause** 20 **[**Liquidated Damages**]**.

"Material Adverse Effect" means Material Adverse Effect on (a) the ability of Contractor to exercise any of its rights or perform/discharge any of its duties/obligations under and in accordance with the provisions of this Contract and /or (b) the legality, validity, binding nature or enforceability of this Contract.

"Materials" shall mean all construction materials including but not limited to all items required to be incorporated in the Works, for construction and completion of the Works and set out in the Technical Specifications and Drawings.

"Master Plan" means the plan defining the layout of the Project Facility within the Project Site and in conformity with the Detailed Project Implementation Report to be prepared by NATRAX.

"Milestone Event" means the completion of a specific activity and shall include the extent of progress of works (if any) as specified in the Special Conditions of Contract, to be achieved, which reflects progress in the design and Execution of the Works or the occurrence of an event in each case as identified as such in the Payment Schedule.

"Notice to Proceed" means the notice to be issued by NATRAX to the Contractor pursuant to **Clause** 3 **[**Commencement and Notice to Proceed**]**.

"NATIS" shall mean the National Automotive Testing and R&D Infrastructure Project Implementation Society or its successors or assigns.

"NATRAX" means National Automotive Test Tracks, "NATRAX" shall be use in place of "NATRAX" in this tender, the word "NATRAX" may be read as "NATRAX".

"NATRAX Representative" means the person, company or firm appointed by NATRAX to act as its representative and the Engineer In-Charge for the purposes of the Contract and named as such as in Special Conditions of Contract or such other person, company or firm so appointed from time to time by NATRAX and notified in writing as such as such to the Contractor.

"Parties" means NATRAX and the Contractor and "Party" means any one of those Parties.

"Payment Schedule" means the payment schedule described as such and set out at Schedule C **[**Payment Schedule**]**.

"Performance Guarantee" means the guarantee to be procured in accordance with **Clause** 1.9.1 **[**Guarantees**]**.

"Performance Standards" means such performance standards for the operation and maintenance of the Project Facility as may be applicable pursuant to the Contract.

"Permanent Works" means the permanent works to be Executed (including without limitation, all structures and all work intended to form a continuing function after

Completion) and any other work contractually required to be left at the Project Site after Completion in accordance with the Contract.

"Price Breakdown" means the price breakdown of the elements of the Works prepared by the Contractor for the purposes of the Contract and set out at Schedule B **[**Schedule of Prices**]**.

"Programme" shall have the meaning ascribed to it at **Clause** 9.1.5 **[**The Programme**]**.

"Project" means the scope of work as per this tender document and BOQ.

"Project Facility" shall mean facility being one or more of the following facilities as specified in the Special Conditions of Contract, being developed in accordance with the Project and the Detailed Project Implementation Report and includes all its buildings, equipment, facilities, software and systems and includes without limitation, where the circumstances so require, any expansion thereof from time to time and may include any new location to be separately mentioned in the Special Conditions of Contract.

(i) A full-fledged testing and homologation centre within the northern hub of automotive industry at Manesar, Haryana;

(ii) A full-fledged testing and homologation centre within the southern hub of automotive industry at a location at Oragadam, near Chennai, Tamil Nadu;

(iii) Upgradation of existing testing and homologation facilities at Automotive Research Association of India (ARAI), Pune, Maharashtra;

(iv) Upgradation of existing testing and homologation facilities at Vehicle Research and Development Establishment (VRDE), Ahmednagar, Maharashtra;

(v) World-class proving grounds or testing tracks on around 4,000 acres of land, at Pithampur, near Indore, Madhya Pradesh;

(vi) National Centre for Testing of Tractors and Off-Road Vehicles together with national facility for accident data analysis and specialized driving training in northern part of the country at Rae Bareilly, Uttar Pradesh;

(vii) National Specialized Hill Area Driving Training Centre as also Regional In-Use Vehicle Management Centre at Dholchora (Silchar), Assam.

"Project Facility Insurance" means the insurance policies to be purchased and maintained in force by NATRAX, in respect of risks set out in the contract.

"Project Manager" shall have the meaning ascribed thereto in **Clause** 16.5.3.2 (i) [Key Personnel].

"Project Site" means that part of the site as indicated in the Special Conditions of Contract, on, under and over which the Permanent Works are to be Executed and any site to which

any Contractor's Equipment, Materials and Temporary Works are to be delivered and any other places as may be specified in the Contract as forming part of the Project Site.

"Project Site Tests" means tests described as such in the Testing Plans.

"Proprietary Information" shall have the meaning ascribed thereto in **Clause** 1.7.2(vi)(b) [Proprietary Information].

"Punch List Items" means items of works of a minor or snagging nature which do not affect beneficial occupation or use of the Works by NATRAX, or other users and, where agreed with NATRAX, any other works which remain incomplete at the Date of Completion of the Works.

"Provisional Sum" means a sum included in the Contract and so designated in the Bill of Quantities for the execution of any part of the Works or for the supply of goods, materials, Plant or services, or for contingencies, which sum may be used, in whole or in part, or not at all, on the instructions of the NATRAX Representative. The Contractor shall be entitled to only such amounts in respect of the work, supply or contingencies to which such Provisional Sums relate as the NATRAX Representative shall determine in accordance with this Clause. The NATRAX Representative shall notify the Contractor of any determination made under this Sub-Clause, with a copy to the NATRAX.

"Provisional Sum Works" means those parts of the Works designated in Special Conditions of Contract as to be performed against expenditure of a Provisional Sum.

"Quality Assurance Plan" means that plan referred to in **Clause** 9.3 **[**Quality Assurance Plan**]**.

"Related Works" means works other than the Works, performed or undertaken by NATRAX or other contractors or suppliers of NATRAX or any contractor employed in connection with the Project Facility and/or services related thereto or by public or private utilities or by any Statutory Authority or other authorities or by any Relevant Authority, either prior to, concurrently or sequentially with the Works at, on, over or adjacent to the Project Site in connection with or related to the Project Facility and which may be connected to, associated with, ancillary to or otherwise related to or relevant to the Works.

"Related Works Contractor" means any person or persons undertaking Related Works.

"Relevant Authority" includes the GoI, Department of Customs and Excise, the Ministry of Finance, the Department of Heavy Industry, Ministry of Heavy Industries and Public Enterprises or any other subdivision or instrumentality thereof, any local authority, or any authority empowered by the Applicable Laws.

"Request for Payment" means the request for payment issued by the Contractor in accordance with **Clause** 26.2.2 **[**Contractor's Application for Payment**]**.

"Required Insurances" means collectively the Project Facility Insurances and the Contractor Insurances.

"Retention Amount" means that part of the payment of the Contract Sum to be retained by NATRAX in accordance with **Clause** 1.9.5 **[**Guarantees**]**.

"Review Meeting" has the meaning ascribed to it at **Clause** 10.1 **[**Review Meetings**]**.

"Review Period" has the meaning ascribed to it in **Clause** 6.3.2 **[**Contractor's Documents**]**.

"Schedules" means Schedules attached to the Special Conditions of Contract.

"Schedule of Prices" means the schedule identified as such at Schedule B **[**Schedule of Prices**]**.

"Special Conditions of Contract" means the document titled Special Conditions of Contract as included in the Contract, which are compliment to GCC in accordance with the Contract. Such document specifies any special terms and conditions forming part of this Contract and shall be read along with these Conditions when referring to the Contract.

"Statutory Authority" means GoI, or any central or state government or governmental department, commission, board, body, bureau, agency, authority or any companies owned by GoI, instrumentality, court or other judicial or administrative body, central, state, or local body or any other authority empowered by Applicable Laws, having jurisdiction over the Parties, the Project Facility and/or Works and facilities or any portion thereof, or the performance of all or any of the service or obligations of the Parties.

"Subcontractor" means a Subcontractor to whom a part of the Works has been subcontracted or to whom the supply of any goods or materials or labour and services for the Works has been subcontracted as permitted under **Clause** 7 **[**Subcontractors**]** and the permitted legal successors in title to such person, but not any assignee of such person.

"Tax" means all forms of taxation, duties, fees, imposts and levies including (but without limitation) GST, income tax including withholding tax, value added tax, service tax, octroi, entry tax, corporation profits tax, advance corporation tax, capital gains tax, residential and property tax, customs and other import and export duties, excise duties, stamp duty, capital duty, social insurance, social welfare or other similar contributions and other amounts corresponding thereto and any interest, surcharge, penalty or fine in connection therewith which may be payable worldwide by the Contractor, its Subcontractors and any of their employees, and the words "Taxation" and "Taxes" shall be construed accordingly.

"Technical conditions of contract" means the document entitled Technical Specifications and Drawings, as included in the Contract, and any additions and modifications to such document in accordance with the Contract. Such document specifies the purpose, scope, and /or design and specifications and /or other technical criteria for the Works.

"Temporary Works" means all works required in or about the Execution of the Works other than the Permanent Works and the Contractor's Equipment.

"Termination Date" means the dated specified in the notice of Termination given by either Party to the other Party, from which the Contract shall stand terminated, in accordance with the Clause 34.2.2 of this Contract.

"Termination Notice" means the notice of Termination given by either Party to the other Party, in accordance with Clause 34.2.2 of this Contract.

"Testing Plans" means those plans included in the Quality Assurance Plan and referred to in **Clause** 17.1.2 **[**General**]** which set out the tests and inspections required to be performed by the Contractor in accordance with the Technical Specifications and Drawings and the means by which the Contractor intends to conduct and satisfy such tests and inspections.

"Time for Completion" means the time for Completion of the Works as stated in Special Conditions of Contract or such time as may be varied from time to time in accordance with the Contract, calculated from the Date of issue of the Notice to Proceed.

"Works" means the Permanent Works and the Temporary Works or any part thereof.

1.2 Interpretation

In the Contract, unless the context otherwise requires or as otherwise expressly stated:

1.2.1 any reference to a statutory provision shall include such provision as is from time to time modified or re-enacted or consolidated so far as such modification or re-enactment or consolidation applies or is capable of applying to any transactions entered into hereunder;

1.2.2 the words importing singular shall include plural and vice versa, and words denoting natural persons shall include partnerships, firms, companies, corporations, joint ventures, trusts, associations, organisations or other entities (whether or not having a separate legal entity);

1.2.3 the headings are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Contract;

1.2.4 the words "include" and "including" are to be construed without limitation;

1.2.5 any reference to any period of time shall mean a reference to that according to Indian Standard Time;

1.2.6 any reference to day shall mean a reference to a calendar day;

1.2.7 any reference to month shall mean a reference to a calendar month;

1.2.8 the Special Conditions of Contract, the Technical Specifications and Drawings and Schedules form an integral part of the Contract and will be in full force and effect as though they were expressly set out in the body of these Conditions. Terms defined in the Special Conditions of Contract, Technical Specifications and Drawings and Schedules shall have the same meaning throughout the Contract. In case of any conflict between these Conditions and the Special Conditions of Contract, the latter shall prevail;

1.2.9 any reference at any time to any contract, deed, instrument, license or document of any description shall be construed as reference to that contract, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference;

1.2.10 references to recitals, **Clauses**, sub-**Clauses**, clauses, or Schedules in the Contract shall, except where the context otherwise requires, be deemed to be references to recitals, **Clauses**, sub-**Clauses**, clauses and Schedules of or to this Contract;

1.2.11 unless otherwise stated, any reference to any period commencing "from" a specified day or date and "till" or "until" a specified day or date shall include both such days or dates;

1.2.12 definitions within **Clauses** have the meaning ascribed thereto.

1.2.13 the words "tender" shall be synonymous with the word "bid" and the words "tender documents" with the words "bidding documents".

1.3 Record of Measurements and Arithmetic conventions

1.3.1 The records of measurements such as measurement books, level books or any other such records shall be under the custody of the NATRAX Representative and the Engineer In-charge and he/his authorised representative shall make entries of the measurements in the relevant records, conducted jointly by NATRAX and the Contractor and the records are required to be signed by the both parties. These measurement records shall be referred to by the contractor, along with the relevant, accepted / closed RFIs/RITs as per clause 17.1.4, to prepare and submit his request for payment.

1.3.2 All measurements and calculations shall be in metric system and the rounding off of the contents/quantities to the requisite decimal place shall be done based on the relevant IS codes.

1.4 Communications

1.4.1 Wherever these Conditions provide for any agreement, or the giving or issuing of any consent, approval, authorisation, notice, certificate, request, determination, information or report ("communication") from or by any Party or NATRAX Representative such communication shall be valid and effectual only if:

(i) in writing under the hands of a duly authorised representative of such Party or NATRAX Representative, as the case may be and delivered by hand (against receipt), sent by recognised courier, registered mail, or transmitted by facsimile transmission; and

(ii) delivered, sent or transmitted to the address for the recipient's communications as stated in Special Conditions of Contract.

1.4.2 All notices required to be given under the Contract and all communications, documentation and proceedings which are in any way relevant to the Contract shall be in the English language.

1.5 Background Information

1.5.1 NATRAX gives no warranty or undertaking as to the completeness, accuracy or fitness for purpose of any of the Background Information or the various documents that together comprise the Contract or for any representation or statement contained therein. Neither NATRAX nor any of its agents or servants shall be liable to the Contractor in contract, tort (including negligence or breach of statutory duty) statute or otherwise as a result of:

(i) any inaccuracy, omission, unfitness for purpose or inadequacy of any kind whatsoever in the Background Information;

(ii) any failure to make available to the Contractor any materials, documents, drawings, plans or other information relating to the Works or the Project Facility;

(iii) any ambiguities, discrepancies, inconsistencies, divergences, design or construction impracticalities or omissions from, within, or between the documents which comprise the Contract.

1.5.2 In this regard, the Contractor represents and warrants to NATRAX that:

(i) it has conducted its own analysis and review of the Background Information and that it has satisfied itself as to the accuracy, fitness for purpose and completeness of all such Background Information; and

(ii) it has thoroughly examined and discussed the Technical Specifications and Drawings with NATRAX at length and has thoroughly examined the documents comprising the Contract and is satisfied that there are no ambiguities, discrepancies, inconsistencies, divergence, design or construction impracticalities or omissions from, within and between such documents and that such documents are accurate, complete, technically feasible and sufficient in all respects for the purposes of the execution of the Works and that it has consequently agreed to accept full responsibility for the designs and specifications for the Works whether comprised in the Technical Specifications and Drawings or the Contractor's bid; and

(iii) after a complete and careful examination, it has made an independent evaluation of the scope of the Works required and has determined and fully acquainted itself with the nature and extent of the difficulties, the risks and hazards, including without limitation the interfaces and its co-ordination obligations relating to Related Works Contractors, that are likely to arise or may be faced by it in or about of the performance of all its obligations in the Contract and that the same have been taken into account in the programme, the Time for Completion, the Contract Price and all other considerations as to time and cost. The Contractor hereby acknowledges its responsibility in respect of all such difficulties, risks and hazards and agrees that NATRAX shall not be liable in respect of the same in any manner whatsoever to the Contractor whether in contract, tort (including negligence or breach of statutory duty) or otherwise; and

(iv) that there is no ambiguity, discrepancy, inconsistency, divergence between the Technical Specifications and Drawings, the Contractor's bid and the Project Site; and

(v) having carefully considered all aspects of the Works, including the designs, specifications, scope of work, methodologies, programmes and cost plans and all of the Background Information and having carried out all necessary checks, investigations and enquiries of its own, the design and execution of the Works is capable of being carried out and completed to the standards required by the Contract by the Time For Completion at a cost not exceeding the Contract Price.

1.5.3 The Technical Specifications and Drawings shall remain in the sole custody of the NATRAX Representative but two copies thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make at its own expense any further copies required by it. At the completion of the Contract the Contractor shall return to the NATRAX Representative, the Technical Specifications and Drawings provided under the Contract.

1.6 Joint Ventures

1.6.1 The Contractor shall not constitute a joint venture, consortium or other unincorporated grouping of two or more persons (under the Applicable Laws or any equivalent laws) or enter into any partnering or profit sharing arrangements for the design (to the extent required under the Contract) and Execution of the Works, without the prior written consent of NATRAX.

1.7 Confidentiality

1.7.1 The Contractor shall disclose to NATRAX any Confidential Information and other information as NATRAX may reasonably require for verifying the Contractor's compliance with the Contract. Further, the Contractor shall not, without the previous written consent of NATRAX, use, copy, publish, disclose or otherwise deal with, nor cause nor permit its Subcontractors or any persons for whom it is contractually or otherwise responsible for, to use, copy, publish, disclose or otherwise deal with any Confidential Information, otherwise than for the performance of its obligations under the Contract.

1.7.2 Without limiting the generality of the foregoing:

(i) the Contractor shall take all practicable steps to ensure that no photographs, drawings or other image of the Project Site or of the Works or any part thereof or any property of NATRAX or any physical or virtual model thereof, are taken or made, except as may be expressly provided in the Technical Specifications and Drawings or as may otherwise be directed or approved by the NATRAX Representative;

(ii) the Contractor shall not in regard to anything concerning the Works publish any information, drawing or photograph and shall not give interviews to the press or to any person associated with the news media or take part in radio or television schedules except with the written consent of NATRAX Representative and subject to such conditions as it may prescribe;

(iii) if the Contractor receives enquiries from press, radio or television bodies or representatives or other persons associated with the news media concerning the Works or the Contract it shall refer them to NATRAX Representative;

(iv) the Contractor shall not use any part of the Project Site for the purpose of any advertisement, except by way of notice boards approved by the NATRAX Representative as to their form, content, size, number and location; and

(v) the Contractor shall use its best endeavours to procure that its servants and agents and all Subcontractors, their servants and agents comply with this **Clause** 1.7 **[**Confidentiality**]**.

(vi)

(a) the Contractor shall neither disclose any Proprietary Information nor use Proprietary Information other than on NATRAX's behalf except as NATRAX may otherwise authorise in writing. If disclosure to a third party is so authorised, the Contractor shall enter into a confidentiality agreement with said party containing the same terms and conditions with respect to use or disclosure of Proprietary Information as set forth below. The provisions of this **Clause** 1.7**[**Confidentiality**]**shall survive any termination of this Contract.

(b) "Proprietary Information"

As used in this **Clause** 1.7**[**Confidentiality**]** "Proprietary Information" shall mean all information which the Contractor, directly or indirectly, acquires from NATRAX or its affiliates and subsidiaries or from the performance of the Works or any other information concerning the technical and business activities and know-how of NATRAX or its affiliates and subsidiaries, except information falling into any of the following categories:

(1) information which, prior to the time of disclosure hereunder, is lawfully in the public domain;

(2) information which, after disclosure hereunder, enters the public domain, except where such entry is the result of Contractor's breach of this Contract;

(3) information, other than that obtained from third parties which, prior to disclosure hereunder, was already lawfully in Contractor's possession either without limitation on disclosure to others or which subsequently becomes free of such limitation; and

(4) information obtained by Contractor from a third party who is lawfully in possession of such information and not subject to a contractual or fiduciary relationship to NATRAX or any of its affiliates or subsidiaries with respect to said information.

1.7.3 The Contractor shall not and shall procure that its Subcontractors do not use the name "NATRIP" or any name which is likely to be confused with that name, or any image of the proposed new Project Facility in any manner or for any purpose whatsoever and shall not disclose to any third party the fact of the Contract, or any of the details hereof or that the Contractor has agreed to undertake the obligations herein referred to. The Contractor shall not use any device registered or used by NATRAX whether alone or in a combination with the words " NATRIP " and shall not apply anywhere in the world for a trade mark or similar registration including the words " NATRIP " or any device used or registered by NATRAX nor apply anywhere in the world for any trade mark or similar registration that is deceptively similar to the words " NATRIP " or any device used or registered by NATRAX nor apply anywhere in the world for any trade mark or similar registration which may cause confusion as to the ownership of such trade marks or similar rights on the part of the public. The Contractor acknowledges that damages alone would be an inadequate remedy for any breach of this **Clause** 1.7.3 **[**Confidentiality**]** and that NATRAX should, therefore, be entitled to injunctive relief. The Contractor shall indemnify NATRAX in respect of any and all loss, damage, costs, liabilities and expenses incurred in taking such action.

1.7.4 Notwithstanding the provisions of **Clause** 1.7.3 **[**Confidentiality**]**, NATRAX may in its absolute discretion allow or instruct the Contractor in writing to use and/or permit named Subcontractors to use the name "NATRIP", any image of the Project Facility, the fact of its or their involvement in the Project, any device registered or used by NATRAX whether alone or in combination with the words "NATRIP" and/or any trade marks registered in the name of NATRAX, for a consideration to be agreed and on the terms and for purposes specified in an intellectual property licence.

1.7.5 The Contractor shall reasonably assist NATRAX (including with the provision of documentation, evidence and witnesses) with any action taken or to be taken by NATRAX against any Subcontractor and/or agent of the Contractor for the alleged wrongful use of the "NATRIP" name, or any name which is likely to be confused with that name or any image of the Project Facility in any device registered or used by NATRAX or the registration of any trademark.

1.8 NATRAX Representative's Instructions

1.8.1 All instructions given by NATRAX Representative or by any person executing delegated functions under **Clause** 2.2 **[**NATRAX Representative's authority to delegate**]** will be issued in writing and in such form as will be advised to the Contractor after the Effective Date. If an instruction is not so issued, the Contractor shall immediately request in writing, a confirmation of the instruction. The Contractor shall not carry out such instruction until NATRAX Representative issues a written confirmation of the same, provided that if such confirmation is not received in writing by the Contractor within **[**4 (four)**]**Business Days of issue of the Contractor's request for confirmation, such instruction shall be deemed to have been issued in writing and the Contractor shall carry out such an instruction. Provided always that if in the event of an Emergency NATRAX Representative considers it necessary to give an instruction orally, the Contractor shall immediately comply with such instruction

and shall confirm in writing such oral instruction as soon as is possible under the circumstances.

1.8.2 The Contractor shall give adequate notice to NATRAX of other instructions that may be required for the design and Execution of the Works in accordance with the Contract.

1.8.3 Where the Contractor fails to comply with an instruction, NATRAX may engage others to give effect to the instruction. All costs and charges incurred by NATRAX in engaging others shall be paid by the Contractor to NATRAX or may, without prejudice to any other method of recovery, be deducted by NATRAX from any monies due to the Contractor or may be recovered as a debt due and payable to NATRAX on demand.

1.9 Guarantees

1.9.1 The Contractor shall, within **[15** (Fifteen**]** days of the date of acceptance of the Letter of Acceptance, provide to NATRAX the Performance Guarantee from a scheduled bank in India with a branch at New Delhi, in a sum equal to the amount and the period of validity specified in Special Conditions of Contract and in the form appearing in Section 6.3 **[**Form of PB Guarantees**]** for the due observance and performance by the Contractor of the Contract. [The Contractor shall maintain the said Performance Guarantee at its own expense, so that it shall remain in full force and effect until the date set out in Special Conditions of Contract or until the issuance of the Defect Rectification Certificate, whichever is later.] In the event of a net increase in the Contract Sum due to the valuation of Changes equalling 10% or more of the Contract Sum, the total value of the Performance Guarantee shall be increased proportionately by the Contractor, if required by NATRAX. The cost of obtaining (and increasing) the Performance Guarantee shall be at the expense of the Contractor and shall be included in the Contract Sum.

1.9.2 If the Performance Guarantee is or becomes invalid or unenforceable for any reason whatsoever, or if such security is withdrawn or expires, the Contractor must immediately notify NATRAX Representative and obtain within **[**7 (seven)**]** days a replacement Performance Guarantee in the form appearing in Section 6.3 **[**Form of PB Guarantees**]** and which is acceptable to NATRAX in its absolute discretion.

1.9.3 The provision, maintenance and renewal by the Contractor of the Performance Guarantee in accordance with this **Clause** 1.9 **[**Guarantees**]** shall be a condition precedent to any payment by NATRAX to the Contractor under the Contract.

1.9.4 If the Contractor shall fail to provide, maintain and renew the Performance Guarantee in accordance with the Contract, then NATRAX may, without prejudice to any other rights and remedies to which it may be entitled, by written notice immediately terminate the Contractor's employment in accordance with **Clause** 34.1 **[**Termination**]**.

1.9.5 (i) In addition to any other rights contained in the Contract, NATRAX shall be entitled to retain from each payment of the Contract Price an amount (the Retention Amount) equal to the percentage of the Gross Certifiable Amount, specified in the Special Conditions of Contract.

(ii) NATRAX shall certify to the Contractor, in case not explicitly mentioned in the Special conditions of Contract.

(a) 50% of the total Retention Amount held, in the Certificates of Payment to be issued by NATRAX following Completion of the Works; and

(b) The balance of such Retention Amount (50%) as part of the Final Payment or, if a Dispute arises under the Contract, after the final determination of the Dispute, whichever occurs later. NATRAX may, in its absolute discretion, on completion by the Contractor to the satisfaction of the NATRAX Representative of any Punch List Items set out in the Completion Certificate, pay to the Contractor a proportion of that retention held, provided always that the Contractor shall not be able to dispute or in any way challenge NATRAX determination of such proportion.

1.9.6 The NATRAX shall return the Performance Guarantee to the Contractor within 30 days (a month) after receiving the "Defect Rectification Certificate", from the NATRAX representative.

1.10 Detailing

1.10.1 NATRAX Representative shall be entitled (but, save when expressly provided to the contrary in the Contract, no obligation) to supply to the Contractor from time to time, during the progress of the design and the Works, such further drawings, specifications and instructions as the NATRAX Representative shall consider necessary for the purpose of the proper and adequate design and Execution of the Works. The Contractor shall carry out and be bound by the same but shall not be entitled to any extension of time or further payment in relation thereto except as provided by **Clause** 19 **[**Extension of Time for Completion**]** and **Clause** 23 **[**Change**]**.

2. THE NATRAX REPRESENTATIVE

2.1 The NATRAX Representative's duties and authorities

2.1.1 The NATRAX Representative shall be appointed by and shall be responsible to NATRAX and shall carry out the duties specified in, or necessarily implied from the Contract and shall exercise the authority delegated to it by NATRAX. The NATRAX representative shall also be the Engineer In-charge for the contract, unless specified by NATRAX. Subject to the provisions of this **Clause** 2 **[**The NATRAX Representative**]** and to any provision of the Contract, which provides to the contrary, the Contractor shall take instructions, notices, communications, decisions and approvals only from NATRAX Representative.

2.1.2 The NATRAX Representative's duties would include to watch and supervise the Works and to test and examine any Goods to be used or workmanship employed in connection with the Works. The NATRAX Representative shall have no authority to amend the Contract, to release the Contractor of any of his duties, liabilities or obligations under the Contract, nor, create estoppel against it or NATRAX in respect thereof, nor except as expressly provided hereunder or elsewhere in the Contract, to order any Work involving

delay or any extra payment by NATRAX, nor to make any variation of or in the Works nor to waive any right of NATRAX under the Contract. He shall have No authority to relieve the Contractor of any of his obligations under the Contract.

2.1.3 The following shall be the authority of the NATRAX Representative, but not limited to, with prior approval of NATRAX.

(1) Issuing the Notice to Proceed or the order to commence any part of the works.

(2) Approval of Sub-Contractor for any part of the Works.

(3) Issuing the payment certificate and certifying additional cost under the provisions of contract.

(4) Awarding an extension of time.

(5) Issuing notices to contractor with regard to day to day works.

(6) Negotiating the rates on item rates under variation.

(7) Issuing a Defects Liability Certificate.

(8) Levy of Liquidated damages.

(9) Executing the variation of quantities.

(10) Issuing Change Notices and Change orders.

2.2 NATRAX Representative's authority to delegate

2.2.1 NATRAX Representative may from time to time delegate any of its functions to assistants and may at any time revoke any such delegation. It shall notify the Contractor of the names, duties and scope of authority of such assistants. NATRAX Representative may not delegate any duty or authority, and such assistants shall have no authority, to initiate any Change or to issue any certificates, notices, instructions or decisions which may lead to any increase in the Contract Sum or any extension of time. Any such Change Order, Change Notice, certificate, notice, instruction or decision issued by an assistant of the NATRAX Representative shall immediately be referred to the NATRAX Representative for confirmation before the Contractor takes any action with regard thereto.

2.2.2 Any written communication between the Contractor and any assistant of NATRAX Representative shall immediately and contemporaneously be copied by the Contractor to NATRAX Representative.

2.2.3 Any examination, testing or similar act by any assistant of NATRAX Representative, in accordance with its delegation, shall have effect as though it had been an act of NATRAX Representative.

2.2.4 However, if the Contractor questions any communication of an assistant of NATRAX Representative, the Contractor shall, not later than [7 (seven)] days after receipt of such

communication, refer the matter to NATRAX Representative, who shall confirm, reverse or vary such communication.

2.3 Duration of powers and authorities

The powers and authorities vested in the NATRAX Representative and the functions of any assistant of NATRAX Representative under the Contract shall continue and be in force until the duties of NATRAX Representative set out in the Contract have been fully discharged or, in the case of any assistant of NATRAX Representative, until NATRAX Representative revokes or removes the assistant's powers and authorities or until the period specified in the delegation to it expires.

2.4 NATRAX protection

The Parties acknowledge and agree that provisions in the Contract to the effect that matters or work to be done under the Contract shall be carried out with the consent, non-objection or to the satisfaction of or be certified, determined, accepted, confirmed or inspected by the NATRAX Representative are inserted as protection to NATRAX and it is the sole responsibility of the Contractor to ensure that the Works are designed and executed in all respects in accordance with the Contractor's obligations under the Contract. The Contractor further acknowledges and agrees that such provisions are additional to any other rights, whether under the Contract or otherwise, which NATRAX may have for breach of any obligation under the Contract by the Contractor and that no payment by NATRAX nor any expression or implication of satisfaction or acceptance nor any action, examination, comment, rejection, confirmation, certification, determination, consent, non-objection, approval or notice by the NATRAX Representative or failure to do the same shall restrict, debar, exclude or waive any claims, rights or actions whatsoever by NATRAX for any breach of any such obligation by the Contractor.

3. COMMENCEMENT AND THE NOTICE TO PROCEED

3.1 Condition Precedent

The Contract shall become legally binding and in force only upon:

3.1.1 the submission of the Performance Guarantee in accordance with **Clause** 1.9 **[**Guarantees**]**;

3.1.2 satisfaction of any other condition(s) precedent stated in the Special Conditions of Contract;

save for the provisions of this **Clause** 3.1 **[**Conditions Precedent**]**, **Clause** 1.1 **[**Definitions and Interpretation**]**, **Clause** 1.7 **[**Confidentiality**]**, **Clause** 6.1.3(vi) **[**The Contractor's general responsibilities**]**, **Clause** 6.3 **[**Contractor's Documents**]**, **Clause** 31 **[**Dispute Resolution Procedure**]** and **Clause** 34.3 **[**Governing Law and Jurisdiction**]** which shall be effective, legally binding and in force immediately upon the Effective Date.

3.2 The Notice to Proceed

3.2.1 After satisfaction of the conditions precedent set out in **Clause** 3.1 **[**Conditions Precedent**]**, the Contractor shall obtain a Notice to Proceed from NATRAX prior to commencing the design and Execution of the Works.

3.2.2 NATRAX shall give the Contractor not less than [7 (seven)]days notice of the date of issue of the Notice to Proceed or such other shorter period as may be mutually agreed between the Parties.

3.2.3 Upon receipt of the Notice to Proceed, the Contractor shall proceed immediately to design and Execute the Works.

3.3 Following the Notice to Proceed

3.3.1 Within **[30** (Thirty)**]** days or such other period as may be specified by the NATRAX Representative, of the Notice to Proceed, the Contractor shall submit to NATRAX Representative:

(i) in accordance with **Clause** 6.3 **[**Contractor's Documents**]**:

(a) the Quality Assurance Plan;

(b) the Contractor's Health, Safety, Security and Environment Plan;

(c) the Initial Programme and

(d) the Contractor's Project Site Safety Plan

(e) the subcontract management plan

(ii) the following:

(a) evidence of full compliance of its insurance obligations in accordance with **Clause** 25.4 **[**Evidence**]**;

(b) evidence that the Contractor has made adequate arrangement for mobilisation at the Project Site.

3.3.2 It shall be a condition precedent to any payment under the Contract that the Contractor is able, pursuant to **Clause** 6.3 **[**Contractor's Documents**]** to proceed on the basis of the documents submitted pursuant to **Clause** 3.3.1 **[**Following the Notice to Proceed**]**.

4. THE PROJECT SITE

4.1 Access to and possession of the Project Site

4.1.1 Save insofar as the Contract may prescribe:

(i) the extent of portions of the Project Site of which the Contractor is to be given access from time to time; and

(ii) order in which portions shall be made available to the Contractor;

NATRAX will, simultaneously with the Notice to Proceed, give to the Contractor access to and possession of so much of the Project Site as may be reasonably required by the Contractor to commence and proceed with the design (to the extent required under the Contract) and Execution of the Works and to carry out its obligations in accordance with

the provisions of the Contract. NATRAX will, from time to time as the design (to the extent required under the Contract) and Execution of the Works proceeds, give to the Contractor access to and possession of such further portions of the Project Site as may be reasonably required to enable the Contractor to proceed with the design (to the extent required under the Contract) and Execution of the Works in accordance with the Contract.

4.1.2 The Contractor shall not be entitled to uninterrupted access to or exclusive possession of any part of the Project Site and without prejudice to any other restriction contained in the Contract, the Contractor's rights of access to and possession of any part of the Project Site shall in addition be subject to:

(i) any rights of public passage or access existing over any part of the Project Site from time to time;

(ii) the right of NATRAX, the NATRAX Representative, the Related Works Contractors, and representatives of any statutory authority, to have access to:

(a) view the Works or any operations at the Project Site on reasonable notice; and

(b) visit any site or workshop where Goods and Materials are being manufactured, prepared or stored, on reasonable notice and during normal working hours, for the purposes of general inspection and of attending any test or investigation being carried out in respect of the same; and

(c) visit and use, and their staff and visitors may visit and use, any facilities provided on the Project Site for their use; and

(d) the Project Site at any time in an Emergency as any of them (acting reasonably) considers necessary in the circumstances;

provided always that such persons shall comply with all relevant safety procedures.

4.1.3 The Contractor shall liaise with each of the Related Works Contractor(s) in relation to when the various portions of the Project Site will be made available to the Contractor. The Contractor shall keep the NATRAX Representative fully informed as to all communications with such Related Works Contractors as aforesaid. If the Contractor is likely to be delayed by reason of possession not being made available, it shall give notice in writing to the NATRAX Representative immediately.

4.2 Unauthorised persons

The Contractor shall be fully responsible for the presence on or around or for the entry to the Project Site or for any other act, omission, default or interference affecting the Project Site or the Execution of the Works, by or caused by any person not authorised to be on the Project Site and any such act, omission, default or interference shall not be a breach of the obligations of NATRAX to provide access to the Project Site.

4.3 Rights of possession

4.3.1 The Contractor shall not part with or create any Encumbrance on the whole or any part of the Project Site.

4.3.2 The Contractor shall not without the prior written consent of NATRAX use the Project Site for any purpose other than for the purpose of the design (to the extent required under the Contract) and Execution of the Works.

4.4 Additional access and facilities

The Contractor shall bear all costs and charges for any access required by it additional to those provided by NATRAX. The Contractor shall provide at its cost any additional facilities outside the Project Site as may be required by it for the purposes of the Works and the performance of its obligations under the Contract, provided that the Contractor shall obtain the prior written consent of the NATRAX Representative. The Contractor shall allow access to and use of the Project Site/ Project Facility for laying/installing telegraph lines, electric lines or for such other public purposes as NATRAX or any Statutory Authority may specify.

5. CONDITION OF THE PROJECT SITE

5.1 Information from NATRAX

The Contractor acknowledges and agrees that any information and data on climatic, hydrological, topographical and general conditions relating to the Project Site made available to it by NATRAX has been done so for the convenience of the Contractor and that the Contractor enters into the Contract based upon its own investigations and determinations. Without prejudice to **Clause** 1.5 **[**Background Information and the manner in which discrepancies are resolved**]**, NATRAX shall have no responsibility to the Contractor (whether in contract, tort, for breach of statutory duty or howsoever other arising) for or in relation to such information and data whether as to its accuracy, adequacy, sufficiency or completeness.

5.2 Contractor to inspect

Without prejudice to **Clause** 5.1 **[**Information from NATRAX**]** and without limitation to any other provision of the Contract, the Contractor shall be deemed prior to executing the Contract, to have and warrants that it has inspected to the full extent necessary and examined to its satisfaction the Project Site and its surroundings and where applicable, any existing structures or works on, over and under the Project Site and is familiar with and has satisfied itself with the Project Site Conditions including, without limitation:

5.2.1 the nature of the climatic, hydrological, topographical, ecological, environmental conditions at the Project Site (including without limitation all hazards and the potential for any contamination of the Project Site or the sub-soil by any noxious or hazardous substances) and the sub-soil and the general conditions of the Project Site;

5.2.2 the form and nature of the Project Site (including existing ground levels) and its adequacy for the purposes of the design and Execution of the Works;

5.2.3 the risk of injury or damage to property adjacent to the Project Site and to occupiers and users of such property;

5.2.4 the extent and nature of the design, work, plant and materials necessary for the design and Execution of the Works;

5.2.5 the means of communication with and access (including vehicular access) to and from the Project Site, the accommodation it may require and the adequacy of the rights of access set out in the Contract for those purposes (including the nature and extent of any restrictions upon access or use of the Project Site);

5.2.6 the possibility of interference by persons with access to or use of or possession of the Project Site;

5.2.7 the precautions and the times and methods of working necessary to prevent any nuisance, whether public or private, being caused to any third parties on or around the Project Site;

5.2.8 the whereabouts of existing services and mains on or around the Project Site;

5.2.9 conditions affecting shipping and transportation of Goods, plant, equipment and Materials to, through and from the Project Site;

5.2.10 the availability and quality of labour required for the Works;

5.2.11 the availability of water and electrical power for the Works;

5.2.12 the Applicable Laws and Applicable Clearances and local customs relating to the Project Site and the Works; and

5.2.13 the adequacy and suitability of any design or works carried out by other contractors on or around the Project Site which design or works the Contractor has taken over or will take over with the Project Site or with which the design and/or the Execution of the Works is required to integrate.

5.3 Claims

No claim by the Contractor for additional payment or compensation or any extension of time on the ground of any misunderstanding or misapprehension in respect of the matters referred to in this **Clause** 5 **[**Condition of the Project Site**]** or on the ground that incorrect or insufficient information was given to it by NATRAX, NATRAX Representative or NATRAX advisors or consultants, any Statutory Authority, nor shall the Contractor be relieved from any liability, risk or obligation imposed on or undertaken by it under or in relation to the Contract on any such ground or on the ground that it did not or could not foresee any matter which may in fact affect or have affected the design and Execution of the Works.

5.4 Fossils and antiquities

5.4.1 The Contractor acknowledges that as between NATRAX and the Contractor all fossils, antiquities, and other objects having artistic, religious, historic or monetary value and

human remains which may be found on or at the Project Site ("fossils and antiquities") are or shall be deemed to become the absolute property of NATRAX.

5.4.2 Upon the discovery of any fossils and antiquities during the course of the Works, the Contractor shall, at its own cost:

(i) immediately give notice to NATRAX and the NATRAX Representative of such discovery;

(ii) take all steps not to disturb the item and, if necessary, cease any Works in so far as the carrying out of such Works would endanger the item or prevent or impede its excavation; and

(iii) take all steps reasonably necessary to preserve the item in the same position and condition in which it was found and take all reasonably necessary precautions to prevent its personnel or other persons from removing or damaging any of these items.

5.4.3 Following receipt of a notice from the Contractor, NATRAX, through the NATRAX Representative shall as soon as reasonably practicable issue an instruction to the Contractor specifying what action NATRAX requires the Contractor to take in relation to the discovery of the fossil or antiquity.

5.4.4 If instructed by the NATRAX Representative, the Contractor shall allow representatives of NATRAX and/or any Statutory Authority to enter the Project Site for the purposes of removal or disposal of such fossil or antiquity, provided that such entry shall be subject to complying with all relevant safety procedures.

5.4.5 The Contractor shall, at its own cost and without a right to any extension of time, promptly and diligently comply with any instruction issued by the NATRAX Representative under this **Clause** 5.4 **[**Fossils and antiquities**]**.

5.5 Property in excavated material

All materials obtained from excavations or found on or under the Project Site or under any additional site which the Contractor may be allowed to occupy, shall remain the property of NATRAX and shall not be used in the Works or sold or otherwise disposed of without the prior written consent of NATRAX unless otherwise expressly provided for in the Technical Conditions of the Contract. No excavations are to be made upon the Project Site beyond those shown on the Contractor's Documents or described in the Technical Conditions of the Contract without the prior written consent of the NATRAX Representative.

6. THE CONTRACTOR

6.1 The Contractor's general responsibilities

6.1.1 Subject to and in accordance with the terms and conditions of the Contract, the Contractor shall to the satisfaction of NATRAX and NATRAX Representative, design and Execute the

Works and carry out its other obligations under and/or in relation to the Contract and provide all personnel and labour, including the supervision thereof, materials, offices, workshops, tools, machinery, equipment and all other resources and things, whether of a temporary or permanent nature, required in or for such design and Execution of the Works and for carrying out such obligations.

6.1.2 The Contractor shall assume full responsibility for the design and Execution of the Works in accordance with the Contract so as to meet the Time for Completion.

6.1.3 The Contractor shall at its own expense:

(i) take full responsibility for the adequacy, stability and safety of the Works and of all on-site and off-site operations and construction, transportation, testing and reliability and acceptance procedures;

(ii) organise the Project Site during the Execution Period with regard to safety precautions, fire protection, security, transportation, delivery of Goods, Materials, plant and equipment ,control of pollution and the maintenance of competent personnel and labour and general site services;

(iii) do everything necessary (including the payment of all relevant fees) to acquire and maintain all Applicable Clearances and which are not specified as responsibility of NATRAX in Special Conditions of Contract. If requested by NATRAX, the Contractor shall assist NATRAX in obtaining in a timely and expeditious manner any Applicable Clearance which NATRAX is required under the Contract to maintain;

(iv) take all reasonable steps, consistent with a good and experienced employer to maintain harmony and good industrial relations among the personnel employed in connection with the performance of its obligations under the Contract;

(v) provide to NATRAX, NATRAX Representative and representatives of any Relevant Authority and Statutory Authority such assistance as they may reasonably require to carry out their respective duties and functions;

(vi) at all times ensure that it has sufficient, suitable and qualified personnel at the Project Site and in sufficient number to undertake the responsibilities imposed upon the Contractor under the Contract and to provide full attention to the design and Execution of the Works.

6.2 The Contractor's representations and warranties

In addition to any other **Clause** contained in the Contract, the Parties agree that the principal objective of the Contract is the timely completion of the Project Facility of which the Works form an integral part. The Contractor warrants that it is fully experienced in the planning, programming, design, procurement and supply, testing, and execution and co-ordination of construction activities of facilities, complexity and size of the Works and that it possesses the level of skill and expertise commensurate with such experience, upon

which skill and expertise NATRAX is entirely reliant and the Contractor hereby represents and warrants to NATRAX that:

Design

6.2.1 it has satisfied itself as to, and adopts and accepts full responsibility for any design of the Works contained in and reflected by Technical Specifications and Drawings;

6.2.2 there has been exercised and will continue to be exercised in the design and specifications for the Works all the skill, care and diligence to be expected of professionals experienced in and possessing all the expertise necessary for the design and specification of similar projects of the size, scope and complexity of the Works;

6.2.3 the Works have been and will continue to be designed (to the extent required under the Contract) and specified utilising state of the art systems, procedures and technology, high quality goods, Materials and the high standards of workmanship and fabrication consistent and in compliance with Technical Specifications and Drawings;

6.2.4 the Contractor further warrants that upon the Date of Completion of the Works, the Works will be in a condition which will enable NATRAX to meet those Performance Standards which relate to the Works;

6.2.5 that it recognises that the process of producing, optimising, developing and finalising the design of the Works will require the closest consultation, co-operation and co-ordination between itself, NATRAX, the NATRAX Representative, any Relevant Authority and the Related Works Contractors and that it has taken account of the same in the Programme and the Contract Sum. The Contractor further recognises that it will be necessary for the Parties to further develop and agree to such methods and procedures to enable the same to be carried out;

6.2.6 that it is fully responsible for the integration of and for the full and complete co-ordination of the design (to the extent required under the Contract) of the Works with the Related Works and that:

(i) the Contract Sum is inclusive of the cost of the Contractor's compliance under this **Clause** 6.2 **[**The Contractor's Representations and Warranties**]** and **Clause** 13 **[**Related Works**]**; and

(ii) the Contractor has programmed and will continue to programme the design and Execution of the Works in such a way as to ensure its compliance with its obligations in respect of Related Works as set out in **Clause** 13 **[**Related Works**]**.

Workmanship

6.2.7 the Works will be Executed and defects, remedied in accordance with Good Industry Practice, using state of the art systems and technology and accepted professional standards, codes of practice and regulations, and shall meet the intents and objectives of the Contract and comply with all Applicable Laws and be in accordance with Technical Specifications

and Drawings and the functional and other requirements of the Contract, whether expressed or reasonably to be inferred therefrom;

6.2.8 the personnel to be employed by the Contractor in or about the Execution of the Works will be properly skilled, competent and experienced having regard to the nature and extent of the Works;

6.2.9 the Works and every part thereof will be complete in all parts, will be free from defects in design, materials and workmanship and will be in conformity with Technical Specifications and Drawings;

6.3 Contractor's Documents

6.3.1 The Contractor shall prepare all Contractor's Documents. The Contractor shall submit to NATRAX Representative:

(i) within the time given in the Contract, or if no time is so specified then in accordance with the Programme or as may be directed by NATRAX Representative, those Contractor's Documents called for in the Contract or as NATRAX Representative may require and in the numbers and format required by the Contract or, if no such number and format is stated in the Contract, as required by NATRAX Representative; and

(ii) during the progress of the Works such additional Contractor's Documents within such times and in such numbers and format as NATRAX Representative may reasonably require.

6.3.2 NATRAX Representative shall approve and comment on any Contractor's Documents submitted in accordance with **Clause** 6.3.1 **[**Contractor's Documents**]** within **[**15 (fifteen)**]** Business Days after receipt of the Contractor's Document (the "Review Period"). NATRAX Representative shall signify "No Comments" or "comments made" or "resubmit" and return one copy of the Contractor's Document to the Contractor. If NATRAX Representative fails to so do within the Review Period, it shall be deemed that NATRAX Representative has signified "No comments" and the Contractor may proceed as it deems appropriate to comply with its obligations under the Contract.

6.3.3 The notes "No comments" or "comments made" will enable the Contractor to proceed on the basis of the Contractor's Documents provided that in the latter case the Contractor sufficiently addresses any comments made by NATRAX Representative.

6.3.4 Where any Contractor's Document is marked "resubmit" the same shall be amended, modified or prepared again, as the case may be, and resubmitted by the Contractor and the procedure set out in this **Clause** 6.3 **[**Contractor's Documents**]** shall apply to the re-submitted Contractor's Document.

6.3.5 No design or Execution of any part of the Works shall commence prior to the expiry of the Review Period for those Contractor's Documents which are relevant to its design and Execution except as may be expressly agreed in writing by NATRAX Representative.

6.3.6 Notwithstanding any of the provisions of the Contract relating to Contractor's Documents, the Contractor shall be fully responsible for:

(i) the adequacy of the Contractor's Documents in accordance with the Contract; and

(ii) any failures of any Contractor's Documents whether to comply with the Contract and/or to meet its obligations thereunder or otherwise and for any ambiguities, failures, discrepancies, insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities in any such Contractor's Documents howsoever such ambiguities, failures, discrepancies, insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities may have arisen.

6.3.7 The Contractor shall at its own expense carry out any alterations or remedial work necessitated by reason of any ambiguities, failures, discrepancies, insufficiencies, lack of fitness for purpose, errors, omissions, design or construction impracticalities in any Contractor's Documents and shall modify the Contractor's Documents accordingly, or if the same be done by or on behalf of NATRAX, NATRAX shall be entitled to recover from the Contractor all costs reasonably incurred therein and may, without prejudice to any method of recovery, deduct the same from any monies due or which may become due to the Contractor.

6.3.8 The NATRAX Representative shall not be obliged to comment upon any Contractor's Documents without first satisfying itself that to the extent required, such comment is issued with the consent, non-objection or approval of a Statutory Authority, if so required.

6.3.9 If the Contractor wishes to modify any Contractor's Document (including any design contained in Contractor's Documents) which has previously been reviewed by the NATRAX Representative, the Contractor shall immediately give notice to the NATRAX Representative. Thereafter, the Contractor shall submit revised documents to the NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]**.

6.3.10 Save as expressly provided in this Contract, the Contractor shall not seek to recover from NATRAX any loss or claim which may arise from the adoption, use or application by or on behalf of the Contractor or any other person for whom the Contractor is responsible, of the design in any Contractor's Documents.

6.3.11 No review, comment, suggestion, approval on any other communication by the NATRAX Representative made in accordance with the review procedure specified in this **Clause** 6.3 **[**Contractor's Documents**]** or in any other system, method or procedure subsequently agreed, shall in any way relieve the Contractor of any of its obligations under the Contract.

6.3.12 In the case of any Contractor's Documents relating to the design of the Works, such Contractor's Documents shall become part of the Final Design of the Works in accordance with the following:

(i) when the Contractor submits the final submission for either the structural and layout design or the finishes and aesthetics design of a specified area in the Project

Site, it shall notify the NATRAX Representative by issue of a notice titled "Notice of Final Design of a Specified Area" accompanying such Contractor's Document. Such notice shall identify the relevant specified area in the Project Site, the date of submissions of all the Contractor's Documents relating to either the structural and layout design or the finishes and aesthetics design of such specified area in the Project Site and confirm that no further structural and layout design or finishes and aesthetics design is to be undertaken in respect of such specified area. Any Contractor's Document which has been accompanied by a Notice of Final Design of a Specified Area in the Project Site and which has reached a stage at which the NATRAX Representative can confirm and signify in writing "no comment" or "comments made" in accordance with **Clause** 6.3.2 **[**Contractor's Documents**]** will enable the Contractor to proceed on the basis of each Contractor's Document in respect the of the structural and layout design or finishes and aesthetics design (provided that in the latter case the Contractor fully addresses any comments made by the NATRAX Representative) and at which point such Contractor's Documents will become part of the Final Design of the Works.

(ii) In the case of Contractor's Documents relating to the design of the Works, other than the structural and layout design or the finishes and aesthetics design of a specified area in the Project Site, and otherwise as may be directed by the NATRAX Representative, such Contractor's Documents shall become part of the Final Design of the Works when the NATRAX Representative can confirm and signify in writing "no comment" or "comments made" in accordance with **Clause** 6.3.2 **[**Contractor's Documents**]** provided that in the latter case the Contractor fully addresses any comments made by the NATRAX Representative.

6.4 Design Development

Notwithstanding any of the provisions of the Contract including those relating to the instructions or approval or review of or comment on any design documentation or any Contractor's Document by NATRAX, the NATRAX Representative, and/or any Relevant Authority:

(i) the Contractor is responsible for initiating and progressing the production, optimisation, development and finalisation of the design of the Works and for ensuring a regular flow of design documentation to the NATRAX Representative in a timely, orderly, logical and consistent manner and so as not to delay or disrupt the regular progress of the design development or the commencement of the Execution of any part of the Works on the Project Site or the regular progress of the Execution of the Works or any part thereof;

(ii) it shall be a condition precedent to the Contractor's entitlement to be paid or reimbursed any amount in respect of work Executed or Materials or any part thereof supplied under the Contract that the same shall have been Executed or supplied in accordance with the Final Design of the Works;

(iii) the Contractor shall at all times during the design and Execution of the Works keep itself informed and the NATRAX Representative duly appraised, of any changes in Good Industry Practice, state of the art systems and technology, codes of practice and regulations and of any design developments or enhancements which occur or may become available during the course of the design (to the extent required under the Contract) or Execution of the Works and which relate to or could result in an improvement of the Project Facility. The NATRAX Representative may instruct the implementation of any such change, development or enhancement and the Contractor shall immediately implement the same at its own cost and without the right to any additional payment or any extension of time;

(iv) at any time until the design of any part of the Works has become part of the Final Design of the Works, the NATRAX Representative may give an order in writing to the Contractor relating to the design of such part of the Works (known as a "Design Order"). If in the opinion of the Contractor, any Design Order is likely to prevent the Contractor from or in fulfilling any of its obligations under the Contract in respect of the design or Execution of the Works, either directly or indirectly, it shall notify the NATRAX Representative thereof in writing as soon as practicable after receipt of the Design Order from the NATRAX Representative, giving a full statement of its reasons, and the NATRAX Representative shall decide forthwith whether or not the same shall be carried out. The NATRAX Representative may confirm the Design Order in writing and may modify the said obligation to such an extent as it considers may by justified. Until the NATRAX Representative so confirms the Design Order, it shall be deemed not to have been given; and

(v) if such Design Order shall involve any work or supply which is contrary to the Technical Specifications and Drawings and could not be inferred from the Technical Specifications and Drawings then such Design Order shall be treated as an instruction of the NATRAX Representative under **Clause** 23.2.1(i) **[**Procedure for Changes**]**, otherwise such Design Order shall be actioned by the Contractor at its own cost with no entitlement to any extension of time in respect thereof. Provided always that the onus of proving that such work or supply is contrary to and could not be inferred from the Technical Conditions of the Contract shall be on the Contractor.

6.5 Contractor's Guarantee

6.5.1 The Contractor shall guarantee each of the Systems for the respective periods and commencing from the dates ascribed to each thereto under the Special Conditions of Contract ("Guarantee Period"), to the intent that if during the period any defect, inadequacy or unsuitability of design, manufacture, workmanship or materials or failure to meet in any or all respects the requirements of the Contract shall arise or become apparent in any part of the Works so guaranteed, written notice of such defect, inadequacy or unsuitability, or failure to meet the requirements of the Contract shall be given by the NATRAX Representative to the Contractor who shall forthwith submit to the NATRAX Representative for its consent, its written proposals for the remedying or replacement of

the same at no cost to NATRAX. Upon receipt of the written consent of the NATRAX Representative to the Contractor's proposals or any amendments thereto the Contractor shall forthwith, at a time or times convenient to NATRAX and the NATRAX Representative, implement its proposals as accepted with all due speed. If the Contractor shall fail to submit its written proposals within a time considered reasonable by the NATRAX Representative or if such proposals are not, in the NATRAX Representative's opinion, satisfactory, NATRAX may employ and pay other persons to carry out the necessary remedial work or carry out such work itself and the Contractor shall be liable for all costs in connection with such remedial work, which NATRAX may recover from the Contractor as debt.

6.5.2 The Contractor shall at all times save harmless and indemnify NATRAX from and against all claims, liabilities, expenses, costs and losses suffered or incurred by NATRAX which may arise out of or in connection with any defect, inadequacy or unsuitability of the design, manufacture, workmanship or materials or failure to meet in any or all respects the requirements of the Contract or the remedying thereof either by the Contractor, NATRAX, or by others employed by NATRAX.

6.5.3 NATRAX rights under **Clause** 6.5 **[**Contractor's Guarantee**]** are without prejudice to any other right which it may have whether at law or otherwise.

7. SUBCONTRACTORS

7.1 Subcontracting

The Contractor shall not subcontract any part of the Works without the prior consent of NATRAX or the NATRAX Representative. Any such consent shall not relieve the Contractor from any liability or obligation under the Contract and the Contractor shall be responsible for the acts, defaults and neglects of any Sub-Contractor, his agents, servants or workmen as fully as they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen.

Provided that the Contractor shall not be required to obtain such consent for:

(i) the provision of labour, or

(ii) the purchase of materials which are in accordance with the standards and specifications specified in the Technical Specifications and Drawings, or

(iii) the subcontracting of any part of the Works for which the Sub-Contractor is named in the Contract.

The Contractor shall, in order to obtain the prior written consent of NATRAX, notify NATRAX in writing of all subcontracts to be awarded under this Contract. Such notification shall not relieve the Contractor from any liability or obligation under the Contract. Subcontracts must comply with all the provisions of these Conditions of Contract. The Contractor shall promptly advise NATRAX of the name of each Subcontractor which the Contractor intends to select to subcontract any part of the Works, and shall furnish to

NATRAX for approval such information concerning such subcontract as is necessary to determine its compliance with the Technical Specifications and Drawings and other requirements of this Contract, including (i) a description of such item of Materials or services being subcontracted, (ii) a technical analysis of each subcontractor's submission including the technical specifications of the equipment, materials or services being subcontracted, (iii) the purchase order (excluding price).

The Contractor may subcontract any part of the Works but not subcontract the whole of the Works under any circumstances. All Subcontractors shall be appropriately licensed to perform the subcontracted work.

7.2 Subcontractor's Warranty and Assignment of Sub-Contractor's' Obligations

As a condition to its consent to any Subcontractor, NATRAX requires that the Contractor shall procure that any such subcontractor shall execute a warranty in favour of NATRAX in the form to be provided by NATRAX under Schedule E to the Special Conditions of Contract at the same time as it executes a subcontract with the Contractor. The Contractor shall use all its best endeavours to procure the execution of the warranty.

In respect of the work Executed, or Materials supplied by a Subcontractor, any continuing obligation of a Subcontractor under the Subcontract extending for a period exceeding that of the Defects Rectification Period, shall be disclosed to NATRAX by the Contractor and be assignable to NATRAX or its nominee. The Contractor shall ensure that the Subcontractor shall any time, assign to NATRAX, at NATRAX's request, such continuing obligation of a Subcontract exceeding the Defects Rectification Period and the benefit of such obligation for the un-expired duration thereof.

7.3 Responsibility

7.3.1 Subcontracting does not relieve the Contractor from any of its liabilities or obligations under the Contract.

7.3.2 The Contractor shall be fully responsible for the acts, defaults, omissions and neglects of any Subcontractor and their agents, employees, servants and workmen, as fully as if they were the acts, defaults, omissions and neglects of the Contractor.

7.3.3 No consent to the appointment of any Subcontractor or to the terms of any Subcontract by NATRAX or NATRAX Representative shall imply in any way that a Subcontractor has been nominated by NATRAX, nor will it diminish in any way the Contractor's responsibility and liability for the acts, defaults, omissions and neglects of that Subcontractor

7.3.4 Without prejudice to the foregoing, the Contractor shall, on written notice from NATRAX Representative, terminate the employment of any Subcontractor whose acts or omissions, in the reasonable opinion of NATRAX Representative, are putting or shall put, the Contractor in breach of its obligations under the Contract and/or are causing or shall cause a Material Adverse Effect upon the design (to the extent required under the Contract) and Execution of the Works.

7.3.5 Nothing contained in the Contract shall render NATRAX in any way liable to any Subcontractor and the Contractor shall indemnify and keep indemnified NATRAX against all and any liabilities to, and costs, claims and demands of whatsoever nature by any Subcontractor.

7.4 Subcontract Terms

The Contractor shall procure that:

7.4.1 every Subcontractor has knowledge of those terms of the Contract (other than the Contractor's prices and rates) which are relevant to the Subcontractor and provisions in the Contract relating to confidentiality and each Subcontract entered into by the Contractor shall be let on such terms and conditions as are reasonably necessary for the Contractor to ensure compliance with its obligations under the Contract insofar as they relate to the subject matter of the Subcontract;

7.4.2 included in each Subcontract are, inter alia, terms expressly providing:

(i) for deemed knowledge of the terms of the Contract and of the Technical Conditions of the Contract

(ii) that the Subcontractor shall observe, perform and comply with the terms and conditions of the Contract (whether or not the Contract expressly requires the Contractor to obtain the Subcontractor's compliance therewith) insofar as they relate to the Subcontractor or that part of the Works (including, without limiting the generality of the foregoing, any design, inspection, testing, insurance, quality and assurance control, safety requirements or environmental regulations thereof or relating thereto) and shall not commit any action or fail to perform any action within the scope of its Subcontract which puts or shall put the Contractor in breach of its obligations under the Contract or which causes or shall cause a Material Adverse Effect upon the design (to the extent required under the Contract) and Execution of the Works;

(iii) that the Subcontractor provides like warranties as given by the Contractor to NATRAX;

(iv) that the Subcontractor provides like indemnities as given by the Contractor to NATRAX;

(v) that to the extent the Subcontractor is to carry out any design, requiring the Subcontractor to maintain professional indemnity insurance upon customary and usual terms and conditions prevailing for the time in the insurance market and with reputable insurers and with a limit of indemnity which is commensurate with the design which the Subcontractor is to undertake for any one occurrence or series of occurrences arising out of any one event in respect of any negligence, omission or default in the design of the Subcontract;

(vi) that where the Subcontract includes the undertaking of fabrication work and work of a similar nature, the Subcontractor warrants that it has reviewed the drawings

provided by the Contractor and that such drawings will be suitable for the fabrication work proposed;

(vii) that the Contractor is able to fully comply with its obligations **Clause** 7.3 **[**Responsibility**]**;

(viii) that NATRAX and the NATRAX Representative is able to enter upon and remain in or about the site upon which the Subcontractor is undertaking any subcontracted work;

(ix) the Subcontractor is able to provide to NATRAX rights to Intellectual Property relevant to the Subcontract; and

(xi) that upon Termination or repudiation or abandonment of the Contract by the Contractor, if so directed by the NATRAX Representative, the Subcontractor undertakes to provide to NATRAX all designs, documents, materials and other things intended for incorporation in the Works.

7.5 Subcontract Management

7.5.1 The Contractor shall prepare and update a subcontract management plan regularly throughout the duration of the Contract to reflect the latest position of the Contractor's intentions and actions with regard to the subcontracting of the Works.

7.5.2 The Contractor shall within **[**15 (fifteen)**]** days of the Notice to Proceed, submit to the NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** a subcontract management plan which shall contain the following:

(i) a proposed procurement strategy comprising a list of the proposed Subcontract packages and the contractual arrangements for each Subcontract package;

(ii) a proposed procurement programme indicating the dates for tender invitation, tender return and Subcontract award;

(iii) a list of proposed provisions to ensure the requirements of the Contract are reflected in the Subcontracts;

(iv) details of the lines of communication between the Contractor and the Subcontractors;

(v) details of planned briefing sessions and meetings with each Subcontractor and regular meetings with the Subcontractors' senior off-site management to review performance and take corrective actions;

(vi) a Subcontract interface schedule describing details at the interfaces between individual Subcontractors and between Subcontractors and the Contractor to ensure that there are no gaps with regard to the allocation of work and risk;

(vii) a management plan for any key elements of resources to be provided by the Contractor to ensure an adequate and timely flow of resources to the Subcontractors;

(viii) procedures for programme control, quality control, safety control and environmental control;

(ix) a schedule of all Changes ordered by the NATRAX Representative under the Contract showing the actions taken by the Contractor to ensure proper implementation of Changes through the relevant Subcontractors;

(x) a plan providing a means for auditing Subcontractors' receipt of payments from the Contractor and payment of wages by the Subcontractors to their workmen; and

(xi) the Contractor's approach to resolving problems and difficulties between the Contractor and individual Subcontractors and the Contractor's approach to resolving problems and difficulties between the individual Subcontractors.

Within [14 (fourteen)] days after entering into a Subcontract, the Contractor shall update and submit the subcontract management plan to the NATRAX Representative.

7.6 Cancellation of Subcontracts

No subcontract shall bind or purport to bind NATRAX and the Contractor shall ensure that each such subcontract shall contain provisions (a) permitting assignment thereof to NATRAX upon NATRAX's written request, and (b) the right of the Contractor to unilaterally cancel all or a portion of such subcontract which right will be exercised by Contractor if requested by NATRAX.

8. SUFFICIENCY OF THE CONTRACT SUM

The Contractor shall be deemed to have satisfied itself before entering into the Contract as to the correctness and sufficiency of the Contract Sum and of the rates and prices specified, and have based the Contract Sum on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters. The Contract Sum will not be adjusted save as expressly provided in the Contract, and includes any and all direct, indirect and ancillary charges and costs of whatsoever nature, all profit, all license, royalty and other fees, and consumable materials to be provided hereunder and Taxes, duties, tariffs, fees, penalties, levies, insurance premiums, including all Contractor's equipment and licence fees and other charges relating to or arising out of the Contract and the Execution of the Works including its obligations in relation to the Related Works save as expressly provided for in the Contract and in each case, all deductions and withholdings therefor.

9. COMMENCEMENT OF THE WORKS

9.1 The Programme

9.1.1 The Contractor and NATRAX hereby acknowledge and agree that the expeditious preparation and implementation of a programme is of paramount importance in ensuring the proper and effective monitoring and management of the progress of the Works and the co-ordination of the same with any Related Works. Accordingly, the Contractor agrees to co-operate fully with NATRAX in adopting the procedure set out herein so as to ensure that the Programme is submitted as specified in the clauses below.

9.1.2 The Contractor shall submit an Initial Programme to NATRAX Representative within **[**fifteen (15)**]** days of the Notice to Proceed. The Initial Programme shall show the order in which the Contractor proposes to carry out the Works in the first **[**90 (ninety)**]** days following the Notice to Proceed. The Initial Programme shall have regard to, and be consistent with the Time for Completion. The Initial Programme shall be maintained in a "rolling format" updated and submitted on a monthly basis. Every quarter, the Initial Programme shall show progress for the **[**60 (sixty)**]** days immediately prior to the data date and proposed works for the **[**90 (ninety) days**]** following the data date (the "data date" being the date on which progress is updated on the programme).

9.1.3 (i) The Contractor shall submit a further detailed programme within **[**15 (fifteen)**]** days of the Notice to Proceed in addition to the programme submitted in accordance with **Clause** 9.1.1 **[**The Programme**]**. The said programme shall be submitted in accordance with **Clause** 6.3 **[**Contractor's Documents**]** and shall incorporate the Initial Programme and shall be in a form acceptable to NATRAX Representative. The said programme shall be compiled and shall show or include, but not be limited to, the following:

(a) the Time for Completion of the Works;

(b) the order in which the Contractor intends to design and Execute the Works;

(c) define in detail all of the Contractor's work on the Project Site;

(d) the periods for submission of any Contractor's Documents to NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** together with the periods for comment to be given by NATRAX or any third parties;

(e) the Contractor's proposals for complying with its obligations under the Contract in relation to Related Works (including the incorporation within the Programme, of the requirements of any person whose co-operation is needed for the successful Completion of the Works);

(f) details of any Temporary Works which, in the Contractor's opinion, are critical to the satisfactory Completion of the Works.

(g) the critical path(s) which shall be printed in colour unless otherwise agreed with the NATRAX Representative; and

(h) a unique identification/reference number and revision status, indicating clearly the changes incorporated therein.

(ii) Provided always that the programme submitted in accordance with **Clause** 9.1.3 (i) **[**The Programme**]** shall be compiled to satisfy, without limitation, the following requirements:

(a) each activity shown on the programme shall be defined in periods no longer than **[**30 (thirty)**]** days duration;

(b) the programme shall clearly identify all Milestone Events; and

(c) the programme shall contain a sub-network relating to all Related Works which shall clearly identify all interfacing activities and in particular those activities requiring an interface and coordination with Related Works Contractors.

(d) there shall be no artificial constraints on any dates and it should be possible to clearly identify the logic links to these dates;

(e) the Contractor shall incorporate activity codes and/or a work breakdown structure in the programme such that activities can be sorted and/or filtered by any or all of the following:

(1) the whole of the Works;

(2) individual sections and interface areas;

(3) the various floor levels of the Works;

(4) the various areas within the Works as agreed with the NATRAX Representative;

(5) the various areas within the Project Site and the project site of the Related works Contractor;

(6) various disciplines, including, the design and installation of civil and structural works, electrical and mechanical works (further broken down into electrical, mechanical, plumbing and drainage and fire stations) finishes (further broken down into screeding, flooring and floor finishes, false ceilings, raised floors, painting and decoration) and specialist systems;

(f) it shall be possible to clearly identify each phase of each activity or group of related activities from the design, procurement, , execution and testing stages.

(iii) The Contractor shall with the said detailed programme, submit a supporting method statement and resource schedule, consistent with similar schedules submitted with the Tender, which shall include a programme narrative giving a general description of the methods which the Contractor intends to adopt in the Execution of the Works and details and measures that the Contractor has adopted to ensure its obligations under the Contract are fulfilled.

9.1.4 The Contractor and NATRAX shall ensure that the detailed programme submitted in accordance with **Clause** 9.1.3 **[**The Programme**]** shall be achievable and in compliance with the requirements of the Contract and that it shall permit effective monitoring of progress.

9.1.5 The Programme shall be the detailed programme submitted in accordance with **Clause** 9.1.3 **[**The Programme**]** (including any programme re-submitted by the Contractor) and marked with "No Comments" or "comments made" in accordance with **Clause** 6.3 **[**Contractor's Documents**]** provided, in the latter case, that the comments are fully addressed by the Contractor.

9.1.6 The Contractor shall design (to the extent required under the Contract) and Execute the Works regularly and diligently and in accordance with the Programme.

9.1.7 If, at any time, the NATRAX Representative gives notice to the Contractor that the Programme fails (to the extent stated) to comply with the Contract or fails to be consistent with actual progress of the Works and the Contractor's stated intentions or will so fail, the Contractor shall submit to the NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** a revised Programme showing the modifications to the Programme as may be necessary to reflect actual progress of the Works and so as to ensure Completion by the Time for Completion and to take account of any extensions of time granted in accordance with the Contract and any measures required to be taken by the Contractor to expedite the Works. The Contractor shall with the revised Programme in addition submit to the NATRAX's Representative revisions to those documents referred to at**Clause** 9.1.3 **[**The Programme**]**.

9.1.8 Throughout the progress of the Works, the Contractor shall submit to the NATRAX Representative monthly updates of the Programme and any documents which are included in or form part of the Programme.

9.1.9 Following the Notice to Proceed and throughout the progress of the Works, the Contractor shall submit to NATRAX Representative in a format stipulated by NATRAX Representative, a detailed monthly report on the progress of the Works.

9.1.10 The Contractor hereby acknowledges and accepts that any programme, monthly report, schedule and plan to be submitted by it in accordance with this **Clause** 9 **[**The Programme**]** shall not constitute a notice which it is required to give under any provision of the Contract.

9.1.11 The NATRAX Representative's comment or failure to comment upon any document submitted in accordance with this **Clause** 9.1 **[**The Programme**]** signifies merely the understanding of the proposed order, sequence and method of working and shall not:

(i) relieve the Contractor of any of its obligations under the Contract; nor

(ii) create any obligation or liability on the part of NATRAX; nor

(iii) establish the Programme or any programme as part of the Contract.

9.1.12 In addition to the reports required under this **Clause** 9.1 **[**The Programme**]** the Contractor shall supply to the NATRAX Representative at such times as the NATRAX Representative may direct during the progress of the Works such further or special written particulars and information as are required by the NATRAX Representative to enable proper and detailed progress records to be maintained in respect of the Works.

9.1.13 Subject to the foregoing, unless expressly stipulated or described in the Contract, the choice of methods of working, construction methods and Temporary Works, programming the Works and deployment of the Contractor's Equipment and employees on the Project Site shall be the sole responsibility of the Contractor.

9.1.14 It shall be a condition precedent to any payment under the Contract that the Contractor is able, pursuant to **Clause** 6.3 **[**Contractor's Documents**]** to proceed on the basis of the programme submitted pursuant to **Clause** 9.1.3 (i) **[**The Programme**]** and monthly updates of the same.

9.2 "As built" drawings

9.2.1 The Contractor shall maintain a complete set of all Contractor's Documents used in the design and Execution of the Works.

9.2.2 The Contractor shall at the times, periods and stages required by Technical Specifications and Drawings or as directed by NATRAX Representative, submit to NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** 2 (two) complete sets of the "as built" drawings of such part of the Permanent Works in the form specified in Technical Specifications and Drawings and other information in relation thereto as may be required by NATRAX Representative.

9.3 Quality Assurance Plan

9.3.1 The Contractor shall, in a form and content acceptable to NATRAX Representative, submit within **[**30 (thirty)**]** days of the Notice to Proceed, a Quality Assurance Plan to NATRAX Representative. The Quality Assurance Plan shall incorporate the Testing Plans.

9.3.2 The Quality Assurance Plan shall be in accordance with Technical Specifications and Drawings.

9.3.3 The Contractor shall from time to time as reasonably required by NATRAX Representative, submit amendments, revisions, supplements of the Quality Assurance Plan to NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]**.

9.3.4 The Contractor shall at its own cost provide all access, assistance and facilities to enable NATRAX Representative to verify the implementation of the Quality Assurance Plan, other

than the costs associated with travelling, lodging and boarding of NATRAX Representative or its assistant(s)/ nominee(s).

10. Review meetings

10.1 Within the first week of every month from the issue of the Notice to Proceed during the Execution Period or at such intervals as NATRAX Representative may direct, the Contractor shall meet with NATRAX Representative and any of the Relevant Authority and any Related Works Contractors and any of their respective advisers as will be reasonably entitled to attend, to review the development of the design and Execution of the Works ("Review Meetings").

10.2 The NATRAX Representative shall, **[**7 (seven)**]** days prior to the date of a Review Meeting circulate an agenda (as agreed with NATRAX Representative) to all those attending and copies of any Contractor's Documents or drawings, data or information of any kind to be presented at such meeting. All Review Meetings shall be chaired by NATRAX Representative.

10.3 The Contractor shall take reasonable cognisance of any comments or objections raised at any Review Meeting by NATRAX Representative, NATRAX, any Relevant Authority, any Related Works Contractors and any of their respective advisers.

10.4 Following each Review Meeting, NATRAX will prepare and circulate to those attending any such meeting a report listing the Contractor's Documents or drawings, data or information of any kind reviewed and a full minute with particular emphasis on any other design information discussed, any comments made and agreements reached.

10.5 Any comments or objections raised by the NATRAX Representative at any Review Meeting shall be without prejudice to a review of any Contractor's Documents by the NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]**.

11. HEALTH, SAFETY, SECURITY AND ENVIRONMENT

11.1 Importance of Safety

11.1.1 The Contractor is under a general obligation to place the highest importance on the health, safety, security and environment aspects during the Execution of the Works. The Contractor shall establish a Health, Safety, Security and Environment Plan.

11.1.2 The Contractor shall be responsible for all Health, Safety, Security and Environment matters related to the Works and shall submit regular safety reports to NATRAX Representative in accordance with the requirements of NATRAX Representative under this Contract and all relevant Statutory Authorities and as required by Applicable Laws.

11.2 Contractor's Health, Safety, Security and Environment Plan

11.2.1 The Contractor is under a general obligation to place the highest importance on safety during the Execution of the Works. The Contractor shall establish a safety programme to ensure that all activities required to undertake and to complete the design and Execution

of the Works in accordance with the Contract are carried out in a safe manner and comply with Applicable Laws.

11.2.2 The Contractor shall submit regular safety reports to the NATRAX Representative in accordance with the requirements of the NATRAX Representative and all relevant Statutory Authorities and as required by Applicable Laws.

11.2.3 The Contractor's Health, Safety, Security and Environment Plan shall specify in detail:

(i) the Contractor's approach to maintaining the safest possible work environment and ensuring protection against accident and injury to workers and other persons and protection of the Works, the Contractor's Equipment and other property from damage, loss or destruction and shall further include any requirements of the plan as set out in Technical Specifications and Drawings;

(ii) the methods and procedures to be employed by the Contractor to ensure compliance with its obligations specified in **Clause** 11.3 **[**Environment Compliances**]** and shall address all relevant aspects of the Execution of the Works and the environmental management plan.

11.2.4 The Contractor shall from time to time as reasonably required by NATRAX Representative, submit amendments, revisions, supplements of the Contractor's Health, Safety, Security and Environment Plan to NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]**.

11.2.5 The Contractor shall provide all access, assistance and facilities to enable NATRAX Representative to carry out surveillance visits both on and off the Project Site to verify that the Contractor's Health, Safety, Security and Environment Plan is being implemented.

11.3 Environmental Compliance

11.3.1 The Contractor shall comply with all environmental requirements stipulated in Technical Specifications and Drawings and with all Applicable Laws and regulations having application to the Project Facility, including but not limited to standards for noise and vibration levels and airborne and waterborne pollutants and the environmental management plan.

11.3.2 Without prejudice to the foregoing the Contractor shall carry out the Works in a manner:

(i) which prevents unreasonable silting and erosion or pollution of or unauthorised discharges into any river, stream, waterway, drain, watercourse and in a manner which will not have any adverse effect on the Project Facility; and

(ii) so as not to cause or knowingly permit contamination of any land, either on or off any part of the Project Site, by any deliberate or accidental disposal, including leakage or spillage of any effluent, pollutant, contaminant, flammable, corrosive, radioactive or otherwise hazardous substance and waste.

11.3.3 In the event of the occurrence or suspected occurrence of an incident caused by the Execution of the Works or otherwise by the Contractor which could give rise at any time to any environmental damage or damage to the Works or the Project Facility, the Contractor shall:

(i) immediately notify NATRAX Representative of such incident and shall comply with any instruction of NATRAX Representative relating to the incident;

(ii) take and complete promptly whatever action is required to prevent, mitigate or remedy any such environmental damage including any actions required under Applicable Laws in such situations; and

(iii) investigate the incident, and following such investigation, report to NATRAX Representative the details of the incident and the results of such incident.

11.3.4 The Contractor shall, promptly and diligently comply with any instruction issued by NATRAX Representative under this **Clause** 11.3 **[**Environmental Compliance**]**.

11.4 Fencing, lighting and guarding

11.4.1 The Contractor shall consult with any relevant Statutory Authority and shall take all reasonable and proper steps for protecting, securing, lighting and watching all places on or about the Works and the Project Site which may be dangerous to any person on the Project Site or to any member of the public and maintain at its own cost all lights, guards, fencing and watching when and where necessary or required by NATRAX Representative or by any relevant Statutory Authority for the protection of the Works or for the safety and convenience of all persons on the Project Site and members of the general public.

11.4.2 The Contractor shall take such measures in accordance with Technical Specifications and Drawings and Good Industry Practice to prevent access onto the Project Site of any persons or creatures not entitled to be there.

11.5 Major laws

Some of the major laws that are applicable as regards to Safety, Security and Protection of the Environment and the Contractor shall abide are given below:

The Water (Prevention and Control of Pollution) Act. 1974

This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. Pollution means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid gaseous or sold substance into water (whether directly or indirectly) as may, or is likely to create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act. 1981

This provides for prevention, control and abatement of air pollution 'Air Pollution' means the presence in the atmosphere of any 'air pollutant' which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act. 1986

This provides for the protection and improvement of environment and for matters connected therewith and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act. 1991

This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

12. ELECTRICITY, WATER

12.1 General arrangements

12.1.1 The Contractor shall be responsible for making all its arrangements, for and paying all charges in connection with the supply and consumption of electricity and water and the disposal of sewage and other waste as may be necessary for the design and Execution of the Works including the construction, erection, testing and commission of the Project Facility at a convenient point within the Project Site which enables the Contractor to carry on its obligations under this Contract without any hindrance. The Contractor shall be responsible for laying a distribution network according to the Contractor's requirement and shall bear any charges for the utilisation of water and electricity.

12.1.2 Connection of any part of the Permanent Works with utility services such as electricity, water and sewerage services shall be made in accordance with Technical Specifications and Drawings or as NATRAX Representative may reasonably direct. Without prejudice to the generality of the foregoing and without prejudice to its obligations under **Clause** 13 **[**Related Works**]** the Contractor shall during the Execution Period:

(i) review with NATRAX Representative and the Related Works Contractors and other Statutory Authorities the design of the power, water and sewage, gas, telephone, optical fibres interconnections and the construction schedule therefore and shall design, construct and commission such power, water and sewage interconnections to achieve complete compatibility with the design of the power and water interconnections and related equipment of the Related Works Contractor; and

(ii) liaise, co-ordinate and programme with the Related Works Contractor to avoid delays in connecting the Permanent Works to the permanent power and water connections and supply for the Project Facility.

(iii) liaise, co-ordinate and programme with the Related Works Contractor to avoid delays in connecting the Permanent Works to the permanent power connections and supply for the Project facility;

13. RELATED WORKS

13.1 Acknowledgement

The Contractor acknowledges that Related Works shall be performed and that it is of paramount importance that the design and Execution of the Works are fully and completely co-ordinated with the Related Works in view of their concurrent and sequential nature and that such coordination is of the utmost importance to the successful integration of the Works with the Related Works and to the timely completion of the Project Facility. Without prejudice to the foregoing or to **Clause** 1.5 **[**Background Information and the manner in which discrepancies are resolved**]** the Contractor warrants that it has conducted its own analysis and review of the Background Information in respect of the design and execution of Related Works and that it has satisfied itself that there are no ambiguities, discrepancies, inconsistencies, divergence, design or construction impracticalities or omissions from, with and between the same and the documents comprising the Contract.

13.2 Related Works' responsibilities

Accordingly, the Contractor shall at its own cost and expense, at all times and otherwise in accordance with the reasonable requirements and directions of the NATRAX Representative:

13.2.1 take all reasonable steps to co-ordinate and to integrate the design and Execution of the Works, including the work of Subcontractors, with the activities of the Related Works Contractors, and in particular to liaise, consult and co-operate with all authorised parties responsible for the Related Works including the preparation of joint programmes, method statements, co-ordination drawings, specifications; and

13.2.2 convene such co-ordination meetings as are necessary to plan, review and determine co-ordinated activities for the management of interfaces between the Works and the Related Works; and

13.2.3 plan, programme, and schedule the Works so as to minimise any interference with or hindrance to the Related Works; and

13.2.4 at all times refrain from carrying out any operation on the Project Site in a manner which is likely to cause damage or inconvenience to the execution of the Related Works; where such damage or inconvenience is the unavoidable consequence of operations properly to be carried out on the Project Site, the Contractor shall not carry out such operations without first giving reasonable advance notice in writing thereof to the NATRAX Representative (with a copy to those responsible for carrying out the Related Works reasonably likely to

be affected thereby) with a view to reaching an agreed procedure to prevent or minimise any such damage or inconvenience; and

13.2.5 to take at all times every necessary step to protect the Related Works from accidental damage caused by the Works; and

13.2.6 at all times co-operate with NATRAX and any Related Works Contractors so as to promote and foster a co-ordinated and integrated approach to the Works and the Related Works. The Contractor shall co-ordinate its activities with Related Works Contractors so as to prevent, as far as possible, the performance of work by such Related Works Contractors from impeding the performance of the Contractor or unreasonably disturbing the free movement of traffic around, on or in the vicinity of the Project Site; and

13.2.7 comply with all obligations as to interfacing the Works with the Related Works as are detailed in Technical Specifications and Drawings; and

13.2.8 advise NATRAX and Related Works Contractors if it is anticipated that the programme of any Related Works Contractor will prevent the Contractor from designing and Executing the Works in accordance with the Contract and, if so, shall make recommendations or suggestions as to how the programme of the Works may be adjusted without affecting the Related Works, to enable the Contractor to meet its obligations hereunder; and

13.2.9 advise the Contractor if any plans, designs, specifications and drawings of the Related Works Contractors supplied by NATRAX are in any way incompatible or inconsistent with or otherwise detrimental to the Works. In the case of such established incompatibility, inconsistency or detriment NATRAX shall supply the Contractor with full details of the same and make appropriate recommendations as to how the incompatibility, inconsistency or detriment may be remedied; and

13.2.10 monitor the coordination and integration of the Works with the Related Works and advise NATRAX in writing as and when it becomes apparent that the design or Execution of the Works is likely to be the subject of delay and/or disruption and recommend reasonable proposals to reduce or prevent such delay and/or disruption.

13.3 Co-ordination meetings

Without prejudice to the Contractor's obligations under **Clause** 13.2 **[**Related Works' responsibilities**]** the NATRAX Representative shall convene regular co-ordination meetings with the Contractor and Related Works Contractors in order to:

13.3.1 plan, review and determine co-ordinated activities for the management of interfaces between the Works and the Related Works, including those proposals of the Contractor submitted pursuant to **Clause** 9.1 **[**The Programme**]**; and

13.3.2 discuss and resolve conflicts in the order and sequence of the Works and Related Works in order to effect reasonable co-ordination and integration of the Execution of the Works with the execution of the Related Works; and

13.3.3 advise the Contractor of further developments in respect of the Project Facility including where appropriate, details of Related Works.

13.4 Allowance in the Contract Sum

The Contractor shall be deemed to have made adequate allowance in the Contract Sum and in the Programme for compliance with its obligations under this **Clause** 13 **[**Related Works**]** and for any interference with the progress of the design (to the extent required under the Contract) and Execution of the Works caused by Related Works and for all expenses arising in relation to provision of access and co-operation for the purposes of this **Clause** 13 **[**Related Works**]**.

13.5 Failure to co-ordinate

In the event that the design (to the extent required under the Contract) and the Execution of the Works and the design and execution of the Related Works are not being co-ordinated and integrated to the reasonable satisfaction of NATRAX, NATRAX may issue such instructions as are necessary including, but not limited to:

13.5.1 suspending the progress of the design or Execution of the Works or any part thereof; and/or

13.5.2 changing the Works including the omission of work from the Contract and its execution by others.

For the avoidance of doubt, where NATRAX acting reasonably, determines that an instruction under this **Clause** 13.5 **[**Failure to Co-ordinate**]** is required as a result of a breach by the Contractor of its obligations under this **Clause** 13 **[**Related Works**]** the Contractor shall not be entitled to any payment whatsoever in respect of any such instruction or to any extension of time in respect thereof and the costs to NATRAX of such instruction including the cost of any such suspension, or removal and execution by others shall, without prejudice to NATRAX's other rights under the Contract, be deducted from the Contract Sum.

13.6 The NATRAX Representative's assistance

13.6.1 In the event that the design and Execution of the Works and the design (if any) and execution of any Related Works are unable to be co-ordinated and integrated in accordance with this **Clause** 13 **[**Related Works**]** as a result of circumstances beyond the control of the Contractor, the Contractor may, along with the submission of a report, request the NATRAX Representative:

(i) to issue within **[**10 (ten)**]** days of the Contractor's request, such instructions as the NATRAX Representative may consider necessary to enable the Contractor to comply with its obligations under this **Clause** 13 **[**Related Works**]**; and/or

(ii) to use its reasonable endeavours to assist in procuring the removal of the hindrance or impedance preventing the Contractor from complying with its obligations under this **Clause** 13 **[**Related Works**]**.

13.7 Contractor to bear costs

The Contractor shall bear all costs and expenses associated with any Change or remedied work rendered necessary to the design (to the extent required under the Contract) or Execution of the Works or the work of any Related Works Contractor as a result of any failure on the Contractor's part to comply with the provisions of this **Clause** 13 **[**Related Works**]**. Subject always to this **Clause** 13 **[**Related Works**]**, if in the opinion of NATRAX Representative any cost is or is likely to be incurred as a result partially of a failure by the Contractor and partially as a result of a failure by a Related Works Contractor, then in the event that the Contractor and the Related Works Contractor are unable to agree on the apportionment of such costs between them, the NATRAX Representative may instruct the Contractor to make a Change or carry out any repair it deems necessary and, notwithstanding the provisions of **Clause** 23 **[**Change**]** in valuing such Change or repair, it shall be entitled to make what it, in its absolute discretion considers a fair reduction, in any payment to the Contractor to reflect its assessment of the Contractor's responsibility for the necessity to make such Change or repair as a result of the Contractor's failure to comply with the requirements of this **Clause** 13 **[**Related Works**]**.

13.8 Contractor's obligations

Without limiting its obligations under this **Clause** 13 **[**Related Works**]** or **Clause** 6 **[**The Contractor**]**, the Contractor shall exercise due care and diligence in the design and Execution of the Works where such design and Execution of the Works affects or is likely to affect the Related Works and shall bear all costs, expenses, damages and losses suffered by any Related Works Contractor as a result of its failure to comply with such obligations.

13.9 Contractor's indemnities

The Contractor shall indemnify and keep indemnified NATRAX against all claims, proceedings, damages, costs, losses, charges and expenses of any nature whatsoever arising from the Contractor's failure to comply with its obligations under this **Clause** 13 **[**Related Works**]**.

13.10 Temporary Works

The Contractor shall be fully responsible for the cost of all delays to the Works or any part where such delays have been occasioned to or in connection with Temporary Works by the defaults or omissions of any Related Works Contractor and it shall not be entitled to any extension of time or additional payment in respect thereof. Such responsibility shall in no way be in derogation of the Contractor's other obligations under this **Clause** 13 **[**Related Works**]**.

14. DELIVERY TO THE PROJECT SITE

14.1 Delivery to the Project Site

14.1.1 The Contractor shall at its own risk and expense, be fully responsible for the proper packing, marking, loading, transportation, customs clearance, delivery to the Project Site, unloading and proper storage and security of all Contractor's Equipment, Temporary

Works and Materials required for the purposes of the Contract and for or in connection with the Works and for making all arrangements in connection therewith and for the reception thereof on the Project Site.

14.1.2 When marking any Contractor's Equipment, Temporary Works and Materials, the Contractor shall be responsible for ensuring that all such equipment and any part thereof and their transportation containers are properly marked and consigned.

14.2 Packing List

A packing list itemising the contents of each case shall be enclosed in each package. A copy of the packing list, together with despatch details shall be provided forthwith upon despatch to the NATRAX Representative. The Contractor shall provide all attendance, handling and transport up to and including off-loading into the appropriate Project Site storage area.

14.3 Importation

The Contractor shall be responsible at its own cost for obtaining any Applicable Clearances necessary for the export of Contractor's Equipment, Temporary Works and Materials from the country of origin and any Applicable Clearances necessary for their importation into India and the re-export from India of Contractor's Equipment as may be the case.

14.4 Customs Clearance

NATRAX will use its reasonable endeavours in assisting the Contractor, where required, in obtaining the customs clearance of any Contractor's Equipment, Temporary Works and any Materials required for the Works.

14.5 Documents

Upon despatch of each shipment of significant items of Materials and Contractor's Equipment, the Contractor shall notify the NATRAX Representative by facsimile or email of the description of the Materials and the Contractor's Equipment and the point and means of the despatch and the estimated time and point of delivery at the Project Site and the Contractor shall furnish NATRAX with all relevant transportation, insurance and testing documentation in respect of such equipment, including without limitation:

14.5.1 ocean bills of lading;

14.5.2 commercial invoices;

14.5.3 packing lists;

14.5.4 insurance policy certificate;

14.5.5 certificate of origin;

14.5.6 inspection and test certificate;

14.5.7 customs declaration details.

The ocean bill of lading must be a full set of "clean on-board" bill of lading.

15. Contractor's EQUIPMENT AND OTHER PROVISIONS

15.1 Contractor's Equipment and Temporary Works

15.1.1 All Contractor's Equipment and Temporary Works provided by the Contractor or its Subcontractors shall, when brought on to the Project Site, be deemed to become the property of NATRAX in the event of Termination of Works on account of default of the Contractor and to be exclusively intended for the design and Execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Project Site to another, without the consent of the NATRAX Representative. Provided that such consent shall not be required for vehicles engaged in transporting any staff, labour, Contractor's Equipment and Temporary Works to or from the Project Site.

15.1.2 The Contractor shall upon written request by the NATRAX Representative produce to the NATRAX Representative all documents evidencing title to or the contractual basis of the Contractor's right to use any item of Contractor's Equipment. In the event of failure to comply with such a request within **[**7 (seven)**]** days, without prejudice to any other rights or remedies available to NATRAX, NATRAX may withhold any payments otherwise due to the Contractor in accordance with the Contract.

15.2 NATRAX not liable for damage

NATRAX shall not at any time be liable for the loss of or damage to any of the Contractor's Equipment and Temporary Works.

15.3 Conditions of hire of Contractor's Equipment

15.3.1 With a view to securing, in the event of Termination, the continued availability, for the purpose of Executing the Works, of any hired Contractor's Equipment, the Contractor shall not bring on to the Site any hired Contractor's Equipment unless there is an agreement for the hire thereof (which agreement shall be deemed not to include an agreement for hire purchase) which contains a provision that the owner will, on request in writing made by NATRAX within **[**7 (seven)**]** days after the Termination Date and on NATRAX undertaking to pay all hire charges in respect thereof from such date, hire such Contractor's Equipment to NATRAX on the same terms in all respects as the same was hired to the Contractor, save that NATRAX shall be entitled to permit the use thereof by any other contractor employed by it on occasion of the Contractor's termination.

15.3.2 The Contractor shall upon request made by the NATRAX Representative at any time in relation to any item of hired Contractor's Equipment immediately notify to the NATRAX Representative in writing the name and address of the owner thereof and shall certify that the contract for the hire thereof contains a provision in accordance with the requirements of Clause 15.3.1 **[**Conditions of hire of Contractor's Equipment**]**. The Contractor shall also upon request as aforesaid give a like notification (but without certification) in regard to any Contractor's Equipment held under a contract of hire purchase thereof.

15.3.4 In the event of NATRAX entering into any agreement for the hire of Contractor's Equipment pursuant to Clause 15.3.1 **[**Conditions of hire of Contractor's Equipment**]** all sums properly paid by NATRAX under the provisions of any such agreement and all costs incurred by it (including stamp duties) in entering into such agreement shall be deemed to be part of the costs of Executing the Works.

15.4 Hire purchase payments by NATRAX

NATRAX, shall in order to avoid seizure by the owner of any Contractor's Equipment held under a contract of hire purchase thereof, be entitled to pay to such owner the amount of any overdue instalment or other sum payable under any contract for hire purchase and in the event of its doing so any amount so paid by NATRAX shall be a debt due from the Contractor to NATRAX and may be deducted by NATRAX from any monies due or that may become due to the Contractor under the Contract or may otherwise be recovered by NATRAX from the Contractor.

15.5 Re-export of Contractor's Equipment

In respect of any Contractor's Equipment which the Contractor imports for the purpose of the Execution of the Works, the NATRAX Representative will use its reasonable endeavours to assist the Contractor if so requested and to the extent it is able to do so in procuring any Applicable Clearances for the re-export of such Contractor's Equipment by the Contractor upon the removal thereof as aforesaid.

15.6 Approval not implied

The operation of this Clause 15 **[**Contractor's Equipment and Temporary Works**]** shall not be deemed to imply any approval by the NATRAX Representative of the Contractor's Equipment and/or the Temporary Works or any part thereof, or other matters referred to therein nor shall it prevent the NATRAX Representative's right to order the removal of any such Contractor's Equipment and/or Temporary Works or part thereof, at any time.

15.7 Incorporation of Clause into Subcontracts

The Contractor shall, where entering into any Key Subcontract or Major Subcontract for the Execution of any part of the Works, incorporate in such Subcontract (by reference or otherwise) the provisions of this Clause 15 **[**Contractor's Equipment and Temporary Works**]** in relation to plant, equipment and Materials and tools and Temporary Works brought on to the Project Site by the Subcontractor.

15.8 Re-vesting and removal of Contractor's Equipment

Upon removal of any Contractor's Equipment and Temporary Works which have been deemed to become the property of NATRAX under Clause 15.1 **[**Contractor's Equipment and Temporary Works**]** with the NATRAX Representative's consent, as aforesaid, the property therein shall be deemed to re-vest in the Contractor and upon Completion of the Works the property in the remainder of such Contractor's Equipment and Temporary Works as aforesaid shall, subject to the termination provisions of the Contract, re-vest in the Contractor who shall remove the same. If the Contractor shall fail to remove any Contractor's Equipment or Temporary Works as aforesaid within such reasonable time

after Completion of the Works as may be allowed by the NATRAX Representative or should fail to comply with its obligations under Clause 15.3.1 [Upon Termination], NATRAX may:

15.8.1 sell any such Contractor's Equipment and Temporary Works; or

15.8.2 return any hired Contractor's Equipment at the Contractor's expense to the person, firm or company from whom such Contractor's Equipment was hired by the Contractor

and after deducting from any proceeds of sale the cost, charges and expenses of and in connection with such sale and in connection with such return as aforesaid, NATRAX shall, subject to any right of set-off, pay the balance (if any) to the Contractor but to the extent that the proceeds of any sale or return are insufficient to meet all such costs, charges and expenses the excess shall be a debt due from the Contractor to NATRAX and shall be deductible or recoverable by NATRAX accordingly as aforesaid.

16. LABOUR AND CONTRACTOR'S PERSONNEL

16.1 Labour Compliances

16.1.1 In the employment of labour for the Execution of the Works the Contractor shall comply and shall require its Subcontractors to comply without limitation, with all requirements of any Applicable Law relating to the employment of workmen or any subsequent modification or re-enactment thereof including but not limited to, matters relating to timely payment of wages and allowances, payment of minimum wages, payment of overtime, grant of leave, payment of workmen's compensation, working hours, safety, maternity benefits, holidays, framing of standing orders, disciplinary action against employees, payment of provident fund contributions, payment of gratuities and payment of bonuses.

16.1.2 The Contractor shall be responsible for making all arrangements for the payment, feeding, housing, health, safety, sanitation and transport of all labour. The Contractor shall be responsible for labour camps, preservation of peace, sanitary arrangements, infectious diseases, medical facilities at site, use of intoxicants, age limits of labour, observance of peace, etc.

16.1.3 Provision of labour camp

The Contractor, shall, at his own expense, make adequate arrangements for the housing, supply of drinking water, canteen and provision of latrines and urinals, for his staff and workmen employed on the Works, directly or through petty Contractors or sub-Contractors and for temporary creche (Bal-mandir) where 50 or more women are employed at a time. All camp sites shall be maintained in a clean and sanitary condition, by the Contractor, at his own cost.

16.1.4 Compliance with Rules for Employment of Labour

The Contractor shall comply with all laws, bylaws, rules and regulations, for the time being in force, pertaining to the employment of local or imported labour, and shall take all

necessary precautions to ensure and preserve the health and safety of all staff, employed or the Works directly or through petty Contractors or Sub-Contractors.

16.1.5 Preservation of Peace

The Contractor shall take requisite precautions, and use its best endeavors to prevent any riotous or unlawful behavior by or amongst his workmen, and others, employed on Works directly or through petty Contractors or assignees or Subcontractors and for preservation of peace and protection of the inhabitants and security of property in the neighborhood of Works. In the event of NATRAX requiring the maintenance of a Special Police Force at or in the vicinity of the Project Site, during the tenure of works, the expenses thereof shall be borne by the Contractor and if paid by NATRAX, shall be recoverable from the Contractor.

16.1.6 Sanitary Arrangements

The Contractor shall obey all sanitary rules, and carry out at his cost all sanitary measures that may from time to time be prescribed by the Local Medical Authority, and permit inspection of all sanitary arrangements at all times by the NATRAX Representative or the Medical staff of NATRAX and the staff of the local municipal or other authorities concerned. Should the Contractor fail to make adequate sanitary arrangements, these will be provided by NATRAX, and the cost thereof recovered from the Contractor.

16.1.7 Outbreak of infectious Diseases:

The Contractor shall maintain the Labour Camp in a sanitary condition taking all necessary precautions to detect the outbreak of infectious diseases. The Contractor shall provide them with suitable prophylactics for the prevention of malaria, gastroenteritis, typhoid and other water-borne diseases.

The Contractor shall remove from the Contractor's camp such labour and their families, who refuse protective inoculation and vaccination, when called upon to do so by the NATRAX Representative or the NATRAX Representative's representative on the advice of medical authority. Should Cholera, Plague or any other epidemic, contagious or infectious disease break out, the Contractor shall on its own burn the huts, beddings, clothes and other belongings of or used by the infected persons, and promptly erect new huts on healthy sites as required by the NATRAX Representative, within the time specified by the NATRAX Representative's requisition, failing which the same may be done by NATRAX and cost thereof recovered from the Contractor.

16.1.8 Medical Facilities at Site:

The Contractor shall, at its own cost, provide First Aid and medical facilities, at the Project Site as may be prescribed by the NATRAX Representative, on advice of Medical Authority in relation to the strength of the Contractor's staff and workmen employed on the Works, directly or through petty Contractors or Sub-Contractors.

16.1.9 Use of Intoxicants:

The sale of ardent spirits or other intoxicating drugs or beverages upon the Works, or in any of the buildings, encampments or tenements owned or occupied, by or within the control of the Contractor or any of his employees employed on the Works directly or through petty Contractors or sub-Contractors shall be forbidden, and the Contractor shall exercise its influence and authority to secure strict compliance with this condition. The Contractor shall also ensure that no labour or employee is permitted to work at the Project Site in an intoxicated state or under the influence of drugs.

16.2 Contractor to indemnify

The Contractor shall indemnify NATRAX against any claim for legal action arising out of the Applicable Laws due to the failure of non-compliance of the provisions of the Applicable Laws which arise out of or in connection with the employment of any labour for the Execution of the Works and penalty or any other amount levied by the authorities from NATRAX, shall be recoverable form the payments due to the Contractors or from the security deposit or both, as debt due and payable on demand.

16.3 Engagement of Labour

The Contractor shall make its own arrangements for the engagement of all labour, local and otherwise, skilled, semi-skilled and unskilled, as may be required for the proper and timely Execution of the Works and shall use all diligence in arranging for a sufficient and suitable supply of such labour but all such arrangements in India shall be in accordance with the general local usage and subject to the Applicable Laws.

16.4 Project Site records and returns

The Contractor shall maintain and keep at the Project Site wage books and time sheets showing the wages paid to and time worked by all labour employed by the Contractor and its Subcontractors in and about the Execution of the Works or any part thereof and all records, forms, declarations, registers, notices, and copies of filings made with labour authorities as are required to be maintained by the Contractor pursuant to the Applicable Laws and the Contractor shall produce such wages books, time sheets and records for inspection by NATRAX Representative or any representative of a Statutory Authority.

16.5. Contractor's Personnel

16.5.1 General

The Contractor shall at all times ensure that it has sufficient, suitable and qualified personnel at the Project Site and in sufficient number to undertake the responsibilities imposed upon the Contractor under the Contract and to provide full attention to the design and Execution of the Works.

16.5.2 The Contractor's Project Organisation Chart

16.5.2.1 The Contractor's Project Organisation Chart to be submitted by the Contractor to the NATRAX Representative in accordance with Clause 3.3.1 **[**Following the Notice to Proceed**]** shall show the proposed organisation to be established by the

Contractor for carrying out the Works and shall be consistent with the Contractor's project organisation chart submitted with the Tender submission. The chart shall evidence that the Contractor has the requisite organisation in place and that it has designated and proposed suitable persons as Key Personnel, whose identities and bio-data it shall include with the Contractor's Project Organisation Chart, to supervise the design and Execution of the Works and to deal with NATRAX, the NATRAX Representative and any Statutory Authority, as appropriate.

16.5.2.2 The Contractor shall promptly notify the NATRAX Representative of any proposed revision or alteration of the Contractor's Project Organisation Chart, which shall be submitted to the NATRAX Representative in accordance with **Clause 6.3[**Contractor's Documents**]**.

16.5.3 Key Personnel

16.5.3.1 The NATRAX Representative shall be entitled to interview any or all of the persons designated and proposed as Key Personnel before deciding whether or not to consent to their appointment. If NATRAX interviews any of the proposed Key Personnel, NATRAX shall be deemed to consent to such Key Personnel if it makes no objection within **[**3 (three)**]** days of the interview of the last proposed person to be interviewed. If NATRAX objects to any of the proposed Key Personnel within such 3 (three) day period, then the Contractor must nominate a replacement or replacements, as applicable within **[**7 (seven)**]** days and this Clause 16.5.3.1 **[**Key Personnel**]** applies to such nomination.

16.5.3.2 The Key Personnel are to be engaged throughout the period of the Contract and shall include one or more of the following positions as set out in the Special Conditions of Contract:

(i) a representative who shall be resident in a location convenient to the Project Site, to give its whole time to the superintendence of the Works, to be in full charge thereof and who shall be empowered by the Contractor to act on the Contractor's behalf in all matters in relation to the Contract. Such representative shall be known as the "Project Manager";

(ii) on the Works at the Project Site, a sub-representative who shall give its whole time to the superintendence of the same. Such representative shall be known as the "Construction Superintendent";

(iii) a suitably qualified and experienced person to be known as the "Project Site Safety Officer", to act as manager of the Contractor's Project Site Safety Plan and be responsible for all safety matters related to the Works;

(iv) a suitably qualified and experienced person at the Project Site to be known as the "Environmental Compliance Manager" to ensure the effective implementation of the Contractor's Environmental Management Plan;

(v) a suitably qualified and experienced person to be known as the "Quality Assurance Manager", to act as manager of the Quality Assurance Plan and be responsible for all quality matters related to the Works; and

(vi) a suitably qualified and experienced person to be known as the "Design Co-ordinator", to act as co-ordinator of the design.

16.5.3.3 Every Key Personnel shall:

(i) be empowered to receive and shall receive on behalf of the Contractor, decisions, directions, orders and instructions given to it by the NATRAX Representative;

(ii) be fluent in the English language;

(iii) be available to discuss, explain or make presentations on any part of the Works for which it is responsible; and

(iv) be competent and authorised by the Contractor.

16.5.3.4 The Contractor may only remove or replace a member of the Key Personnel with the prior written consent of NATRAX, provided that any substitute personnel must be qualified for the duties of the position and there is an uninterrupted transition between the Key Personnel and their replacement.

16.5.4 English speaking persons

The Contractor shall provide and shall, if so required by the NATRAX Representative, procure that any Subcontractor shall provide competent and authorised English speaking persons, approved by the NATRAX Representative, on all parts of the Works (including premises where design is being undertaken) where work is in progress, whose English shall be sufficiently fluent to allow them to discuss and explain the technical aspects and design of the part of the Works in question.

16.5.5 Technical Assistants

16.5.5.1 The Contractor and, where appropriate any Subcontractor shall provide and employ in connection with the design and Execution of the Works only such engineers and technical assistants as are skilled and experienced in their respective callings and such engineers, managers, sub-representatives, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise.

16.5.5.2 All the Contractor's engineers and technical assistants and other personnel, who are required to deal directly with the NATRAX Representative or any delegate or assistant of the NATRAX Representative, or their respective senior staff shall:

(i) not be transferred from the Works without the prior written approval of the NATRAX Representative;

(ii) be named and listed, along with the Key Personnel, in the Contractor's Project Organisation Chart; and

(iii) be fluent in the English language, and when appropriate in the NATRAX Representative opinion, in the predominant language of the labour force.

16.5.6 Removal of Contractor's employees

The NATRAX Representative may object to and require the Contractor to immediately remove from the Works at the Contractor's expense any person employed by the Contractor or its Subcontractors in relation to the Works and such person shall not be employed again upon the Works without the written permission of the NATRAX Representative. Any person so removed from the Works shall, unless the NATRAX Representative specifies otherwise, be replaced, at the Contractor's expense as soon as possible by a competent substitute approved by the NATRAX Representative.

16.5.6 Contractor to maintain discipline

The Contractor shall at all times be responsible for the discipline of its employees and those of its Subcontractors and for ensuring that they perform their duties in a safe, orderly and clean manner in accordance with the requirements of the NATRAX Representative.

16.6 Subject to Clause 16.5.3.1, the contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these foreign personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use his best endeavours in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.

The Contractor shall be responsible for the return of these foreign personnel to the place where they were recruited or to their domicile. In the event of the death or disability of any of the foreign personnel or members of their families during or in connection with the Execution of Works, the Contractor shall be solely responsible for making the appropriate arrangements for their return or burial and shall be completely liable for any claims for compensation/ legal proceedings by such foreign personnel or their family (as the case may be) in relation to such disability/ death without any liability whatsoever to NATRAX or the NATRAX Representative and the Contractor shall indemnify NATRAX in case NATRAX is held liable under any Applicable Law and/ or any court order for such burial/ return or claims of the foreign personnel or the family of such foreign personnel.

17. TESTING / INSPECTION

17.1 General

17.1.1 All materials, works and workmanship shall be of the respective kinds and standards described in the Contract and in accordance with NATRAX Representative's instructions and shall be subjected from time to time to such tests / Inspections as provided for in the Contract. The Contractor shall provide such assistance, instruments, machines, consumables and artificial loads and labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the Works for testing as set out in the Testing Plans.

17.1.2 The Testing / Inspection Plans being a part of the Quality Assurance Plan, shall be submitted to NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** at the times and in the manner stated in the Contract or as otherwise directed by NATRAX Representative. Where the Contractor is able to proceed on the basis of the Testing / Inspection Plans submitted in accordance with **Clause** 6.3 **[**Contractor's Documents**]**, all tests and inspections shall be conducted in accordance with the said Testing /Inspection Plans. In preparing the Testing / Inspection Plans, the Contractor shall define the tests / Inspections which it is to perform in accordance with the tests / Inspections set out in this **Clause** 17 **[**Testing / Inspection**]**.

17.1.3 Notwithstanding **Clause** 17.1.2 **[**General**]**, the NATRAX Representative may, if it considers it appropriate or necessary, at any time change the requirements for inspection and/or testing, in which event it shall so inform the Contractor in writing and the Contractor shall forthwith give effect to such change, including submitting any Testing / Inspection Plans to the NATRAX Representative in accordance with **Clause** 6.3 **[**Contractor's Documents**]** and the provisions of **Clause** 17.2 **[**Testing Costs**]** shall apply.

17.1.4 Any notice (Request for Inspection / Testing [RFI/RIT], wherever applicable) which must be given by the Contractor to NATRAX Representative in accordance with the Contract with respect to the Contractor's intention to carry out any tests / Inspection must include details of:

(i) the item / works to be tested / Inspected;

(ii) the test / Inspection to be performed; and

(iii) the proposed date and location of the test / Inspection, provided always the Contractor shall give notice of the date of any test Inspection in accordance with Technical Specifications and Drawings or as otherwise directed by NATRAX Representative.

17.1.5 NATRAX Representative or its nominee and any other person designated by NATRAX may attend and witness any test / Inspection.

17.1.6 The Contractor agrees that neither the execution of any test nor the issue of any test certificate / acceptance of Inspection report (RFI/RTI) releases the contractor from any of its responsibilities, obligations, or liabilities (including repair of replacement of any

equipment or part of the works damaged during the carrying out of any tests / rejected during inspection) under the Contract.

17.2 Testing Costs

The cost of making any test or inspection under the Contract shall be borne by the Contractor if such test or inspection is intended by or provided for in the Contract or should have reasonably been anticipated by the Contractor as likely to be required. Any accommodation and travel costs incurred by NATRAX or its agents in attending tests and inspections shall be borne by NATRAX.

Save, as aforesaid, where any test is ordered by the NATRAX Representative which is neither intended nor provided for by the Contract nor could reasonably have been anticipated by the Contractor, then the cost of such test shall be borne by the Contractor if the test shows any design, workmanship or materials not to be in accordance with the Contract or the NATRAX Representative's instructions, or if the test was required as a result of any failure of the Contractor to comply with its obligations under the Contract.

17.3 Project Site Tests

17.3.1 The Contractor must:

(i) Procure the carrying out of the Project Site Tests; and

(ii) Not allow an item of Materials to be transported to the Project Site unless it has successfully completed the Tests during Manufacture.

17.3.2 Within **[**7 (seven)**]** days of completion of any Project Site Tests, the Contractor must give the NATRAX Representative a report of the test results in a form approved by the NATRAX Representative.

17.3.3 The NATRAX Representative may, within **[**7 (seven)**]** days of receipt of a report produced in accordance with **Clause** 17.3.2 **[**Project Site Tests**]**, give the Contractor a notice that it considers:

(i) such report is deficient in any way, and that it directs the Contractor to correct and re-submit the report and the Contractor must re-submit the report;

(ii) in its reasonable opinion, that the Contractor has failed the test; or

(iii) that the relevant test has been successfully performed.

17.3.4 If, in the reasonable opinion of the NATRAX Representative, the Works fail any Project Site Test, the Contractor must:

(i) give the NATRAX Representative notice of the cause of the failure and the remedial action to be taken;

(ii) remedy the cause of the failure; and

(iii) reschedule, re-perform and report on results of the test in accordance with this **Clause** 17.3 **[**Project Site Tests**]**.

18. TIME FOR COMPLETION, RATE OF PROGRESS AND ACCELERATION

18.1 Time for Completion

The Contractor shall Complete the Works within the Time for Completion or such other time as may be determined in accordance with **Clause** 19 **[**Extension of Time for Completion**]**.

18.2 Rate of progress

If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the design and Execution of the Works is at any time, in the opinion of the NATRAX Representative, too slow to achieve Completion within the Time for Completion, the NATRAX Representative shall so notify the Contractor who shall thereupon take such steps as are necessary, subject to the consent of the NATRAX Representative, to expedite progress so as to complete the Works within the relevant Time for Completion. The Contractor shall not be entitled to any additional payment or compensation for taking such steps. If any steps, taken by the Contractor in meeting its obligations under this Clause 18.2 **[**Rate of progress**]**, involve NATRAX in additional supervision costs, such costs shall, after due consultation with the Contractor, be determined by the NATRAX Representative and shall be recoverable from the Contractor by NATRAX, and may be deducted by NATRAX from any monies due or which may become due to the Contractor and the NATRAX Representative shall notify the Contractor accordingly. Neither such notice given by NATRAX pursuant to this Clause 18.2 **[**Rate of progress**]** nor NATRAX failure to issue such notice shall relieve the Contractor from its obligations to achieve the quality and rate of progress required by the Contract.

18.3 Acceleration

18.3.1 Where the NATRAX Representative considers that the Contractor by adopting measures (referred to in this Clause 18.3 **[**Acceleration**]** as "Acceleration Measures") would be able to complete the Works earlier than the expiry of the Time for Completion or would be able to extinguish or significantly reduce any extension of time to which it would otherwise be entitled pursuant to Clause19 **[**Extensions to the Time for Completion**]**, the NATRAX Representative shall notify the Contractor in writing. The NATRAX Representative may in writing also request the Contractor to provide, the estimates of:

(i) the price of adopting the Acceleration Measures; and

(ii) any saving in time which could be made by adoption of the Acceleration Measures; and

(iii) details of any other terms and conditions sought by the Contractor in consideration of agreeing to adopt the Acceleration Measures

(iv) which estimates, details, terms and conditions are jointly referred to in this Clause 18.3 [Acceleration] as the "Acceleration Proposals".

18.3.2 The Contractor shall deliver the Acceleration Proposals to the NATRAX Representative within [14 (fourteen)] days of the NATRAX Representative's request made under Clause 18.3.1 [Acceleration]. The Contractor shall use its best endeavours to prepare Acceleration Proposals which would enable the Works to be accelerated in the most economical manner practicable.

18.3.3 Within [14 (fourteen)] days of receipt of the Acceleration Proposals, NATRAX shall notify the Contractor in writing that the Acceleration Proposals are agreed, not agreed or that the NATRAX Representative wishes to discuss them with the Contractor. If the Acceleration Proposals are agreed to or are agreed following any discussion between the Parties and the NATRAX Representative thereafter instructs the Contractor to implement the Acceleration Measures:

(i) the Contractor will do so at the time agreed in the Acceleration Proposals; and

(ii) the Contractor shall be paid in respect of such Acceleration Measures as the Parties have agreed.

18.3.4 If:

(i) the Contractor shall not have submitted Acceleration Proposals as required under Clause 18.3.2 [Acceleration]; or

(ii) the Acceleration Proposals are not agreed to under Clause 18.3.3 [Acceleration]; or

(iii) the NATRAX Representative and the Contractor cannot reach agreement in relation to the Acceleration Proposals within [14 (fourteen)] days of the NATRAX Representative's notice to discuss under Clause 18.3.3 [Acceleration]

the NATRAX Representative shall be entitled to instruct the Contractor to adopt the Acceleration Measures in any event, with such additions or amendments thereto as the NATRAX Representative shall require. If so directed by the NATRAX Representative, the Contractor shall without prejudice to its rights under Clause 32 [Dispute Resolution Procedure] proceed to implement the proposed Acceleration Measures in accordance with the NATRAX Representative's instructions.

18.3.5 Subject to the terms of any agreement made between the NATRAX Representative and the Contractor under Clause 18.3.3 [Acceleration] if by adopting the Acceleration Measures, the Contractor reduces, but does not extinguish, the delay to the Completion of the Works for which it would have been entitled to a greater extension of time under Clause 19 [Extension of Time for Completion] than that actually required because the Acceleration

Measures were adopted, then the Contractor shall, in any event, be granted, subject to Clause 19 [Extension of Time for Completion], an extension of time for the residual delay.

18.3.6 In the event that the NATRAX Representative issues an instruction pursuant to Clause 18.3.4 [Acceleration]:

(i) the Contractor shall prepare and submit to the NATRAX Representative all such information and documents relating to the implementation of the Acceleration Measures as the NATRAX Representative may reasonably require in writing; and

(ii) the NATRAX Representative shall as soon as reasonably practicable determine any adjustment to the Time for Completion as it considers fair in all the circumstances and shall so notify the Contractor in writing; and

(iii) the NATRAX Representative shall determine the sums which shall be added to the Contract Price for performance of the Acceleration Measures instructed.

18.3.7 If the NATRAX Representative and the Contractor cannot reach agreement under Clause 18.3.3 [Acceleration] and the NATRAX Representative does not instruct the Contractor to adopt the Acceleration Measures, the Contractor shall have no claim for additional payment or compensation or an extension of time arising out of or in connection with the preparation of the Acceleration Proposals made or any failure to reach agreement pursuant to this Clause 18.3 [Acceleration].

19. EXTENSION OF TIME FOR COMPLETION

19.1 Contractor's notice of event likely to cause delay

The Contractor shall closely monitor the progress of the Works and shall give written notice to NATRAX Representative, with a copy to NATRAX:

19.1.1 as soon as it can foresee any incident, circumstance and/or event of any nature affecting or likely to affect the progress of the Works such that the Completion of the Works will be or is likely to be delayed; or

19.1.2 should it have been unable to foresee such a incident, circumstance and/or event, then as soon as it becomes aware of the commencement of the incident, circumstance and/or event which has affected or is likely to affect the progress of the Works such that Completion of the Works will be or is likely to be delayed.

19.2 Reasons for delay and extension of time

It shall be a condition precedent to any extension of time by NATRAX under any provision of the Contract, that in respect of each and every incident, circumstance or event identified in the notice given in accordance with **Clause** 19.1 [Contractor's notice of event likely to cause delay] the Contractor shall, as soon as possible after such notice but in any event not later than [30 (thirty)] days after such notice or such longer period as NATRAX Representative may in its absolute discretion determine, notify NATRAX Representative in writing of any factors and the relevant Contract provision which it considers may entitle

it to claim an extension of time together with a statement, by reference to the Programme where appropriate, providing:

19.2.1 full and detailed particulars of the expected effects of the delay;

19.2.2 the reasons why the delay has occurred or is likely to have occurred;

19.2.3 an explanation of any measures that the Contractor has adopted or proposes to adopt to avoid or reduce or mitigate the consequences of the delay or impediment;

19.2.4 details of which of the Delay Events (if any) has caused the delay or impediment;

19.2.5 details of any adverse effect on the ability of the Contractor to meet Technical Specifications and Drawings and any other requirements under the Contract;

19.2.6 an estimate of the extent of the expected delay in Completion beyond the relevant Time for Completion and any anticipated additional costs if any, as allowed under the Contract, resulting from the delay.

19.2.7 details of the documents the Contractor proposes to prepare and maintain to support any claim for an extension of time which must include a critical path network and other documents as required by the NATRAX Representative in order to demonstrate entitlement;

19.2.8 details as to the effect on the Programme;

19.2.9 details of the measures which it has discussed and agreed with its Subcontractors to facilitate the reprogramming of the performance of their services as a consequence of the delay;

19.2.10 further substantiation of any particulars and estimate aforesaid as the NATRAX Representative may reasonably request;

19.2.11 reasons as to why in the Contractor's opinion, the Contractor is entitled to any extension of time or compensation payment pursuant to any Project Document by reason of any delay; and

19.2.12 confirmation that it is a notice pursuant to this **Clause** 19.2 **[**Reasons for delay and extension of time**]**.

19.3 Further particulars

19.3.1 The Contractor shall give such further written notices or supporting particulars for any claim or any other notices which are required by NATRAX Representative as may be reasonably necessary or as NATRAX Representative may reasonably require for keeping up to date the particulars, estimates and substantiation referred to in **Clause** 19.2 **[**Reasons for delay and extension of time**]**.

19.3.2 Without any admission of liability on the part of NATRAX, NATRAX Representative may, on receipt of a notice under **Clause** 19.2 **[**Reasons for delay and extension of time**]** inspect

such contemporary records of the Contractor and may monitor the record-keeping and/or instruct the Contractor to maintain further contemporary records. The Contractor shall permit NATRAX Representative to inspect all records and shall supply it with copies thereof as and when NATRAX Representative instructs.

19.3.3 Where a circumstance has a continuing effect or where the Contractor is at any time unable to determine whether the effect of a circumstance will actually cause delay to the Completion of the Works, a statement to that effect with reasons and interim written particulars (including details of the likely consequences of the circumstance on the progress of the design and Execution of the Works and an estimate of the likelihood of and likely extent of the delay) must be submitted by the Contractor within [30 (thirty)] days of the notice given in accordance with **Clause** 19.1 [Contractor's notice of event likely to cause delay]; the Contractor shall thereafter submit to NATRAX Representative further interim written particulars at intervals of not more than [30 (thirty)] days until the actual delay caused (if any) is ascertainable, when it shall thereafter within [30 (thirty)] days submit to NATRAX Representative full and detailed particulars of the cause and actual extent of the delay in accordance with **Clause** 19.2 [Reasons for delay and extension of time].

19.4 Delay Events

Subject to the other provisions of this **Clause** 19 [Extension of Time for Completion], the Contractor will only be entitled to an extension of the Time for Completion where a delay to the achievement of Completion is caused by:

19.4.1 the Contractor not being given access to the Project Site or any part thereof in accordance with **Clause** 4 [The Project Site]; or

19.4.2 a Change instructed under **Clause** 23 [Changes] other than where such Change is instructed as a consequence of any default or breach of the Contract by the Contractor; or

19.4.3 any act, omission, default or breach by NATRAX; or

19.4.4 any act, omission, default or breach by a Related Works Contractor; or

19.4.5 a Force Majeure Event.

19.5 NATRAX Representative to determine extension

Subject always to proper compliance by the Contractor with the provisions of this **Clause** 19 [Extension of Time for Completion], NATRAX Representative shall determine any extension of the Time for Completion and shall notify NATRAX and the Contractor accordingly.

19.6 Compliance

19.6.1 It shall be a condition precedent to the Contractor's right to any extension of time that it shall have complied fully and strictly with any of the provisions of this **Clause** 19 [Extension of Time for Completion] in respect thereof. For the avoidance of doubt it is confirmed that this **Clause** 19.6 [Compliance] shall apply whether or not any other

provision of the Contract is expressly stated to be subject to this **Clause** 19 **[**Extension of Time for Completion**]**.

19.6.2 Without prejudice to the generality of the foregoing:

(i) the Contractor shall constantly use its reasonable endeavours to prevent and/or minimise delay in the progress of the Works, howsoever caused, and to prevent Completion of the Works being delayed or further delayed beyond the Time for Completion and the Contractor shall not be entitled to an extension of time in respect of any cause of delay nor for any period of delay which by the exercise of reasonable endeavours could be avoided or reduced (to the extent that such could have been reduced). The onus of proving that the Contractor has exercised all reasonable endeavours, and that despite such endeavours, the delay could not be avoided or reduced, shall in all cases rest with the Contractor;

(ii) the Contractor shall not under any circumstances be entitled to an extension of time where the delay or likely delay is, or would be, attributable to the default, breach, negligence, improper conduct or lack of endeavour of the Contractor or any persons for whom it is contractually or otherwise responsible for and further the Contractor shall not be entitled to an extension of time where delay arises as a consequence of the termination of a Subcontractor's employment by the Contractor.

(iii) if upon the request or claim by the Contractor for an extension of time for alleged delay to the progress of the Works, the NATRAX Representative is of the opinion that such delay was caused or materially contributed to by any concurrent or interacting cause or causes of delay which are not Delay Events, then in considering or revising any extension of time in respect of that delay, the NATRAX Representative may treat the said concurrent or interacting cause as the operative cause of the delay, provided always that to the extent that the delay caused by a Delay Event exceeds the period of delay which the NATRAX Representative under this **Clause** 19 **[**Extension of Time for Completion**]** attributes to the operative cause of delay, the Contractor shall be entitled to an extension of time for that excess period;

(iv) the Contractor shall have kept and maintained such records (including those referred to in the notices under this **Clause** 19 **[**Extension of Time for Completion**]** as may be reasonably necessary to support any claim for an extension of time it may subsequently wish to make;

(v) if there are two or more concurrent causes of delay and only one of those concurrent causes is a delay which would entitle the Contractor to an extension of time the Contractor is not entitled to an extension of time for the period of that concurrence;

(vi) it is a further condition precedent to the Contractor's entitlement to an extension of time that the critical path noted on the Programme is affected in a manner which might reasonably be expected to result in a delay to the Contractor achieving Completion by the Time for Completion; and

(vii) no relief shall be granted to an Affected Party to the extent that any failure or delay in its performance would nevertheless have been experienced by the Affected Party had an event of Force Majeure not occurred.

19.6.3 The Contractor shall after consultation with the NATRAX Representative submit to the NATRAX Representative within **[**7 (seven)**]** days of the consultation in accordance with **Clause** 6.3 **[**Contractor's Documents**]** revisions to the Programme which the Contractor considers necessary to enable it to meet any extension of time fixed in accordance with this **Clause** 19.5 **[**NATRAX Representative to determine extension**]** and the requirements of the NATRAX Representative.

19.6.4 The NATRAX Representative shall not be obliged to take into account any circumstances which are not notified to it in accordance with the periods referred to in this **Clause** 19 **[**Extension of Time for Completion**]** but may upon the written request of the Contractor extend the said periods if it considers the request for such extension reasonable.

19A. PROCEDURE FOR CLAIMS

19A.1 Notice of claims

If the Contractor considers that it may have grounds to claim any additional payment or any extension of time pursuant to any Clause of the Conditions or otherwise, it shall in addition to compliance with any other procedure or obligation in relation thereto, give notice to the NATRAX Representative, with a copy to NATRAX, within fourteen **[**14 (fourteen)**]** days after the event giving rise to the claim has first arisen. The notification shall include details of the clause under which the claim is made, the circumstances in which the claim arises and details of the records that the Contractor will maintain to substantiate the amount of its claim.

19A.2 Contemporary records

Upon the happening of the event referred to in Clause 19A.1 **[**Notice of claims**]**, the Contractor shall maintain such contemporary records (including those referred to in its notice under Clause 19A.1 **[**Notice of claims**]**) as may reasonably be necessary to support any claim it may subsequently wish to make. Without any admission of liability on the part of NATRAX, the NATRAX Representative may, on receipt of a notice under Clause 19A.1 **[**Notice of claims**]**, inspect such contemporary records and may instruct the Contractor to maintain any further contemporary records as are reasonable and may be material to the claim of which notice has been given. The Contractor shall permit the NATRAX Representative to inspect all records maintained pursuant to this Clause 19A.2 **[**Contemporary records**]** and shall supply it with copies thereof as and when the NATRAX Representative so instructs.

19A.3 Substantiation of claims

Within **[**28 (twenty eight)**]** days, or such lesser time as may be reasonably required by the NATRAX Representative, of giving notice under Clause 19A.1 **[**Notice of claims**]**, the Contractor shall send to the NATRAX Representative an account giving detailed particulars of the amount claimed and the grounds upon which the claim is based. Where

the event giving rise to the claim has a continuing effect, such account shall be considered to be an interim account and the Contractor shall, at such intervals as the NATRAX Representative may reasonably require, send further interim accounts detailing the aggregate amount of the claim and any further grounds upon which it is based. In cases where interim accounts are sent to the NATRAX Representative, the Contractor shall send a final account within [28 (twenty-eight)] days of the end of the effects resulting from the event. The Contractor shall, if required by the NATRAX Representative so to do, copy to NATRAX all accounts sent to the NATRAX Representative pursuant to this Clause 19A.3 [Substantiation of claims].

19A.4 Monthly particulars

In addition to its obligations under Clause 19A.1 [Notice of claims], Clause 19A.2 [Contemporary records] and Clause 19A.3 [Substantiation of claims] hereof, the Contractor shall send to the NATRAX Representative by the 7th (seventh) day of every month an account giving as full and detailed particulars as is possible, of all claims for any additional payment compensation or any extension of time (whether arising under the express provisions of this Contract or otherwise in relation to the performance of the Contractor's obligations thereunder) to which the Contractor may consider itself entitled, including all Change Orders issued by the NATRAX Representative which it has Executed during the preceding month. In the event of the Contractor failing to comply with this Clause 19A.4 [Monthly particulars], NATRAX shall not be bound to make any additional payment or grant any extension of time to the Contractor in respect of any such claim or claims and the Contractor shall conclusively be deemed to have waived such claim or claims.

19A.5 Payment of claims

Subject to Clauses 19A.4 [Monthly particulars] and Clause 19A.6 [Failure to comply], the Contractor shall be entitled to have included in any Certificate of Payment issued by the NATRAX Representative pursuant to Clause 38.3.1 [Certificates of Payment] such amount in respect of any Change Order or any admissible claim as the NATRAX Representative may consider due to the Contractor provided that the Contractor shall have supplied sufficient particulars to enable the NATRAX Representative to determine the amount due, if any, in respect of such Change Order or claim. If such particulars are insufficient to substantiate the whole of the claim and subject to Clause 19A.6 [Failure to comply] the Contractor shall be entitled to payment in respect of such part of the claim as the particulars may substantiate to the satisfaction of the NATRAX Representative.

20. LIQUIDATED DAMAGES

20.1 Liquidated Damages for delay

If the Contractor fails to Complete the Works in accordance with the Contract so that the Date of Completion of the Works has not occurred within the Time for Completion, then the Contractor shall pay or allow to NATRAX Liquidated Damages for such default for every day which shall elapse between the Time for Completion and the date stated in the Completion Certificate as being the Date of Completion of the Works. Provided always that the aggregate liability of the Contractor for Liquidated Damages under this **Clause** 20.1

[Liquidated Damages for delay] shall not exceed the percentage of the Contract Sum as specified in Special Conditions of Contract.

20.2 Payment of Liquidated Damages

20.2.1 On or before the first Business Day of any month following the Time for Completion NATRAX shall notify the Contractor in writing of the amount of Liquidated Damages that may have become due in the preceding month.

20.2.2 NATRAX may:

(i) deduct and retain the amount of any Liquidated Damages becoming due under **Clause** 20.1 [Liquidated Damages for delay] from any sums due or which become due to the Contractor; or

(ii) require the Contractor to pay such amount to NATRAX within [28 (twenty-eight)] days after receipt of the notice pursuant to **Clause** 20.2.1 [Payment of Liquidated Damages] notwithstanding any dispute between the Parties as to the amount due or the liability to make payment of the same.

20.2.3 The payment of Liquidated Damages does not in any way relieve the Contractor from any of its obligations to complete the Works or from any other obligations and liabilities of the Contractor under the Contract.

20.2.4 For the avoidance of doubt and without prejudice to any continuing obligations of the Contractor under the Contract or otherwise, the issue of any Completion Certificate does not relieve the Contractor in respect of Liquidated Damages which have accrued up to the date of such Completion Certificate, but which have not yet been paid by the Contractor.

20.3 Genuine Pre-estimate of Damages

The Parties recognise the expense and inconvenience likely to be incurred from any need to prove the loss and damage that will be suffered by NATRAX in the event of a failure by the Contractor to achieve Completion of the Works by the relevant Time for Completion. The Parties acknowledge that the Liquidated Damages is a genuine pre-estimation of and reasonable compensation for the loss and damage that will be suffered by NATRAX in the event of any such failure on the part of the Contractor.

20.4 Payment of Bonus

NATRAX shall pay the bonus amount to the contractor, for each day of early completion of works, as specified in the special conditions of contract. The completion date shall be the date as specified in the special conditions of contract OR the date as approved and notified by the NATRAX representative in consideration of extension of time granted to the contractor for the completion of works as covered in the contract.

21. COMPLETION OF WORKS

21.1 Completion of Works

21.1.1 The Date of Completion of the Works shall be the date upon which the following criteria have been satisfied or waived in writing by NATRAX at its sole discretion:

(i) the design and Execution of the Works, other than the performance of obligations to be performed during the Defects Rectification Period, has been completed in accordance with the Contract, save in respect of the Punch List Items;

(ii) all outstanding work which NATRAX Representative requires to be completed before issue of the Completion Certificate, has been satisfactorily completed;

21.2 Application for an issue of the Completion Certificate

21.2.1 The Contractor shall make a written application to NATRAX Representative with a copy to NATRAX for a Completion Certificate no later than **[**2 (two)**]** Business Days of the satisfaction of the conditions stated in **Clause** 21.1 **[**Completion of the Works**]**. Such application shall be accompanied by an undertaking to finish any outstanding work in accordance with **Clause** 21.2.2 **[**Application for and issue of the Completion Certificate**]**. The Works shall be deemed to be complete when the Completion Certificate is issued by the NATRAX Representative in accordance with the provisions hereof.

21.2.2 NATRAX Representative shall, within **[**7 (seven)**]** days after receiving the Contractor's application in accordance with **Clause** 21.2.1 **[**Application for and issue of the Completion Certificate**]** either:

(i) issue the Completion Certificate to the Contractor with a copy to NATRAX and NATRAX stating the date upon which the Works achieved Completion in accordance with **Clause** 21.1 **[**Date of Completion of the Works**]** and specifying any outstanding work, if any, which the Contractor is required to complete and the period or periods within which such work is required to be completed, such work to include:

(a) the Punch List Items;

(b) any other outstanding work notified to the Contractor by NATRAX Representative; or

(ii) in the event that the conditions set out in **Clause** 21.1 **[**Completion of the Works**]** have not been satisfied, NATRAX Representative shall reject the application giving its reasons, specifying:

(a) the work required to be carried out by the Contractor to enable the Completion Certificate to be issued; and

(b) the period within which such work is required to be completed.

21.3 Completing Punch List Items and any other outstanding works

21.3.1 The Contractor shall provide in writing to NATRAX Representative reasonable notice of its reasonable requirements with respect of access to and use of the Works for the carrying out of:

(i) the outstanding Works including any Punch List Items specified in the Completion Certificate;

(ii) any rectification, repair or replacement of any items in accordance **Clause** 22.1 **[**Defects rectification by the Contractor**]**.

21.3.2 NATRAX shall use reasonable endeavours to secure such access from NATRAX on behalf of the Contractor. When carrying out such work the Contractor shall comply with all reasonable instructions of NATRAX with regard to the safety of the Works and the ongoing performance by NATRAX of its obligations and shall complete the work in such manner that, so far as reasonably practicable, does not prevent, hinder or otherwise interfere with the performance of NATRAX of its obligations and the exercise of its rights during the Project Facility operations period.

21.3.3 The Contractor shall complete any Punch List Items specified in the Completion Certificate within the time instructed reasonably by NATRAX Representative.

21.3.4 Within 60 (sixty) days of Date of Completion of the Works, the Contractor shall furnish to NATRAX, three copies of "As built Documents" duly verified by the NATRAX Representative, including without limitation an "as built" survey illustrating the layout of the Project Facility and the Works, and setback lines, if any, of the buildings and structures forming part of Project Facility and the Works reflecting the Project Facility as actually designed, engineered and constructed.

21.4 Completion of parts

21.4.1 If in accordance with the requirements of the NATRAX Representative, any part of the Permanent Works has been completed, the NATRAX Representative may in its absolute discretion issue to the Contractor a Completion Certificate in respect of that part of the Permanent Works before Completion of the whole of the Works as aforesaid and upon the issue of such certificate the Contractor shall be deemed to have undertaken to complete any Punch List Items in that part of the Permanent Works during the Defects Rectification Period.

21.4.2 No completion certificate issued in accordance with **Clause** 21.4.1 **[**Completion of parts**]** shall be deemed to certify completion of any ground or surface requiring reinstatement, unless such certificate shall expressly so state.

22. RECTIFICATION OF DEFECTS AND MAINTENANCE OF THE PERMANENT WORKS

22.1 Defects rectification by the Contractor

22.1.1 The NATRAX Representative shall have the right, but not the obligation, to instruct the Contractor in writing to Execute all such work of repair, amendment, reconstruction, rectification and make good defects, imperfections or other faults in the Works and any part thereof, as the case may be, during the Defects Rectification Period or within **[**14 (fourteen)**]** days after its expiration as a result of an inspection made by or on behalf of the NATRAX Representative at any time or times prior to its expiration. For the avoidance of doubt, the Contractor's obligations under this **Clause** 22 **[**Rectification of defects and Maintenance of Permanent Works**]** apply to any damage to any Related Works caused by the Contractor.

22.1.2 All such work instructed under **Clause** 22.1.1 **[**Defects rectification by the Contractor**]** shall be carried out by the Contractor at its own expense if the necessity thereof shall in the opinion of the NATRAX Representative be due to the use of materials or workmanship not in accordance with the Contract or the neglect or failure on the part of the Contractor to comply with any of its obligations, expressed or implied, under the Contract.

22.1.3 The Contractor shall if required by the NATRAX Representative in writing carry out such searches, or tests as may be necessary to determine the cause of any defect, imperfection or fault.

22.1.4 At all times during the Defects Rectification Period NATRAX shall be fully entitled to Execute all work of repair, amendment, reconstruction, rectification and make good defects, imperfections or other faults in the Works and any part thereof, as the case may be, by its own workmen or by other contractors and if the necessity thereof shall in the opinion of the NATRAX Representative be due to the use of materials or workmanship not in accordance with the Contract or the neglect or failure on the part of the Contractor to comply with any obligations, expressed or implied under the Contract, NATRAX shall be entitled to recover from the Contractor the cost thereof or may deduct the same from any monies due or that become due to the Contractor.

22.1.5 If any defect, imperfection or other fault be such that, in the opinion of the NATRAX Representative, it shall be impracticable or inconvenient to remedy the same, the NATRAX Representative shall ascertain the diminution in the value of the relevant part of the Works due to the existence of such defects, imperfections or other faults and deduct the amount of such diminution from the sum remaining to be paid to the Contractor in respect of such parts of the Works, or failing such remainder it shall be recoverable as a debt due and payable to NATRAX on demand.

22.2 Defects Rectification Certificate

The NATRAX Representative shall issue to the Contractor (with a copy to NATRAX) the Defects Rectification Certificate for the Works as soon after the expiration of the Defects Rectification Period as the Contractor shall, in the NATRAX Representative's opinion, have completed all its obligations whether under **Clause** 22 **[**Rectification of defects and maintenance of the Permanent Works**]** or otherwise, which relate to the Works or part thereof, as the case may be, including any work redesigned or amended, replaced and

renewed, and shall state thereon the date when such obligations shall have in its opinion been so completed.

22.3 Continuing Obligations

Notwithstanding the issue of the Defects Rectification Certificate the Contractor shall remain liable for the fulfilment of any obligation incurred under the provisions of the Contract prior to the issue of the Defects Rectification Certificate which remains unperformed at the time such Defects Rectification 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.

22.4 Endemic Failures

22.4.1 Notwithstanding any other provisions of the Contract (including this **Clause** 22.4 **[**Endemic Failures**]**) if, during the course of Execution of the Works or in the 7 (seven) year period immediately following the date of Completion of the Works NATRAX forms the opinion that, because of the nature and frequency of the failures of any part of the Works caused as a consequence of a breach of the Contractor's obligations under the Contract, including, but not limited to, any component or sub-assembly thereof, such part can properly be said to have failed endemically it may so certify by notice in writing to the Contractor to that effect.

22.4.2 Should any part of the Works be certified under **Clause** 22.4.1 **[**Endemic Failures**]** to be the subject of an endemic failure then the Contractor shall as soon as reasonably practicable renew or alter or replace (including as necessary redesigning) all such or parts throughout the Works whether or not such part had experienced failure, so as to avoid any subsequent defect therein. The cost of such renewal, repair, alteration or replacement (including any redesign) shall be borne by the Contractor together with the cost of any work ancillary thereto. Before commencing any renewal, alteration or replacement the Contractor shall submit to NATRAX for its review, the Contractor's proposals for such renewal, alteration or replacement.

22.4.3 The renewals, repairs, alterations or replacements (including redesign) shall be carried out and completed to the reasonable satisfaction of NATRAX and so that the Works will meet the Contractor's obligations under the Contract. The provisions of this **Clause** 22.4 **[**Endemic Failures**]** shall apply to all such renewals, repairs, alterations and replacements as though the part of the Works in question, together with any other part of the Works affected thereby had been the subject of a Completion Certificate on the date the renewal, repair, alteration or replacement was completed.

22.4.4 Any renewals, repairs, alterations or replacements under **Clause** 22.4 **[**Endemic Failures**]** shall be without prejudice to the Contractor's other obligations under the Contract including without limiting the generality thereof this **Clause** 22.4 **[**Endemic Failures**]**. Nothing contained in this **Clause** 22.4 **[**Endemic Failures**]** shall prejudice any other rights or remedies NATRAX may have.

22.4.5 If the Contractor disagrees with NATRAX notification of evidence or failure under **Clause** 22.4 **[**Endemic Failures**]**, the Contractor shall nevertheless proceed to effect the renewal,

repair, alteration or replacement required and the Contractor's rights in respect thereof shall be determined in accordance with **Clause** 32 **[**Dispute Resolution Procedure**]**.

22.5 Liability for Latent Defects

22.5.1 The Contractor shall be liable for the costs of rectification of any Latent Defect in and/or damage caused to the Works as a result of such Latent Defect which is notified to the Contractor and which may appear or occur during the Latent Defects Rectification Period.

22.5.2 If any such Latent Defect in and/or such damage to the Works shall appear or occur, the NATRAX Representative shall notify the Contractor immediately stating the nature of the Latent Defect and/or damage. In the event that such Latent Defect is a defect which does not affect the proper operation and maintenance of the Project Facility NATRAX may, in its sole discretion, allow the Contractor a reasonable period of time in which to rectify the Latent Defect. If the Contractor fails to rectify any such Latent Defect and/or such damage within the period notified by the NATRAX Representative NATRAX may, at the Contractor's risk and expense, rectify the Latent Defect and/or such damage or may employ another contractor to carry out such rectification.

22.5.3 In the event that such Latent Defect is adversely affecting the operation and maintenance of the Project Facility NATRAX may, in its sole discretion employ and pay another contractor to carry out such rectification and recover the cost of such rectification from the Contractor.

22.6 Maintenance Obligations

22.6.1 The Contractor shall take full responsibility for the maintenance and upholding of the Permanent Works and the site offices (if any) used by the Contractor during the Defects Rectification Period.

22.6.2 The Contractor shall ensure that its maintenance obligations are performed in such a manner as will permit the proper performance by NATRAX in its operation of the Project Facility and so as not to affect the activities of the Project Facility users.

22.6.3 In the event the Contractor has failed to maintain and uphold the Permanent Works during the Defects Rectification Period in accordance with the relevant provisions of the Technical Specifications and Drawings and such failure has not been remedied within **[**14 (fourteen)**]** days despite a written notice to that effect issued by the NATRAX Representative, NATRAX may, without prejudice to any of its rights and/or remedies under the Contract, be entitled to cause the maintenance and upholding of the Permanent Works to be undertaken by others at the risk and cost of the Contractor and NATRAX shall be entitled to recover from the Contractor the cost thereof or may deduct the same from any monies due or that become due to the Contractor.

23. CHANGES

23.1 General

23.1.1 The Contractor shall not carry out any Change except as directed by NATRAX Representative and in accordance with this **Clause** 23 **[**Change**]**.

23.1.2 The Contractor acknowledges and accepts that no Change shall in any way vitiate or invalidate the Contract.

23.1.3 Subject to the terms of this **Clause** 23 **[**Change**]**, the Contractor will be required to perform any Change howsoever initiated.

23.2 Procedure for Changes

23.2.1 NATRAX Representative has the right to initiate a Change at any time by either:

(i) instructing in writing a Change Order in which case the Contractor shall comply with **Clause** 23.2.3 **[**Procedure for Changes**]**;or

(ii) issuing a written notice proposing a Change (a "Change Notice").

23.2.2 Within **[**14 (fourteen)**]** days of receipt of a Change Notice, the Contractor shall provide to NATRAX Representative a written statement setting out detailed particulars of any effect the proposed Change would have on the Works and Related Works and/or on any other provisions of this Contract if the proposed Change is effected (a "Change Notice Response") including:

(i) the work and/or Goods required or no longer required as a consequence of the Change;

(ii) an estimate of the increase or decrease in the Contract Price (which will include any extra costs necessarily incurred (if any) by the Contractor for delay or disruption as a consequence of a Change OR any change in the contract price, resulting out of variation of agreed quantities);

(iii) any effect on the availability and/or cost of insurance;

(iv) any effect on the Programme, the Payment Schedule and the Time for Completion;

(v) any proposed modifications to the Contract;

(vi) whether on account of the Change any Applicable Clearances will not be obtainable without onerous conditions or within a reasonable period or any existing Applicable Clearances will be revoked or adversely affected;

(vii) whether the Change would, if implemented, give rise to a breach of any Applicable Law or be contrary to Good Industry Practice;

(viii) whether the Change is technically feasible on reasonable commercial terms;

(ix) where **Clause** 23.3.1(ii) **[**Contractor Changes**]** applies, a calculation of the benefit the Contractor believes NATRAX will obtain, expressed in financial terms; and

(x) any other information which NATRAX may reasonably request.

23.2.3 Following receipt of a Change Order, the Contractor must immediately implement the Change subject to the following terms:

(i) the Contract Sum will, be amended in accordance with the principles to be mutually agreed between NATRAX and the Contractor;

(ii) any extension of time will be determined in accordance with **Clause** 19 **[**Extension of Time for Completion**]** and NATRAX Representative is entitled to take account of the Contractor's estimate (if any) set out in **Clause** 23.2.2 **[**Procedure for Changes**]** when determining such extension of time;

(iii) these Conditions (as amended from time to time) will apply to the Change as though it formed part of the Works.

23.2.4 Following receipt of a Contractor's Change Notice Response, NATRAX Representative may either:

(i) issue a written Change Order to the Contractor, on such terms and conditions as NATRAX Representative may deem appropriate and the Contractor shall implement the Change in accordance with **Clause** 23.2.3 **[**Procedure for Changes**]**; or

(ii) withdraw the Change Notice.

The Contractor shall not be entitled to any costs or extension of time as a result of preparing a Change Notice Response.

23.2.5 If:

(i) the Contractor fails to comply with its obligation under **Clause** 23.2 **[**Procedure for Changes**]**; or

(ii) if the NATRAX Representative rejects the information provided by the Contractor pursuant to **Clause** 23.2 **[**Procedure for Changes**]** (which the NATRAX Representative is entitled to do in its absolute discretion);

NATRAX shall be entitled, following notification to the Contractor, to engage a third party to perform the Change, in which case the Contractor shall cooperate fully with any such third party or the NATRAX Representative may nevertheless instruct a Change Order which the Contractor shall comply with and **Clause** 23.2 **[**Procedure for Changes**]** shall apply.

23.2.6 Notwithstanding the provisions of **Clause** 23.2.2 **[**Procedure for Changes**]** and **Clause** 23.2.5 **[**Procedure for Changes**]** the NATRAX Representative may instruct a Change Order at any time, whether before or after receipt of the Contractor's estimate under **Clause** 23.2 **[**Procedure for Changes**]** which the Contractor shall comply with and **Clause** 23.2 **[**Procedure for Changes**]** shall apply.

23.3 Contractor's Changes

23.3.1 The Contractor may from time to time during its performance of the Contract propose to NATRAX Representative any Change which the Contractor considers:

(i) necessary for the proper design and Execution of the Works; or

(ii) which adopted will:

(a) substantially reduce the cost of Executing, maintaining and operating the Works or the Project; or

(b) improve the efficiency or value to NATRAX of the Completed Works (including a reduction in the life cycle costs associated with the Project); or

(c) otherwise be of benefit financial or otherwise, to NATRAX

and such proposal must be in writing and shall be in the form of and contain such information as required of a Change Notice Response referred to in **Clause** 23.2.2 **[**Procedure for Changes**]**.

23.3.2 Where **Clause** 23.3.1(i) **[**Contractor's Changes**]** applies NATRAX Representative may either:

(i) issue a written Change Order to the Contractor and the Contractor shall implement the Change in accordance with **Clause** 23.2.2 **[**Procedure for Changes**]**; or

(ii) reject the Change proposed by the Contractor.

The Contractor shall not be entitled to any costs or extension of time as a result of preparing a proposal in accordance with **Clause** 23.3.1 **[**Contractor's Changes**]**.

23.3.3 Where **Clause** 23.3.1 (ii) **[**Contractor's Changes**]** applies NATRAX Representative may, at its sole discretion, accept or reject the Contractor's proposed Change and failure by NATRAX Representative to respond within **[**14 (fourteen)**]** days shall be deemed to be a rejection. If NATRAX wishes to implement a Change suggested by the Contractor, NATRAX shall be liable to pay the Contractor a proportion identified in Special Conditions of Contract.

23.4 Omissions

23.4.1 The Contractor acknowledges that a Change may involve the omission of any part or parts of the Works up to 20% (twenty percent) of the total Contract Price and the Contractor acknowledges and agrees that NATRAX may engage others to carry out that part or parts so omitted.

23.4.2 In case of an omission of any part or parts of the Works being due to any reason other than a failure of the Contractor to comply with the obligations under the Contract, NATRAX and the Contractor shall mutually agree the reasonable compensation payable to the Contractor on account of loss of profit and overheads arising from the omission of any part or parts of the Works, provided that such compensation agreed shall not exceed 10% (ten percent) of the part or parts of the Works omitted. The value of the part or parts of the Works omitted shall be determined in accordance with **Clause** 23.5.1 **[**Valuation of Changes**]**.

23.4.3 The Contractor further acknowledges that any one or more omissions will not constitute a basis to allege that NATRAX has repudiated the Contract, no matter the extent or timing of such omission.

23.5 Valuation of Changes

23.5.1 The valuation of a Change to be paid by NATRAX to the Contractor, or by the Contractor to NATRAX, as the case may be, shall be calculated as follows:

(i) the Parties will endeavour to agree to the valuation; and

(ii) failing an agreement under **Clause** 23.5.1(i) **[**Valuation of Changes**]** within a reasonable time (but no more than **[**28 (twenty-eight)**]** days after the NATRAX Representative's direction in accordance with **Clause** 23.2.4(i) **[**Procedure for Changes**]**, NATRAX will determine the valuation, subject to the following:

(a) in the event that the Change involves additional works, the increase to the Contract Price will be no more than the estimate (if any) provided in accordance with **Clause** 23.2.2 **[**Procedure for Changes**]**; and

(b) in the event that the Change involves the omission of part of the Works or results in a saving to the Contractor, the reduction in the Contract Price will be no less than the estimate (if any) provided in accordance with **Clause** 23.2.2 **[**Procedure for Changes**]**;

the following valuation principles shall apply:

1. where the varied work is similar in character to and Executed under similar conditions to work priced in the Price Breakdown, such work shall be valued at the applicable rates and prices in the Special Conditions of Contract;

2. where the varied work is not of a similar character to or not Executed under similar conditions to work priced in the price breakdown then the NATRAX Representative shall establish a new rate for such work based upon the rates or prices contained in the Special Conditions of Contract insofar as may be reasonable making such allowances thereto by way of additional or deductions as may be necessary to take account of any dissimilarity in the character of the work or the conditions under which the work was Executed;

3. where work is omitted, the rates and prices in the Special Conditions of Contract shall be used to value the work omitted provided that if part only of an item of work is omitted then NATRAX Representative shall establish a new rate or price by which to value the omitted work which shall be fair and reasonable.

4. where the varied work cannot be properly valued in accordance with the provisions of **Clauses** 23.5.1(ii) (1), (2) or 3 **[**Valuation of Changes**]** above,

the NATRAX Representative shall establish a new rate or price for such work which shall be fair and reasonable.

23.5.2 The Contractor shall maintain all proper records relating to any Change Order instructed and in addition the NATRAX Representative shall be entitled within [14 (fourteen)] days after issuing a Change Order to instruct the Contractor as to any records that the NATRAX Representative requires it to keep. The Contractor shall keep such records at its own expense and submit them to the NATRAX Representative as directed.

23.5.3 Without prejudice to **Clause** 23.2 [Procedure for Changes] the NATRAX Representative may, in its absolute discretion, instruct a Change Order in circumstances where, in its absolute discretion, the Contractor will fail to meet any of its obligations under the Contract or where it is necessary on account of some default or breach of the Contract by the Contractor or those for whom it is responsible for, in which case the Contractor shall not be entitled to any extension of time or any increase in the Contract Sum, and any adjustment to the Time for Completion.

23.6 Day works

23.6.1 NATRAX Representative may if, in its opinion, it is necessary or desirable order in writing that any additional or substituted work including any Provisional Sum Works shall be executed on a daywork basis. The Contractor shall then be paid for such work in accordance with the Daywork Schedule. No variation of any daywork unit rate or price shall be considered for items in the Daywork Schedule, notwithstanding the quantity of work performed under such schedule. The Contractor shall furnish to NATRAX Representative such receipt or other records as may be necessary to prove the amounts paid and before ordering materials shall submit to NATRAX Representative quotations for the same for its approval.

23.6.2 In respect of all work executed on a daywork basis the Contractor shall during the continuance of such work deliver each day to the NATRAX Representative an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement also in duplicate showing the description and quantity of all Materials and equipment used thereon or therefore. One copy of each list and statement will if correct or when agreed be signed by the NATRAX Representative and returned to the Contractor. At the end of each month the Contractor shall deliver to the NATRAX Representative a priced statement of the labour and material (except as aforesaid) used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the NATRAX Representative shall consider that for any reason the sending of such list or statement by the Contractor in accordance with the foregoing was impracticable it shall nevertheless be entitled to authorise payment for such work either as daywork (on being satisfied as to the time employed and Materials and equipment used on such work) or at such value therefore as it shall consider fair and reasonable.

24. INTELLECTUAL PROPERTY

24.1 Intellectual Property

24.1.1 All Intellectual Property which is proprietary to NATRAX or the Contractor shall be the exclusive property of NATRAX or the Contactor respectively, as the case maybe.

24.1.2 It is agreed between the Parties that, subsequent to the date hereof, all and any Intellectual Property developed by the Contractor and/or NATRAX either jointly or severally in connection with the performance, execution and implementation of the Works, shall at all times be and remain the sole and exclusive property of NATRAX. The Parties however agree that if the Contractor wishes to use for development of facilities owned by the Contractor/in house such Intellectual Property (i.e. that having been jointly or severally developed by the Contractor and/or NATRAX) for a period until the expiry of five (5) years from the date of this Contract, then in such an event the Contractor shall be entitled to use the said Intellectual Property without any cost/charge for use thereof.

However, where (i) the Contractor intends to use the said Intellectual Property subsequent to the expiry of the period of five (5) years from the date of this Contract; or (ii) the Contractor intends to use the said Intellectual Property right for any third party at any time, then in such event, the Contractor shall be entitled to use the said Intellectual Property right with the prior written approval of NATRAX and on such commercial terms as may be mutually agreed to between the Parties.

24.2 Unique Copyright

24.2.1 The Contractor hereby grants to NATRAX an option exercisable by notice from NATRAX to the Contractor at any time and as often as required to take an assignment from the Contractor with full title guarantee of all Intellectual Property in any Contractor's Documents (and all modifications and amendments to such Contractor's Documents), whether existing at the date of the Notice to Proceed or coming, into existence in future and wherever in the world arising, relating to any aspect of the Contractor's design which in NATRAX's reasonable opinion is original or unique to or individually characteristic of the Project ("Unique Copyright") and no further fees shall be payable by NATRAX in respect of such assignment.

24.2.2 To the extent that NATRAX becomes beneficial owner of any Unique Copyright pursuant to this **Clause** 24.2 **[**Unique Copyright**]** NATRAX hereby grants to the Contractor an irrevocable, royalty-free, non-exclusive licence to use and to reproduce such Unique Copyright for the purpose of performing the Contract Obligations. Such licence is granted on the basis that such Unique Copyright shall not be used except for the purpose specified in this **Clause**.

24.3 Infringing Matter

24.3.1 The Contractor warrants and represents that:

(i) it has all rights and licences necessary to grant, assign and transfer to NATRAX licences and assignments in accordance with this **Clause** 24.1.2 **[**Intellectual Property**]**; and

(ii) there is and will be no infringement of any Intellectual Property, in respect of the rights licensed and transferred to NATRAX pursuant to **Clause** 24.1.2 **[**Intellectual Property**]** or assigned otherwise used in connection with the Works.

24.3.2 The Contractor shall indemnify and hold harmless NATRAX against all issues, claims, damages, liabilities, costs and expenses (including legal costs) incurred by it in respect of any breach of the warranty in **Clause** 24.3.1 **[**Infringing Matter**]**. The Contractor shall ensure that in any appointment and/or Subcontract with any Subcontractor, the Contractor obtains the right to licence, assign and transfer in accordance with **Clause** 24.1.2 **[**Intellectual Property**]** the Intellectual Property in all or any Contractor's Documents and that such Subcontractor will enter into and execute such documents in favour of NATRAX and/or the Contractor and/or its Subcontractors to effect a valid licence and/or assignment of such Intellectual Property.

24.3.3 If either NATRAX or the Contractor is prevented from operating or using the Works or any Intellectual Property or any part thereof ("Infringing Matter"), the Contractor must at its own expense, in addition to its other obligations under the Contract, take all steps necessary to procure for NATRAX the right to operate or use the Infringing Matter for its intended purpose.

24.3.4 If the Contractor is unable to procure those rights referred to in **Clause** 24.3.3 **[**Infringing Matter**]** within such time as NATRAX directs, the Contractor must promptly, and at its own expense, comply with any direction by NATRAX to do one or more of the following:

(i) modify the Infringing Matter (but not so as to adversely affect its functionality or fitness for the purpose for which it is intended);

(ii) replace the affected part of the Infringing Matter, so as to overcome the infringement;

(iii) remove the affected part of the Infringing Matter and compensate NATRAX for any cost, loss, expense or damage incurred by NATRAX;

(iv) acquire a licence for NATRAX to use such Intellectual Property;

and any such direction is not a Change Order nor does it entitle the Contractor to any extension of time or any additional payment.

24.3.5 The Contractor represents and warrants that except for amounts included in the original Contract Sum, no royalties or other payments are due or payable by NATRAX to the Contractor or any other person in respect of any Intellectual Property or the use of or the grant of a right to use any Intellectual Property.

24.3.6 NATRAX shall be entitled to assign or transfer the licence of the Intellectual Property granted by the Contractor in accordance with **Clause** 24.1.2 **[**Intellectual Property**]** to any person or persons engaged in connection with the design operation and/or maintenance of the Works.

24.3.7 The Contractor's obligations under this **Clause** 24.1.2 **[**Intellectual Property**]** will not cease on the completion, expiry or termination of the Contract or any other discharge of the Contract.

24.3.8 As between the Parties, NATRAX shall retain the copyright and other Intellectual Property in the Technical Conditions of the Contract and other documents provided or made by (or on behalf of) NATRAX.

25. INSURANCES

25.1 Project Facility Insurances

NATRAX shall at its cost and expense, purchase and maintain in force (or procure that they are taken out and maintained in force) with reputable insurers, the Project Facility Insurances.

25.2 Contractor Insurances

The Contractor shall at its cost and expense, purchase and maintain in force (or procure that they are taken out and maintained in force) with reputable insurers, the Contractor's Insurance.

As a minimum, the Contractor shall maintain the following Insurances:

(a) Insurance for Works, Plant and Materials: for the full reinstatement cost including the cost of demolition, removal of debris and professional fees and profit until the date of issue of Defect Rectification Certificate;

(b) Insurance for Contractor's Equipment: for not less than the full replacement value, including delivery to Site until the date of issue of Completion Certificate.

(c) Insurance against Injury to Persons and Damage to Property: for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under (a) & (b) above) or to any person (except persons insured under (d) below), which may arise out of the Contractor's performance of the Contract and occurring before the date of issue of Defect Rectification Certificate.

(d) Insurance for Contractor's Personnel: against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel for the whole duration these Personnel are assisting in execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

25.3 Required Insurances

The terms of the Required Insurances shall entitle NATRAX to maintain the policies in force after termination of the Contractor's employment under the Contract.

25.4 Evidence

Either Party, at the request of the other shall, from time to time, provide to the other Party copies of all insurance policies (or appropriate endorsements, certifications or other

satisfactory evidence of insurance) obtained in accordance with the Contract (including the provision of copies of renewal confirmations as soon as possible).

25.5 Compliance

25.5.1 The Contractor shall from time to time promptly pay any insurance premium due, keep the insurance policies in force and valid and furnish copies thereof to NATRAX in accordance with this **Clause** 25 **[**Insurances**]**. Within **[**10 (ten)**]** days of receiving any insurance policy certificates in respect of the Insurances, the Contractor shall furnish to NATRAX, copies of such policy certificates, copies of the insurance and evidence that the insurance premiums have been paid in respect of such Insurances.

25.5.2 The Contractor shall not cancel, modify or allow to expire or lapse any Contractor Insurances until the expiration of at least **[**60 (sixty)**]**days notice of such cancellation, modification or non-renewal has been provided by the Contractor to NATRAX.

25.5.3 If at any time the Contractor fails to obtain or maintain in full force and effect any and all of the Contractor Insurances required under this Contract, NATRAX may at its option obtain and maintain such insurance and all sums incurred by NATRAX therefore shall be reimbursed by the Contractor to NATRAX within **[**5 (five)**]** days from the receipt of claim in respect thereof made by NATRAX.

25.6 Premiums

25.6.1 NATRAX will bear the cost of all insurance premiums in relation the Project Facility Insurances, and the Contractor will bear the cost of all insurance premiums in relation to the Contractor's Insurances.

25.7 Deductibles and application of insurance proceeds

25.7.1 The Contractor shall be responsible for the amount of any deductibles under the Required Insurances to the extent to which the claim results from an act, omission or default on the part of the Contractor or from circumstances for which the Contractor indemnifies NATRAX under the Contract. Regardless of the loss, any deductions in excess of the deductibles prescribed under the Contractors Insurances, or any amounts not recovered from the Insurer by the Contractor, notwithstanding compliance by the Contractor under **Clause** 25.5 **[**Compliance**]** shall be borne by the Contractor.

25.7.2 The proceeds of all insurance policies received shall be promptly applied by the Contractor towards repair, renovation, restoration or re-instatement of the Works or any part thereof which may have been damaged or destroyed.

25.7.2 The Contractor shall carry out such repair, renovation, restoration or re-instatement to the extent possible in such manner that the Works after such repair, renovation, restoration or re-instatement be as far as possible in the same condition as it were prior to such damage or destruction, normal wear and tear excepted.

26. PAYMENT

26.1 Payment Schedule

The Payment Schedule includes a schedule setting out each Milestone Event to be achieved in a month for the Works.

26.2 Contractor's Application for Payment

26.2.1 From the date of issue of the Notice to Proceed, on the 5th (fifth) Business Day of any month, the Contractor may submit a Request for Payment, to NATRAX Representative in respect of the preceding month.

26.2.2 Within each Request for Payment the Contractor shall show separately:

(i) the amounts which the Contractor claims to be payable as the cost of the Works completed during that month; and

(ii) the cumulative amount of all prior payments made by NATRAX; and

(iii) any amounts to which the Contractor considers are due and payable to it in accordance with the provisions of the Contract.

26.2.3 The Contractor's Request for Payment shall:

(i) be prepared on forms in the form and in a number advised by NATRAX Representative; and

(ii) contain confirmation of the relevant Milestone Events which, in the opinion of the Contractor have been achieved in that month which applies to each such Milestone Event; and

(iii) be accompanied by:

(a) Copy of relevant records of measurement of works, jointly taken and signed by both the parties;

(b) a status report describing in such detail as may reasonably request, the percentage of any uncompleted Milestone Event for the month in question and the work to be undertaken by the Contractor prior to the next Request for Payment;

(c) certification by NATRAX Representative confirming that the Milestone Events referred to in the Request for Payment have been achieved.

(d) confirmation by the Contractor of any amounts due and owing from the Contractor to NATRAX pursuant to the Contract;

(e) the Contractor's certification that the quality of all completed Works accords with the requirements of the Contract;

(f) the Contractor's certification that each obligation, item of cost or expense mentioned in that Request for Payment has not been the basis of any previous payment.

(g) the Contractor's certification that it has reviewed all financial and budget data contained in the Request for Payment;

(h) the Contractor's certification that the quality of all completed Works accords with the requirements of the Contract;

(i) the Contractor's certification that each obligation, item of cost or expense mentioned in that Request for Payment has not been the basis of any previous payment; and

(j) the Contractor's certification that each Subcontractor who performed part of the Works which was included in the immediately preceding Certificates of Payment was paid all amounts then due to it for such Work

(k) The Contractor providing evidence of the validity of the Contractor's Insurances.

26.3 Certificates of Payment

26.3.1 Within **[**14 (fourteen)**]** Business Days of receipt of the Contractor's Request for Payment under **Clause** 26.2 **[**Contractor's Application for Payment**]**, NATRAX and NATRAX Representative shall review such request and, shall issue to the Contractor, a Certificate of Payment certifying what amounts NATRAX shall pay. Each Certificate of Payment shall be for an amount which in the opinion of NATRAX, is the basis of the Request for Payment and pursuant to the Contract, is properly due to the Contractor (the "Gross Certifiable Amount") less (i) the cumulative amounts of payments previously certified as due to the Contractor, (ii) any deduction on account of recovery of Advance Payment, and (iii) Retention Amount.

26.3.2 In the event that the Contractor fails to achieve any Milestone Event specified in the Payment Schedule, the Contractor shall not be entitled to the payment value attributable to that Milestone Event until the relevant Milestone Event has been achieved. When the relevant Milestone Event is achieved, the Contractor may include the payment value attributable to the Milestone Event in the next Request for Payment.

26.3.3 No sum shall be included in the Certificate of Payment in respect of Materials yet to be incorporated into the Permanent Works unless the NATRAX Representative is satisfied that:

(i) such Materials have been properly acquired and properly and not prematurely delivered to the Project Site;

(ii) such Materials have been properly stored on the Project Site and fully protected against loss, damage or deterioration;

(iii) the Contractor's records of the requisitions, orders, receipts and use of any Materials are kept in a form approved by the NATRAX Representative, and such records are available for inspection by the NATRAX Representative; and

(iv) the Contractor has submitted a proper statement of the cost of acquiring the Materials together with such documents as may be required for evidencing such cost.

26.3.4 Without prejudice to any other rights of NATRAX to withhold payment to the Contractor, NATRAX may withhold from any payment due to the Contractor such amount as NATRAX deems reasonably necessary or appropriate:

(i) if in the opinion of the NATRAX Representative the progress of the Works at the time of the Request for Payment is behind the progress of the Works as set out in the Programme; and/or

(ii) to protect it from any losses, expenses, costs or liability because of any one or more of the following reasons:

(a) defects and deficiencies in any Works, whether or not payment has been made;

(b) unsatisfactory performance of the Contract;

(c) the filing of third party claims relating to the Works or any of its commitment parts for which the Contractor is liable;

(d) the Contractor's failure to make payments to Subcontractors;

(e) failure by the Contractor to provide or procure replacement Performance Security in accordance with the Contract;

(f) failure by the Contract to provide evidence of insurance coverage in accordance with the Contract;

(g) reasonable evidence that Completion will not occur by the Time for Completion;

(h) any overpayments made by NATRAX with respect to a previous payment;

(i) failure by the Contractor to submit a properly updated monthly Programme; and

(j) failure by the Contractor to provide satisfactory evidence that the costs of all labour and Materials and other obligations arising out of the Contract have been fully satisfied and discharged by the Contractor and/or to otherwise fail to submit adequate supporting documentation for any Request for Payment.

26.3.5 Any Provisional Sum Works shall only be executed in whole or part upon the NATRAX Representative's instruction. If the NATRAX Representative issues no such instruction, the Provisional Sum Works shall not form part of the Works and the Contractor shall not be entitled to payment for it. The Contractor shall be deemed to have allowed the necessary time and resources to enable design and Execution of the Provisional Sum Works in so far as the scope and nature of the Provisional Sum Works was reasonably foreseeable.

26.3.6 The Contractor shall be entitled only to such amount in respect of the Provisional Sum Works as the NATRAX Representative determines in accordance with this Clause 26.3.6. The NATRAX Representative shall notify the Contractor of any such determination. The NATRAX Representative shall have the authority to issue instructions to the Contractor for every Provisional Sum Works for which the Contractor shall be entitled to a part of the Provisional Sum as determined by the NATRAX Representative.

26.3.7 The Contractor shall produce to the NATRAX Representative all quotations, vouchers, invoices, accounts or receipts in connection with the expenditure in respect of the Provisional Sum Works, except where the Provisional Sum Works is valued in accordance with the item wise rates quoted by the Contractor in its bid submitted to the Employer.

26.3.8 In respect of every Provisional Sum the NATRAX Representative shall have authority to issue instructions for the execution of work or for the supply of goods, materials, Plant Sums or services by the Contractor, in which case the Contractor shall be entitled to an amount equal to the value thereof determined in accordance with Clause 23.

26.4 Payment

NATRAX shall pay the amount certified in a Certificate of Payment less the amount paid earlier in accordance with **Clause** 26.3.1 **[**Certificate of Payment**]**, no later than **[**15 (fifteen)**]** Business Days from the date of such Certificate of Payment.

26.5 Final Payment

26.5.1 Within **[**14 (fourteen)**]** Business Days after receipt of the Defects Rectification Certificate, the Contractor must submit a final payment claim entitled "Final Request for Payment", which must include:

(i) statements for the Contract Sum, summarising and reconciling all previous payments made by NATRAX and adjustments in the Contract Sum;

(ii) such other amounts as the Contractor considers to be due from NATRAX under the Contract.

26.5.2 Within **[**28 (twenty eight)**]** days of the receipt of the Contractor's Final Request for Payment, NATRAX Representative shall review the statements for the Contract Sum, submitted in accordance with **Clause** 26.5.1 **[**Final Payment**]** and issue to the Contractor a Final Certificate of Payment certifying the payment which NATRAX proposes to make which in the opinion of NATRAX, on the basis of the Final Request for Payment and the Contract, is due to the Contractor less any amount which NATRAX is entitled to withhold, return or set off pursuant to the Contract (the "Final Payment").

26.6 Disbursal of Final Payment

The Final Payment shall be paid to the Contractor within **[**45 (forty five)**]** Business Days of the notice of the Final Payment.

If the Contractor owes amounts to NATRAX under the Contract which are greater than the Final Payment, then such excess is a debt due and payable on demand and may be deducted from any payments otherwise due from NATRAX to the Contractor and NATRAX may also have recourse to the Performance Guarantee and/or retention provided under the Contract.

26.7 Mode of Payment

All payments under the Contract shall be made in accordance with the method stipulated in Special Conditions of Contract.

26.8 Corrections to Certificates of Payment

NATRAX Representative may in any Certificate of Payment make any correction or modification that should properly be made in respect of any previous Certificate.

26.9 Currency of Payment

The Contract Price and all payments to be made to the Contractor in respect thereof shall be in the currency set out at Special Conditions of Contract.

26.10 NATRAX right to set off

NATRAX shall, notwithstanding any provision to the contrary included in the Contract, be entitled to deduct from and set off against any amount due to the Contractor under the Contract, any amount or amounts which the Contractor is liable to pay to NATRAX under the Contract.

26.11 Advance Payment for Mobilisation of works.

26.11.1 The advance payment to the contractor for mobilisation of works shall be limited to the percentage (%), as given in the special conditions of contract. Such advance payment shall also carry an interest as mentioned in the special conditions of contract. The Contractor shall, together with each Request for Payment containing an application for the Advance Payment, provide to NATRAX an Advance Payment Guarantee from a Scheduled bank in India to which NATRAX has given its prior approval in writing and in a sum equal to the Advance Payment, in the form appearing in Schedule D **[**Form of Guarantees**]**. NATRAX shall pay the Advance Payment within **[**7(seven)**]** days of the receipt of the Advance Payment Guarantee.

26.11.2 Provided always that the Contractor shall not be entitled to submit a Request for Payment containing an application for the Advance Payment until it has demonstrated to the satisfaction of NATRAX Representative that it has mobilised at the Project Site, consistent with its obligations under the Contract and has complied with its obligations under **Clause** 3.3 **[**Following the Notice to Proceed**]**.

26.11.3 The Contractor shall maintain each Advance Payment Guarantee so that they shall remain in full force and effect until the expiry of [28 (twenty-eight)] days from the date upon which the full amount of the Advance Payment shall have been repaid after which no claim shall be made against the said guarantee. The cost of obtaining Advance Payment Guarantee shall be at the expense of the Contractor and shall be deemed to be included in the Contract Sum.

26.11.4 The Contractor agrees and acknowledges that following payment by NATRAX of the Advance Payment and provided that if NATRAX is unable to deduct the Advance Payment, including the interest as mentioned in the special conditions of contract, NATRAX at its discretion shall be entitled to demand the repayment of the whole or the remaining balance of the Advance Payment or to deduct so much of the outstanding amount thereof from amounts due and payable to the Contractor until the whole of the Advance Payment is repaid.

26.11.5 In addition to any other rights contained in the Contract, NATRAX shall be entitled to recover the Advance Payment by making deductions from the Gross Certifiable Amount, or to redeem the Advance payment Guarantee from the issuer bank to recover the balance advance amount payable to NATRAX.

26.11.6 The advance payment shall be fully repayable to NATRAX by the contractor, within a specific time, as mentioned in the special conditions of contract, counted from the date of release of such payment. The repayment shall not be linked to the certificate of payments and the same shall be dealt separately through A/c. Payee cheque or demand draft as per the schedule given in the special conditions of contract. The contractor shall submit a fund utilisation certificate, giving details of expenditure of funds, spent towards the mobilisation of works, along with the last re-payment schedule.

26.11.7 No other advance payment shall be paid, such as material advance etc.

26.12 Effect of Payment

The making of any payment shall in no event constitute the acceptance of any Works performed by Contractor pursuant to this Contract.

27. TAXES AND DUTIES

27.1 Contractor to pay Taxes

Unless specifically stated elsewhere in the Contract, the Contractor is solely liable for payment of, and warrants that it will pay, or ensure the payment of:

27.1.1 all Taxes imposed and assessments made in relation to the Contractor's Equipment, the Materials and the Works;

27.1.2 all contributions payable by any Applicable Law, award and pursuant to any contract with all industrial or trade union or other association of employees or otherwise with respect to or ascertained by reference to the wages, salaries or other compensation paid to employees of the Contractor or its Subcontractors in respect of the Works, including taxes or

contributions for workers' compensation, unemployment or sickness benefit, old age benefit, welfare funds, pensions and disability insurance;

27.1.3 the cost of all import or export licences if required;

27.1.4 the cost of any port dues including (but not by way of limitation) wharfage dues, storage, charges, quay rent, craneage, shipping dues, pilotage fees, anchorage, berthage and mooring fees, quarantine dues, loading, porterage and overtime fees for any Goods, Materials and equipment to be used in connection with the Execution of the Works;

27.1.5 all charges and other expenses in connection with the landing and shipment of all Goods and equipment and any part thereof, materials and other things of whatsoever nature brought into or despatched from India for the purposes of the Contract; and

27.1.6 the Contractor indemnifies and keeps indemnified NATRAX against all liability for payment of all of the above Taxes, assessments and contributions, duties, costs and fees and all liability arising in respect of any non-payment.

27.2 Withholding Tax/Income Tax deducted at source

NATRAX shall be entitled to deduct in accordance with Applicable Law, Income Tax or withholding tax or other deductions (as the case may be), from any payments made to the Contractor, and the amount so deducted shall be deemed to be a payment made to the Contractor. NATRAX shall provide a certificate certifying the deduction so made.

27.3 Exemptions and Concessions

27.3.1 The benefit of any Tax exemption or concessional rate available when the Contractor purchases Materials will be passed on to NATRAX through a reduction in the Contract Sum.

27.3.2 Where NATRAX and its contractors (including the Contractor) are entitled to an exemption or concession concerning any Tax to be levied in India in respect to Goods supplied under the Contract, NATRAX must use reasonable endeavours to enable the Contractor to claim such concession or exemption.

27.4 General

27.4.1 The Contractor must provide sufficient information regarding the nature and cost of the Works to enable all the relevant statutory obligations of NATRAX that are dependent upon that information to be satisfied.

27.4.2 The Contractor shall fully indemnify, save harmless and defend NATRAX including its officers, servants, agents and subsidiaries from and against any and all loss and damages arising out of or with respect to failure of the Contractor (a) to comply with Applicable Laws and Applicable Clearances and/or (b) to make payments of Taxes relating to the Contractor's Subcontractors and representatives income or other taxes required to be paid by the Contractor without reimbursement hereunder and/or (c) to pay amounts due as a result of materials or services furnished to the Contractor or any of its Subcontractors which

are payable by the Contractor or any of its Subcontractors or any other person employed or engaged by the Contractor in connection with the Works.

28. NATRAX

28.1 NATRAX obligations

Notwithstanding anything contained in the Contract and in addition to and not in derogation or substitution of any of its other obligations under the Contract, NATRAX shall:

(i) provide all assistance and support to the Contractor to obtain from Statutory Authorities all Applicable Clearances other than those which are NATRAX responsibility.

(ii) use reasonable endeavours to assist the Contractor in the procurement of the peaceful use of the Project Site by the Contractor under and in accordance with the provisions of the Contract and without any let or hindrance from any Relevant Authority, Statutory Authority or persons claiming through or under it/them.

29. CONTRACTOR'S COVENANTS

29.1 Setting Out and Boreholes

29.1.1 The Contractor shall be responsible for:

(i) the true and proper setting-out of the Works and for the correctness of the position, levels, dimensions and alignment of all parts of the Works; and

(ii) the provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities.

29.1.2 If, at any time during the Execution of the Works, any error appears in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the NATRAX Representative, shall, at its own cost and with no entitlement to any extension of time, rectify such error to the satisfaction of the NATRAX Representative.

29.1.3 The checking of any setting-out or of any line or level by the NATRAX Representative shall not in any way relieve the Contractor of its responsibility for the accuracy thereof and the Contractor shall carefully protect and preserve all bench-marks, sight-rails, pegs and other things used in setting-out the Works. Any instruction given by the NATRAX Representative pursuant to this **Clause** 29.1 **[**Setting out and Bore Holes**]** shall not be deemed to be a Change Order and the Contractor shall not be entitled to any extension of time or additional payment in respect thereof.

29.1.4 **Boreholes and exploratory excavations**

29.1.4.1 If at any time during the Execution of the Works, the Contractor considers it necessary or desirable to make boreholes or to carry out exploratory excavation or investigations of the ground it shall apply to NATRAX

Representative for permission to do so, giving details of its reasons and proposed boring methods. Such permission shall not be unreasonably refused or delayed by the NATRAX Representative.

29.1.4.2 The Contractor shall observe such requirements in connection therewith as the NATRAX Representative may impose as a condition of any permission it may give and shall furnish to the NATRAX Representative full details of such work, including borehole logs, and of any interpretation and conclusions which it, or any Subcontractor undertaking such work on its behalf, makes or reaches based on such information as may be obtained from such work. All such work shall be undertaken at the expense of the Contractor and the Contractor shall be responsible for such use as it may make of the results thereof. Any third party carrying out such work shall be deemed for the purposes of the Contract to be a Subcontractor.

29.2 Urgent repairs

If, by reason of any accident or failure or an Emergency or other event occurring to, in or in connection with the Works or any part thereof during the period of the Contract, any remedial work or repair shall, in the opinion of NATRAX Representative, be urgently necessary and the Contractor is unable or unwilling or not available at once to do such work or repair, NATRAX may by its own or other workmen do such work or repair as NATRAX Representative may consider necessary. If the work or repair so done by NATRAX is work which, in the opinion of the NATRAX Representative, the Contractor was liable to do at its own expense under the Contract, all costs and charges properly incurred by NATRAX in so doing shall within **[**14 (fourteen)**]** days from the date of receipt of the claim be paid by the Contractor to NATRAX or may without prejudice to any other method of recovery, be deducted by NATRAX from any monies due or which may become due to the Contractor or may be recovered as a debt.

29.3 Increased Monitoring and Right to Open Up

29.3.1 Increased monitoring

29.3.1.1 If, following any viewing, visit or inspection of the Project Site, it is discovered that there are defects in the Works or that the Contractor has failed to comply with the Technical Conditions of the Contract, the NATRAX Representative may (without prejudice to any other right or remedy available to it) by notice to the Contractor:

(i) specify the defect requiring rectification and the period for rectifying the same which shall be within **[**7 (seven)**]** days of the date of the notice or such other time as, in the opinion of the NATRAX Representative, is reasonable. If the Contractor has been notified of a defect(s) in accordance with this **Clause** 29.3.1 **[**Increased monitoring**]** and has failed to rectify it within the relevant period the cost incurred by NATRAX in the rectifying of the defect(s) as certified by the NATRAX Representative, shall be paid by the Contractor to NATRAX or may, without prejudice to any other method of

recovery, be deducted by NATRAX from any monies due to the Contractor or may be recovered as a debt due and payable to NATRAX on demand;

(ii) require the Contractor to implement measures to avoid such defects re-occurring;

(iii) require the Contractor to increase its quality assurance and quality control resources; and

(iv) increase the level of the NATRAX Representative's monitoring of the Contractor until such time as the Contractor shall have demonstrated to the satisfaction of the NATRAX Representative that it is capable of performing and will perform all its obligations under the Contract.

29.3.1.2 The NATRAX Representative may identify and instruct that work forming or intended to form part of the Works shall not be covered up or put out of view without the consent of the NATRAX Representative. The Contractor shall give reasonable notice to the NATRAX Representative before any such work is to be so covered up and shall afford the NATRAX Representative the opportunity of inspection before the work is covered up.

29.3.2 Subject to the **Clause** 29.3.3 **[**Right to open up**]** the NATRAX Representative shall have the right at any time to request the Contractor to open up and/or inspect and test any part or parts of the Works and any Materials where the NATRAX Representative reasonably believes that such part or parts of the Works is or are defective and the Contractor shall comply with such request.

29.3.3 If, following the exercise by the NATRAX Representative of its right pursuant to **Clause** 29.3.2 **[**Right to open up**]**, the inspection shows that the relevant part or parts of the Works or any Materials is or are defective, the Contractor shall rectify and make good such defect(s) and any consequence of such rectification and/or making good defect(s) shall be carried out by the Contractor at no cost to NATRAX (including without limitation, any reinstatement) and the Contractor shall not be entitled to any extension of time in relation to such rectification and making good of the Works. If the inspection shows such part or parts of the Works or any Materials is or are not defective, the NATRAX Representative shall, after due consultation with the Contractor, determine the Contractor's costs in respect of uncovering and reinstating the same, which shall be added to the Contract Sum, unless the NATRAX Representative had reasonable grounds to believe that such part or parts of the Works or any Materials were defective.

29.4 Improper work

The NATRAX Representative, without prejudice to the generality of its powers, shall have the authority to issue instructions (which shall be effected by the Contractor with all reasonable speed and at its sole expense without any right to an extension of time) from time to time for:

29.4.1 the removal from the Project Site, within such time or times as may be specified in the instruction, of any part of the Works which, in the opinion of the NATRAX Representative, are not in accordance with the Contract;

29.4.2 the substitution of proper and suitable part of the Works;

29.4.3 the removal and proper re-Execution, notwithstanding any previous test thereof or interim payment therefor, of any work which, in respect of any workmanship or design by the Contractor is not, in the reasonable opinion of the NATRAX Representative, in accordance with the Contract; and

29.4.4 such testing, as it may consider necessary or desirable following any instruction issued pursuant to this **Clause** 29.4 **[**Improper work **]**.

29.5 Suspension

29.5.1 The NATRAX Representative may suspend (i) progress or performance of all or any part of the Works (ii) delivery of any Materials or any part thereof or Contractor's Equipment which is ready for delivery to the Project Site by an order (herein called a "Suspension Order") issued to the Contractor in writing with a copy to NATRAX where:

(i) it is necessary by reason of some act, default, omission or breach by the Contractor (or those it is contractually responsible for) or a matter for which it is responsible or by reason of some default or breach reasonably anticipated by the NATRAX Representative; or

(ii) it is necessary for the proper Execution of the Works; or

(iii) it is necessary in accordance with **Clause** 13.5.1 **[**Failure to co-ordinate**]**; or

(iv) an unsafe condition or Emergency exists or is likely to result at the Works or any part of the Project Site; or

(v) it is a necessary consequence of an action of any Statutory Authority.

29.5.2 A Suspension Order shall be final, conclusive and binding on the Contractor. On receipt of a Suspension Order, the Contractor shall immediately suspend any delivery or any part or all of the Works as the case may be, for such time and in such manner as the NATRAX Representative may consider necessary and immediately advise the NATRAX Representative of any aspects of the Works which need to be continued to maintain the safety and security of the Works.

29.5.3 Following receipt of a Suspension Order the Contractor shall during any suspension, properly protect and secure the Works and the Goods and shall not remove any Goods from the Project Site without the prior consent of the NATRAX Representative and the Contractor shall take all reasonable measures to minimise the costs and losses of the suspension to NATRAX and the Contractor, including meeting with the NATRAX Representative on a regular basis.

29.5.4 The Contractor shall, in a reasonable time, undertake any necessary action instructed by the NATRAX Representative to remedy the circumstances that led to the issue of a Suspension Notice and the Contractor shall notify the NATRAX Representative immediately upon completing such action. The NATRAX Representative shall within **[**7 (seven)**]** days of receipt of such notice either instruct the Contractor to resume the Works or identify by means of a further written notice the additional action which is required to be taken by the Contractor before an instruction to resume can be given.

29.5.5 The NATRAX Representative may at any time instruct the Contractor to resume the Works or such part of the Works that are the subject of a Suspension Order, in which case the Contractor shall do so as soon as is reasonably practicable and in any event within **[**20 (twenty)**]** days of such instruction. Upon resumption of the Works, the Contractor shall immediately undertake an examination of the affected parts of the Works and shall make good any deterioration or defect in or loss of the Works, the Materials or any part thereof that may have occurred during the suspension.

29.5.6 In the event that the NATRAX Representative issues a Suspension Order in accordance with **Clause** 29.5.1 (i) to (iv) **[**Suspension**]** the Contractor shall not be entitled to any addition to the Contract Sum or any extension of time. The Contractor shall not be entitled to any addition to the Contract Sum or to any extension of time where the necessity to issue such a Suspension Order was due in any way to the act, default, omission or breach by the Contractor (or those it is contractually responsible for) or a matter for which it is responsible or by reason of some default or breach reasonably anticipated by the NATRAX Representative.

29.6 Audit

29.6.1 It is an agreed term of the Contract that NATRAX reserves to itself the right to carry out a pre payment audit of the Final Payment including all supporting vouchers, abstracts, etc.

29.6.2 It is an agreed term of the Contract, that NATRAX reserves to itself or through its nominee the right to carry out a post payment audit and / or technical examination of the Works, and the Final Payment including all supporting vouchers, abstracts, etc., and to make a claim on the Contractor for the refund of any excess amount paid to the Contractor, if as a result of such examination, any over-payment to the Contractor is discovered to have been made in respect of any Work done or alleged to have been done by the Contractor, under the Contract. Such payments or recoveries, however, shall not carry any interest.

29.6.3 Without prejudice to **Clause** 29.6.1 **[**Audit**]** and **Clause** 29.6.2 **[**Audit**]**, the Contractor shall maintain complete and accurate records in respect of the design and Execution of the Works and in connection with the Contract and all transactions related thereto during the Design and Execution Period and in accordance with the NATRAX Representative instructions. The system of accounting to be employed by Contractor shall be in accordance with NATRAX's practices, and Contractor's records and books of account referred to above and all supporting documents shall be maintained in such a manner as to provide an audit trail and as to facilitate any examination and audit thereof by NATRAX.

29.6.4 Any of the Contractor's records offices shall be maintained in accordance with the Technical Specifications and Drawings and all such records contained therein shall be maintained for at least **[**5 (five)**]** years after the issue of the Defects Rectification Certificate ("Audit Period"). NATRAX and/or its duly authorised representatives shall have, during the Audit Period, the right to audit, examine, and make photocopies of all accounts, records, correspondence, manuals, drawings and all other documents, including but not limited to all labour hours and costs, material costs, subcontract costs, rental costs and other charges pertaining to the Contract to verify the amounts and reliefs claimed and to verify compliance with the terms and conditions hereof and with the Applicable Laws.

29.6.5 The Contractor shall make the accounts, records, correspondence, manuals and drawings and all other documents referred to in **Clause** 29.6.4 **[**Audit**]** available for inspection on reasonable notice and during normal business hours to the NATRAX Representative and any persons authorised by the NATRAX Representative and shall furnish copies of the same, at NATRAX cost, if called for.

(i) This **Clause** 29.6 **[**Audit**]** shall extend to transactions with third parties when the transactions are deemed by NATRAX to relate, actually or potentially, to performance under the Contract and compliance with Applicable Laws.

(ii) To the extent the any accounts, records, correspondence, manuals and drawings and all other documents referred to in this **Clause** 29.6 **[**Audit**]** are to be created or maintained on a computer or other electronic storage device, the Contractor shall comply with any reasonable request of the NATRAX Representative from time to time relating to procedures for the back-up and off-site storage of copies of such records.

(iii) Upon termination of the Contractor's employment for whatever reason under the Contract, the Contractor shall make all such arrangements to deliver the records referred to in the notice to NATRAX or its nominee in as complete a form as required under the Contract at such time, in such manner and at such location as the NATRAX Representative shall reasonably specify

29.7 Illegal gratification

29.7.1 Bribe, commission, gift or advantage: Any bribe, commission, gift or advantage given or offered by the Contractor directly or through its partner, agent or any officer or employee of NATRAX, or to any person / institution connected with NATRAX, in relation to obtaining or the execution of this or any other Contract with the NATRAX Representative or NATRAX, shall in addition to any criminal liability which the Contractor may incur, subject the Contractor to termination of the Contract and all other Contracts with NATRAX, and liability for payment of any loss or damage to NATRAX, resulting from such termination. NATRAX shall be entitled to deduct the amounts so payable from any money / moneys due to the Contractor alone, or jointly under the Contract or any other contract with NATRAX. The Contractor shall not be due, nor shall be paid any compensation whatsoever for any loss, alleged or actual, suffered by the Contractor when the Contract is so terminated.

29.7.2 Monetary dealing of Contractor with employee of NATRAX or NATRAX Representative: The Contractor shall not lend or borrow money from, or enter into any monetary dealings or transactions directly or indirectly, with any employee of NATRAX Representative or NATRAX, and if the Contractor does so, NATRAX shall be entitled forth-with to terminate the Contract and all other Contracts with NATRAX. The Contractor shall be liable to pay compensation for any loss or damage to NATRAX resulting from such termination and NATRAX shall be entitled to deduct the amounts so payable from the money(s) due to the Contractor.

29.7.3 Settlement of dispute as to commission of such offence: If any question or dispute as to the commission of any such offence arises under Sub-clauses (bribe, commission, gift or advantage) and (monetary dealer of Contractor with employee of NATRAX or NATRAX Representative), the same shall be settled by NATRAX Representative, in such manner as the NATRAX Representative shall consider fit and proper, and such decision shall be final and binding.

29.8 Avoidance of Damage to Roads and Bridges

29.8.1 Contractor to prevent damage to roads and bridges

29.8.1.1 The Contractor shall use every reasonable means to prevent any of the highways, railway or bridges communicating with or on the routes to the Project Site (including access and link roads) from being damaged or injured by any traffic of the Contractor or any of its Subcontractors. In particular the Contractor shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and materials to and from the Project Site shall be limited as far as reasonably possible and so that no unnecessary damage or injury may be occasioned to such highways, railways and bridges.

29.8.1.2 Should it be found necessary for the Contractor to move one or more loads of Contractor's Equipment, machinery or pre-constructed units or part of units of works over part of a highway railway or bridge, the moving whereof is likely to damage any highway, railway or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load on to such highway, railway or bridge give notice to the appropriate authority of the load to be moved and obtain the required approval of the said authorities for its proposals for protecting or strengthening the said highway, railway or bridge. The Contractor shall be responsible for the cost and expenses of any necessary work for the protection or strengthening the said highway, railway or bridge.

29.8.2 Transport of Materials and Contractor's Equipment

The Contractor shall indemnify and hold harmless NATRAX from and against any claims, proceedings, damages, costs, charges or expenses in respect of damage to any highway,

railway, bridges or any other traffic facilities or route for vehicular movement and/or persons that may be caused by the traffic of the Contractor or any of its Subcontractors.

29.8.3 Access routes

The Contractor shall be deemed to have been satisfied as to the safety, suitability and availability of access routes up to the Project Site. Without prejudice to the generality of the foregoing:

29.8.3.1 NATRAX shall not be responsible for any claims which may arise from the use or otherwise of any access route to, from and over the Project Site;

29.8.3.2 NATRAX does not guarantee the suitability or availability of particular access routes and all costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall (as between the Parties) be borne by the Contractor;

29.8.3.3 the Contractor shall provide such signs or directions along access routes to, from and over the Project Site as required by the Technical Specifications and Drawings and shall obtain any permission which may be required for the provision of such signs and directions; and

29.8.3.4 without prejudice to its obligations under Clause 22.1 **[**Defects rectification by the Contractor**]** the Contractor shall (as between the Parties) be responsible for the maintenance of access routes over the Project Site until the Completion.

29.8.4 Road Diversions

Where it is necessary that operations required for the Execution of the Works or any part thereof interfere with the use or occupation of or access to any public or private roads or footpaths the Contractor shall, before it commences such operations, apply for and obtain the written approval therefor from the relevant Statutory Authority or the permission of the person affected, as the case may be, and shall observe all the requirements that the same in order to be allowed to interfere with any public or private roads or footpaths. The Contractor shall give the NATRAX Representative prior notice of all operations referred to in this Clause 29.8.4 **[**Road Diversions**]** and shall, as the same takes place, send copies to it of all correspondence and inform it of all discussions relating to such operations and the work undertaken.

29.8.5 Contractor not to interfere

All operations necessary for the Execution of the Works or any part thereof shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with any or with the convenience of the public, or the access to, use and occupation of public or private roads or footpaths or any properties (adjoining the Project Site or otherwise) whether in the possession of NATRAX or of any other person.

29.8.6 Waterborne traffic

Where the nature of the Works is such as to require the use by the Contractor of waterborne transport the forgoing provisions of this Clause 29.8 [Avoidance of damages to roads and bridges] shall be construed as though "road" included a lock, dock, sea wall or other structure related to a waterway and "vehicle" included craft, and shall have effect accordingly.

29.9 Care of the Works, Liability for Accidents and Damage

29.9.1 Contractor to take full responsibility for care of the Works

29.9.1.1 The Contractor shall bear full risk in and take full responsibility for the care of the Works (and, without limitation for the care of any works carried out on the Project Site by other contractors) from the date of issue of the Notice to Proceed until [14 (fourteen)] days after the date of issue of the Completion Certificate, when such responsibility for the care of the Works shall pass to NATRAX as instructed to the Contractor by the NATRAX Representative.

Provided that the Contractor shall take full responsibility for (i) the care of any outstanding Works for incorporation therein which it undertakes to finish during the Defects Rectification Period until such outstanding Works have been completed pursuant to the Contract and for (ii) the care of the Works or any part thereof which may require repair or remedy during the Defects Rectification Period and Latent Defects Rectification Period and for any part of the Works affected thereby, for the period that such Works are under repair or remedy by the Contractor.

29.9.2 Responsibility to rectify loss or damage

29.9.2.1 If any loss or damage happens or occurs to the Works or any part thereof during the period for which the Contractor is responsible for their care in accordance with Clause 29.9.1 [Contractor to take full responsibility for care of the Works], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works conform in every respect with the provisions of the Contract and are to the satisfaction of the NATRAX Representative.

29.9.2.2 For the avoidance of doubt and without limiting the Contractor's liability under the remainder of the Contract, the Contractor shall also be liable for any loss or damage to the Works:

(i) which occurs after the Completion Certificate for the Works has been issued and which arose from a previous event for which the Contractor was liable.

(ii) occasioned by the Contractor in the course of any operations carried out by it for the purpose of complying with any of its obligations under Clause 22 [Defects Rectification Period].

29.9.3 Damage to persons and property

The Contractor indemnifies and keeps indemnified NATRAX 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 design and Execution of the Works and the remedying of any defects therein and against all claims demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

29.10 Clearance of the Project Site

On completion of the Works, the Contractor shall clear away and remove from the Project Site all equipments, surplus materials, rubbish and Temporary Works of every kind and leave the whole of the Project Site and the Works clean and in a workmanship condition, tidy and in an aesthetically pleasing appearance to the satisfaction of NATRAX and the NATRAX Representative. The Contractor shall, unless otherwise instructed in writing by NATRAX Representative, remove all signs of temporary construction facilities such as such as haul roads, work areas, structures, foundations of Temporary Works, stockpiles of excess or waste materials and other vestiges of construction prior to the issue of the Completion Certificate

30. FORCE MAJEURE

30.1 Force Majeure - Obligations of the Parties

30.1.1 "Force Majeure" shall mean any event beyond the control of NATRAX or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected, and which could not have been prevented by exercise of reasonable skill and care and good industry practices and shall include, without limitation, the following:

(i) War, hostilities, invasion, act of foreign enemy and civil war;

(ii) Rebellion, revolution, insurrection, mutiny, conspiracy, riot, civil commotion and terrorist acts;

(iii) Strike, sabotage, unlawful lockout, epidemics, quarantine and plague;

(iv) Earthquake, fire, flood or cyclone, or other natural disaster.

As soon as reasonably practicable but no more than 48 (forty-eight) hours following the date of commencement of any event of Force Majeure, an Affected Party shall notify the other Party of the event of Force Majeure setting out, inter alia, the following in reasonable detail:

30.1.2 the date of commencement of the event of Force Majeure;

30.1.3 the nature and extent of the event of Force Majeure;

30.1.4 the estimated Force Majeure Period,

30.1.5 reasonable proof of the nature of such delay or failure and its anticipated effect upon the time for performance and the nature of and the extent to which, performance of any of its obligations under the Contract is affected by the Force Majeure.

30.1.5 the measures which the Affected Party has taken or proposes to take to alleviate/mitigate the impact of the Force Majeure and to resume performance of such of its obligations affected thereby.

30.1.6 any other relevant information concerning the Force Majeure and /or the rights and obligations of the Parties under the Contract.

30.2 Meetings with NATRAX Representative

As soon as reasonably practicable and in any case within **[**5 (five)**]** days of notification by the Affected Party in accordance with the preceding **Clause** 30.1 **[**Force Majeure - Obligations of the Parties**]**, the Parties shall along with NATRAX Representative and others, meet and hold discussions and where necessary conduct physical inspection and/or survey of the Works in order to:

30.2.1 assess the impact of the event of Force Majeure; and

30.2.2 to determine the likely duration of the Force Majeure Period; and

30.2.3 to formulate damage mitigation measures and steps to be undertaken by the Parties for resumption of obligations the performance of which shall have been affected by the underlying Force Majeure.

30.3 Reporting during the Force Majeure Period

The Affected Party shall during the Force Majeure Period provide to the other Party and NATRAX Representative with regular (not less than weekly) reports concerning the matters set out in **Clause** 30.2 **[**Meetings with NATRAX Representative**]** in addition to any other information, details or document, which the other Party or NATRAX Representative may reasonably require.

30.4 Performance obligations

30.4.1 If the Affected Party is rendered wholly or partially unable to perform any of its obligations under the Contract because of an event of Force Majeure, it shall be excused from performance of such obligations to the extent it is unable to perform the same on account of such Force Majeure, provided that in case the Affected Party is the Contractor, the Contractor shall be entitled to an extension of time under **Clause** 19 **[**Extension of Time for Completion**]**.

30.4.2 When the Affected Party is able to resume performance of its obligations under the Contract, it shall give to the other Party written notice to that effect forthwith and shall promptly resume performance of its obligations hereunder.

30.4.3 The Affected Party shall continue to perform such of its obligations which are not affected by the event of Force Majeure and which are capable of being performed in accordance with the Contract.

30.5 Liability for other losses, damages etc.

Save and except as expressly provided in this **Clause** 30 **[**Force Majeure**]** neither Party hereto shall be liable in any manner whatsoever to the other Party in respect of any loss, damage, cost, expense, claims, demands and proceedings relating to or arising out of occurrence or existence of any event of Force Majeure.

30.6 Exceptions to Force Majeure

None of the following events shall be construed to relieve any Party of its obligations hereunder by reason of **Clause** 30 **[**Force Majeure**]**:

(i) any changes in market conditions including without limitation changes that affect the supply prices of the Goods;

(ii) commercial impracticability or hardship;

(iii) a Party's lack of funds.

31. DISPUTE RESOLUTION PROCEDURE

31.1 Amicable Resolution and Mediation

31.1.1 Save where expressly stated to the contrary in the Contract, any dispute, difference or controversy of whatever nature between the Parties, howsoever arising under, out of or in relation to the Contract including disputes, if any, with regard to any acts, decision or opinion of NATRAX Representative and so notified in writing by either Party to the other (the "Dispute") shall in the first instance be attempted to be resolved amicably in accordance with the procedure set out in **Clause** 31.1.2 **[**Amicable Resolution and Mediation**]** below.

31.1.2 Either Party may require such Dispute to be referred to a person nominated by each Party , for amicable settlement. Upon such reference, the two shall meet at the earliest mutual convenience and in any event within **[**15 (fifteen)**]** days of such reference to discuss and attempt to amicably resolve the Dispute.

31.1.3 In the event that the Dispute in question is not resolved amicably within 15 (fifteen) days of such meeting between the Parties in accordance with **Clause** 31.1.2 **[**Amicable Resolution and Mediation**]** either Party may refer the Dispute to arbitration in accordance with **Clause** 32.2 **[**Arbitration Procedure**]**.

31.2 Arbitration Procedure

Save where expressly stated to the contrary in the Contract, any Dispute shall be finally settled by binding arbitration under the Arbitration and Conciliation Act 1996 Act and in accordance with the UNICTRAL rules (the "Arbitration Rules") by three arbitrators appointed in accordance with the Arbitration Rules.

31.3 Place of Arbitration

The place of arbitration shall be New Delhi.

31.4 English Language

The request for arbitration, the answer to the request, the terms of reference, any written submissions, any orders and awards shall be in English and, if oral hearings take place, English shall be the language to be used in the hearings.

31.5 Enforcement of Award

The Parties agree that the decision or award resulting from arbitration shall be final and binding upon the Parties and shall be enforceable in accordance with the provisions of the Arbitration and Conciliation Act.

31.6 Performance during Arbitration

Pending the submission of and/or decision on a Dispute and until the arbitral award is published, the Parties shall continue to perform their respective obligations under the Contract without prejudice to a final adjustment in accordance with such award.

32. REPRESENTATIONS AND WARRANTIES, DISCLAIMER

32.1 Representations and Warranties of the Contractor

The Contractor represents and warrants to NATRAX that:

32.1.1 it is duly organised, validly existing and in good standing under the laws of [the country of its incorporation] ;

32.1.2 it has full power and authority to execute, deliver and perform its obligations under the Contract and to carry out the transactions contemplated hereby;

32.1.3 it has taken all necessary corporate and other action under Applicable Laws and its constitutional documents to authorise the Execution, delivery and performance of the Contract;

32.1.4 it has the financial standing and capacity to design and Execute the Works;

32.1.5 the Contract constitutes its legal, valid and binding obligation enforceable against it in accordance with the terms hereof;

32.1.6 it is subject to the Applicable Laws with respect to the Contract and it hereby expressly and irrevocably waives any immunity in any jurisdiction in respect thereof;

32.1.7 the execution, delivery and performance of this Contract will not conflict with, result in the breach of, constitute a default under or accelerate performance required by any of the terms of the Contractor's Memorandum and Articles of Association or any Applicable Laws or any covenant, contract, understanding, decree or order to which it is a party or by which it or any of its properties or assets are bound or affected;

32.1.8 there are no actions, suits, proceedings or investigations pending or to the Contractor's knowledge threatened against it at law or in equity before any court or before any other judicial, quasi judicial or other authority, the outcome of which may result in a Material Adverse Effect upon the Works;

32.1.9 it has no knowledge of any violation or default with respect to any order, writ, injunction or any decree of any court or any legally binding order of any Statutory Authority which may result in a Material Adverse Effect upon the Works;

32.1.10 it has complied with all Applicable Laws and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have Material Adverse Effect upon the Works;

32.1.11 no representation or warranty by the Contractor contained herein or in any other document furnished by it to NATRAX or to any Statutory Authority in relation to Applicable Clearances contains or will contain any untrue statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading; and

32.1.12 no bribe or illegal gratification has been paid or will be paid in cash or kind by or on behalf of the Contractor to any person to procure the Contract or any other benefit under the Contract to procure other Contracts in relation to which the Contractor may be a party in relation to the Project.

32.1.13 without prejudice to any express provision contained in the Contract, the Contractor acknowledges that prior to the execution of the Contract, the Contractor has after a complete and careful examination made an independent evaluation of the Project Site, the Technical Specifications and Drawings and any information provided by or on behalf of NATRAX and has made an inspection of the Project Site and has determined to its satisfaction the nature and extent of risks and hazards as are likely to arise or may be faced by the Contractor in the course of performance of its obligations hereunder.

33. TERMINATION

33.1 Termination

33.1.1 Subject to the other provisions of the Contract, NATRAX shall have the right to serve a notice of termination of the Contract on the Contractor and forthwith terminate the Contract without prejudice to any of its other rights and remedies against the Contractor and without being liable to pay any loss or compensation if:

(i) the Contractor fails to pay any amount due and payable under the Contract within [21 (twenty one)] days of receipt of notice given by NATRAX of such non-payment;

(ii) if any distress or execution is levied upon any of the assets of the Contractor;

(iii) at any time during the currency of the Contract there is a change in the effective control of the Contractor as at the date of the Contract;

(iv) the Contractor fails to complete, test and commission the Contractor's Works/Project Facility within the Time for Completion or commits any other violation/breach of the terms and conditions of the Contract which is not rectified within [14 (fourteen)] days of the date of receipt of notice from NATRAX in this regard.

(v) any of the following events occurs:

(a) the passing of a resolution by the shareholders of the Contractor for the winding up of the Contractor;

(b) the appointment of a liquidator in a proceeding for the winding up of the Contractor or the Contractor entering into a compromise with its creditors; or

(c) the making by the court of an order winding up the Contractor,

(d) The Contractor either:

(i) Appoints a subcontractor without the prior approval of NATRAX, or terminates any of the Subcontractor; or

(ii) having terminated any of the Subcontracts with the consent of NATRAX, appoints a replacement Sub-Contractor without the prior approval of NATRAX.

(e) the Contractor without the consent of NATRAX assigns or transfers all or any of its rights or obligations under the Contract;

(f) the Contractor repudiates the Contract or otherwise evidences an intention not to be bound by the Contract; or

(g) the expropriation, confiscation or compulsory acquisition of the Project Facility;

(h) as a result of Force Majeure, the Contractor is unable to proceed with the Works for a period of [90(ninety)] consecutive days or [180(One Hundred and Eighty)] days in a year (whichever is less);

(i) if the Contractor or any of its servants or agents commit or suffer to be committed or omit or suffer to be omitted any act, deed, matter or thing which in the opinion of NATRAX Representative whose decision (without an obligation to give reasons therefor) in this regard will be final, is prejudicial to the interests or reputation of NATRAX.

(j) the Contractor offers, gives or promises any payment directly or indirectly to any government, political party, or official thereof, or any candidate for political office, or to NATRAX in order to influence any substantive decision of, or induce any party or person to use its influence to offset any substantive decision of any Relevant Authority or Statutory Authority or NATRAX in regard to any aspect of the Contract;

(k) the Contractor makes any warranty or representation in or in accordance with the Contract which was materially incorrect when made so as to materially affect NATRAX's interests; or

(l) in the event that the Contractor's liability for Liquidated Damages reaches the cap on such damages as set out in Special Conditions of Contract and the Completion Certificate for the whole of the Works has not been issued; or

(m) fails to provide, maintain or renew and/or comply with its obligations in relation to the Performance Security; or

(vi) the Contractor has, without valid reason and NATRAX's consent, failed to commence the Works promptly, or fails to progress the Works regularly and/or diligently, or has suspended the progress of the Works for more than [7 (seven) days;] or

(vii) the Contractor has failed to adhere to the Technical Specifications and Drawings and in the reasonable estimation of the NATRAX Representative, such failure is likely to mean that Completion of the Works is likely to be delayed beyond the relevant Time for Completion; or

(viii) the Contractor's personnel is/are incompetent, have acted in a manner prejudicial to NATRAX's best interest or have failed to comply with NATRAX's health, safety, environment or other rules or regulations and procedures; or

(ix) the Contractor has failed to achieve two Milestones consecutively.

33.2 Termination Procedure

33.2.1 A notice of termination given pursuant to this **Clause** 33 [Termination] (each a "Preliminary Termination Notice") shall specify in reasonable detail the circumstances giving rise to the Preliminary Termination Notice. If, within [21 (twenty one)] days following the service by NATRAX of a Preliminary Termination Notice, the Contractor pays all sums which are due and payable to NATRAX or remedies the breach to the satisfaction of NATRAX existing as at the date of the Preliminary Termination Notice then:-

(i) such Preliminary Termination Notice shall be revoked and all existing rights of termination in favour of NATRAX under the Contract shall terminate (but without prejudice to any rights of NATRAX in respect of any future breach of the Contract); and

(ii) The Contractor shall continue to perform its obligations under the Contract in a diligent and proper manner.

33.2.2 Within the period of [21 (twenty one)] days following the receipt of the Preliminary Termination Notice by the Contractor and unless the Parties shall have otherwise agreed or the circumstances giving rise to the Preliminary Termination Notice shall have ceased to exist or shall have not been remedied, NATRAX may terminate the Contract by giving written notice (a "Termination Notice") to the Contractor and the Contract shall terminate on the date mentioned in the Termination Notice ("Termination Date").

33.2.3 The termination of the Contract by NATRAX for reasons other than breach can be made by a written notice to the Contractor and nothing herein will obligate NATRAX to terminate the Contract or be liable for any exercising its right of termination and NATRAX may pursue all remedies available in law instead of termination.

33.3 Upon Termination

33.3.1 Upon Termination for any reason whatsoever, the Contractor shall to the extent instructed by the NATRAX's Representative:

(i) cease all further work as instructed by the NATRAX's Representative in the Termination Notice and the Contractor shall carry out works for the sole purpose of securing, preserving and protecting that part of the Works already Executed and any work required to leave the Project Site and the Works in a clean and safe condition;

(ii) remove all the Contractor's Equipment and Temporary Works;

(iii) repatriate the Contractor's and Subcontractor's personnel from any part of the Project Site and the Works;

(iv) deliver to NATRAX the Works Executed by the Contractor as at the Termination Date;

(v) ensure that it and those it is contractually or otherwise responsible for, vacate the Project Site;

(vi) deliver to NATRAX "as built drawings" showing all work carried out since commencement of the Works; and

(vii) promptly and in an orderly manner deliver to NATRAX all documents relating to the Works which are for the time being under the control of the Contractor;

33.3.2 Without prejudice to **Clause** 33.3.1 **[**Upon Termination**]** upon Termination:

(i) NATRAX may enter the Project Site and the Works thereof and expel the Contractor therefrom and NATRAX may complete the Works itself or by employing any third party;

(ii) NATRAX may, to the exclusion of any right of the Contractor over the same, take over and have free use, without payment to the Contractor, of any Contractor's Equipment and Temporary Works of which have been delivered to the Project Site for such period as the NATRAX's Representative considers necessary for the Execution of the Works, without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same.

(iii) NATRAX may at any time sell any of the said Contractor's Equipment, Temporary Works and any unused materials and apply the proceeds of sale in or towards for satisfaction of any sums due or which may become due to it from the Contractor under the Contract; and

(iv) NATRAX shall have the power and authority to prohibit the Contractor and any person claiming through or under the Contractor from entering the Project Site.

34. MISCELLANEOUS

34.1 Assignment and Charges

34.1.1 Subject to **Clauses** 34.1.2 **[**Assignment and Charges**]**, neither Party shall assign the Contract or the rights, benefits and obligations hereunder save and except with prior consent of the other Party.

34.1.2 The Contractor shall not create nor permit to subsist any Encumbrance over or otherwise transfer or dispose of all or any of its rights and benefits under the Contract except with prior consent in writing of NATRAX, which consent shall not be unreasonably withheld.

34.2 Interest

Any sum which becomes payable under any of the provisions of the Contract by one Party to the other Party shall, if the same be not paid within the time allowed for payment thereof, shall be deemed to be a debt owed by the Party responsible for payment thereof to the Party entitled to receive the same. Such sum shall until payment thereof carry the Default Interest Rate from the due date for payment thereof until the same is paid to or otherwise realised by the Party entitled to the same.

However an interest as specified in the SCC shall be charged to the contractor towards the advance payment till such payment is fully recovered by NATRAX.

34.3 Governing Law and Jurisdiction

The Contract shall be governed by the laws of India. In respect of all matters arising out of or relating to the Contract, the Courts at New Delhi, India.

34.4 Waiver

34.4.1 Waiver by either Party of any default by the other Party in the observance and performance of any provision of or obligations under the Contract:

(i) shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions or obligations under the Contract;

(ii) shall not be effective unless it is in writing and executed by a duly authorised representative of such Party; and

(iii) shall not affect the validity or enforceability of the Contract in any manner.

34.4.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of the Contract or any obligation hereunder nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver/breach of any terms, conditions or provisions of the Contract.

34.5 Survival

Termination or expiry of the Contract (i) shall not relieve NATRAX or the Contractor of any obligations already incurred hereunder which expressly or by implication survives termination hereof, and (ii) except as otherwise provided in any provision of the Contract expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of such Party prior to the effectiveness of such termination or arising out of such termination.

34.6 Amendments

The Contract constitutes a complete and exclusive understanding of the terms of the Contract between the Parties on the subject hereof and no amendment or modification hereto shall be valid and effective unless agreed to by all the Parties hereto and evidenced in writing.

34.7 Severability

If for any reason whatsoever any provision of the Contract is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties shall negotiate in good faith with a view to agreeing upon one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable. Provided failure to agree upon any such provisions shall not be subject to dispute resolution under this Contract or otherwise.

34.8 No Partnership

Nothing contained in the Contract shall be construed or interpreted as constituting a partnership between the Parties. Neither Party shall have any authority to bind the other in any manner whatsoever. The Contract shall be construed to have been entered on a principal to principal basis.

34.9 Exclusion of implied warranties

This Contract expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties or any representation by any Party not contained in a binding legal Contract executed by the Parties.

34.10 Entire Agreement

The Contract constitutes the entire agreement between the Parties and supersedes all prior negotiations, commitments, representations, communications and agreements relating to the Contract either oral or in writing except to the extent they are expressly incorporated herein. The Contractor confirms that it has not relied upon any representation inducing it to enter into the Contract (whether or not such representation has been incorporated as a term of the Contract) and agrees to waive any right which it might otherwise have to bring any action in respect of such representation. The Contractor further confirms that there is

not in existence at the date of the Contract any collateral contract or warranty of which the Contractor is the beneficiary which might impose upon NATRAX obligations which are in addition to or vary the obligations expressly contained in the Contract and which relate in any way to the subject matter of the Contract. The Contractor's only rights arising out of, or in connection with, any act, matter or thing said, written or done, or omitted to be said, written or done, by or on behalf of NATRAX (or any agent, employee or subcontractor of NATRAX) in negotiations leading up to the Contract or in the performance or purported performance of the Contract or otherwise in relation to the Contract are the rights to enforce the express obligations of NATRAX contained in the Contract and to bring an action for breach thereof. Nothing in this **Clause** 34.10 **[**Entire Agreement**]** is intended to exclude liability of the Contractor for fraud or fraudulent misrepresentation.

34.11 Liability and Indemnity

34.11.1 The Contractor shall indemnify, defend and hold NATRAX harmless against any and all proceedings, actions and third party claims arising out of a breach by the Contractor of any of its obligations under the Contract except to the extent that any such claim has arisen due to breach by NATRAX of any of its obligations under the Contract.

34.11.2 NATRAX will, indemnify, defend and hold harmless the Contractor against any and all proceedings, actions, third party claims for loss, damage and expense of whatever kind and nature arising out of breach by NATRAX, its officers, servants and agents of any obligations of NATRAX under the Contract except to the extent that any such claim has arisen due to breach by the Contractor of any of its obligations under the Contract.

34.11.3 In the event that either Party receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under the Contract (the "Indemnified Party") it shall notify the other Party ("Indemnifying Party") within **[**7 (seven)**]** days of receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, provided that, such approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim it may conduct the proceedings in the name of the Indemnified Party subject to the Indemnified Party being secured against any costs involved to its reasonable satisfaction.

34.11.4 The Indemnified Party shall have the right, but not the obligation, to contest, defend and litigate any claim, action, suit or proceeding by any third party alleged or asserted against such party in respect of, resulting from, related to or arising out of any matter for which it is entitled to be indemnified hereunder and their reasonable costs and expenses shall be indemnified by the Indemnifying Party. If the Indemnifying Party acknowledges in writing its obligation to indemnify the person indemnified in respect of loss to the full extent provided by this **Clause** 34.11.3 **[**Liability and Indemnity**]**, the Indemnifying Party shall be entitled, at its option, to assume and control the defence of such claim, action, suit or other proceedings, liabilities, payments and obligations at its expense and through counsel of its choice provided it gives prompt notice of its intention to do so to the Indemnified Party and reimburses the Indemnified Party for the reasonable cost and expenses incurred by the Indemnified Party prior to the assumption by the Indemnifying Party of such defence. The Indemnifying Party shall not be entitled to settle or compromise any claim, action, suit or

proceeding without the prior written consent of the Indemnified Party unless the Indemnifying Party provides such security to the Indemnified Party as shall be reasonably required by the Indemnified Party to secure, the loss to be indemnified hereunder to the extent so compromised or settled.

34.11.5 If the Indemnifying Party has exercised its rights under **Clause** 34.11.3 **[**Liability and Indemnity**]**, the Indemnified Party shall not be entitled to settle or compromise any claim, action, suit or proceeding without the prior written consent of the indemnifying Party (which consent shall not be unreasonably withheld or delayed).

34.11.6 If the Indemnifying Party exercises its rights under **Clause** 34.11.3 **[**Liability and Indemnity**]**, then the Indemnified Party shall nevertheless have the right to employ its own counsel and such counsel may participate in such action, but the fees and expenses of such counsel shall be at the expense of such Indemnified Party, when and as incurred, unless:

(i) the employment of counsel by such party has been authorised in writing by the Indemnifying Party; or

(ii) the Indemnified Party shall have reasonably concluded that there may be a conflict of interest between the Indemnifying Party and the Indemnified Party in the conduct of the defence of such action; or

(iii) the Indemnifying Party shall not in fact have employed independent counsel reasonably satisfactory to the Indemnified Party to assume the defence of such action and shall have been so notified by the Indemnified Party; or

(iv) the Indemnified Party shall have reasonably concluded and specifically notified the Indemnifying Party either:

(a) that there may be specific defences available to it which are different from or additional to those available to the Indemnifying Party; or

(b) that such claim, action, suit or proceeding involves or could have a Material Adverse Effect upon it beyond the scope of the Contract.

Provided that if **Clauses** 34.11.6(ii) (iii) or (iv) **[**Liability and Indemnity**]** shall be applicable, counsel for the Indemnified Party shall have the right to direct the defence of such claim, action, suit or proceeding on behalf of the Indemnified Party and the reasonable fees and disbursements of such counsel shall constitute legal or other expenses hereunder.

35. Superstition of General Conditions of Contract

Any clause/s contained in this General Conditions of Contract shall be superseded with the relevant clause/s in the Special Conditions of Contract.

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 5

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section- 5 - SPECIAL CONDITIONS OF CONTRACT [SCC]

The following Special Conditions of Contract (SCC): Part A (Contract Data) and Part B (Special Provisions) include amendments and additions to the General Conditions of Contract (GCC). Clause numbers in the SCC correspond to those in the GCC. As per GCC 1.5 (Priority of Documents), the SCC takes precedence over the GCC.

Part A: of the SCC, includes data to complement the GCC.

Part B (Specific Provisions) includes amendments and additional project specific Conditions of the Contract.

Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

PRECEDENCE OF CONTRACT:

1. Contract agreement

2. Notice to proceed

3. LOA

4. Letter of Bid

5. Addendums and pre-bid clarifications

6. SCC

7. GCC

8. TCC

9. Drawings,

10. Priced BOQ

11.The schedules, technical proposals of the contractor and any other documents forming part of the contract

Part A - Data To Complement the GCC

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
Scope of work	1.1	**Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P**
Contract Periods/ Time for Completion	1.1	Eight (08) Months from date of issue of NTP including rainy season.
Amount of Advance Payment	1.1 & 26.11.1	Up to Ten (10) % of the Contract Price, with a simple interest rate of 10% per annum on the balance outstanding, against the BG, amounting to the advance amount together with its interest amount (110% of the Advance amount), valid for 12 months shall be paid upon release of NTP and on request of the contractor. "The mobilisation advance shall not be paid in less than two instalments" as decided by NATRAX/NAB representative as specific request by the contractor. On each occasion of the release of mobilisation advance, Bank Guarantee equivalent to 110% of the advance so paid shall be furnished by the contractor for the period mentioned above.
The Contract Sum	1.1	[to be filled in before signing the Contract] shall be as per LOA/Contract Agreement issued to successful bidder.
The Default Interest Rate	1.1	14% interest for the above period.
The Defects Rectification Period,	1.1	12 (Twelve) Months, Counted from date of Completion of works. (expect items mentioned in BOQ)
Latent Defect Rectification Period	1.1	Deleted
Liquidated Damages	1.1	0.1% of the Contract Price per day to a maximum of 10% of the Contract Price.
Milestone Events	1.1	Deleted
NATRAX Representative/EIC	1.1	Shall be notified to successful bidder.

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
Address for Recipient's Communications	1.4.1 (ii)	NATRAX NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur), Dhar District, Madhya Pradesh-454774 GSTIN----------
Amount of Performance Guarantee	1.9.1	Five (05) % of the contract price. However, the amount of Performance Guarantee shall be increased proportionally with every 10% increase in the Contract sum due to valuation of changes. *In addition to this if the rates found abnormally low than NATRAX may seeking additional PBG up 05% of contract amount.*
Date of Issue/Expiry of the Performance Guarantee	1.9.1	60 days after the expected expiry of the Defects Rectification Period for the Works.
Retention Amount	1.9.5	A retention amount @ ten (10%) shall be deducted from each interim payment certificate (gross), limited to five percent (5%) of the contract price. The same will be returned after the expiry of defect rectification period. Full Retention money can be refunded on request of the Contractor during the DLP, after submission of unconditional BG from any scheduled Bank in India having branch in Indore, acceptable to NATRAX/NAB of equivalent amount valid up to completion of defect rectification period.
Applicable Clearances that are NATRAX/NAB Responsibility	6.1.3 (iii)	None
Health, Safety and Environment	11	In case the Contractor fails to comply the NATRAX/NAB Representative instructions given for implementation as per applicable/standard HSE plan, NATRAX/NAB reserve its right to carry out the same from any other agency and the expenditures incurred therein will be borne by the Contractor which may be recovered from any monies dues with the Contractor
Water	12.1.1	The contractor may utilize the available water sources inside the project premises with prior approval of

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
		NATRAX/NAB and shall pay all applicable charges levied by any other Government Authorities other than NATRAX.
Land for construction of labour camp, site office, fabrication yard and setting up the batching plant, hot mix plant etc.	16.1.3	Land will be provided to the bidder, but the contractor has to indemnify NATRAX/NAB, against any legal, local and/or environmental problems and all these camps / offices / yards shall be dismantled and taken off the site after completion of work.
Key Personnel	16.5.3.2	In addition to GCC, MEC 4 of NIT shall be applicable, failing which NATRAX reserve the rights to levy a penalty for non-deployment of adequate resources.
Maximum Liquidated Damages	20.1	Maximum 10% of the Contract Price.
Quantity Variations	23.3	NATRAX/NAB shall, having regard to the Scope of Works and the approved Contract Price, shall have power to order variations within the Scope of the Works if considers necessary or advisable during the progress of the Works. Such variations shall form part of the Contract and the Contractor shall carry them out and include them in updated Programmes produced by the Contractor. Oral orders for Variations, unless followed by written confirmation, shall not be taken into account. Revision in rates for all the items provided in BOQ for any extent of variations is not allowed, during the entire currency of the contract. The Contractor shall inspect the Project Site and make himself satisfied with the quantities with respect to Tender Drawings and Technical Specifications for the execution of complete works.
Payment & Mode of Payment	26.0	Subject to any deduction which NATRAX may be authorised to make under the Contract, the Contract Price shall be payable as follows: a) The Contractor shall, on progressive completion of work, submit to the NATRAX the IPCs bills for monthly progress, together with

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
		all necessary supporting documents, details and necessary certification. Bills shall be processed for payment after due certification by the NATRAX EIC. b) The bills for extra work, if any, shall be submitted separately after due settlement of rates for such items of work and paid after the completion of such extra work. (prior approval shall be taken for any type of variation) c) Payments due and payable by NATRAX shall be made within 14 (Fourteen) days from the date of receipt of complete and correct invoices and documents supported by requisite certification of the NATRAX /EIC. d) All payments to the Contractor shall be made by RTGS mode in Indian Rupees only. e) Payments would be made as per work certification for actual quantity of work executed at site and certified for payment. f) The GST/Taxes & duties of Govt. will be reimbursed on actual basis upon the payment to concerned Govt. portal and reflecting on the GST portal.
Contractor's Changes	23.3.3	Nil
Valuation of Changes	23.5.1 (1)	New rate or price shall be derived from any relevant rate or price in the contract BOQ.

	23.5.1 (2)	1. New Rate or Price for NON BOQ items shall be finalized by the NATRAX/NAB rep. based on the following criteria for which the Contractor is bound to accept the same without any contractual/financial implications. 2. The input of materials, labour, machineries, taxes, contractors profit, overheads etc, shall be adopted as per MPSOR /DSR standard data book for analysis of rates. 3. The rate of labours shall be latest applicable rates published by authorized Govt dept.,. a) The hire charges of machinery shall be adopted from MPSOR with escalation considering the latest indices published by Ministry of Commerce and Industry for plant and machinery. b) The hire charges for the machinery, which are not available in MPSOR then three (03Nos.) of quotations for the same machinery will be submitted by the Contractor which may be verified by NATRAX/NAB rep. from market and accordingly the lowest rates available in the market will be finalized and deemed to be accepted by the Contractor. 4. Three (03Nos.) of quotations for the rates of materials will be submitted by the Contractor which may be verified by NATRAX/NAB rep. from market and accordingly the lowest rates available in the market will be finalized and deemed to be accepted by the Contractor . 5. In case of item of works not confirming to MPSOR specifications, the rates shall also be adopted/derived from DSR or any other relevant schedule rates. 6. The items of works which are not available in MPSOR/DSR the rates shall be evaluated at site based on the actual expenditures incurred by the Contractor per units for which the rate analysis along with the supportive documents of invoices of materials, no. of labours and machinery deployed shall be submitted by the Contractor for obtaining the approval from NATRAX/NAB.

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
Amount of advance payment	26.11	Maximum 10 % of Original Contract Price
Payment against material stored at site	26.3.3(ii)	Can be considered for specific items only, at the discretion of the NATRAX/NAB. The payment will be made only against the actual cost of materials and upto 70% of invoice amount will be decided by NATRAX/NAB Rep. discretion. The payment shall be done separately OR may be clubbed with the monthly payment certificate as per the direction of NATRAX/NAB.
Repayment of Advance Payment	26.11.4	The procedure for deduction of Advance Payment shall be as under: Deductions shall be at an amount equal to the sum of 10% of the advance amount and such advance amount shall be fully recoverable from each payment certificates within 12 months from the date of issue of such advance payment or as per the consumption of materials in the works whichever is earlier as per the discretion of NATRAX/NAB.
Taxes	27.1	The rates quoted by the contractor shall be deemed to be inclusive of the Goods and Service Tax (GST) and other levies, duties, royalties, cess, tax, toll taxes of central and state governments, local bodies and authorities that the contractor will have to pay for the performance of this contract. NATRAX will perform such duties in regard to the deduction of such taxes at source as per applicable law. The tax if any paid by the contractor shall not be reimbursed by NATRAX. And change in legislation will not applicable for reimbursement of tax.
Statutory compliances		The bidder should be overall responsible for compliance of all the statutory compliances as per law of land viz labour law, ESI, PF etc.

Conditions	Ref. GCC	Modification /supplementary in addition to GCC Clauses
Realistic work program	3.3	Should submit a realistic work program containing realistic dates including deployment of resources like Manpower, Machines and Materials. The work program should be preferably submitted in MS Project/primavera showing all milestones including the critical path of the project and date of raising IPA.
DISPUTE RESOLUTION PROCEDURE	31	Place of Arbitration shall Indore (MP).
Governing Law and Jurisdiction	34.3	The Contract shall be governed by the laws of India. In respect of all matters arising out of or relating to the Contract, the Courts at Indore (MP), India

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P."

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 6.1 & 6.2

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

SECTION 6: CONTRACT FORMS:
SECTION- 6.1- FORMAT OF ARTICLES OF AGREEMENT

CONTRACT AGREEMENT No.: Tender No. ---------- , Dated------
……the ….. 2025

THIS AGREEMENT is made on …….. between **National Automotive Test Tracks (NATRAX), a Unit of National Automotive Board (NAB)** having its registered office at ---------- (hereinafter referred to as "the Employer" which expression shall include its successors and assigns), and whose principal place of business is at National Automotive Test Tracks (NATRAX), NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur),Dist. Dhar (M.P.)-454774 , of the One Part,

AND

M/s. …….., having its registered office at ……., (Hereinafter referred to as "the Contractor"), of the Other Part:

WHEREAS the Employer invited bids through open tender, vide Invitation for Bids dated, …/…. /2025 for **"----------name of works----------.**

AND WHEREAS the Employer has selected ……., as the successful bidder ("the Contractor") pursuant to the bidding process and negotiation of contract prices, awarded the **Letter of Acceptance (LoA) No. ……,** to the Contractor on …… for a total sum of …….. [Rupees …… Only].

I. **AND WHEREAS** the Employer desires that the Works (as defined in the Bidding Document) be implemented, performed, executed and completed by the Contractor, including the remedying of any defects therein and wishes to appoint the Contractor for carrying out such Works.

II. **AND WHEREAS** the Contractor acknowledges that the Employer has entered into or will enter into other contracts with other contractors and/or parties for elements of the Project (as defined in the General Conditions of Contract) (and not comprised in the Works) and that the Employer will have Related Works performed and that it is of paramount importance that the Works are fully and completely co-ordinated by the contractor with the Related Works in view of their concurrent and sequential nature.

III. **AND WHEREAS** the terms and conditions of this Contract have been fully negotiated between the Employer and the Contractor as parties of competent capacity and equal standing.

IV. The Employer and the Contractor agree as follows:

1. In this Agreement (including the recitals) capitalized words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

   The Letter of Acceptance (LoA) issued by NATRAX.

   The complete Bid as submitted by the Contractor.

   The Addenda issued by NATRAX.

   Any other documents forming part of this Contract Agreement till date. (PBG, BGs, PoA etc.)

   The Bill of Quantities.

   Supplementary Agreements executed from time to time.

3. Any changes/modifications/amendments required to be incorporated in the Contract Agreement at a later stage shall be discussed and mutually agreed by both the parties and such supplementary agreements shall be binding on both the parties and shall form the part of this contract agreement.

4. The key personnel earmarked for this Project from NATRAX and Project Management Consultants shall be intimated to the contractor from time to time. The key personnel to be deployed for the project from the Contractor's side shall be decided and mutually agreed from time to time.

5. The contractor's submissions under clause 3.3 (c) of the General Conditions of Contract, 'the Initial Program', shall be further detailed and a realistic 'Detailed Work Schedule' shall be prepared, complying to the 'time for completion', as specified in the Special Conditions of Contract and submitted to the Employer, within 21 days from the date of issue of the relevant 'Notice to Proceed' and the said Detailed Work Schedule shall be discussed and mutually agreed by both the parties, within 30 days from the date of issue of the relevant 'Notice to Proceed', to be issued for the works.

6. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity, in all respects with the provisions of the Contract.

7. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

8. This Contract shall be governed by and construed in accordance with the laws of India. Each Party hereby submits to the jurisdiction as set out in the Dispute Resolution Procedure in the Conditions of Contract.

V. IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed in accordance with the laws of India on the day, month and year indicated above.

For and in the name of NATRAX under NATRIP acting through and represented by **Sh. ……. (……)** (Signature)	For and in the name of the **M/s. ……..,** acting through and represented by **Sh. ……)** (Signature)
Witnessed by: **Sh. ……)/NATRAX** (Signature)	Witnessed by : **Sh. ……, M/s……..** (Signature)

Section 6.2- PERFORMANCE BANK GUARANTEE

(To be executed on non-Judicial stamped paper of an appropriate value)

National Automotive Test Tracks (NATRAX),
NH-52, Old Agra- Mumbai Highway,
Near to Pithampur Flyover,
Post Khandwa (Near Pithampur),
Dist. Dhar (M.P.)-454774

Date : .....

Bank Guarantee No	:	.....
Amount of Guarantee	:	.....
Guarantee Period	:	From ..... to.....
Guarantee Expiry Date	:	.....
Last date of Lodgement	:	.....

WHEREAS National Automotive Test Tracks (NATRAX), having its corporate office at NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur), Dist. Dhar (M.P.)-454774."**The Owner**" which expression shall unless repugnant to the context includes their legal representatives, successors and assigns) and having their registered office at 124, Udyog Bhawan, New Delhi - 110011, has executed a binding to the contract on [*Please insert date of acceptance of the letter of acceptance(LoA)*] ("**Contract**") with [*insert name of the Successful Bidder*] ……(hereinafter referred to as the "**Contractor**" which expression shall unless repugnant to the context include its legal representatives, successors and permitted assigns) for the performance, execution and implementation of the Works ("**Works**" shall have the meaning ascribed to it in the Contract] based on the terms & conditions set out in the Tender Documents number [*insert reference number of the Tender Documents*]dated [*insert date of issue of Tender Documents*]…….and various other documents forming part thereof.

AND WHEREAS one of the conditions of the Contract is that the Contractor shall furnish to the Owner a Bank Guarantee from a scheduled bank in India having a branch at Pithampur for an amount equal to 05% (Five percent) of the total Contract Sum (the amount guaranteed under this bank guarantee shall hereinafter be referred to as the "**Guaranteed Amount**") against due and faithful performance of the Contract from the post-commissioning stage of the Works under the Contract, including the performance bank guarantee obligation and other obligations of the Contractor for the supplies made and the Works being performed and executed by under the Contract. This bank guarantee shall be valid from the date hereof up to the expiry of the Warranty Period including any extension thereof.

AND WHEREAS the Contractor has approached [*insert the name of the scheduled bank*] (here in after referred to as the "**Bank**") having its registered office at [*insert the address*]……and at the request of the Contractor and in consideration of the promises made by the Contractor, the Bank has agreed to give such guarantee as hereunder:-

(i) The Bank hereby undertakes to pay under this guarantee, the Guaranteed Amount claimed by the Owner without any further proof or conditions and without demur, reservation, contest, recourse or protest and without any enquiry or notification to the Contractor merely on a demand in the form set out in Appendix I ("**Demand**") from the Owner stating that the amount claimed is due to the Owner under the Contract. Any such demand made on the Bank by the Owner shall be conclusive as regards the amount due and payable by the Bank under this bank guarantee and the Bank shall pay without any deductions or set-offs or counterclaims whatsoever, the total sum claimed by the Owner in such Demand. The Owner shall have the right to make an unlimited number of Demands under this bank guarantee provided that the aggregate of all sums paid to the Owner by the Bank under this bank guarantee shall not exceed the Guaranteed Amount. In each case of demand, resulting to change of PBG values, the Owner shall surrender the current PGB to the bank for amendment in price.

(ii) However, the Bank's liability under this bank guarantee shall be restricted to an amount not exceeding [*figure of Guaranteed Amount to be inserted here*]……only).

(iii) The Owner will have the full liberty without reference to the Bank and without affecting the bank guarantee to postpone for any time or from time to time the exercise of any powers and rights conferred on the Owner under the Contract and to enforce or to forbear endorsing any powers or rights or by reasons of time being given to the Contractor which under law relating the Surety would but for the provisions have the effect of releasing the surety.

(iv) The rights of the Owner to recover the Guaranteed Amount from the Bank in the manner aforesaid will not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Contractor and / or that any dispute(s) are pending before any office, tribunal or court in respect of such Guaranteed Amount and/ or the Contract.

(v) The guarantee herein contained shall not be affected by the liquidation or winding up, dissolution, change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money due to the Owner in respect of such liability or liabilities is effected.

(vi) This bank guarantee shall be governed by and construed in accordance with the laws of the Republic of India and the parties to this bank guarantee hereby submit to the jurisdiction of the Courts of Madhya Pradesh for the purposes of settling any disputes or differences which may arise out of or in connection with this bank guarantee and for the purposes of enforcement under this bank guarantee.

(vii) All capitalized words used but not defined herein shall have the meanings assigned to them under the Contract.

(viii) NOTWITHSTANDING anything stated above, the liability of the Bank under this bank guarantee is restricted to the Guaranteed Amount and this bank guarantee shall expire on the expiry of the Warranty Period under the Contract.

(ix) Unless a Demand under this bank guarantee is filed against the Bank within six (6) months from the date of expiry of this bank guarantee all the rights of the Owner under this bank guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

(x) However, in the opinion of NATRAX, if the Contractor's obligations against which this bank guarantee is given are not completed or fully performed by the Contractor within the period prescribed under the Contract, on request of the Contractor, the Bank hereby agrees to further extend the bank guarantee, till the Contractor fulfils its obligations under the Contract.

(xi) We have the power to issue this bank guarantee in your favour under Memorandum and Article of Association and the Undersigned has full power to do so under the Power of Attorney dated [*date of power of attorney to be inserted*]……granted to him by the Bank.

Date:

Bank

Corporate Seal of the Bank

By its constituted Attorney Signature of a person duly authorized to sign on behalf of the Bank.

Appendix-I

FORM OF DEMAND

[To the issuing Bank]

Dear Sirs

The Contract between National Automotive Test Tracks (NATRAX) and [*Please insert the name of the Successful Bidder*]

Bank Guarantee No. ***** ("the Bank Guarantee")

We refer to the above Contract and Bank Guarantee. Terms defined in the Bank Guarantee shall have the same meaning when used herein.

In accordance with the terms of the Bank Guarantee, we require payment by you of the sum of Rs. [*****] (*** Rupees) to the following account:

Account Number: [ ] with [ ] Bank, [ ] Branch, Sort Code [ ].

Yours sincerely,

[Signed by
[ ]
for and on behalf of
NATRAX

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P."

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 7.1, 7.2 & 7.3

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section 7.1- FORM FOR FINANCIAL CAPACITY

FINANCIAL DATA IN INR

Financial Capacity: *Should have the* ***Average Annual Financial*** *turnover of at least* ***Rs. 50.00 Lakh*** *in the last 3 financial years (2022-23, 2023-24 & 2024-25). Relevant proof for supporting the above shall be submitted or certificate from CA will be require..*

Financial Years	2022-2023	2023-2024	2024-25
cumulative Construction Turnover			
Net Worth			
Current Assets			
Current Liabilities			
Total Revenues			
Profits Before Taxes			
Profits After Taxes			

- **Bidder shall fill the financial data** and attach copies of financial statements (balance sheets including all related notes, and income statements) for the last three years and current financial year, as indicated above, complying with the following conditions.
  - All such documents reflect the financial situation of the Bidder and not sister or parent companies.
  - Historic financial statements must be audited by a chartered accountant.

  Historic financial statements for the last F.Y is not computed; unaudited figures may be furnished. In case of becoming successful bidder, they may submit the audited statements before award of works.

Note: undertaking with Documental proof in favor of above submission should be submitted along with technical qualification as desired in bid document.

Signature of the Authorized Signatory

Section 7.2- List of Equipment (Minimum Requirement as and when required)

1) Whereas it is entirely the responsibility of the Contractor to deploy sufficient machineries and mechanical equipment to ensure compliance with his obligations under the Contract, the list hereunder is included for information. This list constitutes the Employer's estimate of the minimum essential basic holding of plant and mechanical equipment which the Contractor will require in order to meet all of his performance obligations under this Contract.

Sr. No.	Name/Type of Equipment	Max. age (in Years)	Nos.
1	Mobile RMC Plant (capacity 20 cum per hour)	5 years	1
2	Dumper	5 years	2
3	Hydraulic Excavator (bucket capacity 1 cum)	3 years	1
4	Pile grouting machine	5 years	1
5	Floor compactor/screed vibrator	3 years	2
6	Concrete Vibrator	3 years	3
7	Water tank (6000 ltr) with tractor	10 year	1
8	Hydra crane (for Fabrication & Erection)	5 Years	1
9	Shuttering materials	New condition	200 sqm

Note: an undertaking showing the availability of the above machines for this project should be submitted with documentary proof. In case of owned or rented, the documentory proof for owning/renting of above equipments/machine may also be submitted along with technical qualification as desired in bid document.

Signature of the

Authorized Signatory

Section 7.3- Personnel Capabilities

(to be fill and submit by bidder)

1) The Bidder shall supply general information on the management structure of the firm and shall make provision for suitably qualified personnel to fill the key positions as required during contract implementation and as suggested in Section.

MINIMUM KEY PERSONNEL FOR THE PROJECT

Whereas it is entirely the responsibility of the contractor to deploy sufficient Key Personnel at his office and at the site to ensure compliance with his obligations under the Contract. The list hereunder constitutes the Employer's assessment of minimum key site personnel requirements and is issued for information only.

Sr. No.	Personnel	Qualification/ Experience	Nos.
1	Project manager (Civil)	BE/BTech (Civil)/10 years	1
2	Structural Designer	BE/BTech (Struct.)/10 years	1
3	Billing Engineer	BE/Btech (Civil)/05 years OR Diploma (Civil)/10 years	1
4	Site Engineer	BE/Btech (Civil)/05 years OR Diploma (Civil)/10 years	1

Note: An undertaking with documental proof in favor of above submission should be submitted along with technical qualification as desired in bid document. The above minimum personnel shall be deployed for this project site.

Signature of the

Authorized Signatory

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P."

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

1. Technical Bid:

   (i) Other Conditions of Contract (OCC)

Section 8

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

TENDER DOCUMENT

Section 8- CONTACT DETAILS FORM

BIDDERS ARE REQUESTED TO SUBMIT THE FOLLOWING DETAILS WITHIN 7 DAYS FROM THE DATE OF PURCHASE OF TENDER DOCUMENTS

[THE SIGNED DOCUMENT MAY BE SCANNED/FAXED]

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

GENERAL DETAILS OF BIDDER

1. **NAME OF THE COMPANY** :……..
2. **COMMUNICATION ADDRESS** :……..
3. **PHONE NO.** :……:
4. **FAX NO.** :……..
5. **E-Mail ID.** :…….

PARTICULAR DETAILS OF THE BIDDER'S REPRESENTATIVE

6. **NAME OF THE CONTACT PERSON** :……
7. **DESIGNATION** :……..
8. **PHONE NO. (DIRECT)** :……..
9. **MOBILE NO.** :…….
10. **E-MAIL ID** :…….
11. **NAME OF THE ALTERNATE CONTACT PERSON** :……
12. **E-MAIL ID** :……

Signature of the

Authorized Signatory

NOTE: You are requested to check the E-mail IDs given by you regularly for the incoming mails form NATRAX.

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENT FOR

"Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

COVER PAGE

This Tender Contains:

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   (i) Other Conditions of Contract (OCC)

Section 9

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section-9- Checklist

Sl. No	GENERAL	YES/NO
1	Have you send the contact details form to NATRAX?	
2	Have you read and understood various conditions of contracts like ITB,SCC,TCC (Technical specifications, drawings) and all other contractual requirements ?	
	TECHNICAL BID	
3	Have you enclosed the EMD for Rs. 2.56 lakhs in the technical Bid?	
4	Have you taken prints of all the sections of tender, including addenda, in the prescribed paper size and signed on all the pages of the tender documents?	
5	Have you attached proof for having met the following minimum eligibility criteria?	
5.1	*legally valid entity: Certificates issued by registrar of firms/companies*	
5.2	*Financial Capacity of last 3 financial years*	
5.3	Technical Capability: Certificates issued by govt. Depts/ Autonomous bodies/ PSUs/Reputed Private Firms (only). TDS certificate/C.A's certificate incase required	
5.4	Details of proposed Technical Manpower	
6	Have you attached the proof of authorisation to sign on behalf of the bidder in the technical Bid?	
7	Have your technical bid been prepared for packing as per Tender?	
	FINANCIAL BID	
8	Have your financial Bid proposal is duly filled, sealed and signed on all pages?	
9	Have you filled your quotes against all items?	
10	Have you verified the calculation of prices?	
11	Have your financial bid been properly packed as per Tender?	

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Technical Conditions of Contract (TCC)

The Technical Conditions of Contract contains the following Sections:

Section 10.1	Technical Specifications Civil Works
Section 10.2	Technical Specifications Electrical Works

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Technical Conditions of Contract (TCC)

The Technical Conditions of Contract contains the following Sections:

Section 10.1 – Technical Specifications Civil Works

TCC Civil works

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

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Section 10.1 - TECHNICAL SPECIFIATION

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

I. Part 1- TCC – Civil works

i. TCC Civil works

DETAILED TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

1. EARTH WORK
2. CONCRETE WORKS
3. REINFORCEMENT
4. FORMWORK
5. STRUCTURAL STEEL
6. MASONRY
7. FLOORING
8. CEMENT PLASTERING AND POINTING
9. DOORS , WINDOWS & VENTILATORS
10. PAINTING
11. WATERPROOFING
12. ALUMINIUM STRUCTURAL GLAZING & CLADDING WORK
13. ALUMINIUM WINDOWS & VENTILATORS
14. M.S. GRILLS/RAILING
15. FLASE CEILING WITH GYPBOARD AND G.I. FRAMEWORK

16. FENCING WORK WITH BARBED WIRE, CHAIN LINK ETC

17. OVER HEAD SLIDING DOOR- AUTOMATIC

DETAILED TECHNICAL SPECIFICATION

1.EARTH WORKS

SITE PREPARATION

1.1 Site Investigation

The contractor shall carefully examine the site and make all inspections necessary in order to determine the full extent of the work required making the completed work conform to the drawings and specifications. The contractor shall satisfy himself as to the nature and location of the work, conditions, the conformation and condition of the existing ground surface, and the character of the existing ground surface, and the character of equipment and facilities needed prior to and during the execution of the work. The contractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles or utilities to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the drawings, or between the drawings and specifications shall be brought to the Engineer's attention immediately in order to obtain necessary clarifications on the exact nature of the work to be performed.

1.2 Site Clearance

The site shall be cleared of rubbish / debris of all kinds, loose rocks, small trees, not exceeding 30 cm in girth (measured at one meter above ground level), shrubs, stumps, grass, brush wood, undergrowth and any other vegetation, superficial earth etc.as directed by the Engineer-in-Charge. The site clearance shall be done twenty meters around the periphery of the proposed construction. Such site clearance shall be done in advance of the earth work and excavation operations and shall not be paid for. All materials arising from site clearance shall be the property of the Corporation and shall be disposed off by the Contractor at his own cost, as herein provided. All serviceable materials shall be temporarily stacked in separate lots at the site, at places as directed by the Engineer-in-Charge. These materials shall be transported to any place within Air India premises and stacked properly as and where directed by the Engineer-incharge. All products of site clearance which, in the opinion of the EIC are not useable, shall be carted away by the Contractor to disposal areas designated by the EIC, spread and levelled evenly in layers or the Contractor shall cart away the

same as directed by the Engineer-in-Charge. The site clearance shall cover all the operations required in full for clearing the site and its surroundings, including providing labour, materials, tools, equipments and incidentals necessary to complete the work. It will also include handling, salvaging, piling or stacking or collecting and disposing off cleared materials

1.3 Site Grading

The levels and measurement of the existing site, as shown on the drawings are believed to be correct but the contractor shall verify them and also examine the nature of the ground as noclaim or allowance whatever will be entertained thereafter on account of any errors or omissions in the levels of the description of the ground turning out different from that expected or shown on the drawings. Existing surface, after removal of all unwanted and unsuitable material shall be

graded to the levels and slopes indicated in the contract drawings. Such grades and levels shall facilitate the intent of design

1.4 Existing utilities

Where existing utilities are encountered and found to interfere with the construction activity in this contract, they shall be removed if not required to be maintained or relocated to avoid interference or protected, supported and maintained during the construction phase, the exact dependent on the instruction of the Engineer.

1.5 Disposal

All rubbish and unwanted materials including unusable soil as they accumulate from time to time during the progress of the works and at completion including that of subcontractors shall be cleared and carted away and all materials condemned by the Engineer are to be removed from the works, within forty eight hours.

1.6 Classification of soils

All materials encountered in excavation will be classified in the following groups irrespective of mode of excavating the materials and the decisions of the Engineer-in-Charge in this regard shall be final and binding to the contractor.

Classification of Soils

1.6.1 Ordinary Soil - Generally any material which yields to the ordinary application of shovel like turf, sand, loam, soft shale, mixture of sand & clay or any mixture of these soils.

1.6.2 Hard Soil - Material requiring the application of pick such as stiff clays mixed with moorum etc.

Soil Mixed with Boulders - This shall consists of moorum, gravel or hard clay intercepted with boulders not larger than 30 cm cube which in the opinion of Engineer-in-charge do not require blasting and which shall be removed by iron, bars and shovel.

1.6.3 Disintegrated Rock - Slates, shale's, laterite and other materials which do not require blasting and can be removed with crow picks and shovel.

1.6.4 Ordinary Rock - Lime stone, sand stone and such other compact rocks which can be quarried or split with crowbars or wedge.

1.6.5 Hard Rock - Requiring blasting and comprise of

(1) Rocks like granite, gneiss, quartzite or trap for the excavation of which the use of mechanical plant or blasting is required.

(2) But where blasting is prohibited for any reason and excavation has to be carried out by chiselling or any other agreed method. Design Consideration Detailed design is not required for spread foundation for light structure as normal requirements, such as the minimum width of footing as given below shall generally be sufficient to bring the bearing pressure within safe limits. However in case of soils having very low bearing strengths, such as very soft clay, if may be necessary to design the width of footing, in short the pressure coming on soil due to building and foundation shall not be more than the safe bearing capacity of soil. Foundations on partly made up ground and partly natural grounds on the fill comprising of mixed material which has been compacted unevenly shall be avoided as they are likely to give variable support from place to place. Where it is not possible to avoid such site, raft foundation may be adopted. Where the foundation can be separated in to two independent units, a slip joint may be introduced to take care of unequal settlement. Wherever Localized pockets of soft soil occurs, such soft soil shall be dug out to sufficient depth and the pockets filled with sand.

1.6.6 Sulphate Bearing Soil- In areas where considerable quantities of soluble salts and sulphates is expected, special precautions shall be taken by any of the following methods.

(i) Dense cement concrete, M-15 or richer mix may be used to reduce permeability and increase resistance to attack from sulphates .

(ii) Portland puzzolana cement may be used to control and reduce the activity of the sulphates.

(iii) Special cements like aluminium cement, super sulphated cement, which are sulphate - resistant may be used.

(IV) A third layer of cement concrete (with sulphate resistant cement) and coated with bitumen be laid before laying of foundation concrete to prevent infiltrations of pore water in sulphate soils.

1.6.7 Black Cotton Soil- Black Cotton Soil is dangerous for buildings on accounts of its volumetric changes with the change of atmospheric conditions. It swells excessively when wet and shrinks excessively when dry. This soil has a great affinity for water. The differential settlement of the structure, caused by the moment of ground on account of alternate swelling and shrinkage, results in formation of cracks. The cracks thus formed are some times 15 to 20 cm. wide and 2.5 to 4 m deep. There fore following precautions should be taken. With the bearing capacity 5.5 tons/m2, the loading should be restricted to 4.9 tons/m2, if water is liable to find an access to the foundation. To take foundation to such depths, where the cracks cease to extend. The minimum depth of foundation should be at atleast 1.5 m. To provide R.C.C ties or band 10 cm. to 15 cm. deep, all round the main walls of the building at plinth level, lintel level and eaves level. If the depth of black cotton strip above given ground is only 1 to 1.5 m, the entire soil above the hard be Black cotton soil be prevented by direct contact of masonry work below ground level. This can be done by making wider trenches for foundation and filling spaces on either side of foundation masonry with sand or moorum. This extra width may be 20 cm. on either side. The foundation trench should be made firm or hard by ramming it well. A 30 cm. thick layer (in two layers of 15 cm. each) of moorum should be spread and rammed. On the layer either a stone or sand bed should be raised to desired height to rest the foundation concrete. In ordinary buildings, the foundation should be taken at least 30 cm. deeper than the depth where cracks stop, in case of compound wall this depth may be taken as 15 cm. Construction in black cotton soil should be undertaken during dry season. Approximate safe bearing capacity of soil is shown in Table I. d may be completely removed and foundation-laid on the hard bed below

TABLE I : SAFE BEARING CAPACITY

Sl. No.	*Type of Rocks/Soils*	*Safe Bearing*		*Remarks*
		Kg/Cm²	*T/m²*	
(a) Rock				
(i)	Rocks-hard without lamination and defects, for example, granite, trap and diorite.	33	330	-
(ii)	Laminated rocks, for example, sandstone and lime-stone in sound condition.	16.5	165	-
(iii)	Residual deposits of shattered and broken bed rock and hard shale, cemented material.	9	90	-
(iv)	Soft rock	4.5	45	-

Sl. No.	Type of Rocks/Soils	Safe Bearing		Remarks
		Kg/Cm²	T/m²	
(b) Non-cohesive Soils				
(v)	Gravel, sand and gravel, compact and offering high resistance to penetration when excavated by tools.	4.5	45	-
(vi)	Coarse sand, compact and dry.	4.5	45	Dry means that the ground water level is at a depth no less than the width of foundation below the base of the foundation
(vii)	Medium sand. compact and dry.	2.5	25	-
(viii)	Fine sand, silt (dry lumps easily pulverized by the fingers)	1.5	15	-
(ix)	Loose gravel or sand gravel mixture, loose coarse to medium sand dry	2.5	25	
(x)	Fine sand, loose and dry.	1	10	-
(c) Cohesive soils				
(xi)	Soft shale, hard or stiff clay in deep bed, dry.	4.5	45	This group is susceptible to long term consolidation settlement
(xii)	Medium clay, readily indented with a thumb nail.	2.5	25	
(xiii)	Moist clay and sand clay mixture which can be indented with strong thumb pressure.	1.5	15	-
(xiv)	Soft clay indented with moderate thumb pressure.	1	10	-
(xv)	Very soft clay which can be penetrated several inches with the thumb.	0.5	5	
(xvi)	Black cotton soil or other shrinkable or expansive clay in dry condition (50% saturation)			To be determined after investigation
	(d) Peat			To be determined after investigation
	(e) Made-up Ground			To be determined after
(xvii)	Fills or made-up ground			To be determined after

Note : It is suggested that actual bearing capacity shall be calculated on the basis of soil test and same shall be adopted for actual design of foundation.

1.6.8 Soils & Hard Murrum-Soil of all sorts, silt, sand, gravel, murrum (soft or hard), stiff clay, kankar and other soft excavation not covered in the items mentioned hereunder and hard murrum comprising of all kinds of disintegrated rock or shale or indubrated conglomerate interspersed with boulders of size between 0.03 cum. and 0.76 cum. weathered and decomposed rock which could be removed with pick, bar, shovel, wedges, hammers, though not without some difficulties

1.6.9 Soft-Rock-This shall include all materials which is rock but which does not need blasting and can be removed with a pick, bar, wedges, pavement breakers, pneumatic tools, etc.

1.6 Stripping Surface Materials

Before the surface of any part of the Site is disturbed or the works thereon are begun, the contractor shall take and record levels of such part, in the manner specified or as agreed with the Engineer. Two working days notice is to be given to the Engineer so that the recording of levels can be performed in the presence of the Engineer. Before any excavations are commenced the surface materials shall be carefully stripped and set aside for re-use as directed by the Engineer.

1.2. EXCAVATION

The contractor shall notify the Engineer-in-charge before starting excavation and before the ground is disturbed, to enable him to take existing level for the purpose of measurements. The ground levels shall be taken at 5 to 15 metres intervals in uniformly sloping ground/Natural Ground and at distance where local mounds, pits, or undulations are met with, as directed by the Engineer-in-charge. The ground levels shall be recorded in field books and plotted on plans, which shall be signed by the Contractor and the Engineer-in-charge, before the earthwork is actually started and a copy of the same shall be submitted to NATIS. The labour required for taking levels, shall be supplied by the Contractor at his own cost. The Contractor shall perform excavation in all types of soils, murrum, soft and hard rock, boulders etc. in foundation, over areas and in trenches to widths, lines, levels, grades and curves as shown in the drawing or lesser widths, lines, levels, grades and levels as directed by the Engineer-in-charge and per items in the schedule of quantities. The item in the schedule of quantities shall specify the excavation in trenches or over areas. For this purpose, the excavation for any depth in trenches for foundation not exceeding 1.5m in width or 10sqm. on plan shall be described as excavation in foundation trenches. Excavation exceeding 1.5m in width as well as 10sqm. on plan (excluding trenches for pipes, cables etc.) and exceeding 30cm in depth shall be described as excavation over areas. Excavation exceeding 1.5m in width as well as 10sqm. on plan but not exceeding 30cm. in depth shall be described as surface Excavation.

Bulk excavations shall be made to such sizes depths and inclinations as the Engineer may direct or as may be necessary to construct the Works. No extra payment shall be made to the contractor for working in a confined space. In the case of concrete roads or concrete foundations to roads the concrete shall be broken up and disposed of as the Engineer shall direct. Any existing reinforcement shall be cut and bent to the sides of the excavation in order that the new reinforcement to be provided in the reinstatement of the surface shall be lapped with the existing reinforcement by at least 300 mm. The top edge of the trench shall be as straight as practicable. Any excavation material stored on site for backfilling or other purposes shall be deposited compactly in such a manner that it will cause no damage and as little inconvenience as possible. The Engineer reserves the right to direct the contractor as to the lengths of trench or portions of bulk excavations which shall remain open at any one time. No pipes or concrete shall be laid or any permanent works commenced until the Engineer has inspected and approved the excavations.

1.2.1 Execution

The excavation for basements, foundations, footings, trenches, pavings, walkways, etc shall be carefully got out to net width and depth as shown on the drawings. "Battering" or "Benching" to the sides of excavation shall have the prior approval of the Engineer. Extra excavation (i.e. excavation beyond the limits required by the drawings), carried out without prior approval of the Engineer will not be measured and such extra excavation will be filled in at the contractor's expenses with concrete (mix specified by the Engineer) well rammed in position and brought upto the required level. Any water that may accumulate in the excavation, due to any cause, is to be bailed or pumped out. Adequate pumping or other facilities shall be employed to keep all the excavations clear of water constantly, glare any damage to buildings or other property or cause inconvenience in the property. The contractor shall take care to avoid damage to water mains or other underground utilities pipes cables, etc. during excavation work; when met with during excavation, they should be properly supported. Any damage done to the above during excavations shall be made good at the contractors expenses. No foundation shall be put in the excavation before the same is measured and sanctioned by the Engineer-in-Charge. The contractor shall protect the excavation from the effect of the weather or other damage and make good the damages if any to the satisfaction of the Engineer-in-Charge. Pit and trench bottom shall be smoothened and lightly rammed to a uniform surface and such portion of boulders or rock, as required shall be removed to make the bottom to the required level. The contractor shall at his own expenses and without extra charges, make provision as needed to uphold the sides of excavation and also protect the excavation against the sides of public utilities and service and other structures. The rates for excavation shall include use and waste of timber or steel work, planking and shuttering and open or closed polling boards.

1.2.2 Excavation in all sorts of soils & murram

The item shall include dry or wet excavation and removal of excavated material and its stacking and disposal in a manner hereinafter specified. The water met with if any shall be bailed or pumped out by the contractor as necessary at his own cost. The contractor shall provide all materials and all labour necessary for the excavation and completion of the works in accordance with the drawings and specifications and the intent there of. The contractor shall provide necessary protection to labour,

materials equipment etc. to ensure safety against risk and accident. The ISI standard in this regard shall be followed (IS : 3764-1966). The contractor shall be liable to pay compensation for injury to life, and damage to property, if any,

caused due to any operation connected with this item. The contractor shall hand over the site of work in neat and tidy condition after completion of work and shall remove all rubbish of construction work. The contractor shall carry out the work of trial pit of required size and depth and at places as directed by the Engineer to accurately locate and determine the soil strata and water table and shall fill back as required and as ordered.

1. 2.3 Shoring

Wherever shoring is found necessary by the Engineer-in-Charge the contractor shall provide the same in the best possible manner with the materials as required and as directed by the Engineer-in-Charge to his complete satisfaction. The contractor shall be responsible for providing secured shoring and for taking every other precaution which may be necessary or proper for protecting any building or any other structure from getting damaged by the excavation of any trench or otherwise by the execution of works in the vicinity of such buildings or structure. After the work is completed near buildings, the contractor shall remove the shoring if any and make good any damage that might have been done. No part of the shoring shall, any time, be removed by the contractor without obtaining permission of the Engineer-in-Charge. While taking out shoring planks, the hollows, if any, formed shall simultaneously be filled in with soft earth well rammed with rammers after watering.

1.2.4 Excavation to be Kept Free from Water

The contractor shall keep all excavations free from water and sewage whether affected by tides floods storm or otherwise so that the Works shall be constructed in dry conditions. No sub-drainage pipes shall be left in unless they are filled with M – 10 concrete or other approved material. No water shall be discharged into any watercourse or sewer including those sewers laid under the contract..

1.2.5 Pumping out water

The contractor shall provide and work at his own cost of all pumping machinery required to keep foundations, trenches and other excavations, clear of water, whether it will be subsoil water, storm water, leakage from tanks, wells, drains, septic tank, sewers or pipes so that there may be no accumulation of such water. The contractor shall see that no masonry is laid, no concrete is deposited, no joints made and no measurements taken in water. The pumping shall be continued during and after execution of any portion of the work like masonry, curing, etc. under this contract, and repeated so long as the Engineer-in-Charge may consider it necessary. The pumps and power applied must be such as the Engineer-in-Charge may consider the necessary, and no separate payment shall be made for de-watering during any stage of execution of this contract. If proper pumping machinery is not provided, the Engineer-in-Charge may stop the work altogether until the pumping machinery is provided to his

satisfaction and requirement. The contractor shall provide and maintain in working order stand by pumping units to be available and employed in the event of mechanical failure. The contractor must also arrange for night and day manning and operating of the pumps wherever necessary to ensure that at all times and in all weather, the work could proceed.

1.2.6 Breaking Out and Temporary Reinstatement

Holes made for de-watering pipes shall be filled with bentonite as soon as the de-watering equipment is withdrawn. The backfill material shall be suitable to refill the holes completely and the Contractor shall ensure no voids remain.

1.2.7 Sight Rails

Before a trench excavation is commenced for laying sewer lines, sight rails (two uprights), one on each side of the trench to be excavated and a cross rail nailed thereto, shall be erected one each above the manholes and one set in the middle length, or at distances as fixed by the Engineer-in-Charge, uniform height above the proposed invert level of the pipes. The depth of excavation and the level of the pipe invert level shall be checked by boning rods of appropriate length. The sight rails and boning rods shall be provided, fixed and maintained by the contractor at his own cost.

1.2.8 Slips and Falls and Excess Excavation

Every precaution shall be taken by the contractor to prevent slips and falls of earth and other materialin the excavations. In the event of slips or falls occurring or in the event of excavation being made in excess of the minimum necessary or practicable for the construction of the Works or in the event of any over excavation whether or not necessary beneath the formation of a structure the voids so formed shall be filled. In all cases where the voids so formed when backfilled would provide support for the permanent works or adjacent structures and services then such voids shall be filled solid with M - 10 concrete at the contractor's expenses. In all other cases the voids shall be filled with selected excavated material thoroughly compacted. In the event of any trench for pipelines exceeding the minimum allowable widths as specified or shown on the Drawings the Engineer will order the restoration of the trench width or the use of an alternative bedding material or such other remedial action as in his opinion is necessary. The contractor shall then carry out the measures so ordered by the Engineer and shall have no claim against the Employer for any additional costs resulting from such instructions.

1.2.9 Surplus Excavated Material

The Contractor shall be responsible for making all arrangements for the disposal of surplus excavated material arising on any part of the Site to the place as directed by the EIC

1.2.10 Fencing / lighting

The contractor shall make all proper provisions for protecting the work by fencing and by watching and lighting at night, or otherwise as may be directed by the Engineer-in-Charge. In the event of contractor not fully complying with the provisions of fencing, lighting, watching the Engineer may with or without notice to the contractor put up a fence, improve the lighting and adopt such other measures as he may deem necessary for the safety and all costs of such works including penalty to the contractor. The contractor shall also provide and display special boards painted with fluorescent paints indicating the progress of the work.

1.3. BLASTING OPERATIONS

General

The Contractor shall acquaint himself with all the applicable laws and regulations concerning storing, handling and the use of explosives. All such laws, regulations and rules etc. are current from time to time shall be binding upon the Contractor. The provisions detailed in these rules are supplementary to the above laws, rules and regulations etc. and are applicable except where they conflict with the aforementioned laws etc. from time to time. Further, Engineer may issue modifications, alterations or new instructions from time to time, the Contractor shall comply with the same without these being made a cause for any claim.

1.3.1 Materials

All materials such as explosives, detonators, fuse, tamping materials etc. that are proposed to be used in the blasting operations shall have the prior approval of the Engineer in charge. Black powder and safe explosives (as commonly current in India) shall be used wherever possible. Explosives with Nitro glycerine shall only be used under exceptional circumstances, and where the above explosives are not effective. The use of a fuse with only one protective coat is prohibited. The fuse shall be sufficiently water resistant as to be unaffected when immersed in water for thirty minutes. The rate of burning of the fuse shall be uniform and not less than 4 seconds per 2.5 cm of length with 10% tolerance on either side. Before use, the fuse shall be inspected and the moist, damaged or broken one discarded. The rate of burning of all new types of fuses or when they have been in stock for long shall be tested before use. The detonators used shall be capable of giving effective blasting of the explosives, moist or damaged detonators shall be discarded.

1.3.2 Personnel

Excavation by blasting will be permitted only under personal supervision of competent and licensed persons and trained workmen. All supervisors and workmen in charge of make up, handling, storage and blasting work shall be adequately insured by the Contractor. The storage shall be in charge of a very reliable person, approved by the Engineer, who may, if necessary cause police enquiries being made as to his reliability, antecedents etc. The Contractor shall have to produce a security for the person in charge of the explosives if and as required by the Engineer, or the Civil authorise of the District. The Contractor shall make sure that his supervisors and workmen are fully conversant with all the rules to be observed in storing, handling and use of the explosives. It shall be assured that the Supervisor in charge is thoroughly acquainted with all the details of the handling and blasting operations.

1.3.3 Storage of Explosives

The Contractor shall build a magazine for storing the explosives. The site of the magazine, its capacity and design shall be subject to approval by the Engineer, and the Inspector of Explosives before the construction is taken up. As a result, the explosives should be stored in a clean, dry, well ventilated, bullet proof and fire. Proof building, on an isolated site. The explosive, detonators and fuses shall each be separately stored.

1.3.4 Use of Explosives

For the transport of the explosives and detonators between the store and the site, closed and strong containers made of soft materials such as timber, zinc, copper, leather and the like, shall be used. The explosives and detonators shall be carried in separate boxes and transported separately. For the conveyance of primers, special containers shall be used. The boxes and containers used shall be kept well closed. Explosives shall be stored and used chronologically to ensure the ones received earlier, being used first. A make up house shall be provided at each working place in which cartridge will be made up by experienced men as required. The make up house shall be separated from other buildings. Only electric storage battery lamps shall be used in this house. No smoking shall be allowed in make up house. Disposal of deteriorated explosives: All deteriorated explosives shall be disposed off in an approved manner. The quantity of the deteriorated explosives to be disposed off shall be intimated to the Engineer, prior to its disposal. Preparation of primers: The primers shall not be prepared near open flames or fires. The work of preparation of primers shall always be entrusted to the same personnel. Primers shall be used as soon as possible, after they are ready. Changing of holes: The work of charging shall not commence before all the drilling work on site is completed and the supervisor has been satisfied to that effect, by actual inspection. While charging open lamps shall be kept away. For charging with powdered explosives, naked flame shall not be allowed. Only wooden tamping rods without any kind of metal on them shall be allowed to be used. Boreholes must be of such size that the cartridges can easily pass down them. Only one cartridge shall be inserted at a time and gently pressed with the tamping rod. The sand clay or other tamping materials used for filling the hole completely shall not be tamped too hard.

1.3.5 Blasting

Blasting shall be carried out during fixed hours of the day, which shall have the approved of the Engineer in charge. The hours, once fixed, shall not be altered without prior written approval of the Engineer in charge. The site blasting operations shall be prominently demarcated by red danger flags. The order to fire shall be given only by the Supervisor incharge of the work and this order shall be given only after giving the warning signals three times, so as to enable all the labour, watchmen etc. to reach safe shelter and after having ascertained that no body is within the danger zone. A bugle or a whistle with a distinctive note shall be used to give the warning signal. This bugle shall not be used for other purposes. All labour shall be made acquainted with the sound of the bugle and shall be strictly warned to leave their work immediately at the first warning signal and make for safe shelters, and not to leave the shelters until the all clear signal has been given. All the roads and foot – paths leading to the blasting area shall be watched. In special cases, suitable extra precautions shall be taken. The Engineer may however permit blasting for underground excavation, without restriction of fixed time, provided that, he is satisfied that proper precautions are taken to give sufficient warning to all concerned and that the work of other agencies on the site is not unduly hampered. For lighting the fuses, a lamp with a strong flame such as a carbide lamp shall be used. The supervisor shall watch the time required to the fixing of the fuses and shall see that all the workmen are under safe shelters in good time.

1.3.6 Electrical Firing

Only the supervisor in charge shall keep key of the firing apparatus and shall keep it always with himself. Special apparatus shall be used as a source of current for the blasting operations. Power lines shall not be tapped for the purpose. All the detonators should be checked before use. For blasts in one series only detonators of the same manufacturers and of the same group of electrical resistance shall be used. Such of the electrical lines as could constitute danger for work of charging shall be removed from the site. The firing cable shall have a proper insulating cover so as to avoid short circuiting due to contact with water, metallic parts of rock. The use of the earth as a return line shall not be permitted. The firing cable shall be connected to the source of current only after ascertaining that nobody is in the area of blasting. Before firing, the circuit shall be checked by a suitable apparatus. After firing, whether with or without an actual blast, the contact between the firing cable and the source of current shall be cut-off before any persons are allowed to leave the shelters. During storm, charging with electrical detonators shall be suspended. The charges already placed into the holes shall be blasted as quickly as possible, after taking all the safety precautions and giving necessary warning signal. If this is not possible, the site shall be abandoned till the storm has passed.

1.3.7 Precautions after Blasting

After the blast, the supervisor shall carefully inspect the work and satisfy himself that all the charges have exploded. After the blast takes place in underground works the workmen shall not be allowed to go to face till all the toxic gases are evacuated from the face.

1.3.8 Mis-Fires

If it is suspected that part of the blast has failed to fire or is delayed, sufficient time shall be allowed to elapse before entering the danger zone. When the fuse and blasting caps are used, a safe time should be allowed and then the Supervisor alone shall leave the shelter to see that misfire. Drilling near the hole that has misfired shall not be permitted until one of the following operations has been carried out by the Supervisor. The Supervisor should very carefully (when the tamping is of damp clay extract the tamping with a wooden scraper or jet of water or compressed air (using a pipe of soft material) and withdraw fuse with the primer and detonator attached. A fresh primer and detonator with fuse shall then be placed in this hole and fired. The Supervisor shall get one of the tamping cleared off and indicate the direction by placing stick in the hole. Another hole may then be drilled at least 23 cm. away and parallel to it; this hole should then be charged and fired. The balance of the cartridge and detonators found in the muck shall be removed. Before leaving his work, the Supervisor should inform the Supervisor of the relieving shift of any case of misfire and shall point out the position with a red cross denoting the same and also state what action, if any, he has taken in the matter. The Supervisor shall at once report to the office, all cases of misfire, the steps taken in connection there with. The names of the Supervisor in charge of day and night shifts must be noted daily in the contractor's office. If a misfire has been found to be due to defective detonator, or dynamite, the whole quantity of box from which the defective article was taken, must be returned to the authority as may be directed by the Engineer in charge for inspection to ascertain whether the whole box contains defective materials. Redrilling the holes that have misfired either wholly or partly shall not be permitted.

1.3.9 Accidents

The contractor shall be solely responsible for any accident during the entire procedure of handling explosives and blasting shall pay necessary compensation to the persons affected or for damage to lands property etc. without claims.

1.4 FILLING OPERATIONS

1.4.1 Backfill material–Excavation Material

Excavated material used for backfilling, shall be free from debris or other contamination, shall be suitably graded to obtain the required compaction and shall not contain stones, rock or concrete fragments larger than 10cm in the largest dimension. Two thirds of the backfill shall consist of well graded material not exceeding 3 cm in the largest dimension.

1.4.2 Importing Material

Where material from excavation is neither adequate in quantity nor satisfactory in quality, backfill material may be imported. Borrow pits for this purpose shall be identified by the contractor in the vicinity of the site approval from the Engineer – in – Charge shall be obtained for the satisfactory quality

of the material. Borrow material used for backfilling shall be sound, clean, uncontaminated granular material free from organic and deleterious material and shall not contain more than 10 percent by weight of clay or silt, individually or in combination.

1.4.3 Execution Deposition of fill

Fill materials shall be deposited in layer of not more than 20 cm in loose thickness for compaction by heavy equipment and not more than 12 cm loose thickness for hand compacted fill, so as to meet suitable extent of compaction. The contractor is responsible for the arrangement and payment for all embankment material and the material selected shall meet the approval of the Engineer – in – Charge.

1.4.4 Backfilling of trenches

No backfilling shall be carried out until all debris and other objectional materials have been removed from the trench and until the Engineer – in – Charge has inspected and approved the pipe installations and bedding. Backfilling shall be carried out in layers as defined below and in such a way that it does not disturb alignments, grades or stability of pipes. Backfilling shall only be carried out with approved materials.

1.4.5 Backfilling around structures and foundations

Backfilling around completed foundation and wall shall be done to the line and level shown on the drawing. This will be done with selected and approved earth from excavation material approved by Engineer-in-Charge. Backfilling around liquid retaining structure shall be done only after testing of structures against leakage and approval by Engineer-in-Charge. No separate payment will be made for backfilling. Rate quoted for excavation should include backfilling also.

1.4.6 Filling in foundations

Subgrades for concrete slabs shall be sand or gravel which have been tamped such that it is well compacted. The finish shall be with a 3cm tolerance when measured with a 3 m straight edge in any direction or location.

1.4.7 Deterioration of Materials

If deterioration of material takes place during the progress of work, the contractor shall at his own expense remove such material and replace it with fresh approved material.

1.4.8 Compaction Control

a. Fill backfills under and adjacent to structures shall be compacted to not less than 95 percent of maximum dry density.

b. Fill materials shall be moistened or dried, to within two (2) percent of optimum moisture content and compacted so as to conform to the following listed values when in accordance with these specifications.

c. All other fills shown on the plans shall be compacted to not less than ninety (90) percent of maximum dry density.

d. All working areas shall be protected from damage by water and site drainage shall be maintained at all times. Heavy equipment shall not be operated within 60 cm of any existing structure and vibrating roller not within 150 cm of any structure.

Disposal of surplus material

If the quantity of excavated material to be disposed off in permanent spoil dumps exceed the quantity which can be disposed off in the permanent spoil disposal areas in the site it shall be disposed off from site to a location as directed by the Engineer-in-Charge, including loading, unloading and spreading, etc. Complete surplus material or unsuitable material ordered to be disposed off shall be transported off the site and deposited at such a disposal site. Material so deposited shall be shaped up or spread and leveled as directed by the Engineer-in-Charge.

1.5. ANTITERMITE TREATMENT:

General:

Pre constructional anti-termite treatment is a process in which soil treatment is applied to a building in early stages of its construction. The purpose of anti-termite treatment is to providethe building with a chemical barrier against the sub-terrain termites. Anti-termite treatment being a specialized job, calls for thorough knowledge of the chemicals, soils, termite to be dealt with and the environmental conditions, in order to give effective treatment and lasting protection to the property undergoing treatment. It is therefore imperative that the works of anti-termite treatment should be got executed through specialized agencies only. The specialized agency should be preferably a member of the Indian pest control Association and shall have sufficient experience of carrying out similar works of magnitude envisaged in this tender.The pre constructional soil treatment is required to be applied during the construction stages of the sub-structure up to plinth level. The contractor has to be watchful of the various stages of sub-structure works and arrange to carry out the soil treatment in time after proper coordination with Department and other contractors if any, working at site.

1.5.1 Scope:

The scope of pre constructional anti-termite treatment covers the soil treatment with approved chemicals in water emulsion in foundation trenches for columns, plinth beams, plinth filling, at junction of walls and floor, in expansion joints etc. in stages as detailed in this specifications and drawings.

Unless otherwise stipulated, the anti-termite treatment will be carried out as per IS 6313 (part II) 1981 and / or as per direction of the Engineer-in-charge.

1.5.2 Site preparation:

In order to ensure uniform distribution of the chemical emulsion and to assist penetration, the following site preparation shall be carried out:

a) Remove all trees, stumps, logs or roots from the building site.

b) Remove all concrete form work if left anywhere, leveling pegs, timber off-cuts and other building debris from the area to be treated.

c) If the soil to be treated is sandy or porous, preliminary moistening will be required to fill capillary spaces in soil in order to prevent the loss of emulsion through piping or excessive percolations.

d) In the event of water logging of foundation, the water shall be pumped out before application of chemical emulsion and it should be applied only when the soil is absorbent.

e) On clays and other heavy soils where penetration is likely to be slow and on sloping sites, where run-off of the treating solution is likely to occur, the surface of the soil should be scarified to a depth of 75mm at least.

f) All sub-floor leveling and grading should be completed. All cutting trenches and excavations should be completed with backfilling in place, borrowed fill must be free from organic debris and shall be well compacted. If this is not done supplementary treatments should be made to complete the barrier.

1.5.3 Chemical to be used:

The effectiveness of chemical depends upon the choice of the chemical, the dosage adopted and the thoroughness of application. The chemical solutions or emulsions are required to be dispersed uniformly in the soil and to the required strength so as to form an effective chemical barrier which is lethal and repellent to termites and shall comply as per relevant IS codes.

1.5.4 Soil treatment:

One of the following chemicals in water emulsion, after approval from the Engineer-incharge shall be used uniformly over the area to be treated. Chemical % of concentration ofChemical by weight in the Kerosene emulsion

I. Heptachlor 20 EC emulsifable concentrates (I.S.6439 - 19781-R) 0.5

II. Chlordance 20 EC emulsifable concentrates (I.S.2682-1984 II-R) 1.0

III. THIODAN 35 EC emulsifable concentrates (Endosulphan) 0.5

IV. Chlorpyriphos 20 EC emulsifiable concentrates (I.S. 8944-1974) 1.0

The contractor should produce voucher(s) for the chemical purchased and should get verified the sealed container(s) of the specified chemical from the Engineer-in-charge before preparing the emulsion / use for t he treatment.

1.5.5 Mode and Rate of Application:

The chemical emulsion as stated above will be applied uniformly by sprayers at the prescribed rates as detailed below in all the sages of the treatment.

1.5.6 Treatment in Foundation Trenches:

In case of normal wall load bearing structures, columns pits, wall trenches and basement, the treatment shall be at 5 litres/sqm. or surface area of the bottom and sides to a height of at least 300mm. After the foundation work, the sides shall be treated at 7.5 litres/sqm.of vertical surface of substructure on each side. After the earth filling is done, treatment shall bed one by rodding the earth at 150mm centers close to wall surface and spraying the chemical with the above dose i.e. 7.5 litres/sqm. In case of framed

structure, the treatment shall start at adepth of 500mm below ground level. From this depth the backfill around the columns, beams and R.C.C. basement walls shall be treated at 7.5 litres / sqm. of the vertical and at 5 litres /sqm. for the horizontal surface at the bottom in the trenches / pits.

1.5.7 Treatment on Top Surfaces on Plinth Filling:

The top surface of the filled earth within plinth walls shall be treated with chemical emulsion at the rate of 5 litres/sqm. of the surface area before sub-base to floor is laid. If filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes up to 50 to 75mm deep at 150 mm centers both ways shall be made with crow bars on the surface to facilitate saturation of the soil with the emulsion.

1.5.8 Treatment at Junction of Walls and floors:

Special care shall be taken to establish continuity of the vertical chemical barrier on the inner wall surfaces from the finished ground level (or from level where the treatment had stopped) up to the level of the filled earth surface. To achieve this a small channel 30 X 30 mm. shall be made at all the junctions of wall / column with floor (before laying sub-grade) and rod holes made in the channel up to the finished ground level at 150mm apart and the iron rod moved backward and forward to break the earth and chemical emulsion poured along the channel at 7.5 litres (or at recommended quantity per sqm. of the vertical wall / column surfaces so as to soak the soil right up to the bottom. The soil shall be tamped back into place after this operation.

1.5.9 Treatment for Expansion Joints:

The soil beneath the expansion joins shall receive special attention when the treatment under 2.5.1 above is in progress. This treatment shall be supplemented by treating through the expansion joint after sub-grade has been laid at the rate of 2 litres per metre length of expansion joint.

1.5.10 Precautions during Treatment:

1. Utmost care shall be taken to see that the chemical barrier is complete and continuous. Each part of the area shall receive the prescribed dosage of chemical emulsion.
2. The treatment should not be carried out when it is raining or when the soil is wet with rain or sub-soil water.
3. Once formed, the treated soil barrier shall not be disturbed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

1.5.11 Precautions for Health Hazards and Safety Measures:

All the chemicals mentioned above are poisonous and hazardous to health. These chemicals can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray mist or swallowed. Persons handling or using these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely source of accidental poisoning. They should be cautioned to observe carefully all the safety precautions particularly when handling these chemicals in the from of concentrates. These chemicals are usually brought to the site in the form of emulsifiable concentrates. The containers should be clearly labelled and should be stored carefully out of the reach of children and pets animal. They should be kept securely locked. Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water especially before eating. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash into the eyes they shall be flushed with plenty of water and

immediate medical attention should be sought. The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed during mixing. Care should be taken in the application of chemicals / soil toxicants to see that they are not allowed to contaminate wells or springs and other sources of drinking water.

1.5.12 Guarantee :

The contractor has to furnish the guarantee per EIC from the date of completion of work, starting that in case of reappearance of termites within the building area due to defective materials or workmanship or due to any other reasons, the contractor will carry out the necessary post constructional treatment to keep the entire area free from termite, once again, without any extra cost to the Department during the guarantee period.

1.5.13 Mode of measurement:

The payment will be made on the basis of plinth area measurements at ground floor only for all the stages of treatment in sqm. correct to two places of decimals. Rate includes the cost of materials, labour and all tools, plants, sprayers required for complete operation.

2. CONCRETE WORKS

General

This section covers the requirements for concrete works and placing procedures, finishing and curing procedures for both cast-in-site and pre-cast cement concrete and including reinforced concrete. The Engineer strictly requires that at no time whatsoever will the mixer operator or those supervising or inspecting the works be permitted to alter the quantity of water specified by the Engineer of mixing the concrete. Batching shall be accurate and as specified by the Engineer.

2.1 Water / Cement Ratio : The water/cement ratio will be determined after mix trials by the Contractor in the presence of the Engineer or his Representative. If batching is by volume, the Contractor shall be required to fabricate such volumetric batchers and water containers as the Engineer may determine and require so as to simulate the ideals of the trial mix without recourse to assessments by site staff and workmen.

2.2 Weighing : The Contractor shall make available always a weighing machine if so required by these documents, guaranteed by the Contractor for its accuracy, for weighing cement and batches of aggregate as and when the Engineer or his Representative or his assistant may require. The machine shall be capable of weighting up to 75 Kilograms and shall be accurate to half (+0.5) Kilogram.

2.3 Compaction : All concrete shall be thoroughly compacted and fully worked around the reinforcement by vibration just sufficiently so that the appearance of laitance is kept to a minimum and in such manner as directed by the Engineer's Representative. Under no circumstances shall concrete be compacted by trowels or the like.

2.4 Transport and Placing : Fresh concrete from the mixer shall be transported to formwork where required by the quickest and most efficient means so as to prevent pre-set or segregation or any loss of ingredients and maintaining the required workability. Any laitance from previous mixes shall be removed.

2.5 Testing of Materials

Materials shall be tested as hereinafter specified and unless specified otherwise all sampling and testing shall be performed by Employer-approved Testing Laboratory, at the Contractor's expense.

2.6 Cement : Cement shall comply with the requirements of IS : 269, IS : 8041, IS : 455, IS : 8112, IS : 8043, IS : 6909 IS 1489, IS : 12269. The testing laboratory at the discretion of the Engineer, shall perform such tests as are deemed necessary. Cement bags or bulk silos shall be tagged for identification at location of sampling. Tests will include tensile tests and weighing the cement supply to check for net weight received at site and used in the works.

2.6.1. On arrival at the site, cement shall be stored in weather proof silos designed for the purpose or in dry weather - tight and property ventilated structures with floors raised 15 to 20 cm above ground level, 30 cm away from walls and with adequate provision to prevent absorption of moisture or flooding. All storage facilities shall be subject to approval by the Engineer and shall be such as to permit easy access for inspection and identification. Each consignment of cement shall be kept separately and the Contractor shall use the consignments in the order in which they are received. Any cement in drums or bags which have been opened shall be used immediately. Different types of cement shall be kept in clearly marked separate storage facilities. Not more than 15 bags shall be stacked vertically in one pile. Cement shall be stored in double locking arrangement, so that cement transactions can be with the knowledge of supervisory staff. Daily account of cement shall be maintained by Contractor in the prescribed register and shall be made available to inspecting authorities for store verification.

2.6.2. The Contractor shall provide from each consignment of cement delivered to the site such samples as the Engineer may require for testing. Any cement which is, in the opinion of the Engineer, lumpy or partially set shall be rejected and the contractor shall prompty remove such cement from the site.

2.6.3. Cement which has been stored on the site for more than ninety (90) days and cement which in the opinion of the Engineer is of doubtful quality shall not be used in the works until it has been retested and test sheets showing that it complies in all respects with the relevant standard have been delivered to the Engineer.

2.7 Water for Concrete Mixing & Curing : Water shall be clean, reasonably clear and free from injurious quantities of salt, traces of oil, acids, alkalies, organic matter and other deleterious materials. The sources of water shall be approved by the Engineer and the containers for conveyance, storage and handling shall be clean. If necessary, standard cement tests shall be conducted using the water intended to be used, in comparison with those adding distilled water to check quality of water. Water shall meet the requirement of 4.3 of IS 456 – 78. Generally potable water is fit for mixing and curing.

2.7Aggregate

The fine and coarse aggregates shall be measured separately either by volume in gauge boxes made as hereinafter specified or by weight using machines with weighbatching attachments. For high grade concrete the fine aggregate shall be measured singly or cumulatively by weight. The Engineer will rule on this requirement.

2.7.1 Aggregates for Concrete

Aggregates shall comply with the requirements of IS : 383 : 1970

2.7.2 Fine Aggregate : Sand for concrete work shall be clean, well graded and shall consist of strong, dense, durable gritty particles, free from veins injurious amounts of disintegrated pieces, alkali, vegetable matters and other deleterious substances and shall be approved by the Engineer. Maximum size of particle shall be restricted to 5 mm minimum being 0.15 mm.

2.7.3 Coarse Aggregates

The coarse aggregate shall generally be cubical in shape broken generally from best trap granite / quartzite / gneiss stones as available and generally used in the region. It shall be hard, strong, dense, durable, clean and of proper gradation, veins, free from skin and coatings and weathered aggregates shall not be permitted for use. The maximum size of coarse aggregate shall be as large as possible but not greater than 1/4 of the minimum thickness of concrete member provided that in case of R.C.C. the size presents no difficulty to surround the reinforcement thoroughly and fill up the corners properly. In plain cement concrete, the maximum size may be 80mm subject to above limitations in absence of any special provisions. For heavily reinforced beams the maximum size shall be restricted to 5 mm less than minimum lateral distance between the bars. Generally for R.C.C. works 20 mm nominal size of aggregate shall be satisfactory. Aggregates will be tested before and after concrete mix is established and whenever character or source of material is changed. Tests will include a sieve analysis to determine conformity with limits of gradation.

2.6.7.1. Samples of aggregates 50g. in weight will be taken by the Contractor at source of supply and submitted to the Engineer before placing orders. These samples if approved shall remain preserved in

the Engineer's care for reference and the type of aggregate used in the works may not be altered without the Engineer's prior approval.

2.6.7.2. Aggregates shall be obtained from an approved source and shall conform to the requirements of IS : 383. For fine aggregate grading in table of IS : 383 : 1970 shall be applicable. Aggregates shall not be flaky scoraceous or elongated particles, defined as particles having a maximum dimension greater than five times the minimum dimension. Aggregate shall have a water absorption not exceeding two percent when tested in accordance with IS.

2.6.7.3. The Contractor shall sample and carry out analysis in the presence of the Engineer's representative, of the fine aggregate and each nominals size of coarse aggregate in use employing the methods described in IS : 383 and 2386 at least once in each week when concreting is in progress and at such more frequent intervals as the Engineer may require. The grading of all aggregates shall be within the respective limits specified in the codes, aggregate vary more than IS from the approved fineness mouldes, the Engineer may instruct the Contractor to alter the relative proportions of the aggregates in the mix to allow for such difference, or may require further trial mixes.

2.6.7.4. Storage of aggregates shall be provided at each point where concrete is made such that each nominal size of coarse aggregate and the fine aggregate shall be kept separated at all times. Contamination of the aggregates by the ground or other foreign matter shall be effectively prevented at all times, and each heap of aggregate shall be capable of draining freely. The Contractor shall ensure that graded coarse aggregates are dumped, stored and removed from store in a manner that does not cause segregation.

2.6.7.5. Wet fine aggregate shall not be used until, in the opinion of the Engineer, it has drained to a constant and uniform moisture content, unless the Contractor with the knowledge of the Engineer measure the moisture content of fine aggregate and adds water in each batch of concrete mixed to allow for the water contained in the fine aggregate.

2.8 Classes of concrete

All cement concrete whether used in R.C.C. work or plain cement concrete work shall be designed in grades (by strength at the age of 28 days). M10, M15, M20 and M25 Where M refers to the mix and the number 10, 15 20 and 25 represent the specified 28 days works cube compressive strength of the mix under reference, expressed in N/mm3. The proportions of cement, aggregate water for ordinary cement concrete shall be as per relevant standard. The cement concrete shall be tested for compressive strength at the age of 28 days of 15 cm. cubes in accordance with the latest IS : 516.

2.9 Strength requirement of Concrete

Grade of concrete in all RCC work shall not be less than M20 with a minimum cement content of 432 Kg/Cu.m and with a maximum water cement ratio of 0.45. For quick result the contractors shall carry out compression tests on representative 15 cm cubes cast in accordance with relevant IS 516 at 7 days in addition to the normal 28 days compressive strength. However, the 28 days compressive strength alone shall be the criteria for acceptance or rejection of the concrete. Suitable water cement ratio for the different mixes an use shall be determined in consultation with the Engineer and shall generally not be exceeding 0.45 (i.e 4 percent by weight). The exact value being fixed after taking into account all relevant factors such a strength required, weather condition, water absorbed material, workability and slump required consistant with the work requirements, methods of compaction, etc.

2.10 Admixtures : Admixtures shall mean material added to concrete materials during mixing for the propose of altering properties of normal concrete mixes. If NATIS recommends to use admixtures the contractor shall first obtain the written permission of the Engineer in-charge. The methods of use and the quantities of use shall be subject to the approval of the Engineer in Charge. The methods of use and the quantities of admixture used shall subject to the Engineer's approval, which approval or other shall in no way limit the Contractor's obligations under the contract to produce concrete with the specified strength and workability. Concrete of any class containing an admixture shall be separate designed and have separate preliminary tests and trial mixes and tested for approval by the Engineer as if it were a separate class of concrete.

2.11 Concrete Mix Design

Procedure for designing concrete mixes shall be as per IS : 10262 - 82. Recommended guidelines for concrete mix design.

2.12 Mix Design

Mix design is normally a prerequisite to any concreting job and will be required on all major works. If required by the Documents, an approved testing laboratory shall, at the contractor's expense, design a mix for each class fo concrete and shall submit full details of the mix designs to the Engineer for his approval. The Engineer's representative and the Contractor shall clearly code each approved mix with a number and date, and file all details for identifying and reproducing exactly the same mix.

Each mix design shall be such that the aggregate shall comprise fine aggregate and coarse aggregate of the size specified and the combined aggregate grading shall be continuous. Aggregate shall be calculated by weight, and batching procedures shall be established. The cement content by weight shall not be outside the minimum and maximum limits calculated from the minimum and maximum dry aggregate to cement ratios. The mixes shall be designed to produce an average concrete strength at

twenty-eight days after manufacture not less than trail mix test strength specified. The water/cement ratio shall the region of 0.45 to 0.55 and shall never exceed 0.60.

The proportions of cement, aggregate water determined by the Contractor in his mix design shall be preliminary mix of concrete made and tested for strength work-ability under laboratory conditions observing the appropriate requirements. These preliminary mixes shall be repeated adjusted proportions as necessary until concrete mixes meeting requirements of the preliminary and trial mix tests specified with the workability defined herein have been produced. If at time during construction of the works, the source of cement aggregates is changed, or the grading of the aggregate alters, further preliminary mixes shall be undertaken.

After the Engineer's approval the preliminary concrete design for each class of concrete and during or following carrying out of the preliminary tests the Contractor shall prepare a trial mix of each class in the presence of the Engineer. The mixes shall be mixed for the same time and handled by means of same plant that the Contractor proposes to use in the works proportion of cement, aggregates and water shall be care determined by weight in accordance with the approved mix (or modified mix design after preliminary tests) and sieve analysis shall be made, by approved methods of the fine aggregate and nominal size of coarse aggregate used.

2.13 Waiver of Mix Design and Weigh Batching

On certain works the Engineer may waive the requirement of designing mixes and may allow the use of established nominal mix proportion, provided always that preliminary trials are made to establish the volumetric batching procedure and mix strengths. The Contractor will ensure that any established procedure approved by the Engineer is strictly adhered to, so as to achieve consistent strength, durability and economy of the concrete while ensuring approved workability of the mix. Any waiver of mix design or weigh batching will not relieve the Contractor of his obligations to consistently produce concrete of the specified and approved strength and durability as determined by works tests defined hereafter. However in any particular work/part of work the Engineer may decide to adopt mix design (mix) concrete.

2.14 Water : Water for mixing concrete, mortar or grout shall sat the recommendations of IS : 456. If required to do so by Engineer, the Contractor shall take samples of the water and them for quality.

2.15 Workability

The workability of each class of concrete shall be such that satisfactory compaction can be obtained when the concrete is placed and vibrated in the works. There shall be no tendency to segregate when it i handled, transported and compacted by the methods which the Contractor proposes to use when handling, transporting and compacting that class of concrete in the works.

2.16 Batching Cement

All cement used in making concrete shall be measured by weight either with an approved weighing machine or by making the size of each batch of concrete such as to require an integral number of complete bags of cement of weight consistent with the requirements of C1.9 of IS : 269. In case of ordinary mixes the cement bag shall be taken to be 50 Kg. (35 litres).

2.17 Gauge Boxes

Gauge boxes shall be soundly constructed by the Contractor, with the approval of the Engineer and shall be of timber or of steel to contain exactly the volume of the various aggregates required for one batch of each mix. Each gauge shall be clearly marked with the mix code and the aggregate for which it is intended. When calculating the size of the gauge box for fine aggregate an allowance shall be made for the bulking of the fine aggregate due to the average amount of moisture contained in the stockpiles on the site. Before the Contractor shall put any gauge box into use on the site he shall obtain the approval of the Engineer of the size and construction of such gauge box.

2.18 Water Containers

Containers for measuring water shall be soundly constructed of metal to contain the exact quantity of water required for a batch of mix, due allowance having been made for the moisture content of the aggregates, as hereinafter specified, or such fractions of the quantity as are approved by the Engineer. Containers shall have spouts, the spill levels of which have an outlet valve and hose fixed to the bottom of the container. Before any container is put into use, the approval of the Engineer shall be obtained.

2.19 Weigh-Batching

Weigh-batching machines shall provide facilities for the accurate control and measurement of the materials either singly or cumulatively and shall be capable of immediate adjustment of operators in order to permit variations if ordered by the Engineer. All weight dials shall be easily visible from the place at which filling and emptying of the hoppers is controlled.

2.20 Uniformity of Mix : Concrete shall be mixed in batches in plant capable of mixing the aggregates, cement and water (including admixtures, if any) into a mixture uniform in colour and consistency and of discharging the mixture without segregation.

2.21 Contractor's Returns : The Contractor shall render to the Engineer, not more than twenty-four hours in arrears, a daily return for each class of concrete of the number of batches mixed, and total

volume of concrete placed, the number of batches wasted or rejected and the weight of cement used. In case of ordinary mixes, where permitted the cement bags consumed for quantities of various classes of concrete shall be furnished. In addition daily details of time of starting concrete, closure, No. of batches through mixer, W.C. ratio, slump, date of striking form works etc. shall be maintained. This day-to-day records shall be authenticated by responsible supervisory staff.

2.22 Plant and Equipment Generally

All mixing and batching plants boxes, containers and other equipment shall be maintained free of defects or of set concrete or cement and shall be cleaned before commencing mixing. At such intervals as may be directed by the Engineer the Contractor shall provide weights, containers and equipment necessary for testing the accuracy of the weighing plant, water measuring plant and admixture dispenser.

2.23 Laitence : Where laitence on a life of concrete is evident or if a substantial bond between this lift or bay of concrete and the next is required, in the opinion of the Engineer's Representative, the Contractor shall have the surface wire brushed after initial (one day) set of the concrete or have it bush-hammered at no extra cost to the Owner. Any reinforcing bars covered in laitence shall be wire brushed to clean the surface of the metal.

2.24 Binding : As ordered by the Engineer, or as shown on the drawings the formation surfaces on which concrete is to be placed shall be covered with either blinding concrete not less than 75 mm thick, or waterproof building paper, or polythene sheeting immediately after completion of the final trimming of the excavation.

2.25 Inspection

Concrete shall not be placed until the Engineer has inspected the formwork and the reinforcing steel, and taken necessary measurements of the latter, and has approved the surfaces upon which the concrete is to be placed.

2.26 Transporting : Fresh concrete shall be transported from the mixer to its place in the works as quickly and as efficiently as possible by methods which will prevent pre-set or segregation. If segregation has nevertheless occurred in any instance the materials shall be remixed or discarded at the option of the Engineer.

2.26 Placing : Fresh concrete shall be placed and compacted before initial set has occurred and, in any event, not later than thirty minutes from the time of mixing. Concrete shall be carefully placed in

horizontal layers which shall not be allowed to slide or flow down sloping surfaces but shall be placed in its final position form skips, or similar devices. If this is impracticable, it shall be shovelled into position care being taken to avoid segregation. No concrete shall be dropped more than 1.5 m. If greater drops are necessary approved chutes may be used. If the concrete abuts against earth or any other material liable to become loose or to slip, care shall be taken to avoid falls of materials on to the surface of the wet concrete. As far as possible concrete for any particular portion shall be done in one continuous operation leaving construction joints, if specified by drawing. Before commencing subsequent concrete on the one left incomplete all the loose particles, laitance etc. shall be removed and surface shall be covered with thick cement slurry. The concrete compacted manually shall be laid in layers not more than 15 to 20 cm. The successive layer shall follow within 30 minutes or earlier.

2.28 Compaction

All concrete placed in-situ shall be compacted with power drive or pneumatic internal type vibrators unless otherwise approved by the Engineer in writing, and shall be supplemented by hand spading and tamping where required. Vibrating screen type vibrators may be used for thin slabs. There shall be sufficient and spare vibrators of adequate capacity to compact the work in hand.

2.29 Vibration : Vibrators shall be inserted into the uncompacted concrete vertically and at regular intervals. Where the uncompacted concrete is in a layer above freshly compacted concrete the vibrator shall be allowed to penetrate vertically for about 75 mm into the previous freshly compacted layer. The vibrators shall not be allowed to come into contact with the reinforcement or formwork nor shall they be withdrawn weekly from the mass of concrete but shall be drawn back slowly while in motion so as to leave no voids. Internal type vibrators shall not be placed in the concrete in any arbitrary manner nor shall concrete be moved from one part of the work to another by means of the vibrators. The vibrators shall have minimum 3600 (and preferably 5000) impulses per minute.

2.30 Duration : The duration of vibration shall be limited to that required to produce satisfactory compaction of the concrete without causing segregation. Vibration shall on no account be continued after the appearance of water or grout on the surface.

2.31 Hand Compaction : This shall be permitted exceptionally for small jobs by the Engineer. In such cases, compaction shall be attained by means of rodding, tamping, ramming and slicing with suitable tools. The thickness of concrete layers will also be suitably reduced when hand compaction is resorted to.

2.32 Underwater concreting

No concrete shall be placed in water without the Engineer's written permission, which may only be granted if in his opinion it is not practicable to place the concrete in the dry. Concrete shall not be placed is running water nor shall concrete be allowed to fall through water. Any water entering the area where concrete is being placed shall, at the Contractor's expenses, be kept clear of the concreting works. If under water concreting is permitted, the specified mix of concrete shall be strengthened by increasing the cement content by atleast 10.0% and reducing the water/cement ratio tono more than 0.45, and the placing shall be only through a temmmie approved by the Engineer. The volume or mass of the coarse aggregate shall not be less than 1_ times nor more than twice that of the fine aggregate. The materials shall so proportioned as to produce a concrete having a slump of not less than 100 mm & not more than 180 mm.

2.33 Curing

All concrete shall be protected from the effects of sunshine, rain, running water or mechanical damage and cured by covering with jute, hessian or similar absorbent material kept constantly wet or a layer of sand kept covered with water is also permissible for a continuous period of fourteen days at least from the date of placement. Should the Contractor fail to water concrete continuously, the Engineer may provide labour, materials required for watering and recover the cost from the Contractor.

2.34 Finishing

Immediately after removal of forms any undulations, depressions, cavities, honey combing, broken edges or corners high spots and defects shall be made good and finished with cement mortar 1:2 but the necessity of such finishing must be exceptional and total surface requiring finishing shall not exceed 1%. Where concrete surface is to receive plaster, the surface shall be roughened immediately after removal of forms and within a day thereof to secure a hold for the plaster. The rate of concrete is inclusive of this roughening and finishing. Concrete after finishing shall be cured for the full period. The concrete surfaces, where plastering is not required shall be finished to smooth surface with a carbarndum stone rubbing as required by the engineer.

2.35 Joints

Construction joints are defined as joints in the concrete introduced for convenience in construction at which special measures are taken to achieve subsequent continuity without provision for further relative movement.

2.42 Submittal : No concreting shall be started until the Engineer has approved the method of placing, the positions and form of the construction joints and the size of lifts.

2.36 Jointing : The face of a construction joint shall have all laitance removed and the aggregate exposed prior to the placing of fresh concrete. The laitance shall wherever practicable be removed by spraying the concrete surface with water under pressure and brushing whilst the concrete is still green. Where the laitance cannot be removed whilst the concrete is green, the while of the concrete surface forming part of the joint shall be hacked to expose the aggregate. Where aggregate is damaged during hacking, it shall be

removed from the concrete face by further hacking. All loose matter shall be removed and the exposed surface thoroughly cleaned by wire brushing, and washing down, and the surface to which fresh concrete is applied shall be lean and damp.

2.37 Expansion Joints

Expansion joints are defined as joints intended to accommodate relative movement between adjoining parts of a structure special provision being made where necessary for maintaining the water tightness of the joint.

A. The joint location and type will be as indicated in the drawing.

2.44.1. The Contractor shall comply with the instructions of manufacturers of proprietary jointing materials and shall, if required by the Engineer, demonstrate that the jointing materials can be applied satisfactorily and will last the life of the structure.

2.44.2. Flexible water stops shall be fully supported in the formwork, free of nails and clear of reinforcement and other fixtures. Damaged waterstops shall be replaced and during concreting care shall bet taken to place the concrete so that water stops do not bend or distort.

B. Jointing : The surface of set concrete shall not be disturbed and concrete shall be placed against the dry finished surface.

2.44.3. If ingress of water or corrosive agents in the joint is possible, the steel, where such steel is continued, shall be cleaned and coated with two coats of an approved bituminous paint to a distance not exceeding 10 mm.

2.44.4. Where specified, the surface of the set concrete shall be painted with two coats of an approved bituminous paint which shall be allowed to dry before placing new concrete against it. Care shall be taken to prevent paint getting on the waterstop, if any.

2.44.5. Expansion joints shall be formed by a separating strip of pre-formed compressible unperishable joint filler, to be approved by the Engineer.

2. 38 Hydraulic Test

Structures designed as water retaining shall be hydraulically tested. Hydraulic test shall be as per relevant standards or as directed by the Engineer in charge. Water required for such tests shall be arranged by the contractor at his own cost.

2.39 Protection of Concrete

Concrete placed below ground level shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances, shall be kept free from contact with such ground and with water draining there during placing for a period of three days or as otherwise instructed thereafter. No load of any kind, however light, shall be allowed on concrete which has not adequately set,

and unless it has been pronounced fit by the Engineer. Immediately after the compaction of the concrete has been completed contractor shall ensure that it is adequately protected from the weather. Protective materials shall be kept continuously damp and in position for a minimum period of fourteen days or such other time as the Engineer may direct. Where large sections of concrete are poured special precautions as approved by the Engineer shall be taken to reduce and dissipate the heat generated by the setting and hardening of the concrete.

The contractor shall set up a mini lab for conducting cube strength etc. The contractor shall provide such details along with the lender.

3. REINFORCEMENT

Reinforcement shall be FE 500 as per the requirement as indicated and specified. Supply and delivery of reinforcing bars and mesh, bending, wire brushing and cleaning, steel fixing and the attendance of the fitter during concreting, to inspect fixed reinforcing bars and maintain bars in correct position at each locations. Whenever mention of I.S. codes is made, the latest editions thereof shall be applicable. All continuous inspections shall be performed by the Engineer's representative or his authorised assistant or a specialist called by the Owner or the Engineer. Reports as required by code or authorities concerned shall be prepared and submitted to the owner and such authorities.

3.1 Cleanliness of Reinforcement : The Contractor shall ensure that all reinforcing bars are thoroughly wire brushed and cleaned free of loose mill scale loose rust, coats of paints oil mud or other coating.

3.2 Concreting Operations : During concrete placing, a fitter shall be in attendance to inspect fixed reinforcing bars and maintain bars in correct positions at each pour locations.

Drawings : The Engineer will supply detailed drawings of reinforced concrete works. Working drawings and bar bending schedules shall be prepared by the Contractor from drawings supplied to him by the Engineer.

3.3 Samples : At least one month in advance of placing an order by him the Contractor shall submit four samples of reinforcing bars which he intends ordering in case the steel is to be supplied by the Contractor. The samples shall confirm to IS : 10790 Part 2 – 1984. The Engineer may carry out any test he may require, to satisfy that the steel to be brought by the Contractor complies with the test specifications. The Engineers reserves the right to shortlist the vendors and the contractor shall procure only from such sources.

3.4 Reinforcing Bars

Reinforcing Bars shall either be supplied by the Owner or shall have to be brought by the Contractor as laid down in the tender conditions.

3.5 Laps :

Laps ad splices for reinforcement shall be shown in the drawings. Splices, in adjacent bars shall be staggered ad the locations of all splices, except those pecified on the drawing shall be approved by the Engineer-in-charge. The bars shall not be lapped unless the length required exceeds the maximum available length of bars at site.

3.6 Bending :

All bars shall be accurately bent according to the sizes ad shapes shown on the detailed working drawings/ bar being schedules. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and rebent in a manner that will injure the materials. Bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25mm in diameter which may be bent hot if specifically approved by the Engineer-incharge. Bars bent hot shall not be heated beyond cherry red colour (not exceeding 645oC) and after bending shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only of ht means used for straightening and rebinding be such as shall not, in the opinion of the Engineer-in-charge injure the material. NO reinforcement bar shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having links or bends other than those required by design shall not be used.

Unless otherwise indicated or specified, bars shall be bent and fixed in accordance with the provisions of IS : 2502. All bending shall be done cold with the use of an approved bending machine. Incorrectly bent bars shall not be permitted to be used by re-bending.

3.7 Bending at Construction Joints :

Where reinforcement bars are bent aide at construction joints and afterwards bent back into their original position, care should be taken to ensure that no time the radius of the bend is less than 4 bar

diameters for plain mild steel or 6 bar diameters for deformed bars. Care shall also be taken when bending back bars to ensure that the concrete around the bar is not damaged.

3.8 Fixing / Placing ad Tolerance on Placing :

Reinforcement shall be accurately fixed by ay approved means maintain din the correct position as shown in the drawings by the use of blocks, spacer and chairs as per IS 2502 to prevent displacement during placing ad compaction of concrete. Bar intended to be in contact at crossing point shall be securely bound together at all such points with number 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bars in beams or similar members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars

3.9 Welded Wire Mesh

Mesh reinforcement, where specified shall conform to IS : 1566 – 1982.

3.10 Binding Wire

Binding wire shall be 0-90 mm (20 SWG) diameter annealed wire confirming to IS 280.

3.11 Supports and Accessories

Spacers for reinforcement shall be provided as per 7.80 of IS: 2502. The cover blocks as per 73 of IS: 2502 shall be made so as to provide the exact specified cover to reinforcement. Stays, blocks, ties spacers or other supports as approved by Engineer shall be provided at appropriate intervals to avoid sagging of bars between supports. Broken stones, brick pieces, wooden blocks shall not be allowed for the purpose under any circumstances.

3.12 Dowels

Where and as designated on the drawings, steel bar dowels shall be provided for anchorage to previously cast concrete. For anchorage where shown or required to existing construction, an approved non shrink epoxy type grout or approved deferred bolting devices shall be used.

3.13 Cleaning :

Before placing reinforcement and again before concrete is placed, reinforcement shall be wire brushed and cleaned of loose mill scale, oil, or other coating that might destroy or reduce bond.

3.114 Concrete Cover :

Cover over reinforcing bars shall be as indicated. Correct concrete cover to reinforcement shall be maintained with the aid of approved cover blocks. Top reinforcement in slabs shall be maintained in position by means of chairs made out of mild steel, the diameter and quantity being sufficient to ensure security of the reinforcement in shape and position.

3.15 Securing Place :

All reinforcement shall be securely and accurately fixed in positions shown on the drawings, care being taken to prevent contact with coated shutterings and forms, by using approved support or spacer blocks, or chairs where necessary. All intersections of bars shall be secured with approved clips or with wire, the ends being turned into the body of the concrete. The Contractor shall ensure that all reinforcement is maintained in position at all times, particular care being taken during placing of the concrete.

3.16 Splices :

Shall be wired contact lap splices unless otherwise indicated or approved. Splices at points of maximum tensile stress shall be avoided and shall be staggered elsewhere. The lap length and other provisions shall conform to 25.2.5 IS : 450-78.

3.18 1. Vertical Bars : Splicing of vertical bars in concrete shall be at approved positions.

3.18.2. Horizontal Bars : Unless otherwise shown, lap splices shall be made with at least one continuous bar between adjacent splices. Where double mats of bars occur in walls, lap splices in opposite mats shall be offset at least 1.5 m.

3.17 Welding :

Welding of reinforcing bars is not permitted unless indicated or approved by the Engineer in writing in each case. Where permitted in writing, reinforcement which is specified to be welded shall be welded by any process after which the Contractor can demonstrate by bend and tensile tests that the strength of the parent metal is not reduced and that the weld possesses a strength not less than that of the parent metal. The welding procedure established by successful test welds shall be maintained and no departure from this procedure shall be permitted. Welds in positions other than those shown on the drawings shall not be permitted. Welding shall be carried out only by qualified welders with experience of similar works. The standard for welding will be those required by IS : 2751 - 79 code of practice for welding of mild steel bars used in reinforced concrete construction and IS : 9417-1989 Recommendations for welding cold worked steel bars for reinforced concrete construction.

3.18 Misuse : No part of the reinforcement shall be used to support access ways, working platforms, or placing equipment or for the conducting of an electric current.

3.19 Additional Reinforcement : Additional reinforcing bars shall be provided at sleeves and openings as indicated or required. Where additional bars are not shown for such locations, Engineer's instructions shall be obtained and additional bars provided as directed.

3.20 Welded Wire Mesh : All necessary supports and chairs shall be provided to hold in place during concrete pours. Care shall be taken to prevent contact between the mesh and coated shutters. Mesh shall be straightened to lay in flat plane before placing it and mesh shall be bent as shown or required to fit the work. Laps shall be as per 25.5.1 IS : 456.

3.21 Access : Where reinforcing mats have been fixed, access for concreting purposes shall, where necessary, be provided by timber benches or similar approved devices supported by the falsework. Under no circumstances shall such access ways be supported by reinforcement bars or mats.

3.22Substitution : In case sizes of bars other than specified ones are permitted to be used, the C/S area of steel shall have an area not less than designed area provided further that bond stress is not exceeded and criteria for minimum and maximum spacing of bars as per IS : 456 is not violated.

4.FORMWORK

4.1 All formwork shall be constructed of timber, sheet metal or other approved material. It shall be firmly supported, adequately strutted, braced and tied to withstand the placing and vibrating of concrete and the effects of weather. Design of structures shown on the Engineer's drawings does not include any allowance or consideration for imposed construction loads. One copy of the contractor's shoring and form work drawings shall be submitted to the Employer for record purpose only and not for review or approval. Forms, shoring and false work shall be adequate for imposed live and dead loads including equipment and men, height of concrete drop, concrete and foundation pressures and stresses, wind pressures, lateral stability, and other safety factors during construction. The Contractor shall be responsible for the calculations and designs for the formwork. The Contractor shall be held solely responsible for any failure and for the safety of work and workmen. He shall pay necessary compensation, if need be, for damages to work, property and injuries to persons. The scaffolding, hoisting arrangements and ladders shall have easy approach to work spot and afford easy inspection.

Standards and Tolerances : All formwork shall be fabricated in compliance with the best modern practice, so that the finished surface is even, unblemished free of fins and true to line, level and shape as shown by the drawings. The forms shall comply with the requirements of IS : 456.

i. Faces of formwork in contact with concrete shall be free from adhering foreign matter, projecting nails and the like, splits or other defects, and all form work shall be clean and free from standing water, dirt, shavings, chippings or other foreign matter. Joints shall be watertight to prevent the escape of mortar and cement slurry or the formation of fins or other blemishes on the face of the concrete.

ii. Openings for inspection of the inside of the formwork and for the removal of water used for washing down shall be provided and so formed as to be easily closed before placing concrete. Before placing concrete all bolts, pipes or any other fixtures which are to be built in shall be fixed in their correct positions and cores and other devices for forming holes shall be held fast by fixing to the form work or otherwise. Holes shall not be cut in any concrete without the approval of the Engineer.

4.2Formwork Coating

The coating on all formwork shall be of a non-grain raising and non-staining resin or polymer type or mould oil that will not leave residual matter on surface of concrete or adversely affect bonding to concrete of any subsequent paint, plaster, mortar or other applied materials. Coatings containing mineral oils, parafins, waxes, or other non-drying ingredients are not permitted. For concrete surfaces contacting potable stored water, the coatings and form-release agents shall be completely non-toxic. Care shall be taken to prevent the coating from coming into contact with reinforcement or with concrete at construction joints.

4.3 Timber

Timber shuttering shall be fabricated from well seasoned timber which shall not warp under the effects of the ambient temperature and humidity. Boards shall be strong enough to support the stresses imposed on the shuttering without flexing.

4.4 Joints

Timber board joints shall be to rqued and grooved. All joints shall be bonded to prevent loss of grout during concreting.

4.5 Plywood

Plywood shall conform to IS : 4990 and shall be braced as necessary.

4.6 Metal form ties

Ties for climbing shuttering shall be of the prefabricated threaded internal disconnecting type of tensile strength to resist all imposed loads. Ties shall leave no metal within 40 mm of concrete surfaces after removal. The Engineer's approval shall be sought before ties are used on any concrete work.

4.7 Metal Forms

Metal Forms shall be true to detail, in good condition, clean, free from dents, bents, rust and mineral oils.

4.8 Round Column Forms

Round Forms shall be of structural quality fibreboard, metal tubes as specified for metal forms, or fibre glass reinforced plastic, or formed to shape in plywood and braced as necessary.

4.9 Form Joint Sealers

Sealers for joints between form panels shall be of resilient foam rubber strips, or non-hardening plastic type caulking compound free of oil, or waterproof pressure-sensitive plastic tape or a suitable adhesive. Form tie holes shall be sealed with rubber plugs, plastic caulking compound or equal. All joints shall be watertight to totally prevent the loss or leaching of grout during concreting.

4.10 Moulds

For grooves, drips, rebates, profiles, chamfers, and similar items, smooth finished timber coated with specified form coating shall be used Standard products such as extruded polymer plastic units of the indicated or required shapes may also be used.

4.11 Form types and finishes

Finishes to formed surface of concrete shall be classified as Class A, Class B and Class C or such other special finish as may be particularly specified. Where the class of finish is not specified the concrete shall be finished to Class C.

4.12 Various Classes of finishes

4.12.1 Class A – High Quality Finish

Formwork for Class A finish shall be lined with as large panels as possible of nonstaining material with a smooth unblemished surface true to required form such as sanded plywood or hard compressed fibre board, arranged in a uniform approved pattern and fixed back formwork by oval nails. Unfaced wrought boarding or standard steel panels shall not be permitted.

4.12.2 Class B General Finish

Formwork for Class B finish shall be faced with wrought tongued and grooved boards or plywood or metal panels true to required form arranged in a uniform approved pattern free from defects likely to detract from the appearance of the surface.

4.12.3. Class C Unexposed Finish

Formwork for Class C finish shall be constructed of timber, sheet metal or any suitable materials which will prevent loss of cement slurry. The loads shall be properly distributed over base area on which shoring is erected, either concrete slabs or ground ; if on ground, it shall be protected against undermining or settlement, particularly against wetting of soils, and near excavations. The forms shall be constructed to produce in finished structure all lines, grades and camber as required. jacks, wedges, or similar means shall be used and firmly anchored to take any settlement in formwork which may occur before placing of concrete. Camber for beams and slabs shall be as indicated.

4.13 Form construction

Forms shall be build to exact shapes, sizes, lines, and dimensions as required to obtain accurate alignment, location and grades. Provision shall be made for openings, offsets, keyways, recesses, mouldings, reglets, chamfers, blocking, joint screens, bulkheads, anchorages,and other required features. Forms shall be made for easy removal without hammering or prying against concrete. Metal spreaders may be used to provide accurate spreading of forms. Construction of forms shall be such that there will be no sagging, leakage or displacement occurring during and after pouring of concrete. Forms shall be coated with specified coating material; and coating material shall not come into contact with reinforcing bars.

4.13.1. Slopes

Formwork shall be provided for the top surfaces of sloping work where the slope exceeds fifteen degrees from the horizontal (except where such top surface is specified as spaded finish) and shall be anchored to enable the concrete to be properly compacted and to prevent flotation, care being taken to prevent flotation, care being trapped.

4.13.2 Chamfers

All exterior horizontal angles on the finished concrete of 90 degrees or less along the tops of walls shall be given 20 mm chamfers ; columns are required to have chamfers on vertical angles, which run out 125 mm from the bottom and top of the column ; other exterior angles shall be left sharp unless otherwise ordered by the Engineer.

4.13.3 Ties

No ties or bolts or other device shall be built into the concrete for the purpose of supporting formwork without the prior approval of the Engineer. The whole or part of any such supports shall be capable of removal so that no part remaining embedded in the concrete shall be nearer than 50 mm from the surface in the case of reinforced concrete and 150 mm in the case of unreinforced concrete. Holes left after removal of such supports shall be neatly filled with 1:3 drypack mortar which shall contain just sufficient water to make it plastic. It shall be well rammed into the hole and finished flush.

4.13.4 Form Windows

Windows shall be provided in the formwork wherever directed or necessary for access for concrete placement and vibration. Windows shall be of size adequate for tremies and vibrators, spaced at maximum 1.8 m centres horizontally, and shall be tightly closed and sealed before placing higher concrete.

4.13.5 Cleanouts and Cleaning

Temporary openings shall be provided in wall, column and slab formwork for cleaning and inspection. Prior to pouring, all forms and surfaces shall be cleaned and coated to receive concrete.

4.13.6 Re-use

Form material shall be cleaned and reconditioned before re-use.

4.14 Embedded piping, conduits and anchors

All trades which require openings for the passage of pipes, electrical conduits, and other inserts shall be consulted and the necessary pipe sleeves, anchors, or other required inserts shall be properly and accurately installed. Openings required by other trades shall be reinforced as indicated and required. Conduits or pipes shall be located so as not to reduce the strength of the construction, and in no case shall pipes other than conduits be placed in a slab 4 1/2" (11.4 cm) or less in thickness. Conduit buried in a concrete slab shall not have an outside diameter greater than 1/3 of the thickness of the slab not be placed below bottom reinforcing steel or over top reinforcing steel. Conduits may be embedded in walls provided they are not larger in outside diameter than 1/3 the thickness of the wall, are not spaced closer than three diameters on the centre, and do not impair the strength of the structure. Electrical conduits shall be placed with due regard to allowable bend radii continuity in its length from outlet to outlet, and shall be equipped with a pull cord. The outlets shall be temporarily plugged to totally avoid ingress of concrete or grout.

4.15 Field Quality Control

4.15.1 Control during concrete placement

Devices of the tell-tale type shall be installed on supported forms and elsewhere as required to detect formwork movements and deflection during concrete placement. Required slab and beam cambers shall be checked and correctly maintained as concrete loads are applied on forms. Workmen shall be assigned to check forms during concrete placement and to promptly seal any mortar leaks.

4.15.2 Defects in formed surfaces

Workmanship in formwork and concreting shall be such that concrete shall normally require no making good, surfaces being perfectly compacted and smooth. If any blemishes are revealed after removal of formwork, the Engineer's decisions concerning remedial measures shall be obtained immediately. These measure may include but shall be limited to the following :

1. Fins, pinhole bubbles, surface discolouration and minor defects may be rubbed down with hacking immediately the formwork is removed.

2. Abrupt and gradual irregularities may be rubbed down with carborundum and water after the concrete has been fully cured. These and any other defects shall be remedied by methods approved by the Engineer which may include using a suitable epoxy resin or, where necessary cutting out to a regular dovetailed shape at least 75mm deep and refilling with concrete over steel mesh reinforcement sprung into the dovetail.

4.15.3. Removal of Forms and Shoring

Formwork shall be so designed as to permit easy removal without resorting to hammering or levering against the surface of the concrete. The periods of time elapsing between the placing of the concrete and the striking of the formwork shall be as approved by the Engineer after consideration of the loads likely to be imposed on the concrete and shall in any case but not less than the periods shown below, depending on the ambient temperature. Location of Form Time for striking using ordinary Portland cement (days) Seem sides, walls and columns 3 Slab Soffits 7 to 14 Beam Soffits 14 to 21 Not with standing the foregoing the Contractor shall be held responsible for any damage arising from removal of formwork before the structure is capable of carrying its own weight and any incidental loading. The contractor shall be wholly responsible for repairing or reconstruction as directed by the Engineer the section of the Works so affected.

4.15.4 Sharing and Falsework Removal

In retaining wall construction Sharing and falsework shall not be removed until 21 days after concrete placement or until concrete has attained at least 90 percent of the 28 day design compressive strength as demonstrated by control test cylinders, whichever is the earlier.

4.15.5 Restriction

Construction equipment, or permanent loads shall not be imposed on columns, supported slabs, or supported beams until concrete has attained the 28 day design compressive strength as demonstrated by control test Cylinders.

4.15.6 . Concrete curing during removals

Concrete shall be thoroughly wetted as soon as forms are first loosened and shall be kept wet during the removal operations and until curing media or sacking is applied. Potable water supply with hoses or buckets shall be ready at each removal location before removal operations are commenced.

5. STRUCTURAL STEEL

This specification are for the supplying, fabricating and erecting in position mild steel structures such as beams, monorail, platform, M.S.ladders, stairs and M.S.grating etc. from angles channels, flats, plates etc. including cost of steel, cutting to required size, rivetting, bolting or welding, fixing in the line and level, painting with two coats, of red oxide primer and two coats of approved enamel paint. Requirements specified in this section will form a part of detailed specifications for item of works falling

under this category. Indian standards shall apply as if included herein. Design of structure shall be compliance with Indian Standards (IS) viz. for rivets IS:1148-1954 for bolts IS:1148- 1964 and IS:1962 for structural fabrication IS:800-1962, and its latest edition.

Structural steel members, steel joints, plates and connections, steel chair assemblies, pipe supports for piping in all locations, ladders and stairs and miscellaneous metal work for water supply and sewerage and disposal installations. Unless otherwise specified all work specified herein and shown on the drawing shall conform to the applicable requirements of the following specifications and codes. Fabrication and erection of structural steel shall be in accordance with IS:800-962 and amendments issued.

This work shall include the furnishing and installation of all structural steel and miscellaneous metal work and related supports, tanks, manhole steps, equipment guards, anchors and other appurtenances and any other work shown on the drawings or herein specified. All materials shall be new, sound and of the best quality available.

5.0 STANDARD MATERIAL SPECIFICATIONS

1. STRUCTURAL
2. FASTENERS
3. NON-METALS
4. PAINT
5. WALL & ROOF PANELS
6. STANDARD ACCESSORIES
7. SKETCHES

i) Structural

Built-up sections are made from hot rolled plates conforming to ASTM A-572 Gr50 (345 MPa) steel. The plates are joined together on one side of the web by a continuous automatic submerged arc welding process to produce the section required. Hot rolled sections except beams are mill sections complying with IS:2062 (240 MPa) steel.

ERW pipes , sections and crane beams are mill formed sections conforming IS 2062 for 240 MPa yield. Black (non coated) cold formed sections of thickness 1.6 mm, 2.0 mm and 2.5 mm aremade of hot rolled sheet to ASTM A607 Gr50(345 Mpa) steel.

Bracing rods and sag rods are made of steel bars conforming to IS:2062 with a minimum yield strength of 240MPa. Alum/Zinc coated (Galvalume) alloy sheets are 0.47 mm nominal thickness, cold rollformed from a cold rolled coil conforming to ASTM A-792 M, Grade-80 with a minimum yield strength of 550 MPa. These sheets are hot dip coated with a 55% Aluminium and 45% Zinc alloy. Pre-painted sheets are 0.5 mm nominal thickness, coated with a baked silicon polyester finish on top of an Alum/Zinc alloy finished steel sheet (as per the specification above). The paint finish film thickness is 20 microns of silicon polyester on the exterior face and 10 microns of polyester on the interior face.

ii)Fasteners

Primary structural connection are made with electro galvanized (silver) high strength bolts Gr. 8.8 steel conforming to IS 3757 Purlins and girts are connected to their supporting members by machine bolts Gr. 4.6 steel conforming to IS 1363 electro-galvanized (yellow). Anchor bolts are made of rods conforming to ASTM F1554 with a minimum yield strength of 250 MPa. Roof and wall panels are

fastened by No. 12 carbon steel self-drilling screws hot-dip galvanized with polymer coated finish with an integral washer head to which an EPDM elastomer layer is bonded.

iii)Non-Metals

Sky and wall lights are made of translucent white acrylic modified, Ultra Violet stabilized, fiber glass panels. Panels shall be of 3.9 Kg/m2 nominal weight and provide same coverage as panel width with a maximum length of 3250 mm. Profile of light panels matches that of the roof / wall panel.
Closure strips shall match the sheeting profile, and be made of XLPE or similar material.
Adhesive sealing tapes are made of an elastomeric butyl rubber based extruded sealant on silicon release paper. End lap sealant is nutrilized silicon sealant.
Fiberglass insulation is as per IS 8183, 50 / 100 mm thick, with a vapor barrier (foil scrim Kraft/ reinforced white vinyl/reinforced white metalized film scrim kraft facing). Density shall be no less than 16 Kg/m3. No wire mesh is required under the insulation.

iv)Paint

a.Shop Primer

Primary steel shall be cleaned to Specification St2. One shop primer coat of Red Oxide Zinc Chromate shall be applied with an average dry film thickness of 25 microns on all red steel. Shop primer provides protection for elements while in transit and construction, and is not intended to be for permanent protection.

b.Wall and Roof Panel

Exterior and interior finishes on the roof panel and walls shall be Tracdek Aluminium/Zinc alloy with modified silicon polyester (SMP) paint with color selected from the standard Color Guide. Interior finish coat of wall panels shall be polyester paint, Light-Greycolor.
The coil manufacturer shall apply colour coating after proper hot dipped metallic coating and priming has been applied. Finish coats of paints shall be applied and baked on the surface as per the coil manufacturer's standards.

v)Standard Accessories

a.Louvers

S-type fixed louvers shall be manufactured out of 0.5mm silicon polyester coated Galvalume sheet in white colour with insect screen and is supplied in standard modules of 1500 mm wide x 1000 mm high. Special sizes can be manufactured on request.

b.Vents

Gravity flow Ridge Vents shall be 300 mm, 500 mm or 600 mm throat, in 3000 mm long units manufactured out of 0.5mm silicon polyester coated Galvalume sheet in white colour.

c.Roof Extensions

Sidewalk Roof Extensions shall be 900 mm cantilevered roof members located at the eave and sloped at the same pitch as the main structure roof slope. End wall Roof Extension shall be 900 mm cantilevered "C" and "Z" sections which are continuous span extensions of the main building end bay purlins and eave struts. Roof Extensions structural members (except rafters) shall be completely concealed when optional soffit panel is specified.

d.Structural Canopy

Side wall Canopies shall be 1500 mm cantilevered rafters attached at the eave, or at any point below the eave, supporting 200/250 mm deep "Z" purlins. Optional soffit panel shall conceal only canopy purlins, leaving rafters exposed, unless

other wise specified.

e.Fascias and Parapets

Vertical and Curveline fascias shall be of the bracket mounted type.

f.Vertical fascias shall consist of hot rolled "I" section or cold formed "C" section fascia posts supported by a hot rolled section bracket that is cantilevered from the rigid frames columns at side walls and from the endwell posts at end walls, with cold formed 200/250

mm deep "Z" and "C" sections as top and bottom girts respectively. An intermediate "C" grit oriented vertically shall be supplied to support valley gutters when required. Vertical fascias shall project 600 mm from the steel line. The height of the fascia shall vary depending on actual requirements.

Fascia cladding shall be of 0.5 mm thick (nominal) pre-painted Hi-Rib panels. Soffit panels and back side panels are provided only when specified.

g.Curveline Fascias shall consist of the same type of construction as vertical fascias but shall be supplied with curved steel panels having the same corrugation profile as the Hi- Rib panel and shall be available in three types:

Type-I shall have a circular panel at the bottom of the fascia only.

Type-II shall have a circular panel at the top and bottom of the fascia.

Type-III shall be single panel profile curved at the mid height of the fascia.

h.A parapet shall be made from the same construction as the vertical fascia but without the cantilever. The building's wall sheeting shall continue to the top of the parapet.

i.Trims and Liner Panels

Trims shall be made of pre-painted Al-Zn steel, 0.5 mm minimum thickness. All trims shall be White except for corner trims and fascia trims which shall match the panel colors.

Gutters shall be nominal channel made of 0.5 mm Al-Zn steel, pre-painted White.

Downspouts shall be in 100mm square in 0.5mm alum/zinc steel pre-painted in white.

Liner panel shall be 0.5 mm galvanized steel pre-painted with White finish Hi-Rib panels.

All liner trims shall match the liner panel color.

vi)Foundation and Anchorage

Foundation and horizontal ties and concrete floor slabs shall be designed by NATIS/Its representatives. Design shall be based on job site soil conditions. Anchor bolts shall be set in strict accordance with IS Standards and best practices.

Vii)Colour Shade

The colour shade for the roof and wall cladding sheets shall be selected from the standard Colour Shade Card depending upon availability subject to prior sale.

- Doors shall be of 35mm thick and flush
- Single leaf doors shall be 915mm x 2135mm
- All doors shall be prepared for cylindrical locks/mortise locks/aldrops
- Glass, when supplied shall be 5mm thick clear tampered, factory installed
- Each door leaf shall have 4(four) 100mm long hinges
- Rolling shutters shall be manually or electrically chain operated as per the requirement in accordance to relevant standards.

5.1 Material Steel rolled sections, plates and bars shall conform to the latest editions of IS:226, 808, 1730, 1732 & 3954. Pipes used for columns or other structural purposes shall conform to IS:1161-1968. Iron for castings shall conform to IS:210.

5.2 Steel Chequered Plate

Plates shall be of regular quality carbon steel of the thickness shown on the drawings. The raised legs shall be diamond shaped and have an angle and opposed pattern.

The chequered plate (size, location and type) shall be as shown in the drawing. Steel chequered plate and frame shall be galvanised after fabrication unless noted otherwise. All assemblies shall be reinforced on concealed faces as necessary to support the service loads required. Aluminium shall be isolated from dissimilar metals, concrete, masonry and plaster to prevent electrolytic deterioration.

5.3 Common Bolts

Bolts and nuts shall conform to IS:1363-1967. The bolts exposed to liquid surfaces shall be of Stainless Steel or Brass.

5.4 Welding Electrodes

The electrodes shall conform to the requirements of IS:814 latest edition.

5.5 Shop Painting

Structural steel not designated to be galvanised shall be stop-coated using priming coat of red lead as specified in painting section of these specifications. The portion of steel to be embedded in concrete shall not be painted.

5.6 Miscellaneous Structural Works

Steel fabricated components, unit and assemblies for various equipment for waste water treatment plant to be installed shall be fabricated as per drawings and conforming to various standards codes of manufacture as specified and applicable.

5.7 Execution

Erection shall include the installation and erection of all structural steel as called for the section. The contractor shall verify correctness before starting erection. As erection progress, the work shall be securely bolted up to take care of all dead-load, wind and erection stresses. No final bolting or welding

shall be done until each portion of the structure has been properly aligned and plumbed. Bolts shall be drawn up tight and threads set so that nuts cannot become loose.

5.8 Damaged Members

During erection, members which are bent, twisted or damaged shall be straightened or replaced as directed. If heating is required in straightening, a heat method shall be used which will ensure uniform temperature throughout the entire member. Members, which in the opinion of the Engineer are damaged to an extent impairing their appearance, strength or serviceability, shall be removed and replaced with new members.

5.9 Bearing Plates

Bearing plates shall be provided under beams and columns resting on walls or footings. Bearing plates may be attached or loose and aligned on steel wedges or shims. After the supported members have been plumbed and properly positioned and the anchor nuts tightened, the entire bearing area under the plate shall be dry packed solidly with bedding mortar. Wedges and shims shall be cut off flush with edge of bearing plate, and shall be left in place.

5.10 Substitutions

Unless otherwise directed, the exact sections, shapes, thickness, sizes, weights and the details of construction shown for the structural steel work shall be furnished. However, the Contractor, because of his stock or shop practices, may suggest changes if the net area of section is not thereby reduced, if the section properties are at least equivalent and if the overall dimensions are not exceeded. All substitutions or other deviations from drawings and/or specifications shall be specifically noted or "clouded" on the shop drawing submittals.

5.11 Flame Cutting

Flame cutting by the use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of flame-cutting torch will be permitted only on minor members, when the member is not under stress, and only after the approval of the Employer has been obtained.

5.12 Storage of Materials

Structural material, either plain or fabricated, shall be stored above ground upon platforms, skids, or other supports. Material shall be kept free from dirt, grease and other foreign matter and shall be protected from corrosion.

5.13 Steel Stairs

To be fabricated true to size and details and provided complete with all attachments, steel pipe rails and handrails, checker plate-nosed grating type treads and landings. Shop and setting drawings shall be submitted beforehand for approval of the Engineer.

5.14 Anchors Bolts and Anchors

Anchors bolts and anchors shall be properly located an built into concrete to work. Bolts and anchors shall be present by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately. Embedded anchor bolts that are submerged in process water or pump room floors, or are in enclosed tanks or spaces exposed to process gas or moisture, shall be of stainless steel bolts, a non-oxidising lubricant greases will be applied before bolting.

5.15 Ladders

i. Contingent upon designated requirements for different locations, galvanised steel unit will be fabricated conforming to requirements. Rails where indicated will be provided.

ii. M.S.Ladders with stringes as specified and the steps of M.S. bars of specified dia shall be provided. The handholds shall be curved. The size and dimensions shall be as specified or as shown in the drawings.

5.17 Stair Abrasive Safety Nosings

Extended nosings to within 150mm of wall or stringer and equip each with embedded anchorage of secure attachment. Finish flush with concrete at all cast inplate concrete stairs, except or otherwise designated.

5.18 GI Piping Railing

Hand railing shall be with 40 mm of GI pipe in double row with 40mm of GI pipe uprights at a spacing not more than 1.5 m and of one metre clear height. Hand railing shall be painted with two coats of

enamel paints over a coat of red oxide primer. Hand railing shall be provided all around sumps/tanks, platforms, ladders and walkways.

5.19 C.I. Steps

C.I.Steps for wet well shall be as per IS:5455. The steps shall be clean, well cast and shall be free from oil and sand holes, wrappings etc. The C.I. steps shall be PVC consulted heavy duty type having size 300 x 150 x 25 mm. The portion of the step which projects from the wall of the wet well shall have a raised chequered design to provide an adequate non-slip grip. Minimum weight of each step shall be as per IS. The step shall be coated with approved bituminous paint.

5.20 Welding Electrodes

Finishing with Enamel paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, etc. complete on steel work.

5.21 Galvanising

All metal work shown or specified to be galvanised shall be zinc coated as per IS : 2629. The zinc coating should be free from defects and shall have uniform thickness of coating.

a. Galvanised coatings marred or damaged during erection or fabrication shall be repaired by any approved process as directed by the Engineer.

5.22 Test Reports

Certified physical and chemical mill test reports shall be furnished by the Contractor for material used for major structural members.

5.23 Shop Drawings

Five sets of shop drawings shall be submitted to the Engineer for approval before fabrication of any of the work. In approving shop drawings, the Engineer does not assume responsibility for accuracy of the work or work relative to other plant components as constructed.

5.24 Anchor Bolts

Shall be galvanised and shall be fabricated as shown, or specified by the equipment manufacturer. Suitable expansion bolts may be used in lieu of anchor bolts at certain locations. It shall be the

responsibility of the Contractor to request the substitution and obtain the Engineer's approval regarding type and location of expansion bolts proposed to be used prior to pouring concrete.

5.25 Steel Grating

Seat angles and anchors shall be of steel. Grating and support shall be galvanised. Gratings to be supplied and installed as detailed in the drawings.

5.26 Miscellaneous Structural Works

Gravity Ventilator–Throat 600mm & 3.00 mts length shall be executed as per NATIS/standard practice. Header pipes of different diameters shall be executed as per NATIS standards.

Steel fabricated components, units and assemblies for various equipment for water supply and sewage treatment installation shall be fabricated as per drawings and conforming to various standard codes of manufacture as specified and applicable.

6. MASONRY

Brick Masonry

6.1 Manufacture

Common burnt clay building bricks shall conform to the requirements of IS : 1077 and shall be of quality not less than class 50 with moisture absorption rate not exceeding 15 percent as defined in IS : 1077. The bricks shall be chamber burnt and shall not be damaged in any manner and sizes shall conform to the works sizes specified with tolerates as given in 6.2 of IS : 1077.

6.2 Samples

The Contractor shall deliver samples of each type of brick to the Engineer, and no orders shall be placed without the written approval of the Engineer. All the bricks used in the works shall be of the same standard as the approved samples. The samples shall be preserved on site, and subsequent deliveries shall be checked for uniformity of shape, colour and texture against the samples. If in the opinion of the Engineer any deliveries vary from the standard of the samples, such bricks shall be rejected and removed from the site.

6.3 Uniformity

The bricks selected for exposed pointed brickwork walls shall be of uniform colour, deep cherry red or copper colour and uniform texture. Only such bricks as are permitted by the Engineer shall be used.

6.4 Testing

Samples of the bricks shall be tested in accordance with IS : 3495 by the Contractor for compliance with the aforesaid, before any order is placed, and soon after receipt of a consignment. Tests shall be carried out as and when required by the Engineer on samples selected by the Engineer's representative.

6.5 Brick Work

All exposed brickwork shall be constructed in accordance with the provisions of IS : 2212

6.6 Laying

Brickwork shall be uniformly bedded, bricks being laid upwards. Each brick shall be floated and rubbed in upon such sufficient quantity of mortar that the mortar is squeezed up into the joints, but if such joints are not filled with mortar by this process they shall be flushed up with the mortar from the next succeeding bed. The courses shall be laid truly and strictly to line and horizontal level.

6.7 Bond

Brickwork courses shall be alternatively laid in stretcher bond and header bond. Damaged bricks shall not be used. The greatest care shall be taken to prevent mortar dropping on to or in any other way disfiguring or discoloring the bricks, and all edges and sides shall be kept strictly plumb and square, in-line, and flush with the required finished face. As the work proceeds, it shall be continuously checked with a 2 m long straight edge and spirit level.

6.8 Construction

Walls shall be carried up in a uniform manner and no one portion raised more than 1 m above another at any one time, the open end being racked out. Over-hang work shall in no case be permitted. Brickwork shall be cleaned down after each day's work and newly laid brickwork shall be protected by suitable means.

6.7 Dry Weather

In dry weather the suction rate of clay bricks shall be adjusted by wetting as necessary before use. Bricks shall be stored in a free draining area and protected from rain.

6.8 Lintels

Where brickwork rests upon lintels or supporting ribs of concrete, the bricks shall be cut as necessary and carefully bedded so that proper support to the outer leaf of brickwork is obtained.

6.9 Pointing

At the time of laying, all joints of exposed brickwork shall normally be raked out neatly and pointed to 15 mm depth.

6.10 Approval

All workmanship shall be strictly in accordance with the foregoing. The Engineer or the Engineer's representative reserves the right to reject any of the work ongrounds of shabby workmanship. Such rejected work shall be removed and rebuilt to the Engineer's satisfaction.

7.FLOORING

Scope of work :

The work covered under this specification consists of providing and laying at levels and floors, flooring of different types, strictly in accordance with these specifications and relevant drawings.

7.1 Cement Concrete Flooring (Indian Patent Stone) :

Materials :

The specifications for materials, grading, mixing and the quantity of water to be added shall generally conform to their relevant specifications described under plain and reinforced concrete. The maximum size of coarse aggregate shall be 10mm. The fine aggregate shall consist of properly graded sand. Concrete shall be mixed preferably by machine, and hand mixing shall be avoided as far as practicable.

7.1.1 Preparation of Base :

The base concrete surface shall be thoroughly chipped to remove laitance, caked mortar, loose sand, dirt etc. cleaned with wire brush and washed clean and watered until no more water is absorbed. Where the base concrete has hardened so much that roughening the surface by wire brushes is not possible, the same shall be roughened by chipping or hacking at close intervals. The surface shall be soaked with water for atleast 12 hours and surface water removed and dried before laying the topping. Before laying

the concrete, cement slurry at 2.75 kg/ sqm. Of surface shall be applied before laying the topping. Before laying the concrete, cement slurry at
2.75 kg. / sqm. of surface shall be applied for better bond, / flush as per drawings. The edge of each panel into which the floor is divided shall be supported by wooden or metal strips duly oiled to prevent sticking. The panels shall be of uniform size and, unless otherwise specified, no dimension of panel shall exceed 2 m. and the area of a panel shall not be more than 2 sqm. However, the exact size of panel shall be decided by the Engineer-in-charge to suit the size of the room. The joints in the floor finish shall extend through the borders a skirting/ dado. The border shall have mitred joints at the corners of the room. Where aluminium dividing strips are proposed to be provided, the same shall be fixed in cement mortar 1:2 @ 1200 mm. centers or as specified in the schedule for full depth of the finished floor. The depth of dividing strips shall be the thickness as proposed for the finished floor in the item. In the case of flush joints, alternate panels only may be cast on same day. Atleast 48 hours shall elapse before the concreting of adjacent bay is commenced.

7.1.2 Mixing :

The topping concrete shall be of mix of one part of cement, two parts of sand and 4 parts of well graded stone chips of 10mm maximum size. the ingredients shall be thoroughly mixed with just sufficient water to the required plasticity, having water cement ratio not more than 0.4

7.1.3 Laying :

The free water on the surface of the base shall be removed and a coat of cement slurry to the consistency of thick cream shall be brushed on the surface. On this fresh grouted base, the prepared cement concrete shall be laid immediately after mixing. The concrete shall be spread and leveled carefully. The concrete shall be compacted and brought to the specified levels by means of a heavy straight edge resting on the side forms and down ahead with a sawing motion in combination with a series of lifts and drops alternatively with small lateral shifts, either mechanically or manually as directed by the Engineer-in-charge. While concreting the adjacent bays, care shall be taken to ensure that the edges of the previously laid bays are not broken by carelessness or hand tamping. Immediately after laying the concrete, the surface shall be inspected for high or low spots and correction needed shall be made up by adding or removing the concrete and whole surface is again leveled. When the layer is made even, the surface shall be completed by ramming or beating ad then screed to a uniform line and level. Before the initial set commences, the surface shall be sprinkled directly or empty gunny bags spread over the surface of the concrete to absorb excess water coming on top due to floating.

7.1.4 Finishing the surface :

After the concrete has been fully compacted, it shall be finished by toweling or floating. Finishing operations shall start shortly after the compaction of concrete an shall be spread over a period of one to six hours depending upon the temperature ad atmospheric conditions. The surface shall be trowelled intermittently at intervals for several times so as to produce a uniform and hard surface. The satisfactory resistance of floor to wear depends largely upon the care with which troweliing is carried out. The object of trowelling is to produce as hard and close knit a surface as possible. The time interval allowed between successive trowelling is very important. Immediately after laying only just sufficient trowelling shall be done to give a level surface. Excessive trowelling in the earlier stages shall be avoided as this tends to work a layer rich in cement to the surface, some time. After the first trowelling, the duration depending upon the temperature, atmospheric conditions d the rate of setting of cement used, the surface shall be retrowelled many times at intervals to close any pores in the surface shall be retrowelled many times at intervals to close any pres in the surface, and to bring to surface and scrap off any excess water in concrete or laitance (it shall not be trowelled back into the topping). The final trowellign shall be done well before the concrete has become too hard but at such a time t hat considerable pressure

is required to make any impression on the surface. Trowelling of rich mix of dry cement. and fine aggregate on to the surface shall not be permitted. Trowel marks should not be seen on the finished surface. Where broom finish is specified, after the concrete has been thoroughly compacted, and when most of the surface water has disappeared, the surface shall be given broom finish with an approved type of brass or M.S. Fiber. The broom shall be pulled gently over the surface from edge to edge in such a manner that corrugation shall be uniform in width and depth, the depth shall be not more than 1.5 mm. Bromming shall be done when the concrete is in such ac condition that the surface will not be torn or unduly roughened by the operation. Coarse or long bristles which cause irregularities or deep corrugation shall be timed out. Brooms which are worn or other wise unsatisfactory shall be discarded. After the concrete in the bays has set, the joints of the panels should be filled with cement cream and neatly floated smooth or jointed. Care should be taken that just the minimum quantity of cream for joint is used a excess spilling over the already finished surface shall be removed when the cream is still green. Incase of wide joints the same shall be filled with pigmented cement concrete (1:2:4) using approved pigment ad the joint shall be finished in perfectly straight line.

7.1.5 Steel Trowel Finish :

Areas where marblex tiles are proposed to be used are required to have base concrete finished smooth by steel trowel.

7.1.6 Curing :

The completed flooring shall be protected from sun, wind and rain for the first two days and movement of persons over the floor is prohibited during this period. The finished surface shall be covered and cured continuously from the next day after finishing, atleast for a period for 7 days. Bunding with murrum for curing is prohibited as it will leave permanent stain on the finished floor. Cure shall be done by spreading sand ad kept damp throughout the curing period of seven days minimum. The surface shall be protected from any damage to its whatsoever. The surface shall then be allowed to dry slowly. All corners, junctions of floor with plastered wall surface shall be rounded off when required at no extra cost.

7.1.7 Mode of measurement :

The rate for flooring and skirting shall be in square metre of the area covered. The length and width of the flooring shall be measured not between the faces of skiting or dado or plastered faces of walls which is the proudest. All openings in flooring exceeding 0.1 sqm. in areas where flooring is not done shall be deducted and net areas only shall be measured a paid for. Flooring under dado, skirting or plaster shall not be measured for payment. Nothing extra shall be paid for laying the floor at different levels in the same room. The dimensions shall be measured upto places of decimals of a metre and area worked out upto two places of decimal of a square meter.

7.2 Terrazzo / Cement Tile Flooring, Skirting /Dado etc.

Mortars :

7.2.1 Cement Mortar :

This shall be prepared by mixing cement and sand in specified proportions given in schedule of quantities, in a mixer, Hand mixing will not be allowed.

7.2.2 Proportioning :

The unit of measurement for cement shall be a bag of cement weighing 50 kg. and this shall be taken as 0.035 cum. Sand in specified proportion shall be measured in boxes of suitable size. It shall be

measured on the basis of its dry volume. Incase of damp sand, its quantity shall be increased suitably to allow for bulkage which shall be determined by the method given in lime mortar.

7.2.3 Mixing :

The mixing of mortar shall be done at site of work in mechanical mixer. Hand mixing, if permitted, shall be done as directed by the Engineer-in-charge.

7.2.4 Mixing in Mechanical Mixer :

Cement and sand in the specified proportion shall be mixed dry thoroughly in mixer. Water shall then be added gradually and wet mixing continued for atleast one minute. Care shall be taken not to add more water than that shall bring the mortar to the consistency of a stiff paste.

Only the quantity of mortar, which can be used within 30 minutes of its mixing shall be prepared at a time.Mixer shall be cleaned with water each time, before suspending the work.

7.3 Hand Mixing :

The measured quantity of sad shall be leveled on clean masonry platform and cement bags emptied on top. In hand mixing the quantity of cement shall be increased by 5% above the specified, with no extra cost to the Department. The cement and sand shall be thoroughly mixed dry by being turned over and over backwards and forwards several time till the mix is of a uniform colour, The quantity of dry mix which shall be used within 30 minutes shall then be mixed in thoroughly with just sufficient quantity of water to bring the mortar to the consistency of stiff paste. Mixing of mortar on floor slabs or landings of stair case shall not be allowed.

7.3.1 General :

Mortar Shall be used as soon as possible after mixing and before it has begun to set, and in any case within 30 minutes after the water is added to the dry mixture. Mortar unused for more than 30 minutes shall be rejected and removed from the site of work.

7.3.2 Materials :

The terrazzo / cement tiles for flooring and skirting shall be hydraulically pressed under a minimum pressure of 140 kg / sq.cm/ and shall conform to IS 1237-1959 in respect of constituent materials manufacture, shape, tolerances, wearing layers, colour, appearance, general quality of tiles, strength, resistance to wear, water absorption and other tests. The tile

shall be nominal size and thickness as specified in the schedule for flooring, skirting, dado work etc. and shall be of approved Department shall be at liberty to inspect the manufacture of tiles even at the factory to ascertain whether the manufacture is as per the approved tiles for its quality of materials and manufacture. Tiles to be used for skirting and dado shall be sampleshed before placing in position. Contractor shall submit samples for flooring and skirting tile for approval of the Engineer-incharge. The Engineer-in-charge may direct new samples made with varying proportions, sizes d colour of terrazzo chips against varying base before conveying his decision about the approved samples. No claims will be entertained for rejected samples. The contractor shall ensure the terrazzo finish as per approved sample for the entire quantity of tiles, by dry mixing of the cement, marble chips, powder, white cement, pigments etc. in the same proportions. For wearing layer of all tiles, the contractors shall use the cement from one consignment only to ensure uniformity in background colour / shade. If there is a doubt the quality of the tiles, they shall be tested from each consignment as specified in IS 1237-1959 and cost of testing shall be borne by the contractor. Sample tiles after being approved shall be kept with the Engineer-in-charge for reference till the completion of the work. All tiles which are to be incorporated in the work shall strictly conform to the approved

samples. The tiles shall be stored in room or under such cover as will prevent exposure to dampness, sun, rain, accidental injure or staining. Tiles to be incorporated in the work shall be immersed in water for a minimum period of 6 hours before use.

7.3.4 Cleaning of Surface and laying of mortar bedding :

Before laying the mortar bedding the concrete floor surface shall be thoroughly hacked, cleaned of all mortar scales, concrete lumps etc. brushed, washed with water to remove mud, dirt etc. from the surface and shall be thoroughly wetted. Unit and unless the surface is approved by the Engineer-in-charge, the flooring shall not be started. A bedding of cement mortar (1:3of 20mm, thickness or more if required to make up the level or grade) shall be laid evenly and to the require slopes as directed. The terrazzo tiles and evenly set in a thick slurry of cement applied to the sides and bottom and over the prepared base at the rate of 4.4 kg / sqm. The tiles shall than be tamped down with wooden mallet until they are exactly in true plane and line, with the adjacent tiles. Care shall be taken to ensure that the tiles are solidly bedded without voids and air pockets. All tiles shall be extended upto the unplastered surfaces of masonry walls/ RCC columns/RCC walls. The tile shall be close jointed in matching cement slurry ad the cement slurry oozing out thought the thin joints shall be immediately wiped clean. The joints between the tiles shall not be greater than 1.5mm and shall be kept in straight lines or to suit the required pattern. The junction between wall plaster and tile work shall be finished neatly and without any waviness. All tiles shall be laid as to have continuous lines from various rooms to the passage. No change of lines shall be permitted at junction between rooms and passage. The joints shall be fine and mace neatly indistinguishable by grouting of the joins in cement slurry mixed with suitable colouring pigments to match with the tiles. People should not be allowed to walk over the freshly laid tiles. Adjustment of levels in thickness of mortar bedding due to different type of flooring if any, shall be done by the contractor within a reasonable limit/ distance as directed by the Engineer-in-charge without any extra cost tot eh Department.

7.3.5 Curing, Polishing and Finishing:

The day after the tiles are laid, all joints shall be cleaned of the gray cement grout with a wire bush or trowel to a depth of 5mm, and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shade of the topping of the wearing layer of the tiles. The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be ground evenly with machine fitted with coarse grade frit blocks (no. 60). Water shall be used profusely with grinding. After grinding, the surface shall be thoroughly washed, remove all grinding, mud cleaned and mopped, and the joints opened out during grinding shall be grouted once again wherever necessary with matching cement. The surface shall be gain cured. The second grinding shall then be carried out with machine fitted with fine grade grit blocks (no.120) and shall be grouted again the opened out joints with matching cement. The final grinding with machine fitted with the finest grade grit blocks (no.320), shall be carried out the day after the second grinding described in the preceding para or before handling over the floor as ordered by the Engineer-in-charge. For small areas or where circumstances so required, hand polishing may be permitted in lieu of machine polishing after laying, entirely at the discretion of the Engineer-in-charge. For hand polishing, the following carborundum stone shall be used. The polishing shall be done in such a manner that there are no visible scratches on the terrazzo tiles. if scratches are observed, the tiles shall be observed, the tiles shall be removed and replaced by new tiles.

1st Grinding Coarse grade stone (no.60)

2 nd Grinding Coarse Grade Stone (No.60)

Final Grinding Fine grade stone (No. 120)

In all other respects, the process shall be similar as for machine polishing. After the final polish, oxatic acid crystals into powder shall be dusted over the surface (@ 2/3 lb per 100 sq.ft or 32.5 gm. per sqm.) sprinkled water and rubbed hard with Namdah "block (pad of woollen rags).The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean. If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet.

7.3.6 Terrazzo / Cement Tile Skirting :

Terazzo tile in skirting shall be of size as specified in schedule of quantities or as directed by the Engineer-in-charge, hydraulically pressed and shall be obtained from the same source as for the terrazzo / cement tiles for flooring. The design and shade of the skirting tiles shall be exactly similar to that of flooring tiles. The specifications for material and workmanship shall be same as for flooring except that the skirting tile shall be laid against a 12mm. thick backing of cement mortar 1:3 to the full height of skirting, thus allowing uniform projection beyond the plastered surfaces. In case of dado, the back of tiles shall be buttered with a coat of grey cement slurry / paste and edges with grey or white cement slurry / paste as the case may be, with or without pigment to match the shade of tiles an set in the backing / bedding mortar. Any cutting of brick work, concrete etc. required due to unevenness of brick. surface shall be carried out at no extra cost to the Department to maintain this uniform projection beyond the plastered surfaces. The skirting tiles shall be true in plane, line, level ad plumb or flooring the lines. The colour of the skirting tile ad floor tile shall match. The undone portion of plaster work left above the terrazzo tile skirting work shall be finished round or as directed by the Engineer-in-charge in the matching plaster. The item of plastering shall be inclusive of this plaster finishing above the skirting tiles, required to be done after laying of skirting tiles. No additional payment will be admissible for this extra operation.

7.3.7 Mode of measurement :

The length and / or width of the flooring / skirting / dado shall be measured net between the faces of skirting of dado or plaster faces of walls which is the products, and height of skirting / dado shall be measured from the finished level of floor. All openings exceeding 0.1 sqm. In area where tiling is not done shall be deducted and net areas only shall be measured and paid for. Flooring under dado, skirting or plaster shall not be measured for payment. Nothing extra shall be paid for use of cut tiles nor for laying the floor at different levels in the same room. All dimensions shall be measured correct upto 2 places of decimal of a meter and area so worked out shall be correct upto two places of decimal of a sqm. for flooring, skiriging, dado etc.

Note : Wastage I tile cutting to get the required dimension of rooms etc. as specified in drawing or as directed by the Engineer-in-charge shall have to be taken into consideration by contractor while quoting the rate for work to be measured as above. No extra claim on this account will be entertained.

7.4 Kotah Stone Flooring / Skirting / Facia / Shelves

7.4.1 Materials :

Hand cut, machine cut for exposed edges and machine polished kotah stone shall be of the best quality and of the specified thickness, size and the shade which shall be got approved by the Engineer-in-charge. The size given in schedule of qualities are tentative and can vary only slightly as per the availability in the market. The thickness of the slab after it is dressed shall be
20,25,30 or 40 mm as specified in the item. Tolerance of + 2 mm shall be all allowed for the thickness. In respect of length & width, tolerance in length and width shall be permissible upto + 5mm for hand cut slabs ad + 2 mm for machine cut slabs. At its thinnest, no stone shall be thinner than the specified thickness. The stone shall be hard, sound, durable, resistant to wear,

rectangular or square in shape ad as directed by the Engineer-in-charge. Uniformity of size shall generally be maintained for the stones used in any one room. The stone shall be without any soft, venis, cracks or flaws and shall have uniform colour. They shall have natural surface free from broken flakes non top and the exposed surface shall be machine polished to a smooth, even and true plane and the edges hand cut and dressed true and square. The evenness of the surface of slabs and edges of the slab shall not be marred by careless dressing or handling ad no patching up shall be allowed for the slab. The edges shall e quite straight. The under face maybe left as required or rough dressed. Before taking up the work, samples of stone slabs t be used and their dressing and polishing shall be got approved by the Engineer-in-charge and will keep them in his office for reference ad the stone slabs to be used shall conform to the approved sample.

7.4.2 Bedding / Backing coat :

In case of flooring as well as of skirting / dado, mortar bedding shall be cement mortar of thickness and mix specified in the schedule of item.

7.4.3 Construction Details :

Cement mortar as specified for bedding shall be uniformly mixed. The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying ad satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that should interfere with the even bedding of the stones. Before spreading the mortar, the sub-floor or base shall be cleaned of all dirt, set mortar scum or laitance ad of loose materials by hacking ad brought to original levels and then well wetted without forming pool of water on surfaces.

7.4.4 Fixing the stone slab / tile :

Before laying the stone shall be thoroughly wetted with clean water, neat cement grout(2.75kg/sqm.) of honey like consistency shall be spread on the mortar bed over as much areas as could be covered with the slabs within half an hour. The specified type of stone shall be laid on the neat cement coat and shall be evenly and firmly bedded to the required level ad slope in the mortar bed. Each stone shall be gently tapped with wooden mallet sil it is firmly and properly bedded. There shall be no hollows left. If there is a hollow sound on gently tapping off the slab, such slab shall be removed a reset properly. The joints shall be routed with matching cement slurry. Approved pigment shall be used in cement slurry to match with shade of stone. Pigment required to match the shade of stone shall be supplied by the contractor at no extra cost. The stone adjoining the wall shall go about 12mm (about 1/2 ") under the plaster, sorting or dado for the wall. All stone slabs, tiles shall be so laid as to have continues lines from various rooms to the corridors. No change of lines shall be permitted at junction between rooms ad corridors. Only one piece machine cut, Kotah stone shall be used for treads and risers.

7.4.5 Curing :

The flooring shall be kept well wetted with damp ad or water for seven days.

7.4.6 Polishing and cleaning :

When the bedding d joints have completely set d attained required strength, the surface shall be machine polished to give smooth, even ad true plane to the flooring. All flooring shall be thoroughly seaned and handed over free from ay mortar stains etc.

7.4.7 Skirting and dado / Facia :

The quality and type of stone shall be same as mentioned for flooring except of their weight and thickness or backing coat which shall be as mentioned in item schedule. The backing shall conform to

the specifications for cement mortar specified in item of terrazzo tiles. Contractor should take into consideration the fact that touching up of the plaster at the junctioning skirting / dado is invariably done after the skirting /dado/facia work is completed and quote rates accordingly. No extra for this touching up will be entertained. Fixing curing, polishing and cleaning shall be as specified herein before under cement / terrazzo tile skirting, polishing may be done by hand, but a smooth surface ad fine polishing shall be obtained. Joints shall be done in neat matching cement slurry. The junction of plaster and the upper edges of the dado / skirting shall be finished smoothly as directed by the Engineer-incharge without any extra cost.

7.4.8 Mode of measurements :

Flooring, skirting and dado/ facia shall be same as that for terrazzo cement tile, flooring / skirting /dado. Sometimes shall be paid on area basis in sqm. calculated to two places of decimal, where length and breadth shall be measured inclusive of bearing correct to a cm. The permissible tolerance in the specified thickness shall be (+) 2mm.

Note : Wastage in obtaining the required machine cut, hand cut sizes as specified from the commercial sizes available in market shall have been taken into consideration by contractor shall quoting the rate for work to be measured as above and no extra claim on this account will be entertained.

7.5 Glazed / Unglazed / Vitrified tile Flooring, Dado / Skirting / Facia

7.5.1 Materials

Tiles :

The tiles shall be of approved make as specified and shall generally conform to relevant Standards. They shall be flat and true to shape free from cracks, crazing spits, chipped edges and comes. The glazing shall be of uniform shade. The tiles shall be as specified in the schedule of quantity or drawings. The length of all four sides shall be measured correct to 0.1mm and average length breadth shall not vary more than +0.8 mm from specified dimensions. The variation of individual dimensions from average value of length/breadth shall nor exceed +0.5 mm. Tolerance in thickness shall be (+) 0.4mm. The thickness of the tile shall not be less than as specified in the items and shall conform to in all respects. Samples of tiles shall be got approved by the Engineer-in-charge before use on the work.

7.5.2 Preparation of Surface and laying of vitrified Tiles :

Sub grade concrete or RCC slab or side brick wall / or plastered surfaces on which tiles are to be laid shall be thoroughly hacked, cleaned of all mortar scales, concrete lumps etc. brushed, washed with water to remove mud, dirt etc. from the surface, wetted and mopped. 20/12 mm thick plaster of CM 1.3 shall be applied d allowed to harden minimum for 48 hours. The plaster shall be roughened with wire brushes or by scratching diagonal lines 1.5mm deep at 7.5 mm center both ways. The back of tiles shall be buttered with a coat of grey cement slurry paste and edges with white cement slurry and set in the bedding mortar. The tiles shall be tapped and corrected to proper planes ad lines. The tile shall be butt jointed in pattern and joints shall be as fine a possible. The top of skirting /dado shall be truly horizontal ad joints truly vertical. The joints shall be pointed with cementations grout of matching colour of Bal/Roff make. After a period of curing of 7 days minimum, the tiles shall be cleaned and shall not sound hollow when tapped. The surface during laying shall be checked with a straight edge2m. long. The surface of skirting shall be kept flush with plaster with chipping of brick work / concrete wherever required. After the tiles have been laid, surplus cement grout shall be cleaned off.

7.5.3 Mortar and Bedding :

Cement mortar for bedding shall be of proportion specified in items schedule ad shall conform to the specification for materials, preparation etc. as specified under cement mortar. The amount of water added while preparing mortar shall be the minimum necessary to give sufficient plasticity for laying. Care shall be taken in preparation of the mortar to ensure that there are no hard lumps that would interfere with even bedding of the tiles. Before spreading the mortar bed the base shall be cleaned of all dirt, scum or laitance and loose materials and well wetted without forming any pools of water on the surface. The mortar of specified proportion and thickness shall then be even ad smoothly spread over the base by use of screed battens to proper level or slope. Cement mortar of thickness and proportion as specified in the schedule for dado shall be applied to the wall after preparing the wall surface as specified under cement plaster 20mm thick and brought to correct line and plumb and the surface left rough to receive the tiles.

7.5.4 Fixing of other ceramic tiles for flooring :

The tiles before laying shall be soaked in water for atleast 2 hours. The tiles shall be laid on the bedding mortar when it is still plastic but has become sufficiently stiff to offer a fairly firm cushion for the tiles. Tiles which are fixed on the flooring adjoining the wall shall be so arranged that the surface on the round edge tiles shall correspond to the skirting or dado. Neat cement mortar grout 1:2, using fine sand (table III, zone IV ad as per IS 383) of honey like consistency shall be spread over the bedding mortar just to cover as much area as can be tiled within half an hour. The edges of the tiles shall be smeared with neat white cement slurry and fixed in this grout one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints, shall be kept as close as possible and in straight line. The joints between tiles shall not exceed 1.00 mm, in width. The joint shall be grouted with white cement slurry. After fixing the tiles, finally in an even place or slope, the flooring shall be covered with wet sand an allowed undisturbed for 14 days.

7.5.5 Fixing tiles for Dado and Skirting / Facia :

The dado work, shall be done only after fixing the tiles/slabs on the floor, the approved glazed tiles before laying shall be soaked in water for atleast 2 hors. Tiles shall be fixed when the cushioning mortar is till plastic and before it gets very stiff. The back of the tile shall be covered with this layer of cement mortar 1:3 using fine sand (table III, zone IV, IS383-1963), and the edge of the tile smeared with neat white cement slurry. The tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from bottom of wall upwards without any hollows in the bed of joints. Each tile shall be as close as possible to one adjoining. The tiles shall be jointed tiles shall be arranged out in cushioning mortar so that all tiles faces are in one vertical plane. The joints between the tile shall not exceed 1.00mm in width and they shall be uniform. While fixing tiles in dado work, care shall be taken to break the joints vertically. The top of the dado, shall be touched up neatly with the rest of the plaster above If doors, windows or other openings are located within the dado area, the comers, sills, jambs etc. shall be provide with true right angles without any specials. The contractor will not be entitled to any extra claims on this account for cutting of tiles if required.

7.5. 6 Cleaning :

After the tiles have been laid in a room or the day fixing work is completed, the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing, the dado or skirting over shall be washed thoroughly clean, In the case of flooring, once the floor has set, the floor shall be carefully washed clean ad dried. When dry, the floor shall be covered with oil free dry saw dust. It shall be removed only after completion of the construction work and just before the floor is used.

7.5.7 Pointing and Finishing :

The joints shall be cleaned off with wire brush to a depth of 3mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement and floor kept wet for 7 days ad then cleaned. Finished floor shall not sound hollow when tapped with a wooden mallet.

7.5.8 Mode of measurement :

Dado / flooring / skirting shall be measured in sqm correct to two places of decimal. Length and breadth shall be measured correct to 1 cm between the exposed surfaces of skirting or dado. No deductions shall be made nor extra paid for any opening- of area upto 0.-1 sqm The rate shall include all the cost of labour and material involved. White - glazed tiles including specials shall be of the approved make and quality and shall conform to IS 777-1961 in all respects. Samples of the tiles shall be got approved by the Engineer and the material brought for use should conform to the approved samples. Mortar : As per specifications for Shahabad stone flooring. White Cement : This shall be of approved quality and make.

7.5.9 Mortar Bedding

The amount of water added while preparing mortar shall be minimum necessary to give sufficient plasticity for laying. Care shall be taken in the preparation of mortar to ensure that there are no hard lumps. Before spreading the mortar bed, the base shall be cleaned of all dirt, scum, and then well wetted without forming any pools of the water. The mortar shall then be evenly & smoothly spread over the base by the use of screed battens of proper level or slope. The thickness of bedding shall not be less than 12 mm and more than 20 mm in any one place. The tiles shall be laid on the bedding mortar when it is still plastic but has become sufficiently stiff to offer a fairly firm cushion for the tiles.

7.6 Fixing Tiles

The tiles before laying shall be soaked in water for at least two hours. The tiles which are fixed in the floor adjoining the wall shall be so arranged that the surface of the round edge tiles shall correspond to the skirting. Neat cement grout of honey like consistency shall be spread over the bedding mortar just to cover so much area as can be tiled within half-an-hour. The edges of tiles shall be smeared with neat white cement slurry and fixed in this grout; each tile being well pressed and gently tapped with a wooden mallet to achieve proper levelling with the adjoining tiles. The joints between tiles shall not exceed 1.5 mm wide. The joints shall be grouted with a slurry of white cement. After fixing the tiles in even plane, the flooring shall be covered with wet and dust and allowed to mature undisturbed for 14 days.

7.6.1 Cleaning

After the tiles have been laid in a room or the day's fixing work is completed, the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set floor shall be covered with oil free dry saw-dust which shall be removed only after completion of construction work and just before the floor is occupied.

7.6.2 Providing & Fixing White glazed tiles for Skirting Plastering

Cement plaster of about 12 mm for brick walls and 20 mm for stone masonry walls shall be applied to the part of the wall where dodo or skirting is to be fixed. The plastering shall be as per specifications of plastering. The proportion of mortar shall be as mentioned in the item.

7.6.3 Fixing Tiles

Skirting work shall be done only after fixing files on the floor. The white glazed tiles shall be soaked in water for at least 2 hours before use. Tiles shall be fixed when the cushioning mortar is still plastic. The back of tiles shall be covered with a thin layer of neat cement paste and tiles shall then be pressed in the mortar and gently tapped against the wall with wooden mallet. The fixing shall be done from the bottom of wall upward. The tiles shall be joined with white cement slurry. Any difference in the thickness of tiles shall be evened out in cushioning mortar so that all tile faces are in vertical plane. Thickness of joints shall not exceed 1.5 mm. While fixing tiles care shall be taken to break joints vertically. After fixing the dado, skirting, etc, they shall be kept continuously wet for 12 days. If doors, windows or other openings are located within the dado area, the sills, jambs, angels etc. shall be provided with white glazed tiles and appropriate specials and such tiled area shall be measured net along with the dado.

7.6.4 Cleaning

After the tiles have been fixed, the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing, the dado or skirting work shall be washed thoroughly clean.

8.CEMENT PLASTERING AND POINTING

8.1 Plastering

Specifications here under shall cover plastering concrete, stone or brick masonry surfaces in cement mortar of specified proportion and specified thickness including scaffolding, curing etc. complete as directed.

8.2 Materials

Cement Mortar : Cement mortar shall have the proportion of cement to sand as mentioned in the wording of the item or in the special provisions and shall comply with the following for :

8.3 Cement : Cement shall conform to IS : 269 Ordinary Portland cement shall be used. The weight of ordinary Portland cement shall be taken as 50 kg per bag. The Contractor shall ensure that the cement is of sound and requiring quality before using it. Any cement which has deteriorated, caked or which has been damaged shall not be used. The specifications covered under the section `Concrete' shall be applicable in addition.

8.4 Water : Water for mixing cement mortar or concrete shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil, acid and injurious alkali, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause aforescence. Sea water shall not be used. Water fit for drinking shall generally be found suitable for mixing cement mortar. Water fit curing mortar or concrete shall not be too acidic or alkaline. It shall have pH value above 6. Sea water shall not be used for curing purpose.

8.5 Fine Aggregate

All fine aggregate shall conform to IS : 383 – 1963 and relevant portion of IS : 515–1959. Sand shall be clean, well graded, hard, strong, durable and gritty particles free from injurious amounts of dust, clay, kankar nodules, sofit or flaky particles, shale, alkali, salts, organic matter loam mica or other deleterious substances and shall be approved by the Engineer. The maximum size of particles shall be limited to 5 mm (about 3/16"). If the fine aggregate contains more than 4 per cent of clay, dust or silt, it shall be washed. The fine aggregate for cement mortar for masonry and first coat of plaster should generally satisfy as per IS standards.

IS : 2116 – 1980 shall generally apply for sand for plaster. The fine aggregate should be stacked carefully on a clean, hard surface so that it will not get mixed up with deleterious foreign materials.

8.6 Proportion

Cement and sand shall be mixed in specified proportions, sand beings measured in measuring boxes. The proportions will be by volume. The mortar may be hand mixed or machine mixed.

8.7 Preparation

In hand mixed mortar, cement and sand in the special proportions shall be thoroughly mixed dry on a clean impervious platform. Fresh and clean water as specified above shall be added gradually and

thoroughly mixed to form a stiff plastic mass of uniform colour so that, each particle of sand shall be completely covered with a film of wet cement. The water cement ratio may be as under or as directed by the Engineer.

Machine mixed mortar shall be prepared in an approved mixer. Water cement ratio shall be as per hand mixed mortar. The mortar so prepared shall be within 30 minutes of adding water should be used in the work. The mortar remaining unused after that period mortar which has partially hardened or is otherwise damaged shall not be retermpered or remixed. It shall be destroyed or thrown away.

8.8 Scaffolding

Scaffolding required for facility of construction shall be provided by the contractor at his expense. Scaffolding shall be erected with steel sections or pipes, ballies or bamboos of adequate strength so as to be safe for all construction operations. The Contractor shall take all measure to ensure the safety of the work and working people. The Contractor shall be entirely responsible for any damage to property or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Put logholes shall be made good by stones bricks to match the facework when scaffolding is being removed after ensuring that all holes behind are solidly filled in with M-10 cement concrete.

8.9 Preparatory Work

All joints in the facework that is to be plastered shall be raked out to a depth equal to not less than the width of the joints. In case of new works the raking shall be done when the joint mortar is still green. Smooth surfaces of concrete, old plaster etc must be suitably roughened to provide necessary bond for the plaster. In case of stone masonry, bushing on the walls to receive the plaster shall not be more than 12 mm. The surface to be plastered shall be cleared and scrubbed with fresh water and kept wet for 6 hour prior to plastering.

8.10 Gauges

Patches of plaster 15 cm x 15 cm shall be put on about 3m apart as gauges to ensure even plastering in one plane.

8.11 Plastering

In all plaster work the mortar shall be firmly applied with somewhat more than the required thickens and well pressed into the joints and on the surface and rubbed and leveled with a flat wooden rule to give required thickness. All corners must be finished to their true angles or rounded as directed by the Engineer to give neat appearance. The mortar shall adhere to the masonry surface intimately when set,

and there should be no hollow sound when struck. The plastering shall be proceeded from top downwards.

8.12 Watering & Curing

All plaster work shall be kept damp continuously for a period of 14 days. To prevent excessive evaporation on the sunny or windward side of the building in hot dry weather, matting or gunny bags may be hung over on the outside of the plaster in the beginning and kept moist. Should the Contractor fail to water the work to the satisfaction of the Engineer, the latter may engage requisite labour, materials and equipment to water the work properly at the cost of the Contractor. If the plastering work is not done as specified above, the plaster shall be removed and redone at the Contractor's expense.

8.13 Cement Plaster in Two Coats

The first coat for Brick Masonry and rubble masonry shall be of 10 mm and 20 mm thickness respectively. In case more thickness is specified, the work shall be carried out in two coats necessarily.The first coat shall be applied as above, but the surface is not floated or polished but roughened to give a key to the second coat of plaster. For this, before the first coat hardens, it shall be combed in wavy lines, 12 mm apart and 3 mm deep. This coat shall be kept damp for 2 days thereafter and then allowed to dry. Before starting to apply the second coat, the surface of the first coat shall be damped evenly and 2nd coat applied. The final surface (either of the 1st 2nd coat) shall be rubbed smooth after floating it with thick coat of pure cement slurry while base coat is still fresh. If neeru finish is specified, floating with neat cement will not be required. The finished surface shall be true and even and present a uniform texture throughout and all joining marks shall be eliminated.

8.14 Plaster in Single Coat.

After coat of plaster is done, the surface shall be rubbed smooth after floating it with thick coat of cement slurry or the neeru finish as the case may be. The finished surface shall be true and even and present a uniform texture throughout and all jointing marks shall be eliminated.

8.15 Cement Pointing

Specifications hereunder shall cover, cement pointing with mortar of specified proportion to stone masonry or brick work including raking out joints, scaffolding, curing, watering etc complete.

MaterialsCement mortar for pointing shall be of the specified mix.

8.16 Construction Details

Unless other type of pointing are specified in the item or the special provisions, pointing shall be of the grooved type. The joints in the masonry shall be raked out to a depth not less than the width of the joint when the mortar is green. The joints are to be brushed clean of dust and loose particles with a stiff brush. The area shall be washed and the joints thoroughly wetted before pointing is commenced. The raked out joints shall be filled with mortar of the specified mix and required consistency and well pressed and rubbed smooth. A semicircular depression 3 mm dia shall be made in the joint by pressing a clean string with trowel keeping the string exactly horizontal and on the centre line of the joint. The vertical joints shall be similarly marked. These depressed lines will then be immediately rubbed till they become uniformly 6 mm deep 6 mm wide and assume fairly blackish colour. Where joints are not horizontal and vertical as in the case of uncoursed rubble masonry, the pointing shall be made along the centre line of actual joints and the functions of pointing made neatly. The pointing mortar shall not spread over the adjoining stones. Mortar pointing shall be restricted to the width of the joints, and all superfluous mortar shall be removed with a trowel.

8.17 Watering

The pointed face shall be kept continuously wet for 14 days after initial set. Should the mortar perish or deteriorate through neglect of watering or any other default and if the work is not done neatly as specified above, the pointing shall be removed and redone, at the expense of the Contractor.

9. DOORS , WINDOWS & VENTILATORS

9.1 Wood work :

All timber mentioned in the item in schedule of quantities shall be from the heart of a sound tree of nature growth entirely free from sap wood. It shall be uniform in texture, straight in fibre and shall be well and properly seasoned. It shall be free from large, loose dead or cluster knots, wedges, injuries, open shakes, borer holes, rot, decay, discoloration, soft or spongy spot, hollow pockets, pith or center bore and all other defects or any other damages or harmful nature which will affect the strength, durability, appearance and its usefulness for the purpose for which it is required. Only properly seasoned timber shall be used. The samples of species to be used shall be submitted by the contractor to the Engineerin- charge before commencement of the work. The contractor shall produce cash vouchers and certificate from standard kiln seasoning plant as a proof for having been kiln seasoned by them, failing which it would not be accepted as kiln seasoned. Seasoning of timber shall be judged from its moisture content as laid down in I.S. 287-1960. The seasoning of timber shall conform to IS 1141-1993. Scantling of all type of timber shall be straight. Warped scantling shall not be used. Before use in works, the scantling shall be kept in covered and well ventilated place and shall be got approved. The workmanship shall be of best quality. All wrought timber is to be sawn, planed, drilled or otherwise machine worked to the correct sizes and shall be as indicated in drawing or as specified. All joinery work shall fit truly and without wedging or filing. Wood work in frame work shall be wrought. All frame joints shall be put together with white lead and pinned with hard wood pins securing with corrosion resistant star shaped metal pins as approved by the Engineer-in-charge. If after fixing in position, any shrinking or substandard materials or bad workmanship is detected, the contractor shall, forthwith remove them and replace the same at his own cost, all as directed by the Engineer-in-charge. Individual

members shall be of continuous length. The finished size and sections shall be as per drawing or as specified. The heads and posts of frames shall be through tennoned into the mortises to the full widths as shown in the drawing. All necessary mortising, tennoing, grooving matching, tonguing, housing rebate and other necessary works for correct jointing shall be carried out, in the best workmanship like manner. Joints not specifically indicated shall be recognized form of approved joints for each position. All parts of wood work resting on or set in masonry or concrete shall be well painted with two coat of bituminous paint or solignum as directed by the Engineer-in-charge, prior to installations. All nails, screws, hold fasts, fasts, plates, plugs, pins required for wood work joinery and fixing work, shall be provided by the contractor, at his own cost. All materials shall be approved by Engineer-in-charge before using it in works. Painting of door frames shall be carried out as per specifications for painting for wood work. All the embedded timber shall be given two coats of hot tar or solignum before erection. This is incidental to the item and shall not be measured for payment.

9.2 Timber

Timber shall be of quality as specified in BOQ and well seasoned. It shall have uniform colour, be free from defects such as cracks, dead knots, soft spongy spots and waves of injurious open shakes. Grains shall be reasonably straight. The individual hard and sound knot shall not be larger than 6 sq. cm. The aggregate area of all knots shall not exceed 0.5% area of a piece.

All timber shall be treated with chemical wood preservatives and be kiln seasoned to IS 1141 and conform to IS 287 for moisture content. Maximum permissible limit shall be +3% for average moisture content of all samples from a given lot and +5% for individual sample of the given lot. This is applicable when thickness of timber is more than 50 mm. Small size tolerance shall be + 2% and +3% respectively.

Timber used shall be treated anti-termite treatment. Wood work in contact with masonry of concrete shall be painted with hot bitumen coaltar before being placed

in position. Timber received at site shall be marked and stamped for approval prior to being used at site. Sizes specified are not indicative and shall be correct finished sizes within allowable tolerances.

All timber shall be finished to required dimension and texture prior to being treated for chemical preservation. All nails, screws etc. Shall be hot dip galvanized or of brass or non ferrous material. Adhesives and glue shall be as per IS for exterior quality and water repellent.

9.3 WORKMANSHIP

Timber door windows & hand rail sub frames etc.

Timber brought at site shall be as approved by the EIC.

No timber shall be painted, tarred, oiled etc. before its inspection by the EIC. Any effort to hide the defects by plugging, painting, etc. shall render the piece to be rejected by the In charge.

All rejected timber shall be removed at once from the site of work.

All sawing of timber shall be done in straight lines and planes of uniform thickness.

All joints shall be tongued and grooved or of the type shown in the drawings specified in the item or as directed by the EIC. All joints shall be glued with approved adhesive. Joints shall be strong, neat and shall fit without wedging or filling. They shall be pinned with hard wood or bamboo pins of 10-15 mm dia after the members of the frame are glued and pressed together in a suitable vice-mechanism.

Prior to joining, wood members of frame shall be planed smooth and accurate to the full depth. Rebates, roundings, mouldings, etc. as shown in the drawing shall be done before the members are joined.

All timber items shall be subjected to inspection by the EIC prior to any treatment to be carried out. No. item shall be installed unless it is approved by the EIC.

9.4 MEASUREMENTS

9.4.1 Door sub frames shall be measured in cubic metres as detailed in the BOQ.

9.4.2 The price for an item shall include supply of specified quantity and type of timber, sawn, cut, joined, framed and fixed in positron including supply and fixing of approved anti-corrosive treated fixtures, straps, bolts, hold-fasts, spikes, nails, screws, etc. supplying glue, coaltar, paint and anti termite treatment. The items shall also include all materials, labour, scaffolding, use of equipment, etc.

Teak Wood Glazed Shutters :

The beading required for glazing shall be of the best teak wood and shall be fixed as per the design shown in relevant drawing. Any moldings, carvings shown shall be worked out from the teak wood member of bigger size.

9.6 Glazing :

Glazing shall be generally with plain sheet glass of approved make with thickness as mentioned in the schedule of quantities. The detailed specifications for glazing given hereafter shall be followed generally.

9.7 Flush Door Shutters:

Solid core flush door shutters shall be of 5 ply construction and approved make generally conforming to the I.S. specification 2202-1991 (specification for wooden flush door shutter – solid core type). The finished thickness of the shutter shall be as mentioned in the schedule of items.

9.8 Face Veneers :

Commercial face veneers used in flush door shutter shall conform to the requirements laid down in IS 303-1989 specifications for plywood for general purposes (revised) interior grade. Decorative face veneers used in flush door shutters shall be of grad-I and shall conform to the requirements of decorative veneered decorative plywood interior grade. Thickness of veneers shall not exceed 1mm.

9.9 Adhesives :

Phenol formaldehyde synthetic resin (liquid type adhesives) conforming to IS848-1974 specifications for synthetic resins shall be one piece of size not less than 25mm wide and depth equal to the thickness of core. In case of double leaf shutters, the meeting stiles still have lipping of not less than 35mm deep.

9.10 Workmanship and Finish :

All the faces of the door shutter shall be at right angles. The shutter shall be free from twist and warp in its plane. Both faces of the door shutters shall be sanded to a smooth even texture. The workmanship and finish of the face panels shall be in conformity with those specified in I.S. 303-1989 specifications for plywood for general purpose (revised) for commercial type and IS 1659-1990 specification for block boards for decorative type. Department shall be at liberty to inspect the manufacture of shutters in the factory for its quality of materials and workmanship and all facilities shall be extended for such inspection. Cost of visits will be borne by the contractor.

9.11 Tests :

Tests shall be conducted, if required by the Department at contractors cost and acceptance criteria shall be as per IS 2202.

9.12 Tolerance :

Tolerance on nominal width and height shall be (+) 3mm. Tolerance on nominal thickness shall be (+) 1.5mm. The thickness of the individual shutter shall be uniform throughout.

9.13 Miscellaneous :

Wherever mentioned in the Schedule of quantities, vision panels, Venetians, plastic laminates, push slats etc. shall be provided in the flush doors. The vision panels shall be of size mentioned in the drawing and shall be provided with teak wood lipping alround the glass. The glass shall be 4mm thick or as specified of best quality or equivalent approved free from defects. Teak wood Venetians or louvers shall generally conform to relevant specifications of timber. Necessary grooves and rebate in frames shall be provided as per drawing. Formica or approved equivalent plastic laminate of required design, required shade ad colour shall be provided ad fixed on flush door to the required size on any side of the shutter as shown in drawing. It shall be fixed with Fevicol or any other approved adhesive. Fixing shall be done in such a way the there shall not be any air gap, warpage or undulations on the surface. Finished surface of formica shall be cleaned with wax polish. The shutters shall be painted on commercial facing side with two coats of synthetic / flat oil paint of approved shade ad make over an approved coat of primer. The decorative veneer side of the shutter shall be melamine polished with two or more coats as specified in Schedule of Quantities so as to render a satisfactory surface. The flush doors shall be single leaf or double leaf type as mentioned in the schedule of quantities. In case of double leaf shutters, the meeting of the stiles shall be rebated 20mm. And shall be either splayed door square type and the T.W. lipping around the meeting shall not be les than 35mm deep. The meeting stiles shall be in single piece. Sufficient care shall be taken to prevent any damage and loss of shape during handling, transporting, stacking, fixing etc. The door shutters shall be handled with utmost care to prevent any surface damage, warping etc.

9.12 Mode of measurement :

The work covered under the respective items in schedule and the above specifications shall be measured as follows: The cubic contents for wood work shall be measured for the finished size, limiting to those shown in the drawings or ordered by the Engineer-in-charge. The cross sectional dimensions shall be measured equivalent to nearest enclosing rectangle (least rectangle / square) for wrought and planed sizes. The cubical metre. The frames embedded below finished floor shall not be measured. The square metre areas for shutters shall be measured for the exposed surfaces of shutter between frames from inside or outside whichever is more. The linear dimensions shall be measured upto two places of decimals of a meter. The area for payment shall be worked out correct upto two places of decimals of a square meter. The rate for shutters shall include :

- Cost of supply assembly and erecting in position.
- Cost of polishing, painting, supplying wood preservative, screws, nails, holdfast etc.
- Cost of labour for making adjustments in frames, if required, shutters and also for fixing required fittings and fixtures. In case of flush doors, the rate for individual item mentioned in the schedule of quantities shall include cot of shutters, labour for provision of glass for vision panel, plastic laminate sheet push plate, teak wood louvers etc. transporting charges and labour for fixing of fixtures and fastening except fix

9.13 Doors & Windows

Steel doors, windows, ventilators and rolling shutter. Providing and fixing steel door, windows and ventilators as per IS:1038 including all fixtures and fastening and glazed with 4 mm thick plain sheet glass with three coats of enamel paint over a red oxide primer. Providing and fixing in position approved

quality 18 SWG steel rolling shutter push and pull operated of approved make inclusive of all accessories top cover, locking arrangements including 2 coats of approved enamel paint over a coat of red oxide primer.

9.14 General

All steel doors, windows and ventilators shall conform to IS: 1361, and IS:1038 or equivalent as mentioned in specifications and on drawings and as approved by the Engineer-in-Charge. Material used in the fabrication of industrial doors, windows, ventilators etc. shall be the best procurable and conforming to relevant IS specifications. The forms of sections, dimensions, and weight shall conform to relevant IS codes for industrial buildings. The sections shall be cold straightened and finished goods shall be free from dents and other defects. The minimum thickness of glass, if required to be provided shall be 4 mm and 5.5 mm if wired glasses required. It shall be free from flaws, specks, bubbles etc. all panes shall have perfectly squared corners and straight edges. Wood screws M.S.bolts, nuts, screws, washers, peg stays and other oxidised brass fittings shall be treated for corrosion as recommended by relevant Indian Standards. Putty for glazing shall conform to IS:420.

9.15 Workmanship

Doors, windows and ventilators etc. shall be truly square and flat free from twist and warp. They shall be constructed of sections which have been cut to the required lengths, tennoned and revetted or welded at the corners. The general fabrication shall conform to IS:1038 and 1361. The contractor is required to supply doors, windows, ventilators etc., he shall obtain them from an approved manufacturer. The contractor shall first submit for the approval of the Engineer-in- Charge, the name and address of the manufacturer whose metal casement he intends to use, together with typical drawings and specifications, describing the details of construction for each type of door/window. The doors, windows and ventilators shall be either galvanised/or painted as indicated in drawing or schedule of rates. All steel surfaces shall first be thoroughly cleaned free of dust, scale or dirt and mill with one coat of an approved primer conforming to IS:102 before despatch. Alternatively they may be galvanised as described in IS:1361.

9.16 Glazing

All glazing shall be as per IS:1081. Windows and ventilators shall be designed for putty glazing fixed from outside. Where doors are to be glazed, they shall be designed for glazing from inside. All window casements shall have holes drilled in the frames and shutters respectively at suitable places for insterting spring type glazing clips which shall be supplied by the contractor. All glazing shall be puttied to the shutters or frames with good quality putty in addition to glazing clips. Glass panes shall not be placed directly against the metal. A thin layer of putty shall be very evenly spread over the glazing rebate and the glass pressed firmly against it. The necessary ornamental grill shall be provided in steel window as per the instruction of Engineer-in-charge.

9.17 Fixing

Doors, windows and ventilators shall not be for built in at the time the walls are constructed but shall be subsequently fixed into proper opening, as laid down in IS:1801. Holes to accommodate the fixing lugs are to be left or cut, and the casement fixed after all the rough masonry and plaster work have been finished. The lugs of the casement shall be jammed in cement concrete (M-15 mix) with stone chips (10 mm down) at holding the casement in proper position, in line and level. The width of the clear unfinishing opening in the wall should be 25 mm more than the over all width of the door frame to allow for 12.5 mm plaster on each jam. The height of the unfinished opening shall depend upon whether a threshold is required or not. While fixing the door, care shall be taken to see that at least 6 mm space is left between the door and the finished floor.

9.18 Fittings

Hardware shall be fixed as late as possible, preferably just before the final coat of paint is applied. It shall be fitted in workmanlike manner, so that it may not work loose and in such a way that screws and pins are not marked and mutilation by hammers and screw drivers. It shall be tested for correct operation. Where specified, door shall be fitted with a three way bolting device which can be operated from outside similarly be operated from either side or as per drawings. Solid steel bolt handles shall be provided. One on the outside and one on the inside of each shutter. In case of doors provided with service door, the lock shall be fitted on the service doors. All materials shall be the best procurable and shall conform to the relevant IS specifications.

9.20 Windows & Ventilators

`S' type steel louvers of sheet of thickness specified in connection to steel frame shall be provided in window and ventilators as per relevant IS codes and directions of Engineer-in-Charge. All windows, frame and door shutters etc. shall be painted with 2 coats of approved paint over a priming coat of red oxide.

9.21 M.S.Rolling Shutters

It shall be of approved make, made out of 18 gauges 75 mm black lath either mechanically operated from both inside and outside, by reduction gear type mechanism or manually operated according to sizes as per IS specification. It shall be fitted with two self aligning ball bearing with locking arrangement (both inside and outside) including G.I. hosing, hooks, door suspension shafts and top rolling springs pressed etc. complete. The hood and cowl portions shall be fixed to obtain full head room up to tinted soffit. They shall be provided with locking arrangements for padlocks, pulling hooks, handles, top cover

etc. It shall be painted with two coats of approved paint over a coat of approved paint over a coat of red oxide primer. Rolling shutter shall be installed properly by skilled person and shall be adjusted to operate smoothly throughout the full range of operation.

10. PAINTING

10.1 Scope of work :

The work covered under these specifications consist of furnishing the various types of paints and also the workmanship for these items, in strict compliance with these specifications, which are given in detail hereinafter with the item of schedule of quantities.

10.2 Materials :

Paints, oils varnishes etc. of approved brand and manufacture shall be used. Ready mixed paints as recovered from the manufacturer without any admixture shall be used. If for any reason, thinning is necessary in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as instructed by the Engineer-in-charge shall be used. Approved paints, oils or varnishes shall be brought to the site of work by the contractor in their original containers in sealed condition. The materials shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnights work. The materials shall be kept

n the joint custody of the contractor and the Engineer-in-charge. The empties shall not be removed from the site for work, till the relevant item of work has been completed and permission obtained from the Engineer-in-charge. The contractor shall associate the chemist of paint manufacturers before commencement of work, during and after the completion of work who shall certify the suitability of the surface to receive painting and the paint before use etc.

10.3 Commencing Work Scaffolding :

Wherever scaffolding is necessary, it shall be erected on double supports ties together by horizontal pieces, over which scaffolding planks shall be fixed. No bellies, bamboos or planks shall rest on or touch the surface which is being painted. Were ladders are used, pieces of old gunny bags shall be ties on their tops to avoid damage or scratches to walls. For painting of the ceiling, proper stage scaffolding shall be erected. Painting shall not be started until and unless the Engineer-in-charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work. Painting, except the priming coat, shall generally be taken in hand after all other builders work, practically finished.

The rooms should be thoroughly swept out entire building cleaned up atleast one day in advance of the paint work being started.

10.4 Preparation of Surface :

The surface shall be thoroughly cleaned. All dirt, rust, scales, smoke and grease shall be thoroughly removed before painting is started. Minor patches if any in plastered / form finished surfaces shall be repaired and finished in line and level in C.M/ 1:1 and cracks and crevices shall be filled with approved filler, by the contractor at no extra cost to the Department. The prepared surface shall have received the approval of the Engineer-in-charge after inspection, before painting is commenced.

10.5 Application :

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers. When applying also, the paint shall be continuously stirred in the smaller containers so that consistency is kept uniform. The external surfaces of the buildings under reference including he R.C.C. Jalli, fins and the panels above and the panels above and below the window etc. shall be finished in different colours of approved shade. The contractor will make suitable samples at site for Departments approval before taking up the work in hand and they will be allowed to proceed with the work only after getting Departments approval for the same. The painting shall be laid on evenly and smoothly by means of crossing and laying off, the later in the direction of the grain in case of wood. The crossing and laying off consists of covering the area with paint, brushing the surface hard for the first time and then brushing alternately in opposite directions two or three time and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat. Where so stipulated, the painting shall be done with spraying. Spray machine used may be (a) a high pressure (small air aperture) type or (b) a low pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner. Spraying should be done only when dry condition prevails. Each coat shall be allowed to dry cut thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation. Each coat except he last coat, shall be tightly rubbed down with sand paper or fine pumice stone and cleaned of dust before the next coat is laid. No left over paint shall be put back into the stock tins. When not in use, containers shall be kept properly closed.

The final painted surface shall present a uniform appearance and no streaks, blisters, hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work. In case of cement based paints / primers, the absorbent surfaces shall be evenly damped so as to give even suction. In any weather, freshly painted surfaces shall be kept damp for atleast two days. In painting doors and windows, the putty around the glass panes must also be painted, but care must be taken to see that no paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out while painting. Prospect covers of electrical switch boxes have to be painted from inside by removing them. Care shall be taken while removing them in position after painting with respective approved paints. In painting steel work, special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. The additional specifications for primer and other coats of paints shall be as in accordance to the detailed specifications under the respective headings. Any damage caused during painting work to the existing works / surfaces shall be made good by the contractor at his own cost.

10.6 Brushes and Containers :

After work, the brushes shall be completely cleaned off paint and linseed oil by rinsing with turpentine. A brush in which paint has dried up is ruined and shall be kept at a place free from dust. When the paint has been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, so that they are clean and can be used again.

10.7 Measurement :

Painting, unless otherwise stated shall be measured by area in square metre. Length and breadth shall be measured correct upto two places of decimal of a metre. No deduction shall be made for opening not exceeding 0.05 sqm. and no addition shall be made for painting to the beading, moulding edges, jambs, soffits, sils, architraves etc. of such openings. In measuring painting, varnishing, oiling etc. of joinery and steel work etc. the coefficient as in the following table shall be used to obtain the areas payable. The co-efficient shall b applied to the areas measured flat and not girthed in all cases. In case

of painting of door shutter with push plates in plastic laminate, deduction will be made for area of such laminations.

10.8 Precautions :

All furniture, lightings, fixture, sanitary, fittings, glazing, floors etc. shall be protected by covering and stains, smears, splashing, if any shall be removed and any damage done shall be made good by the contractor at his cost.

10.10 Painting, Priming coat on Wood, Iron of Plastered Surfaces Primer

The primer for wood work, iron work or plastered surface shall be as specified in the description of the item. Primer for wood work / Iron & Steel / Plastered / Aluminium surfaces shall be as specified below:

Sl.No. Surfaces Primer to be used

a) Wood work (hard and soft wood) Pink conforming to IS 3536 – 1966

b) Resinous wood and ply wood Aluminium Primer

c) Iron & Steel, aluminium and galvanized steel Work : Zinc chromate primer conforming to IS 104-1962

d) Plastered surfaces, cement brick work, Asbestos surfaces for oil bound distemper and paint Cement primer The primer shall be ready mixed primer of approved band and manufacture.

10.10.1 Preparation of Surface Wood work :

The wood work to be painted shall be dry and free from moisture. The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any, shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material with same shade as paint shall be used where so desired by the Engineer-in-charge. The surface treated for knotting shall be dry before painting is applied. After the priming coat is applied, the holes and indentation on the surface shall be stopped with glaziers putty or wood putty (for specifications for glaziers putty and wood putty – refer as mentioned herein before). Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in the stopping and the latter is therefore liable to crack.

10.10.2 Iron and Steel Work :

All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting, shall be removed. All dust and dirt shall be thoroughly wiped away from the surface. If the surface is wet, it shall be dried before priming coat is undertaken.

10.11 Plastered Surface :

The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactory, painting shall be taken in had. Before primer is applied, holes and undulations, shall be filled up with plaster of Paris / putty and rubbed smooth.

12.11.1 Application :

The primer shall be applied with brushes, worked well into the surface and spread even and smooth. The painting shall be done by crossing and laying off as described herein before.

10.11.2 Other details :

The specifications for Painting (General) shall hold good so far it is applicable.

10.12 Painting with superior quality and Flat Oil ready mixed paints on new Surface Paint :

Ready mixed paints shall be of approved brand and manufacture and of the required shades. They shall conform in all respects tot eh relevant IS specifications.

10.12.1 Preparation of Surface Wood work :

The surface shall be cleaned and all unevenness removed as in para 32.10.2 (a). Knots if visible shall be covered with a preparation of red lead. Holes and indentations on the surface shall be filled in with glaziers putty or wood putty and rubbed smooth before painting is done. The surface should be thoroughly dry before painting.

10.13 Painting with synthetic enamel / Semi glossy Paint on new work Paint :

Synthetic enamel / semi glossy paint of approved brand and manufacture and required shade shall be used for the top coat and an under coat of shade to match the top coat as recommended by the manufacturer shall be used. The paint shall be conforming to IS : 1932 1964.

10.13.1 Preparation of Surface :

This shall be as per painting with superior quality ready mixed paint as mentioned herein before.

10.13.2 Application :

The number of coats including the under coat shall be as stipulated in the item.

10.13.3 Under Coat :

The coat of the specified paint of shade suited to the shade of the top coat shall be applied and allowed to dry over night. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface free from brush marks and all loose particles shall be dusted off. All the cracks, crevices, roughness etc. will be filled with approved putty as per manufacturers recommendations.

10.13.4 Top coat :

Finishing coats of specified paint of the desired colour and shade shall be applied after the under coat is thoroughly dried. Additional finishing coats shall be applied if found necessary to ensure a proper and uniform semi glossy surface.

10.13.6 Painting with Acrylic Emulsion/Plastic Emulsion Paint

This shall be polyvinyl based Acrylic / plastic emulsion paint of approved manufacture of the required shade conforming to IS 5411-1969.

10.13.7 Primer :

The primer to be sued for the painting with acrylic emulsion on cement concrete surfaces, plastered surfaces, A.C. sheets, timber and metal surfaces, if necessary shall be of approved base and as per recommendations of he manufacturers.

10.13.8 Putty :

Plaster filler to be used for filling up (putting) uneven surfaces, small cracks and holes etc. shall be of approved compound and as per recommendations of the manufacturers. No oil based putty shall be used. The putty should be made from a mixture of whiting and plastic emulsion paint or as per manufacturers recommendations.

10.13.9 Finishing coats:

All the finishing coats shall be of matt finish or any other finish as required by the Engineer-in-charge. The number of finishing coats shall be as specified in the item.

10.14 Mode of measurement:

All the measurements for payment shall be taken on net surface area actually painted, unless otherwise specified. Deduction will be made form the areas for fixtures, frills, ventilation, outlets, electrical boxes and such obstructions not painted, if they are individually more than 0.05 sqm. Acrylic emulsion paint is required to be provided on plastered and concrete surfaces in portions of the building. The Department shall reserve the option to delete or increase quantities in full or part from the scope of contract during progress of work. All wood surfaces are to be pointed with semi glossy synthetic enamel paint with an approved primer. All shades and colours of paints shall be subjected to review and prior approval of Engineer-in-charge shall be taken before the application.

10.15 White Washing with lime Preparation of surface :

Before new work is white washed, the surface shall be thoroughly brushed free from mortar dropping and foreign matter. In the case of old work, all loose pieces and scales shall be scrape off and holes in plaster as well as patches of less than o.5 sqm. area each shall be filled up with mortar of the same mix. Where so specifically ordered by the Engineer-in-charge, the entire surface of old white wash shall be thoroughly removed by scrapping and this shall be paid for separately.

10.16 Preparation of lime wash :

The wash shall be prepared from fresh lime stone white lime. The lime shall be thoroughly slaked on the spot, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 40 gm. of gum dissolved in hot water or Fevicol DDL Binder which shall be added to each 10 cubic decimeter of the cream. The approximate quantity of water to be added in making the cream will be 5 litres of water to one kg. of lime. Indigo (Robin Blue) upto 3 gm per kg. of lime dissolved in water, shall then be added and wash stirred well. Water shall then be added at the rate of about 5 litres per kg. of lime to produce a milky solution. The lime shall be tested in a chemical laboratory and test certificate submitted, to conform the quality of lime with regard to its physical and chemical properties. The cost of testing lime shall be borne by the contractor.

10.17 White washing:

The white wash shall be applied with brushes or by spray in the specified number of coats. The operation for each coat in the case of brush application shall consist of a stroke of the brush given from the top downwards, another from the bottom upwards over the first strike, and similarly one stroke horizontally from the right and another from the left before it dries. Each coat shall be allowed to dry before the next one is applied. Further reach coat shall be inspected and approved by the Engineer-in-charge before the subsequent coat is applied. No portion of the surface shall be left out initially to be patched up later on. For new work, three or more coats shall be applied till the surface present a smooth and uniform finish through which the plaster does not show. The finished dry surface shall not show any sign of cracking and peeling nor shall it come off readily on the hand when rubbed. For old work, after the surface has been prepared as described hereinbefore, a coat of white wash shall be applied over the patches and repairs. Then a single coat or two or more coats of white wash as stipulated in the description of the item shall be applied over the entire surface. The white washed surface should present a uniform finish through which the plaster patched do not appear. The washing on ceiling should be done prior to that on walls.

10.18 Protective measures :

Doors, windows, floors, articles of furniture etc. and such other parts of the building act to be white washed shall be protected from being splashed upon. Splashing and droppings, if any, shall be removed by the contractor at his own cot and the surfaces cleaned. Damages, if any to painted surfaces, furniture or fittings and fixtures etc. shall be recoverable from the contractor.

10.19 Measurements :

All measurements for payment shall be taken on net surface areas actually white washed, unless otherwise specified. Deductions will be made from the areas for fixtures, grills, ventilation, outlets, electrical boxes and such obstruction not painted if they are individually more than 0.05 sqm. Length and breadth shall be taken correct upto two places of decimal of a metre and areas so worked out shall be correct upto two places of decimals of a square metre. Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the percentages to allow for the girthed area : Corrugated asbestos cement sheets : 20% Semi-corrugated asbestos cement sheets : 10% The number of coats of each treatment shall be stated. The item shall include removing nails, making good holes, cracks, patches etc. not exceeding 0.05 sqm. each with materials similar in composition to the surface to be prepared.

10.21 Colour Washing :

In the case of colour washing, mineral colours, not affected by lime, shall be added to white wash with proper glue. No colour wash shall be done until a sample of the colour wash to the required tint or shade has been got approved from the Engineer-in-charge. The colour shall be of even tint or shade over the whole surface. It is patchy or otherwise, badly applied, it shall be redone by the contractor, at no extra cost to the Department. For new work, the priming coat shall be of white wash lime or with whiting as specified in the description of the item. Two or three coats, shall then be applied as specified on the entire surface till it represents a smooth and uniform finish. Each coat after applying shall be got approved from the Engineer-in-charge. The finish dry surface shall not be powdery and shall not readily come off on the hand when rubbed. Other specifications as detailed for Whitewashing with lime shall be applicable. Indigo (Neel) shall however, not be added.

10.22 Distempering

12.22.1 Distemper:

Dry distemper (IS 427 - 1965) of approved brand and manufacture, colour and required shade shall be used. The distemper shall be stirred slowly in clean water using 0.6 litre of water per kg. Of distemper or as specified by the manufacturers. Warm water shall preferably be used. It shall be allowed to stand for at least 30 minutes before use. The mixture shall be invariably well stirred before and during use to maintain an even consistency.

10.22.2 Preparation of Surface :

This shall be as for painting work mentioned herein before in so far as it is applicable.

10.22.3 Application :

In case of new work, the treatment shall consist of priming coat followed by the application of two or more coats of distemper till the surface shows an even colour.

10.23 Priming coat:

· Priming coat of whiting shall be applied over the prepared surface. The whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a th9icn slurry which shall then be screened through a clean coarse cloth. Two kg. Of gum and 0.4 kg. of copper sulphate dissolved separately in hot water shall be added for every cum. of the slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for used. No white washing coat shall be used as a priming coat for distempering. · The application of each coat as mentioned in the specifications for painting (General) herein before, shall hold good, as far as it is applicable.

10.24 Oil Emulsion (oil bound) Distempering / Acrylic Distemper

12.24.1 Oil bound distemper :

(IS 428-1969) of approved brand and manufacture, colour and required shade shall be used. The primer where used as on new work shall be cement primer or distemper primer as specified in the item. These shall be of the same manufacture as distemper. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by manufacture. Only s quality of distemper required for days work shall be prepared.

10.24.2 Preparation of surfaces :

The surface shall be prepared as described herein before for painting work in so far as it is applicable and approved putty / filler shall be applied to the entire area to get uniform and smooth surface before application of primer.

10.25 Application :

The cement primer or distemper primer shall be applied by brushing and not by spraying. Hurried priming work shall be avoided, particularly on absorbent surfaces. New plaster patches in old work before applying oil bound distemper primer. The surfaces shall be finished as uniformly as possible leaving no brush marks, priming coat shall be allowed to dry for atleast 48 hours before oil bound is temper is applied. Before applying distemper, the surface shall be lightly sand prepared to make it smooth for receiving, the oil bound distemper, taking care not to rub out the priming coat. A time interval of atleast 24 hours shall be allowed between consecutive coats to permit the proper drying of the preceding coat. Two or more coats of distemper as are found necessary shall be applied over the priming coat to obtain an even shade.

10.27 Water Proofing Cement based paint

10.27.1 Material :

Cement based paint (IS 5410-1969) of approved manufacture, quality, shade and colour only shall be used.

10.27.2 Preparation of surfaces :

The surface shall be thoroughly cleaned off all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing the surfaces. The surface shall be thoroughly wetted with clean water before the water proof cement paint is applied. The prepared surfaces shall be got approved before painting is commenced. The water proof cement paint shall be mixed in such quantities as can be used up with in an hour of its mixing as other wise the mixture will set and thicken, affecting flow and finish. Water proof cement paint shall be mixed with in two stages. The first stage shall comprise of 2 parts of water proof cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the water proof cement paint gradually to the water and not

vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain liquid of workable and uniform consistency. In all cases the manufacturers instruction shall be followed meticulously.

10.27.3 Application :

The solution shall be applied on the clean and wetted surface with brushes spraying machine. The solution shall be kept well stirred during the period of application. To avoid direct heat of the sun during painting, the cement based paint shall be applied on the surfaces already treated with white wash, dry or oil distemper, varnishes, paints etc. it shall not be applied on gypsum, wood and metal surfaces.

10.27.4 Mode of measurement for dry distemper, oil bound distemper and water proof cement Paint:

All measurement for payment shall be taken on net surface area actually paint unless otherwise specified and no co-efficient shall be applied for working to areas. Deduction will be made from areas for opening / obstructions not painted, if they are individually more than 0.05 sq.m. Length and breadth shall be taken correct upto two places of decimal of a meter and areas shall be worked out correct upto two places of decimal of a square meter. Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentage to allow the girthed area a) Corrugate asbestos cement sheets – 20% b) Semi corrugated asbestos cement sheets – 10%. The number of coats of each treatment shall be stated in the schedule of quantities. The whole surface shall be applied with approved putty / filler to get uniform and smooth surface at no extra cost tot eh Department.

10.27.5 Protective Coatings :

On surfaces such as ferrous metals, brass, copper and phosper bronze, a protective coating of suitable bituminous compound or chomated redoxide should be given. New wood should be treated with a leafing grade aluminium primer or a water based acrylic emulsion primer. The surfaces with algae growth thoroughly cleaned down to remove as much growth as possible and effective solution of stabilized house hold bleach (calcium hypochloride) of approved quality with approximate 35% chlorine content @ 2 kgs. per 50 litres (or as per manufacturers recommendations) should be used to treat the surfaces. On chalky or friable surfaces after removing the loose materials by stiff brushing or scraping the surface should be treated with one coat of advanced solvent based materials such as snowsol stabilizing solution or other approved equivalent with white spirit.

10.27.6 Application :

The ready mix Sandtex Matt or other equivalent approved resin based there plastic paint shall be applied on clean and wetted surfaces by means of brushes or roller. The solution shall be kept well stirred during the period of application. To avoid direct heat of the sun, the paint shall be applied on the side in shade. On rough and textured, one under coat of cement based paint such as snocem or other equivalent shall be applied before application of undiluted sandtex Matt finish coat. In case of application of two coats of sandtex matt at normal temperatures, the first one shall be diluted by addition of 25% water and the second coat direct. In extremely hot environs, the second coat shall be diluted @ 2.5 litres of water to 20 litres of paint or as directed. Painting with resin based thermo plastic shall be carried out generally as per manufacturers specifications.

10.27.7 Other details :

The specification for painting (general) mentioned herein before shall hold good as far as they are applicable. Snowsol stabilized solution shall not be applied over bitumen. Snowsol stabilized solution

treated surfaces shall be left unpainted for more than 2 (two) days. Gypsum based materials shall not be used for filling of exterior cracks while preparation of surfaces.

10.27.8 Mode of measurement :

The painting unless otherwise mentioned shall be measured by area in sqm. upto two places of decimal. Length and breadth shall be measured correct upto two places of decimal of a meter. Deduction will be made from the areas of fixtures, grills, ventilation, outlets individually more than 0.05 sqm. The item shall include removing nails, making good holes, cracks, patches etc. Not exceeding 0.1 sqm each with materials similar in composition to the surface to be prepared.

11 .WATERPROOFING

All waterproofing work shall be carried out by the main contractor through a specialised Waterproofing agency as specified in the tender. The work shall be carried out strictly in accordance with the instructions of the manufacturer of the water proofing materials used in waterproofing treatment and the contractor shall be responsible for the proper production of record of ingredients used and the performance of the waterproofing work done. The entire work shall be covered by a performance guarantee for waterproofing for the period mentioned in the description of item. The guarantee shall also be ensured by retaining 10% of the value of waterproofing work done, including treatment of expansion joints for a period of three years in case of bitumen tarfelt treatment and for five years in case of cement based waterproofing treatment. If there is no leakage noticed during the above specified period, the amount retained shall be returned. The Contractor shall promptly attend to any leakage or dampness see or communicated during the period and satisfy the Dept. that the same has been rectified; if required, by conducting a test by storing 75 mm water over the roof for 10 days. If the Contractor fails to carry out the waterproofing rectification, the dept. will, after giving 10 days notice to the Contractor, get the work carried out by another agency at the Contractor's risk and cost. The Contractor may give a Bank Guarantee in lieu of the amount of 10% referred to above.

11.1 WATERPROOFING PERFORMANCE TEST:

11.2 TREATMENT TO CRACKS:

The work shall be carried out by cutting out cracks to V section , minimum 6 mm wide on top, cleaning out with wire brush, filling with cement and sand slurry (1:1) with approved waterproofing compound mixed with cement by weight as specified by the manufacturer and curing as required. The measurements shall be in running metres measured correct to a centimetre. The rate shall include labour and materials required for all operations described.

11.3 WATERPROOF TREATMENT WITH ACRYLIC BASED CHEMICAL OR CEMENT BASED WATRPROOF AGENT:

11.3.1 Preparation of Surface :

The roof surface shall be cleaned with wire brushes and gunny cloth. All scales, mortar falling, loose material etc. shall be removed to base slab surfaces. All cracks shall be made in to "V" grooves 25 mm wide at top and 12 to 20 mm deep and cleaned.

11.3.2 LAYING:

The entire work shall be carried out as per instructions of the manufacturer of the approved waterproofing agent. A layer of neat cement slurry mixed with waterproof agent shall be laid in

convenient lengths and widths. Bricks on edge or broken brick pieces shall be laid in CM 1:4 (1 cement : 4 sand) with waterproof agent. The brick pieces / brick on edge shall be wetted thoroughly before use. Cement Mortar 1:4 shall be filled in the joints and a little above. Waterproofing agent of approved make shall be added at 1% weight of cement in case of acrylic based chemical waterproofing agent in slurry and mortar and properly mixed width cement specified by the Manufacturer before mixing the same with sand. The brick on edge or brick bat work as above shall be laid to proper levels and slopes as required, directed and / or as shown on drawings. Minimum 25 mm thick jointless water proofing layers of cement mortar 1:4 (1 cement : 4 sand) with waterproof agent, shall be laid over the brick bat work and finished smooth with a layer of neat cement slurry mixed with waterproof agent. If directed, string marks showing 300 mm x 300 mm square shall be marked properly. The slope of the finished terrace shall not be less than 1 in 50, unless a flatter slope is expressly permitted by the EIC in writing. The roof surfaces shall slope from all sides towards the rain-water outlets. The treatment shall be properly rounded at junction of walls, etc. and carried out above 300 mm above the level of waterproofing treatment. The edge of the treatment along parapet shall be tucked into a groove 65 mm deep into the parapet. The treatment shall be continued near rain water outlet etc. The entire treatment shall be properly cured for a period of 2 weeks by ponding method. Normally the proportion of acrylic based chemicals is one percent by weight of OP Cement and for other waterproofing compound 2% by weight of cement. The Contractor shall give complete details of waterproofing treatment proposed by him, including the waterproof compound he proposes to use. These details shall include roof fill materials, waterproofing compound, minimum & maximum thickness of slurry, joints thickness, mortar on top of total treatment. The Contractor shall ensure that sufficient slope for effective drainage is provided within the average thickness of waterproofing treatment proposed by the Contractor. In case the average thickness has to exceed that specified, the fact shall be specifically brought to the notice of the EIC. The entire work shall be covered by a guarantee for waterproofing for a period of 10 years as specified in 2.0 above.

11.4 WATERPROOF CEMENT PLASTER:

The work shall be carried out in correct line and level in CM 1:4 (1 cement:4 sand) minimum 15 mm thick as backing coat with approved waterproofing compound, mixed with cement by weight as specified by manufacturer and finished with 6 mm thick uniform grained sand faced plaster coat including curing with 5 years performance guarantee for terrace parapet or external walls or concrete surfaces.

.Measurements shall be in sq.mtrs.

.Rate shall be including material, labour required to carry out complete work.

11.5 INJECTION / PRESSURE GROUTING WATERPROOF TREATMENT:

13.14.1 SURFACE PREPARATION :

The surface to be treated shall be cleaned of all scales, loose materials, and wire brushed clean. All cracks apparent and construction joints shall be made in to V grooves 25 mm at top and above 20 mm deep and treated with cement slurry 1:1 (1 cement : 1 sand) with approved waterproof compound mixed with cement by weight as specified by the manufacturer of the compound. Holes of about 25 mm dia. to receive funnel or pipe nozzles and 25 to 40 mm deep

shall be chiselled at about 1.5 m or less centre to centre as required, in the entire floor and walls to be treated. Nozzles shall then be fixed in these holes and grooves. After the nozzles are set for minimum 24 hours neat cement slurry mixed with waterproofing compound, by weight of cement, as specified by the manufacturer of the compound, shall be injected through these nozzles, by low pressure, gravity for the slurry to run through the minutest cracks and pores in the entire structure. The process shall be

continued till the surface to be treated is bond dry and shall not show any dampness at all. The nozzles shall then be removed and the holes properly filled up.

11.6 CEMENT BASED WATERPROOFING TO TOILET / BATHROOM SLABS ETC.

13.18.1 The surface shall be cleaned of all loose scales, mortar, fallings, etc. by wire brushing and gunny cloth. All cracks shall be cut into V form, cleaned and filled in with cement mortar 1:1 slurry with approved waterproofing compound at 2% by weight of cement. A 20mm thick layer of cement mortar 1:3 shall then be laid and gravel or stone aggregate of 12 m nominal size of fairly uniform size hand set in it while the cement mortar is still green with hand pressure. A final layer of 25 mm thick cement mortar 1:3 shall then be laid over it, compacted with trowels, finished smooth. In all cement based waterproofing compound, as specified by the specialized waterproofing agency shall be mixed. The whole works hall be cured properly for 10 days. The joints with walls shall be rounded 150 mm above the waterproofing treatment level. This treatment is used in bathrooms, equipment floor, office buildings, etc.

11.18.2 MEASUREMENTS:

Superficial flat area of the treatment carried out shall be measured in sq.mt, correct to two places of decimals, length and breadth being measured correct to a cm. The measurements of rounding shall not be taken along the walls.

11.18.3 RATE :

The rate shall include all materials, labour involved in all the operations described.

4 .The waterproofing treatment shall carry performance guarantee of 10 years.

11.7 POLYSULPHIDE JOINTS:

13.19.1 The top 12 mm thick and 20 mm deep strip in the horizontal and vertical expansion joints in slabs, beams, columns, walls, etc. shall be filled properly with patented polysulphide compound as per manufacturer's instructions.

13.19.2 For expansion joints, the joint filled shall be packed firmly to close all gaps or voids.

13.19.3 APPLICATION :

The resin shall be thoroughly mixed with the curing agent and shall be either directly poured or applied with special gun to fill up the joint. The joints are finished flush with the surface. The expansion joints exposed inside the building at any floor level shall be covered with thin aluminium flat (20 gauge) or asbestos cement strip of min. available thickness or wooden beading etc. as directed by EIC. The width of such covering shall be sufficient to cover the entire joint and allowance for fixing nails / screws. The fixing of such strip shall be at one only to allow for the movement at the joint. Alternatively, the strip can be fixed from both sides but the holes on one side to be oval shape to allow unrestricted movement of structural member and to avoid shearing of the flat. Aluminium angles of suitable size, may also be provided, if the joint is at the corner, but shall be fixed on one side only.

11.19.4 MEASUREMENTS:

Measurements shall be in running metres of the length of polysulphide joint work carried out and measured correct to a cm.

11.19.5 RATE:

Rate shall include all materials, labour etc. required for all operations of work as specified including covering with aluminium, asbestos, wooden members as described in the item.

12.ALUMINIUM STRUCTURAL GLAZING & CLADDING WORK

12.1 STANDARDS

The contractor must comply with all relevant Indian and British Standards Code of practice and technical literature relating to best practice pertaining to structural glazing.. Nothing in this clause shall relieve the contractor of his obligations to provide a higher standard where required and directed.

(1) I S 3548 Glazing in building

(2) C P 152 Glazing & Fixing of glass for building

(3) HE 9 WP (I S 63400 WP) Aluminium Extrusion

(4) NAAMM Standard FCI – 89, Field check for water leakage of metal external glazing

(5) NAAMM Standard SG-1-70 Specifictions for dense rubber like compression gasket materials.

(6) A standard specifications for Aluminium Structures – current edition and standard specifications for aluminium sheet metal work in building construction.

12.1.1 It is the Contractor's responsibility to ensure that the codes adopted in these works are acceptance to local building authority

12.1.2 Any conflict discovered between the above mentioned codes and building regulations must be reported to the NATIS/Its Representative, for an instruction to be issued, but as a general rule, the more stringent shall apply.

Quality assurance – Single approved source responsibility

12.1.3 Glass – units shall be as detailed in B.O.Q./ of standard specifications

a. Glass for each to be procured shall be from one approved standards manufacture

b Fabricated glass to comply with ASTM C 1038, ASTM C 1046 and ANSIZ 97.I.

c Submit following certificates

1. Manufacturer's letter certifying glass and glazing material's compatibility.

2. Manufacturer's letter certifying sealed insulating glass units meet or exceed specifications.

3. Manufacture's test certificate for quality of glass supplied.

12.1.4 Sealants

a. Sealant used shall be confirming to standard as approved by the NATIS & meet or exceed specifications.

b. Sealant manufacture to confirm compatibility and give certificate for the following:

1. Manufacturer's Certification that Products:

I) Furnished materials for project meet or exceed specified requirements.

II) Assembled for each joints are compatible with each other.

III) Are suitable for indicated use.

2. Manufacture's certification that sealants, primers, and cleaners comply with local regulations controlling use of volatile organic compounds.

3. Contractor's certifications that products are installed in accordance with Contract Documents, based on inspection and testing specified in the Field Quality Control.

c. Authorised Sealant applicator to be employed for work. He shall have minimum five years

12.1.5 Guarantee

Special Warranties: Prepare and submit

1. Warranty jointly signed by manufacture, installer and Contractor agreeing to repair and / or replace assemblies which fall in material or workmanship during warranty period of 10years.

2. Warranty stating insulated glass units to be free from condensation, fogging and construction of vision due to film on internal surface for 10 years.

12.2 SCOPE OF WORK

14.2.1 The contractor shall be responsible for supply, fabrication, installation, test and guarantee of all items including taking all measures that may be required to complete the work as per Architectural concept drawings and specifications details. The specialist contractor shall submit an outline of recent

comparable works by the firm/ it's technical partner to illustrate the competence, experience and suitability of the firm.

The Brief scope of work is :

a) Supply of all items of structural glazing system as per drawings, engineering data and prepare test reports for concept of Architectural drawings.

b) Fabrication and installation of structural glazing system.

c) All anchors, fixing, attachments, reinforcements, steel reinforcing for mullions and transoms required for a complete installation, except those specifically indicated as being provided by other trades.

e) Finishes, protection coatings and other support members.

f) Sealing with approved sealants within and around the perimeter.

g) Provisions to receive electrical outlets and outlets for conduits and other electrical work.

h) Co-ordination with the work of main contractor and other trades.

i) Guarantee for 10 years

k) All final exterior and interior cleaning.

12.3. MATERIAL AND FINISHES

14.3.1 Aluminium extrusions shall be designed treated alloy IS 63400 or BS 6063-T5, 6063-T6 or 6061-T6

complying with BS 1474 and aluminium sheet shall be designated alloys 1100, 3003 or 5052 complying with BS 1470. All aluminum work shall be constructed of fully heat-treated aluminium alloy.

14.3.2 The extrusion shall be clean, straight and sharply defined lines, free from distortion and defects impairing appearance, strength or durability. They shall be of suitable wall thickness and profile for rigidity and strength in respect to tensile, shear and bearing stresses, capable of providing local and lateral stability.

14.3.3 Aluminium panel profiles and sizes shall be manufactured in accordance with drawings. No alternation of profile panel sizes and location of joints shall be accepted. The system shall be adopted to meet all structural movement and performance requirements as

specified in Indian standards.

12.3.4 Finish

Finish to aluminium framing members shall be micron powder coating of adequate thickness in required shade/ colour as detailed in B.O.Q./ of standard specifications.

12.3.5 Steel

3.2.1 All steel rolled shapes, plates, bars, cold rolled sheet etc. shall comply IS2062 or with the requirements of ASTM A36 or the relevant British Standards.

12.3.6 Separators

Separators between steel and aluminium members and where required shall be rigid type, high impact, smooth both sides Teflon with a minimum thickness of 0.8mm as approved by the NATIS.

12.3.7 Sealant

3.4.1 The compatibility and sequence of installation for all sealant must be carefully considered in all proposals in order to ensure the required cure and optimum performance.

12.3.8 All sealant shall be applied in strict compliance with manufacturer's instructions and recommendations. The contractor shall note that the sealant to be used between glass surfaces, and in adjoining areas shall preferably be supplied by one manufacture.

3.4.3 Gaskets

Structural gaskets shall be EPMD or neoprene with a high resistance to aging and allow joint movements.

12.3.9 Glazing

Glazing shall be as specified in drawing or BOQ or as per design requirement. It shall be Indian / imported hard coated reflective bronze and heat strengthened glass. It shall be of Saint Gobain, float or equivalent approved.

12.4 WORKMANSHIP

12.4.1 General

No materials, equipment or practices shall be used that may adversely affect the functioning, appearance and durability of the completed structural glazing, aluminium cladding and related construction. The work shall be accomplished in compliance with the specified criteria without bucking, opening of welds, cracking of glass, leakage or other harmful effects.

14.4.2 The materials used must be capable of withstanding the effects of in situ installation and allow sufficient tolerance to prevent damage to the finished surface.

14.4.3 Materials, finishes, shapes, sizes, thickness, and joint locations shall conform strictly to those required by the drawings and specifications.

12.4.4 All work shall be of the highest quality, in accordance with best trade practices, and performed by skilled workmen.

12.2.5 All components exposed in the finished work shall be free from warping & oil-cleaning effects.

12.4.6 Manufacturer's Standards Materials, components and system incorporated in the work shall be in compliance with the standards and procedures of the appropriate manufacturers and the standards and codes referred to in this specification.

12.4.7 Storage and Handling

12.4.7.1 Wherever possible all materials shall be stored in dry, well-ventliated conditions prior to fabrication.

12.4.8 Jointing

12.4.8.1 Accurately fit and firmly secure all exposed metal joints with metal to metal hair line contacts.

12.4.8.2 All fastenings into or through aluminium shall be stainless steel, and installed at approved spacings. Fasteners shall not penetrate gutters and drainage system.

12.4.9 All the joints in aluminium framing system and glazed panels as well as joints between aluminium frame with concrete and/ or Masonry meeting surrounds shall be fully sealed and made air, water and weather tight preventing seepage of rain water under heavy wind pressures with provision of adhesive silicone sealant and superior quality approved make EPDM gaskets.

12.4.10 Space at each floor level between the external face of the building frame and the internal face of the building frame and the structural glazing glazed panel shall be sealed air tight by horizontal barrier to prevent of smoke / fire, air conditioned air from one floor level to other floors. There shall be continuous seal for stopping fire and smoke between the structural glazing and the building face.

12.4.11 Sealants

All the joints in glazing shall be air and water tight and capable of preventing leakage of rain water under heavy wind pressure and under heavy weather conditions. Directions of the manufacturer of the sealant shall be strictly followed.

12.5 INSPECTION

All shop and field materials and workmanship shall be subject to inspection by the NATIS at all the times. These inspections shall not relieve the contractor from the obligation to provide materials conforming to all requirements of the contract Document and matching approved samples.

12.6 TESTING

The contractor shall be required to perform necessary test at approved laboratory.

12.6.1 Field Tests

12.6.1.1 NATIS on completion or during the progress may request the Contractor to carry out such test as required to conform acceptability.

12.6.1.2 In the event that such testing should result in uncontrolled leakage, the Contractor shall eliminate the causes of such leakage at no additional cost to the Employer. Remedial measures must maintain standards of quality and durability and are subject to approval.

12.6.1.3 NATIS, If dissatisfied or on account any reason attributable to the contractor shall neither be eligible for any payment nor shall have recourse to approval. He shall not be eligible for any claim on the employer.

12.6.2 Cost of Test

The contractor shall pay for all cost towards testing. The contractor shall arrange witness of test to NATIS and their representatives at his cost. This shall include all transport, lodging, boarding etc. by the Contractor.

12.7 CLEANING

12.7.1 The contractor shall ensure that all actions are taken during installation to eliminate the effects of corrosive substances on the finishes.

12.7.2 The contractor shall clean both internal and external surfaces to remove corrosive substances, dust or cement/mortar dropping during the installation as may directed and instructed by the EIC.

12.7.3 The internal surfaces of glass and aluminium frame are to be cleaned with compatible cleaning agents prior to installation of the internal protective sheeting.

12.7.4 The contractor shall also make good any physical damage to the structure including scratches, dents, abrasions, pitting, etc. to the satisfaction of the EIC.

12.8 PERFORMANCE GUARANTEE:

The structural glazing contractor shall offer performance warranty on stamp paper of appropriate value for the entire installation carried out. The performance guarantee shall cover for replacement of any or all members and components by the structural glazing contractor at his own cost in case of any deficiency or failure in performance of the structural glazing component as per the design requirement as per the directions of EIC.

12.9 MEASUREMENTS

14.9.1 Measurements shall be as per B.O.Q. in Sq.m of actual area covered.

12.10 RATE

Rate shall include all required labour, material, testing at approved laboratory, breakage, wastage, supervision, protection till hand over and free maintenance during defect liability period etc. complete.

12.11 COMPOSITE ALUMINIUM CLADDING

12.11.1 GENERAL

All Aluminium panel used for the cladding of building shall be 4mm thick or as specified in B.O.Q. Aluminium Composite Panel (ACP) 25 micron or as specified in B.O.Q anodized aluminium sheet as manufactured, treated and supplied by ALPOLIC or equivalent approved.

12.11.2 Work shall include as detail in BOQ, drawings without being limited following

Aluminium cladding system as of APOLIC or equivalent all hardware

All anchors fixing, attachments, reinforcements, sections as required in supports & backing Finishes, protections coatings & treatments

All caulking, sealing, clastomeric and metal flashing, and gasket including seating at junctions with building.

Electrical bonding and earthing of all metal claddings elements.

Provision for electrical contents and conduits and other electrical work.

Scheduling & monitoring of work

Samples, mockups and test units

Co-ordination with the work of other agencies

Testing and verification of component and total assembly.

Storage handling protection and cleaning

Final cleaning interior and exterior prior to handover

Guarantees

Fixing to be done in conjunction with Curtain Wall system.

12.11.3 All work in this section shall comply with the standards, codes, specified and also with local codes requirements and regulation.

12.11.3.1 Codes and Standards followed shall be

- Indian standards as published by the Bureau of Indian Standards
- British Standards published by British Standard Institution.

12.12 MATERIAL

12.12.1 Aluminium panel shall be of 4mm / 6mm thick sheet or as specified in B.O.Q. Aluminium sheet and plate shall confirm to Bs 6063 - 76 and ASTM B 209-73. Anodising sheet and plate shall confirm to S 1615 AA 20. The finished surfaces shall be factory protected with self adhesive peel-off foil to withstand exposure to local weather condition without loosing the original peel of characteristic or causing stain or other damage.

12.12.2. All materials shall be free from any defect that may impair the strength, functioning, durability or appearance of the work.

12.12.3 Materials not specified shall be of the best quality and suitable for the purpose intended and as approved by the NATIS.

12.12.4 Dimensional tolerance Width : + 2.0 mm Length : + 4.0 mm Thickness : + 0.2 mm for 3 mm and 4mm thick panel + 0.3 mm for 6mm thick panel Bow : Maximum 0.5% of the length and / or width Squareness : Maximum 5.0mm Surface defect : The surface shall not have any irregularities such as roughness, buckling and other imperfections.

(a) Anchors and connections shall be provided to fully satisfy their required purpose of adjustability, movement and load transfer. (b) All anchors, connections and fixing outboard of the air seal shall be stainless steel / Hot dip galvanized.

12.12.6 Corrosion Protection

(a) All steel parts shall receive a protective treatment commensurate with their respective functions and locations. The treatment shall be one or more of those described above, and approved by the EIC.

(b) Aluminium surfaces in contact with mortar, concrete, fireproofing, plaster, masonry, or absorptive materials of any kind shall be coated with an anti-galvanic material, impervious to moisture.

12.12.7 Lightning Protection

(a) All metal cladding components, as above shall be connected to building ground by earthing jumper cables and connections.

12.12.8 Storage and Handling

(a) Materials shall be stored in a dry, well ventilated location.

12.13 PERFORMANCE

3.1 The Contractor shall demonstrate compliance with Quality Assurance Standards and submit a comprehensive Quality Assurance Programme covering all phases of the work.

12.14 GUARANTEE

The Contractor shall give guarantee against any defects in the workmanship, quality of materials or performance of Contract Works to repair or replace defective workmanship during warranty period. The Contractor shall repair defective work at his own cost. The contractor shall offer performance warranty on stamp paper of appropriate value for the entire contract works carried out after the date of virtual completion as per the directions of EIC.

13. ALUMINIUM WINDOWS & VENTILATORS

13.1 Scope of work :

The scope of work in the tender item includes fabrication supply and installation of anodized matt finished aluminium windows, ventilators, composite units, glazing etc. Strictly in accordance with these specifications and relevant detailed approved shop drawings.

13.2 General :

The contractor shall submit six copies of shop drawings covering all types. Details of work as generally shown in Architectural drawing and envisaged under these specifications before manufacture. The drawing shall show all dimensions, details of construction, installation, fixtures and relation to adjoining and related work. No fabrication work shall be undertaken prior to the approval of the shop drawings from the Engineer-in-charge. The tenderer shall intimate at the time of tendering, the types of sections he proposes to use on the works.

13.3 Materials :

The aluminium alloy used in the manufacture for extruded window section shall correspond to IS 733-1966 (or any further revision thereof). Extruded sections shall conform to IS designation HE9-WP and Hollow sections shall conform to IS Designation HV9-WP. The frame work, stiles, mullions, beadings, transoms, hinges, pegstays, handles etc. shall be structurally suitable to withstand all the load, the members have to sustain. Contersunk screws, nuts, bolts, washers, rivets and other miscellaneous fastening devices shall be of approved cadmium plated or stainless steel as specified in the approved drawings.

13.4 Fabrication :

The frames shall be manufactured square and flat. The corners of the frames shall be fabricated to true right angles. All the fixed, sliding, openable frames shall be constructed from sections which have been cut to length, mitred and mechanically jointed or welded at the corners. Where hollow sections are used with welded joints, argon are welding or flash butt welding shall be employed (Gas welding or brazing not to be done). Sub-dividing bars of units shall be tennoned an riveted into the frames. Water bar in aluminium section shall be provided. The dimensions shown in the drawings are overall heights and widths to the outside of frames of aluminium windows. The side hung shutters shall have projected friction type hinges of aluminium alloy. Concealed projected hinges having structural stability and of good quality will also be considered only after the inspection of the sample submitted by the tenderer. The necessary pegstays, handles, windows fasteners etc. shall be of aluminium. The handle shall be mounted on a handle plate riveted to the opening frame. The pegstays shall be 300mm. long or as required complete with peg and locking bracket and shall have holes for keeping the shutters open in

three different positions. No field fabrication of frames is permitted. The complete fabricated assembly shall be anodized in approved satin finish with minimum film thickness of 0.015 mm. for the entire surface. A thick layer of clear transparent lacquer based on methacrylate or cellulose butyrate shall be applied on the finished sections for the aluminium windows etc. by the supplier to protect the surface from wet cement, lime, dirt, dust etc. during the installation. This lacquer coating shall be removed after installation is complete, if approved by the Engineer-incharge and all sections of the windows shall be protected by the Engineer-in-charge and all sections of the windows shall be protected by P.V.C. film covering..

13.5 Hardware :

All cut outs, recesses, mortising or milling and operation required for fixing the hardware shall be accurately made reinforced with packing plate as required to ensure adequate strength of the connection. All the hardware, accessories shall be of best approved type and of anodized finish same as for the frame and other sections. All hardware shall be free from defects which may affect the appearance and serviceability. All hardware shall be fixed after obtaining the prior approval of the Engineer-in-charge. Approved samples of hardware shall be kept in the custody of Engineer-in-charge.

13.6 Fixing :

The window frames shall be accurately fixed in the brick masonry or R.C.C. work. The fixing of the frame shall be done with cadmium plated brass counter sunk screws driven on the teak wood rough grounds if required or fixed tot eh walls with holdfasts. All aluminium windows shall be fixed in position as per IS 1081-1960 (or any revision thereof): Code of practice for fixing and glazing of aluminium windows. All joints between metal and masonry / rough ground wooden frame shall be fully caulked and mastic or polysulphide compound in order to ensure water tight joints. Joints shall be neatly painted with matching cement an excess materials shall be removed. Hardware shall be fixed in workman like manner all as directed by the Engineer-in-charge.

13.7 Samples :

The sample of different windows shall be submitted to the Engineer-in-charge for approval.

13.8 Glazing :

The glazing shall be of Indian make plain sheet / frosted figured glass of special selected quality and size as mentioned in item description and drawings. The specifications specified herein before shall hold good as far as applicable Glazing will be paid on square metre basis.

13.9 Mode of measurement :

Payment will be made on the basis of weight of fabricated anodized aluminium frames/ members/fixtures along with all fittings actually installed in position without any extra allowance for wastage.

13.10 Guarantee :

All materials and workmanship in above work shall be guaranteed for a period of one year (unless otherwise specified) from the date of handling over. Unqualified performance guarantee for smooth operations of the windows, doors, wall spans and precautionary measures against leakages etc. shall be furnished by the contractor on stamped paper. If so specified, in schedule of quantities. Any defect found during the guarantee period shall be replaced / made good to the original conditions/positions entirely at the cost of the contractor.

13.11 Testing:

All windows shall be tested for water tightness. Any leakage found during testing shall be rectified by the contractor without extra charge.

14. M.S. GRILLS/RAILING & ROLLING SHUTTERS

14.1 General :

The contractor shall submit 6 copies of shop drawings shall show all dimension, details of construction, installation relating tot eh adjoining work.

14.2 Materials :

All structural steel shall conform to IS 226-1963 sections for grills and shall be free from loose mill scales, rusts, pitting or any other defects affecting its strength and durability.

14.3 Fabrication :

The grills shall be fabricated to the design and pattern shown in the drawings. All joints shall be made in best workman like manner with slotting and welding as required to the specified size and shape. The edge of the M.S. flats shall be suitably mitred before welding to get the desired shape. The joints shall be filled to remove excess stay after welding screws, nuts, washers, bolts, rivets and any other miscellaneous fastenings devices shall be of steel and shall be provided by the contractor. Manufactured M.S. Grills then be fixed in between the posts, balusters, M.S. frame work etc. to correct alignment. Any undulations, bends etc. found shall be rectified by the contractor at his own cost. The complete assembly of rill / railing so fixed shall be firm and there shall not be any lateral movements.

14.4 Samples :

Samples of grill and railings shall be submitted for approval of the Engineer-in-charge and to be got approved before taking up for mass fabrication.

14.5 Installation:

The approved grills shall be fixed in position where specified and shown in drawings including in masonry walls, teakwood frames, hand railings etc. Any damages to walls, frames etc. caused during fixing the grills shall be made good by grouting with cement mortar/packing /repairing properly at the contractors cost.

14.6 Painting :

Painting shall be done as per the specification specified under painting.

14.7 Mode of measurement :

Actual area of M.S. grill manufactured and fixed in position shall only be measured in square metre for payment. All measurements shall be taken to two places of decimal of a metre and area shall be calculated to second place of decimals of a square metre. The rate is to include the cost of all materials, labour, transporting, fabricating, installing, scaffolding if necessary, grouting etc. complete.

14.8 Finishing / Painting/Polishing for railing :

Teak wood hand rail shall be polished with wax polish / French polish / melamine with two or more coats over one coat of wood/primer or painted with two coats of synthetic enamel paint / flat oil paint of approved make and shade over one coat of approved primer. M.S. grills, balusters, etc. also to be painted as per specifications specified under Painting/ Polishing.

14.9 Mode of measurements (hand rails) :

Hand railing shall be measured for payment in running metre. The lengths shall be measured along the top center line of the hand rail and shall be measured between ends of balusters, newels, posts as the case may be upto two places of decimals of a metre. Rates shall include fabrication, leaving suitable pockets, grouting the same, providing an fixing suitable teak wood plugs, fixing, all labour, materials, transport, painting/polishing, finishing and scaffolding if necessary.

15. FLASE CEILING

15.1 Scope of work :

The work envisaged under these specifications refer to supplying and fixing in position false ceiling at any floor, any location and at any height.(all materials approved by NATIS)

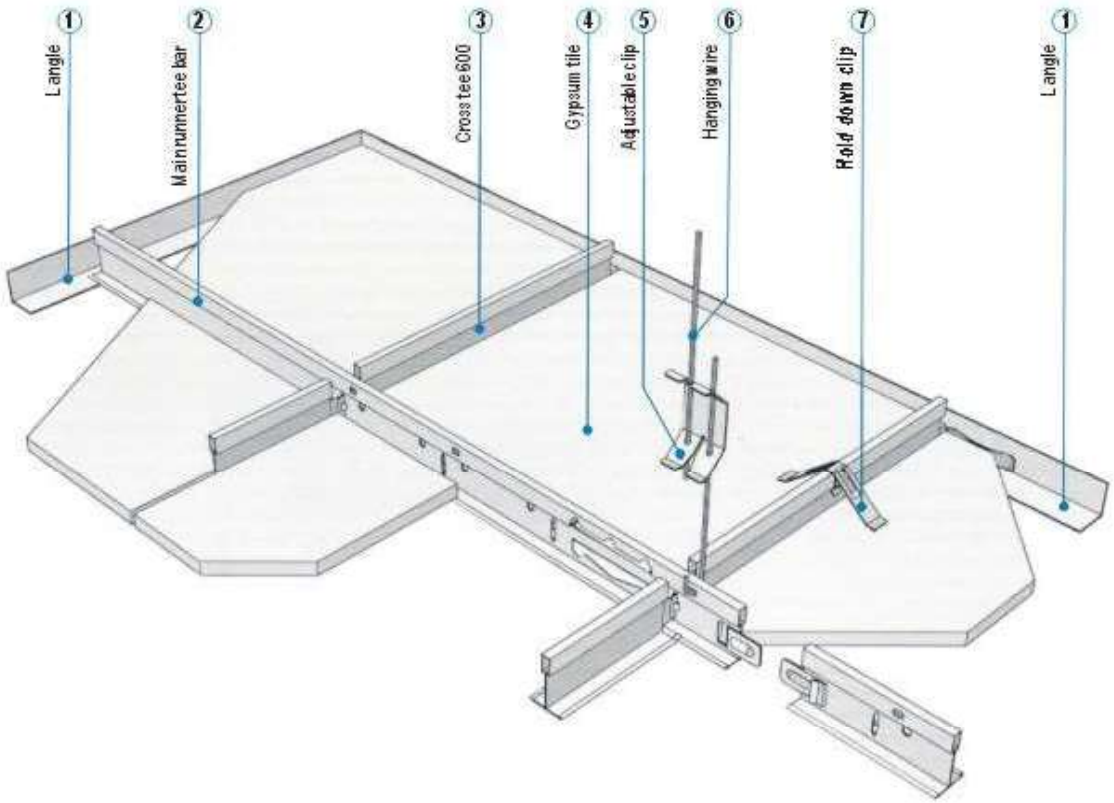
a) Providing and fixing suitable aluminium works and grids powder coated to match the colour including adjustable /suspended hangers.

b) Providing and fixing one layer of 10 mm thk fire proof acrylic aluminium laminated gypsum with fibre tiles , as per standard sizes.

c) Making necessary cut out for light fitting, A.C. grills diffusers and other necessities. The work shall include horizontal, vertical and inclined surfaces depending upon the various requirements.

15.2 Frame work :

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The system is a lay in system which uses acrylic aluminium laminated gypsum panels of size 600x600mm laid on exposed suspended metal ceiling tee bar grid system.

Main components and material specifications:

(1) L angle 24 x 24 x 3000 x 0. 35mm (or 0. 3mm) Galvanized steel with straight edge

(2) Main runner tee bar 38 x 24 x 3600 x 0. 35mm (or 0. 3mm) ; Made of galvanized steel with painted aluminium capping.

(3) Cross tee 600 Made of galvanized steel with painted aluminium capping.

(4) Gypsum tile 600 x 600mm, cutting size 595mm.

(5) Adjustable clip to adjust the ceiling level, made of tempered steel.

(6) Hanging wire 4mm galvanized wire.

(7) Hold down clip to fix gypsum tiles.

All the components shall be of standard approved make. The grid work system shall be suspended from the soffit of RCC ceiling using anchor fasteners of approved type and make and connected to soffit cleats and ceiling angle by means of necessary nuts, bolts and washers etc.

15.3 Acrylic aluminium laminated gypsum

Acrylic aluminium laminated gypsum board of plain series 10 mm manufactured by approved makers as prescribed by NATIS shall be used.. The longitudinal edge of the Acrylic aluminium laminated gypsum board shall be of tapered / square edges, so as to have flush joints while fixing. Handling and transporting of Acrylic aluminium laminated gypsum board shall be done carefully and as recommended by the manufacture's. The board should always be kept in a dry an d covered place sheltered from rain and to avoid dampness from flow, they should be supported on wooden battens which should not be more than 45cm apart on a flat surface. The material shall be stacked in piles of smaller heights and should not be stacked on edges. The board which have deformed due to poor stacking should not be used. Cutting of board should be made in faced side of the board by means of retractable knife or by using a normal saw and the edges of the boards shall be planned using proper files.

15.4 Finishing materials:

All jointing compounds, paper tapes, primer and paints shall be with materials manufactured / recommended by EIC.

15.5 Insulation :

Perimeter channels are leveled at the required position of the finished ceiling line and fixed to the wall with the screws and nylong plugs. The remaining grid component are installed to form a regular grid suspended from the soffit of RCC slab using soffit cleats ceiling angle and anchor fasteners as specified. Extra frame for various cutouts of different shapes, light fittings, AC grills, diffusers, smoke detectors and other necessities have to be provided frame work has to be made with perimeter channel of specified size and shall be suitably supported. The line and level of the grid work has to be checked for perfection and prior clearance of the grid work has to be checked for perfection and prior clearance of the grid work has to be obtained from the Engineer-in-charge before the placement of the board. The Gyp board are fixed with bound edges at right angles to ceiling section with all joints staggered/straight.. Details of A.C. grills, diffusers, recessed type electrical fittings to be erected in false ceiling will be as per specifications and as shown in drawings. The quantities indicated are approximate and is likely to vary depending upon the site conditions. Samples of light fittings will be as per the instructions and approval of EIC.

The scope of works includes fixing with screws, fixtures etc. the recessed electrical light fittings in the grid work of false ceiling/ boxing, Marine plywood (6mm thick)/special G.I. sections, if required, shall

also be provided at no extra cost. The rate quoted shall include all the above mentioned activities related to the completion of the above job.

15.6 Mode of measurement:

Measurements will be made on flat plan area basis in Sq.m calculated to 2 places of decimal. Length and breadth shall be measured corrected to a cm. No deduction shall be made for cutouts made for A.C. grills, diffusers, electrical fittings, smoke detectors etc.

16 FENCING WORK WITH BARBED WIRE, CHAIN LINK ETC.

The work shall generally be carried out as per these specifications, relevant drawings and as directed by the Engineer-in-charge.

16.1 M.S. Posts and Struts :

All the M.S. posts / struts shall be free from rust, scale, cracks, twists and other defects and shall be fabricated to the required shape and size out of the specified sections. The posts and struts shall be conforming to relevant specifications stipulated hereinbefore under relevant sections. All the posts an struts shall be of sizes and lengths as specified in the tender schedule. The exposed surfaces of the posts and struts shall be painted with two coats of approved primer.

16.2 R.C.C Posts and Struts :

All the posts and struts shall be of standard size as specified in schedule. These shall be coasted on suitable places/platforms in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm. nominal size) as per relevant specifications stipulated hereinbefore. The reinforcement shall be provided as hereinbefore under relevant sections. To posts and struts shall be free from honeycombing, cracks and other defects. After casting, the posts / struts shall be left at the same place and cured for a minimum period of 7 days. After 7 days curing the same shall be shifted to a leveled ground and stacked for further curing for 14 days. After 21 days of curing only, the posts/ struts shall be transported to work site without any damage, for fixing in position.

16.3 Spacing of the Posts and Struts :

The spacing of posts shall be as directed by the Engineer-in-charge, to suit the dimensions of the area to be fenced. E very 10th posts, last but one end posts, corner posts, and posts where the level of fencing changes in steps and end post when the fencing changes its direction shall be strutted on both dies or as directed by the Engineer-in-charges. End posts where barbed wire fencing is discontinued shall be strutted on one side only.

18.4 Fixing of M.S. / R.C.C. Posts and Struts :

Pits of size mentioned in the drawings, shall first be excavated centrally in the direction of proposed fencing work, true to line and level to receive the posts. In case of struts, the pits shall be so excavated, as to receive minimum 15cm. concrete cover at any point of the struts to suit its inclination or as shown in the drawing. The pits shall be filled with a layer of 15cm. thick cement concrete of specified mix. The posts and struts shall then be placed in the pits, the posts projecting to the specified height above ground level, true to line, plumb and position, by providing adequate supports temporarily, and cement concrete of specified mix, shall then be filled in so that the posts are embedded in cement concrete blocks of specified sizes. The concrete in foundation shall be watered for atleast 7 days to ensure proper curing.

16.5 Barbed Wire :

The barbed wire shall be of M.S. or G.I. as specified and it shall generally conform to I.S. 278-1978. The base metal of the line and point wire shall be of good commercial quality mild steel. The line and point wire shall be circular in section, free from scales and other defects and shall be uniformly galvanized if specified. The line wire shall be in continuous lengths and shall generally be free from signs of welds. It shall be able to withstand wrapping and unwrapping 8 turns round its diameter. The barbed wire shall consist of two splices per reel. The barbed wire shall be formed by twisting two lines wires one containing the barbs. The barbed wire and its weight shall be followed as per standards. The barbs shall carry four points and shall be formed by twisting tow point wires, each two turns, tightly round one line wire, making altogether 4 (four) complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13mm and not more than 18mm. The points shall be sharp and well pointed. Barbed spacing shall be followed as per standards. Wherever required for every 50 reels or part thereof, samples of the barbed wire and the individual line wires shall be put to tensile test and in case of failure to conform to tensile properties as per standards, two additional tests of each kind shall be made on the samples cut from other reels. On the results of these additional tests, the whole or portion of the barbed wire shall be accepted or discarded as the case may be.

16.6 Fixing of Barbed Wire :

The barbed wire shall be stretched and fixed in number of rows and two diagonals as specified. The bottom row shall be 140mm above ground and the rest at 125 mm or at given spacing as per drawing. The diagonals shall be stretched between adjacent posts from top wire of one post to the bottom wire of the 2nd post. The diagonal wires will be interwoven with horizontal wires by fixing the odd rows of wires, then the diagonal cross wires and lastly the even rows of wires. The jointing of the barbed wire in between the posts shall not be permitted. Necessary holes should be tapped in the posts and the barbed wire shall be fixed in position by means of "U" clamps or bolts and nuts as specified in drawings. In case of fixing with "U" clamps, the legs of the "U" clamps passing through the 10mm dia hole in the RCC post to hold barbed wire shall be turned up and down to get an overlap of 25mm on the face of RCC post. Turn buckles and straining bolts shall be used at the end posts if specified.

16.7 Mode of Measurement :

The work shall be measured in running metre length of fencing correct to a centimetre for the finished work, from center to center of the posts. The rate shall include the cost of labor and material involved in all the operations described above including the cost of barbed wire, turn buckle, straining bolts, bolts and the nuts / U clamps including excavation and foundation concrete or as specified in item description for the work.

16.8 Chain Link :

The chain link shall be of approved manufacture and of correct size, gauge etc. It shall be of M.S. or G.I. as specified of approved manufacture and of required size, gauge etc. The base materials of the wire shall be of good commercial quality mild steel. The wire shall be circular in section, free from rust, scale, cuts, welds and together defects and shall be uniformly galvanized if specified.

16.9 Fixing of the Chain Link Fencing to MS or RCC post:

The chain link of specified height of fencing shall be fixed first to the end post with necessary G.I. approved type U clamps threaded t both the ends and G.I. nut, bolts, washers etc. and with 6 mm dia full height M.S. /G.I. anchor bar. After fixing the chain link at the end post, it shall be stretched tightly and fixed to next post one after the other by the above mentioned clamps and bars etc. leaving 50 mm clearance from the ground and 20mm clearance in the case of concrete coping at bottom to avoid

rusting. The point at the change in level of the fencing. top/bottom, necessary links shall be adjusted suitably as per the manufacturers specification or as directed by the Engineer-in-charge. The entire link fence shall be painted with two coats of synthetic enamel paint of approved make and shade over a coat of approved primer or as specified in the item / drawing.

16.10 Measurement :

The work shall be measured in running metre length of fencing correct to a centimetre for the finished work from centre to center of the posts. The rate shall include the cost of labor and material involved in all the operation described above including the cost of barbed wire, turn buckle, straining bolts and bolts and the nuts / U clamps, 6mm dia M.S. / GI anchor bar etc. including excavation and foundation concrete or as specified in item description for the work.

17.OVER HEAD SLIDING DOOR- AUTOMATIC

Overhead sliding door (make DITECH S.p.A) automatic version consisting of a heavy duty **DOD 14** single-phase 230 V -3 A irreversible electromechanical actuator to be axially fitted on the spring shaft with the following features:
The door consists of:

1 PANEL

The panel is 40mm thick and is supplied in two different heights: 500 and 610mm and is made of galvanized steel double wall manufactured with the sendzimir procedure. Then treated with primer and polyester resin paint and subject to a further treatment which ensures a high surface strength. The finish on the outside of the sheet metal has a streaked effect whilst the finish on the inside of the sheet metal as an embossed orange peel effect; the external side of the panel is made of horizontal louvers featuring a unique design (double tilting) with a100mm pitch.

2 INSULATION

The insulation fitted to the panels is made of 40kg/m2 density, self-extinguishing Class B2, CFCs-free (chlorofluorocarbons) injected polyurethane foam.
The thermal transmittance value is the highest in the industry: K=1.51 W/m^{2}k.

-The seals supplied as standard are anti-ageing EPDM seals and are located in the following hinged points:

a) between panels seal
b) lower doorstop lip seal
c) upper doorstop finned seal fitted to seal the door near the lintel
d) vertical seals, fitted to the side uprights

3 SURROUND PROFILES

The sides of the door panels are fitted with galvanized, white powder coated steel profiles which serve the purpose of keeping the consecutive panels that make up the overhead door aligned, as well as holding against the insulated panel the support side hinge for the sliding rollers.

In the bottom section of the first panel a hideaway seal-holder aluminum profile is fitted, whilst the upper section of the last panel is enclosed in a back painted aluminum profile which acts as holder for the closure lip seal.

4 GUIDES AND SLIDING SYTEMS

The guides are made of galvanized cold profiled sheet metal suitably shaped to hold the side rollers. The joint between the guides that make up the door is spot-welded and its size is calculated according to the door dimensions and sliding unit type. The sliding operation of the panels inside the guides is ensured by silent operation rollers fitted with very strong plastic wheels with radial ball bearings.

5 SPRINGS AND LIFTING CABLES

The suitably loaded torsion springs are made of a steel cable and are located inside the upper guide section, on a horizontal shaft directly connected with the cable winder pulleys made of die-cast aluminium and fitted with helicoidal slots which hold the multiwire steel cables used to lift the door.

6 SAFETY DEVICES

The fully certified safety devices are fitted as standard on all doors and will operate in the following cases, in order to avoid the covering from accidentally falling:

a) In case of traction cable breakage
b) In case of torsion spring breakage

7 Main Features

- **Lisbon automatic door fitted with:**
  - Dod 14 230 V heavy-duty use gear motor
  - External plastic casing painted
  - Cable release for manual operation and provision for a remote handle release
  - Motor self protected by an internal temperature probe
  - Integrated electric brake and internal rotary mechanical stop
  - The drive shaft is suitable for the following installation types:
    - LSD – axial mounting
    - LSDR – chain driven mounting

- Open /close selector switches in double insulated enclosure, complete with 10m cable and EU industrial plug for connection to the gear motor
- Latched operation

8 TECHNICAL SPECIFICATIONS:

DESCRIPTION	
Electromechanical actuators	**DOD 14**
Duty Class	4 – heavy duty
Power supply	230V~/50Hz
Insulation class	Class 1
Input	3 A
Torque/Thrust	60 Nm
Drive shaft rpm	22 RPM
Release for manual opening	Hand crank
Operating temperature	-20°C/+55°C
Protect rating	IP 54
Product dimensions	135 X 264 X 350
Open-close control	Pre wired switch
Control panel	–

9 OPTIONAL ACCESSORIES:

- Push Button
- Additional Pair of photocells
- Additional transmitter
- Galvanized steel internal lock bolt
- Proximate reader & control system

10. MOTORIZED SLIDING DOORS

Single leaf heavy sliding doors made from 22 g GI sheets on both sides with stiffeners and channels, PUF insulation, top and bottom rails and rollers, handles, hold, fasts, one cote of red oxide.

2. Automatic sliding door operator over 60H with complete sliding mechanism for heavy industrial sliding door with back up battery

Description	Over 60H
Application	Electro mechanical actuator
Max capacity	800kg (1 wing)
Duty	Heavy
Intermittence	S3=80%
Power supply	24V DC
Current	16A
Motor power	200W
Operation temperature	-15 c/+50 c

11 SALIENT FEATURES

- Stock managed by encoder providing for automatic slowdown at end of stroke
- Automation of very long leaves up to 9.0mt
- Perfectly noise less sliding, thanks to its rubber belt
- Trolleys with strength and nylon wheels to ensure long durable
- Sturdy fitting bracts for tracks specially engineer to allow most accurate adjustments
- Wide range of accessories, which allow easy installation and adjustment to either new or pre exceeding
- Elegant and functional aluminium extrusion cover it protects the actuator and allows easy inspection

12 ACCESSORIES

- Pair of photocells
- Electric switch (PSC) with galvanized chain
- Additional transmitter
- Voltage stabilizer (single phase)
- Proximity reader with control device

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in
website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Technical Conditions of Contract (TCC)

The Technical Conditions of Contract contains the following Sections:

Section 10	–	Technical Specifications Electrical Works

TCC Electrical works

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section 10 - TECHNICAL SPECIFIATION

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

I. Part 2- TCC – Electrical works

CHNICAL SPECIFICATIONS ELECTRICAL WORKS

1. MEDIUM VOLTAGE 1.1 KV GRADE XLPE/PVC CABLES

1.1 GENERAL

The MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, Specifications, relevant Standard Specifications and cable manufacturer's instruction.

1.2 MATERIAL

The MV cables shall be cross linked polyethylene (XLPE) insulated PVC sheathed of 1100 volts grade as asked for in the schedule of quantities. All power cables shall be with aluminium conductor and control cables shall be with copper conductor as specified in the Bill of Quantities.

1.2.1 SPECIFICATIONS OF PVC INSULATED ALUMINIUM / COPPER CABLE SHALL BE AS FOLLOWS:

a Conductor

Stranded compacted circular conductor shall be of electrical grade high conductivity aluminium/ copper conductor shall be of armoured / unarmoured as specified in the BOQ as per IS 8130 / 84.

b. Insulation

The insulation shall be compounded PVC, application shall be by extrusion process insulation type C (85 deg.C) confirming to IS 5831-1984. The thickness of insulation will be as per the relevant codes.

c. Laying-up

Insulated conductors of multi core cables shall be with thermoplastic fillers in the interstices. The phase identification of cores shall be by colored strips.

d. Inner Sheath

Cores shall be surrounded either by a wrapped or an extruded

PVC sheath. The thickness of the inner – sheath shall be as per

relevant codes.

e. Armouring

The armouring shall be provided over the inner sheath.

Single core cable shall have non-magnetic armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip armouring. Steel wires and strips for armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath

Single and multi core cables are provided with an extruded PVC outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer-sheath shall confirm to Type ST1 of IS 5831. The colour of the outer sheath shall be black.

1.2.2 SPECIFICATIONS FOR XLPE ALUMINIUM/ COPPER CABLE SHALL BE AS FOLLOWS:

a Conductor

Stranded compacted circular conductor shall be of electrical grade high conductivity aluminum / copper conductor per IS 8130/84.

b. Insulation

The insulation shall be of natural unfilled chemically cross linked polyethylene conforming to IS 7098. The thickness of insulation shall be as per the relevant codes.

c. Laying-up

Insulated conductors of multi core cables shall be with plastic fibre in the interstices. The phase identification of cores shall be by colored strips.

d. Inner Sheath

The cores shall be surrounded by either a wrapped or by an extruded PVC sheath. The thickness of the inner sheath shall be as indicated in the relevant codes.

e. Armouring

The armouring shall be provided over the inner sheath.

Single core cable shall have non-magnetic armouring. Multi core cables shall have either galvanized round steel wires or flat steel strip. Steel wires and strips for armouring confirm to IS:3975. The direction of lay of armouring shall be opposite to that of cores.

f. Outer Sheath

Single and multi core cables are provided with an extruded PVC outer-sheath. The thickness of the sheath shall be as per IS:1554-1988. The PVC compound for the outer-sheath shall confirm to Type ST2 of IS 5831. The colour of the outer sheath shall be black.

1.3 INSPECTION

All cables shall be inspected by the contractor upon receipt at site and checked for any damage during transit.

1.4 JOINTS IN CABLES

The Contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoidance of cable jointing. This apportioning shall be got approved by the Owner's site representative before the cables are cut to lengths. Where joints are unavoidable heat shrinkable type joints shall be made. The location of such joints shall be got approved from the Owner's site representative and shall be identified through a marker.

1.5 JOINTING BOXES FOR CABLES

Cable joint boxes shall be installed with heat shrinkable sleeve and of appropriate size, suitable for XLPE armoured cables of particular voltage rating.

1.6 JOINTING OF CABLES

All cable joints shall be made in suitable, approved cable joint boxes and the filling in of compound shall be done in accordance with manufactures' instructions and in an approved manner. All straight joints shall be done in epoxy mould boxes with epoxy resin.

All cables shall be joined colour to colour and tested for continuity and insulation resistance before jointing commence. The seals of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged. The conductors shall be efficiently insulated with high voltage insulating tape and by using

of spreaders of approved size and pattern. The joints shall be completely topped up with epoxy compound so as to ensure that the box is properly filled.

1.7 CABLE TERMINATIONS

Cable termination shall be done in cable terminal box using crimping sockets and proper size of glands of double compression type with earthing facility.

1.8 BONDING OF CABLES

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armour clamp and gland. The clamps must grip the armouring firmly to the gland or casing, so that no undue stress is passed on to the cable conductors.

1.9 LAYING OF CABLES ON CABLE TRAYS

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks. The relative position of the cables, laid on the cable tray shall be preserved and the cables shall not cross each other. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers. All cables shall be laid with minimum one diameter gap and shall be clamped at every metre to the cable tray and shall be tagged for identification with aluminium tag and clamped properly. Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings. All cable shall be identified by embossing on the tag the size of the cable, place of origin and termination.

All cables passing through holes in floor or walls shall be sealed with fire retardant Sealant and shall be painted with fire retardant paint upto one meter on all joints, terminations and both sides of the wall crossings by "VIPER CABLE RETARD".

1.9.1 LAYING OF CABLES IN GROUND

The minimum width of trench for laying single cable shall be minimum 350 mm. Where more than one cable is to be laid in horizontal formation, the width of the trench shall be workout by providing 200 mm gap between the cables, except where otherwise specified. There shall be clearance of 150 mm between the end cable and the side wall of the trench. The minimum dept of the cable trench shall not be less than 750 mm for single layer of cables. When the cables are laid in more than one tier the depth of the trench shall be increased by 300 mm for each additional tier.

1.9.2 EXCAVATION OF TRENCHES:

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided. Where gradients and changes in depth are unavoidable, these shall be gradual. The excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench. The bottom of the trench shall be level and free from stone, brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 100 mm in depth. Prior to laying of cables, the cores shall be tested for continuity and insulation resistance. The cable drum shall be properly mounted on jacks, at a suitable location, making sure that the spindle, jack etc. are strong enough to carry the weight of the drum and the spindle is horizontal.

Cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire drum length shall be laid in one stretch. However, where this is not possible the remainder of the cable shall be removed by `Flaking' i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted off the rollers beginning from one end by helpers standing about 10 meters apart and laid in a reasonably straight line. Cable laid in trenches in a single tier formation shall have a cover of clean, dry sand of not less than 150 mm. above the base cushion of sand before the protective cover is laid. In the case of vertical multi-tier formation after the first cable has been laid, a sand cushion of 300 mm shall be provided over the initial bed before the second tier is laid. Finally the cables shall be protected by second class bricks before back filling the trench.

1.9.3 BACK FILLING:

The trenches shall be back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 300 mm. Unless otherwise specified, a crown of earth not less than 50 mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence.

1.10 CABLES INSIDE BUILDING

Cables inside buildings shall be laid on the cable trays. All cables passing through walls shall run through GI Pipes of adequate diameter 50 mm apart maintaining the relative position over the entire length.

1.11 CABLE TRAYS

Cable Trays shall be Galvanized and factory fabricated out of MS channels, angle iron, tee, bends, sections, flats and perforated sheet for different loads and number and size of cables as given below :

Cable trays shall be galvanized as per Specification given elsewhere.

a. 1500 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 3 No. 40 x 40 x 5 mm angle 1000 mm C/C (2 No. vertical & 1 No. horizontal)

b. 1200 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 3 No. 40 x 40 x 5 mm angle 1000 mm C/C (2 No. horizontal & 1 No. vertical)

c. 1000 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 20 x 40 x 20 x 3 mm 250 mm C/C
Suspenders 3 No. 40 x 40 x 5 mm angle 1500 mm C/C (2 No. horizontal & 1 No. vertical)

d. 750 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 3 No. 32 x 32 x 4 mm angle 1800 mm C/C (2 No. horizontal & 1 No. vertical)

e. 600 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 3 Nos. 32 x 32 x 4 mm angle 1800 mm C/C (2 No. horizontal & 1 No. vertical)

f. 450 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C
Suspenders 3 No. 25 x 25 x 4 mm angle 1800 mm C/C (2 No. horizontal & 1 No. vertical)

g. Supply and fixing of perforated type cable trays of the following sizes of pre- galvanized iron.

i. 300 x 40 x 40 x 2 mm thick
ii. 150 x 40 x 40 x 2 mm thick

Note : *Suitable length of 8 mm dia GI rod suspenders at 1800 mm intervals shall be included in the item for perforated type cable tray.*

1.12 SPECIFICATION FOR HOT DIP GALVANIZING PROCESS FOR MILD STEEL USED FOR EARTHING, CABLE TRAYS OR JUNCTION BOXES FOR ELECTRICAL INSTALLATION

1.12.1 GENERAL REQUIREMENTS

a. Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209- 1992.

b. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.

Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing.

1.13 TESTING OF CABLES

Cables shall be tested at works for the following tests before being dispatched to site by the project team.

a. Insulation Resistance Test.
b. Continuity resistance test.
c. Sheathing continuity test.
d. Earth test. (in armoured cables)
e. Hi Pot Test.

Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Owner's site representative.

a. Insulation Resistance Test (Sectional and overall)

b. Continuity resistance test.
c. Sheathing continuity test.
d. Earth test.

All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Owner's site representative.

2. MAIN DISTRIBUTION / SUB DISTRIBUTION PANELS

Main Distribution Panels, Sub-Distribution Panelsshall be suitable for operation on 3 Phase/single phase, 415/240 volts, 50 cycles, 4 wire system, neutral grounded at transformer. All Distribution panels shall be CPRI approved and manufactured by a approved manufacturer.

Distribution panels shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-13947-1993.

2.1 CONSTRUCTION FEATURES

Distribution panels shall be 2 mm thick sheet steel cabinet for indoor installation, dead front, floor mounting/wall mounting type and shall be form 3b construction. The Distribution panels shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket, padlocking arrangement and bolted back. All removable/ hinged doors and covers shall be grounded by flexible standard connectors. Distribution panel shall be suitable for the climatic conditions as specified in Special Conditions. Steel sheets used in the construction of Distribution panels shall be 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100 V AC. All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self threading screws shall not be used in the construction of Distribution panels. A base channel of 75mmx40mmx5mm thick shall be provided at the bottom for floor mounted panels. Minimum clearance of 275 mm shall be provided between the floor of Distribution panels and the lowest unit.

Distribution panels shall be of adequate size with a provision of spare switchgear as indicated on the Single Line Diagram. Switches shall be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Distribution panels in conformity with the location of cable/conduit connections. Removable sheet steel plates shall be provided at the top to make holes for additional cable entry at site if required.

Every cabinet shall be provided with Trifoliate or engraved metal name plates. All panels shall be provided with circuit diagram engraved on PVC sheet. All live accessible connections shall be shrouded and shall be finger touch proof and minimum clearance between phase and earth shall be 20 mm and phase to phase shall be 25 mm.

2.2 BUS BAR CONNECTIONS

Bus bar and interconnections shall be of high conductivity electrolytic grade aluminium / copper as indicated in the bill of quantities complying with requirement of IS : 5082 – 1981 and of rectangular cross section suitable for carrying the rated full load current and short circuit current and shall be extendable on either side. Bus bars and interconnections shall be insulated with heat shrinkable sleeve of 1.1 KV grade and shall be colour coded. Bus bars shall be supported on glass fiber reinforced thermosetting plastic insulated supports at regular intervals to withstand the force arising from in case of short circuit in the system. All bus bars shall be provided in a separate chamber and all connections shall be done by bolting.

Additional cross sectional area to be added to the bus bar to compensate for the holes. All connections between bus bars and breakers shall be through solid copper / aluminium strips of proper size to carry full rated current and insulated with insulating sleeves.

2.2.1 TEMPERATURE - RISE LIMIT

Unless otherwise specified, in the case of external surface of enclosures of bus bar trunking system which shall be accessible but do not need to be touched during normal operation, an increase in the temperature rise limits of 25° C above ambient temperature shall be permissible for metal surface and of 15° C above ambient temperature for insulating surfaces as per IS 8623(Part-2) 1993.

All main distribution panels and sub distribution panels shall be provided with MCCB of appropriate capacity as per Single Line Diagram. All final Distribution boards shall be provided with Miniature Circuit Breakers. Final Single Phase Distribution boards shall be connected to the incoming supply through double pole MCB units & earth leakage circuit breakers. All wiring for final distribution boards shall be concealed behind 5 mm thick bakelite sheet or M S sheet cover. All Distribution boards shall be completely factory wired, ready for connection. All the terminals shall be of proper current rating and sized to suit individual feeder requirements. Each circuit shall be clearly numbered from left to right to correspond with wiring diagram. All the switches and circuits shall be distinctly marked with a small description of the service installed. Continuous earth bus sized for prospective fault current shall be provided with arrangement for connecting to station earth at two points. Hinged doors/ frames shall be connected to earth through adequately sized flexible braids.

2.3 CABLE COMPARTMENTS

Cable compartment of adequate size shall be provided in the Distribution panels for easy clamping of all incoming and outgoing cables entering from the top/bottom. Adequate supports shall be provided in cable compartment to support cables.

2.5 MOULDED CASE CIRCUIT BREAKER (MCCB)

The MCCB should be current limiting type with trip time of less than 10 msec under short circuit conditions. The MCCB should be either 3 or 4 poles as specified in BOQ. MCCB shall comply with the requirements of the relevant standards IS13947 – Part 2/IEC 60947-2 and should have test certificates for Breaking capacities from independent test authorities CPRI / ERDA or any accredited international lab.

MCCB shall comprise of Quick Make -break switching mechanism, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses

The breaking capacity of MCCB shall be as specified in the schedule of quantities. The rated service breaking capacity (Ics) should be equal to rated ultimate breaking capacities (Icu). MCCBs for motor application should be selected in line with Type-2 Co-ordination as per IEC- 60947-2, 1989/IS 13947-2. The breaker as supplied with ROM should meet IP54 degree of protection.

a. Current Limiting & Coordination

The MCCB shall employ maintenance free minimum let-through energies and capable of achieving discrimination up to the full short circuit capacity of the downstream MCCB. **The manufacturer shall provide both the discrimination tables and let-through energy curves for all.**

Protection Functions

- MCCBs shall be equipped with Thermal-magnetic (thermal for overload and magnetic for short-circuit protection) trip units.

b. Testing

- Original test certificate of the MCCB as per IEC 60947-1 &2 or IS13947 shall be furnished.
- Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

c. Interlocking

Moulded, case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switch board.

i. Handle interlock to prevent unnecessary manipulations of the breaker.

ii. Door interlock to prevent the door being opened when the breaker is in ON position.

iii. Defeat-interlocking device to open the door even if the breaker is in ON position.

- The MCCB shall be current limiting type and comprise of quick make – Break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. All MCCBs rated 200 Amps and above shall have adjustable over load & short circuit pick-up in Thermal magnetic Units.

- The trip command shall override all other commands.

2.6 MINIATURE CIRCUIT BREAKER (MCB)

Miniature Circuit Breaker shall comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be classified (B,C,D ref IS standard) as per their Tripping Characteristic curves defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.MCB shall ensure complete electrical isolation & downstream circuit or equipment when the MCB is switched OFF.

The housing shall be heat resistant and having high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar independent to the external operating handle.

2.6.1 COORDINATION STUDY IN LV NETWORK

LV Switchgear Manufacturer shall submit coordinated & Discriminated solution for LV Network protection devices i.e. **ACB, MCCB, MPCB &** MCB for all Incoming and outgoing devices for all Panels/ DB`s as per BOQ with the help of published discrimination tables. Total discrimination shall be provided up to the short circuit breaking capacity of down stream circuit Breakers.

2.7 EARTHING

Earthing shall be provided as per IS:3043-1987.

2.8 PAINTING

All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivaiting (seven tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/outside shall be as per BOQ confirming to IS Code No.5.

2.9 LABELS

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

2.10 METERS

a. All voltmeters and indicating lamps shall be through MCB's.

b. Meters and indicating instruments shall be flush type.

c. All CT's connection for meters shall be through Test Terminal Block (TTB).

d. CT ratio and burdens shall be as specified on the Single line diagram.

2.11 CURRENT TRANSFORMERS

Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondaries for operation of associated metering.The CTs shall confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 and measurement CTs shall be of accuracy class I.

2.12 POTENTIAL FREE CONTACTS

Potential free contacts shall be provided for connection to Building Automation System in panels indicated in Schedule of Quantities.

2.13 INDICATING PANEL

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/MPCB as per relevant fault level and toggle switch.

2.14 SELECTOR SWITCH

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

2.15 CONTACTOR

Contactor shall be built into a high strength thermoplastic body and shall be provided with an are shield for quick are extinguishing. Silver alloy tips shall be provided to ensure a high degree of reliability and endurance under continuous operation. The magnet system shall consist of laminated yoke and armature to ensure clean operation without hum or chatter.

Starters contactors shall have 3 main and 2 No. NO / NC auxiliary contacts and shall be air break type suitable for making and breaking contact at minimum power factor of 0.35. For design consideration of contactors the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of Star Delta Starters. The insulation for contactor coils shall be of Class "E".

Coil shall be tape wound vacuum impregnated and shall be housed in a thermostatic bobbin, suitable for tropical conditions and shall withstand voltage fluctuations. Coil shall be suitable for 240 / 415 + 10% volts, 50 cycles AC supply.

2.16 THERMAL OVERLOAD RELAY

Thermal overload relay shall have built in phase failure sensitive tripping mechanism to prevent against single phasing. The relay shall operate on the differential system of protection to safeguard against three phase overload, single phasing and unbalanced voltage conditions.

Auto-manual conversion facility shall be provided to convert from auto-reset mode to manual reset mode and vice-versa at site. Ambient temperature compensation shall be provided for variation in ambient temperature from –5deg C + 55 deg C.

All overload relays shall be of three element, positive acting ambient temperature compensated time logged thermal over load relays with adjustable setting. Relays shall be directly connected for motors up to 35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacity.

2.17 TIME DELAY RELAYS

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one set of auxiliary contacts for indicating lamp connection.

2.18 TOGGLE SWITCH

Toggle switches, where called for in Schedule of Quantities, shall be in conformity with relevant IS codes an shall be of 5 amps rating.

2.19 PUSH BUTTON STATIONS

Push button shall be provided for manual starting and stopping of motors / equipment "Green" and "Red" colour push buttons shall be provided for 'Starting' and 'Stopping' operations. 'Start' or 'Stop' indicating flaps shall be provided for push buttons. Push buttons shall be suitable for panel mounting and accessible from front without opening door, Lock lever shall be provided for 'Stop' push buttons. The push button contacts shall be suitable for 6 amps current capacity.

2.20 PROTECTION THROUGH RELAYS

2.20.1 Following protection shall be provided through relay both for the stator side and the rotor side:

i. a. Voltage restrained over current protection (50V/51V)

b. Thermal overload (49)

c. Under / Over Voltage (27 / 59)

ii. Differential Protection (87 G)

Relay shall be percentage biased, low impedance differential relay with following features

- Relay shall provide percentage biased differential protection with dual slope characteristics.
- Relay shall have REF protection element (87 N), which shall monitor the generator for internal earth faults. It shall have a built-in O/C protection, as a backup.

2.20.2 In addition to above, following relays to be provided

- Master Trip Relay
- Trip Circuit Supervision Relay
- Engine Cranking Relay

2.21 WIRING

In wiring a distribution panel it shall be insured that total load of various distribution

panel and/or consuming devices is divided evenly between the phases and number of ways as per Owners drawing.

3. EARTHING

3.1 EARTHING

The system shall be TNS with four wire supply system (R,Y,B,N and 2 Nos. E) brought from the main L T Panel. All the non-current carrying metal parts of electrical installation and all metal conduits trucking, cable sheaths, switchgear, distribution panels, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All metal work such as pipe lines, ducts, cable trays, stair case railing etc shall be bonded to earth.

All earthing shall be in conformity with IS:3043 1987, and the basic system of earthing shall be TNS.

3.2 EARTHING CONDUCTORS

Earthing conductors shall be of copper / GI as mentioned in schedule of quantities and shall be protected against mechanical injury and corrosion.

3.3 SIZING OF EARTHING CONDUCTORS

The cross sectional area of earthing conductor shall not be smaller than half of the largest current carrying conductor subject to an upper limit of 80 Sq.mm. If the area of the largest current carrying conductor or bus bar exceeds 160 sq.mm then two or more earthing conductors shall be used in parallel, to provide at least half the cross sectional area of the current carrying conductor or bus bars. All fixtures, outlet boxes, junction boxes and power circuits upto 15 amps shall be earthed with PVC insulated copper wire.

All 3 phase switches and distribution panels upto 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper / GI wires. All 3 phase switches and distribution panels upto 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper / GI wires. All switches, bus bar, ducts and distribution panels of rating 200 amps and above shall be earthed with minimum of 2 nos separate and independent 25 mm x 3 mm copper / GI tape.

3.4 CONNECTION OF EARTHING CONDUCTORS

Main earthing conductors shall be taken from the earth connections at the main L T panel to an earth electrode with which the connection is to be made. All joints in tapes shall be with four rivets and shall be brazed in case of copper and by welding bolting in case of GI, wires shall be connected with crimping lugs, all bolts shall have spring washers. Sub- mains earthing conductors shall run from the main distribution panel to the sub

distribution panel. Final distribution panel earthing conductors shall run from sub-distribution panel.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution panel. Metal

conduits, cable sheathing and armouring shall be earthed at the ends adjacent to distribution panel at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing. Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord. Switches, accessories, lighting fitting etc. which are rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

3.5 PROHIBITED CONNECTIONS

Neutral conductor, sprinkler pipes, or pipes conveying gas, water or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lightning protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system. The electrical resistance measured between earth connection at the main LT panel and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate or circuit breakers, and shall not exceed 1 ohm. All switches carrying medium voltage shall be connected with earth by two separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G I pipe of adequate size. The overlapping in strips at joints where required shall be minimum 75 mm. The joints shall be riveted and brazed in case of copper and by welding / bolting in case of GI in an approved manner. Sweated lugs of adequate capacity and size shall be used for termination of all conductor wires above 6 sq.mm size. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substances and properly tinned. Equipotential bonding of all metallic structures shall be done.

3.6 EARTHING

The following must always be ensured in earthing system.

- All earths must be interconnected. This includes transformer neutrals, Transformer body, HT Panels, LT Panels, lightning protection system earths, UPS earths etc and provision for interconnection with other services earthing grid etc. shall be made.

- Extraneous conductive parts such as gas pipes, other service pipes and

ducting risers and pipes of fire protection equipment and exposed metalic parts of the building structure.

3.7 The Contractor shall get the soil resistivity test done at his own cost of the area where earthing pits are to be located before starting the installation.

3.8 **RESISTANCE TO EARTH**

The resistance of earthing system shall not exceed 1 ohm.

3.9 **SPECIFICATION FOR HOT DIP GALVANIZING PROCESS FOR MILD STEEL USED FOR EARTHING FOR ELECTRICAL INSTALLATION**

3.9.1 GENERAL REQUIREMENTS

a. Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209- 1992.

b. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.

Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing. Jointing of earthing tape shall be by welding. All joints and cut ends shall be properly painted with aluminium paint.

Specific conditions, codes, List of vendors, quality Assurance Plan for Electrical works

1. GENERAL

These special conditions are intended to amplify the General Conditions of Contract, and shall be read in conjunction with the same. For any discrepancies between the General Conditions and these Special Conditions, the more stringent shall apply.

This tender shall act as a guide to the type of system desired for the project. The

specifications described in this tender are as per the 'Basis of Design' and are the minimum required from the tenderer. The features offered over and above those mentioned in the tender shall be given due credit.

Standard literature, not complying to the format and requirement of this tender, submitted by the contractor, shall not be considered or evaluated.

2. SCOPE OF WORK (SUPPLY, INSTALALTION, TESTING AND COMMISSIONING OF THE WORK AS PER BOQ IN ACCORDANCE TO TECHNICAL SPECIFICATION AND COMFORMING TO ELECTRICAL ACT).

The general character and the scope of work to be carried out under this contract is illustrated in Drawings, Specifications and Schedule of Quantities. The Tenderer shall carry out and complete the said work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the Owner's site representative. The tenderer shall furnish all labour, materials and equipment , as listed under Schedule of Quantities and specified otherwise, transportation and incidental necessary for supply, installation, testing and commissioning of the complete electrical system as described in the Specifications and as shown on the drawings. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/Documents as being furnished or installed, but which are necessary and customary to be performed under this contract. The electrical system shall comprise of following:

a. All conduit work including junction boxes, outlet boxes and wiring for lighting and power

b. Switches, plug sockets, cover plates and other wiring accessories.

c. Cables (HT / LT), Mains and Sub-Mains.

d. LT Panel, Main Distribution / Sub distribution panels & Capacitor Panels.

e. Final Distribution panels.

f. Cables on cable trays and / or within suspended ceiling spaces including installation, cable trays, hangers, supports, cable terminations and all fixing accessories.

g. Earthing (Grounding) System.

h. Supply and Installation of Lighting Fixtures .

i. Supply and installation of Fire Detection & Alarm System

3. PROJECT EXECUTION, MANAGEMENT & COORDINATION

The Contractor shall ensure that senior planning and erection personnel from his organisation are assigned exclusively for this project. They shall have adequate experience in this type of installation. The Contractor shall appoint one Project Manager holding senior management position in the organization. He shall be assisted on full time basis by a minimum of one erection engineers with minimum 5 years experience The entire staff shall be posted at site on full time basis.

The project management shall be through modern technique.

For quality control & monitoring of workmanship, contractor shall assign at least one full- time engineer who would be exclusively responsible for ensuring strict quality control, adherence to specifications and ensuring top class workmanship for the electrical installation.

The Contractor shall arrange to have mechanised & modern facilities of transporting material to place of installation for speedy execution of work.

It is understood that over and above normal project coordination, the Contractor shall ensure the overall compatibility of its systems with all applicable trades (i.e. Architectural, Structural, HVAC, Fire Protection, Plumbing, Telecommunications, Fire Alarm, Security, etc). The Contractor shall check all trade shop drawings to verify the space in which its equipment and materials will be installed to insure adequate headroom and access for maintenance is provided. Where space conditions appear to be inadequate, the Contractor shall notify the Owner prior to any installation work.

The electrical Contractor shall provide, in addition to drafting and engineering personnel, a Coordination Manager to act as the single point of contract for all coordination related activities. Electrical Coordination Manager in addition to the above shall be a dedicated Project Engineer to the coordination process with adequate experience in similar works.

3.1 The Contractor shall prepare large scale comprehensive coordinated CAD drawings in conjunction with all other specialty trades, indicating clearances with structural and architectural construction. All other Contractors shall overlay their work on these CAD drawings utilizing individual CAD layers to produce final coordinated CAD drawings clearing all interferences with all adjacent activities and structures. This includes backgrounds for all areas above and below raised floors as applicable.

3.2 All drawings and drawing layers shall be created in a format compatible with the owner's CAD system.

3.3 The Contractor shall coordinate with all trade drawings and specifications.

3.4 The Contractor will be responsible for providing its services as defined in the

drawing sequence below and shall attend all coordination meetings as scheduled by the Construction Manager.

3.5 In preparing the Shop Drawings, the Contractor will utilize a CAD document sheet of the same size as the Owner's Contract Drawings. The format should be similar and the lettering shall be at least one-eighth inch high.

3.6 Upon completion of the sheet metal drawings, the Contractor shall forward the CAD documents to the next Contractor who shall super-impose its equipment and piping utilizing a different CAD layer. The Contractor shall prepare CAD backgrounds in all areas for coordination regardless of the need for sheet metal in that area. In rotation, the HVAC, Plumbing, Fire Protection, Electrical (to include lighting), Telecommunications (as required), Fire Alarm (as required), Elevator (as required) and Security Contractor (as required) shall super-impose their work on the CAD document using individual layers. Each trade shall have a distinctive CAD layer and color. (Note: All distribution and routing of coordination documents is to be accomplished via electronic file transfer or by the messenger (at contractor's expense) of the disks containing the appropriate files provided by the Contractor who is distributing the files. Messenger costs are included in the Contract. At each transmission of drawings, the Construction Manager shall be forwarded a copy of the corresponding transmittal.) After the last contractor has completed superimposing its work on the CAD document, a meeting will be held at which time all interferences between the various trades and the sequence of installation will be resolved. The electrical Contractor will bring to this meeting a color reproducible mylar of the composite drawings. The resulting changes will be noted on the drawings and all participants will sign the marked up coordinated drawing. Any and all overtime necessary for drafting, coordination, meetings, etc., to maintain the project schedule, is included.

3.7 After submission and approval of the coordination drawings, the Contractors will transfer to their Shop Drawings any changes made during coordination meetings which affect their work. Prior to submission for Approval, the Shop Drawings will indicate that they reflect the result of coordination between all trades and the date of coordination completion. Copies of the coordinated drawings must be distributed to all parties involved.

3.8 Should contractor install its work without coordination, and this work interferes with either this or another trade, it will be solely responsible for all changes (ie. costs to other trades should they be required to relocate) resulting from installing without coordination. Should there be interference in the field after coordination; the trades involved will be required to resolve the problem.

3.9 The Owner will not be responsible for costs incurred from the lack of coordination between the work of the trades.

4. BYE-LAWS AND REGULATIONS

The work shall be carried out to the satisfaction of the Owner's site representative and in accordance with the Specifications, Regulations of the Electric Supply Authority, Indian Electricity Rules and Regulations, latest Indian Standards.

Following codes shall be referred while finalizing the scheme :

A. National Fire Protection Association (NFPA) - USA :

1.	No. 70-90 or 70-93	National Electric Code (NEC)
2.	No. 72-1993	National Fire Alarm Code
3.	No. 101-91	Life Safety Code
4.	No. 92A	Practice for Smoke Control System
5.	No. 76	Telecommunication Facilities
6.	No. 318	Clean Room

Applications Underwriters laboratories Inc.

(UL) - USA :

1.	UL 50	Cabinets and Boxes
2.	UL 268	Smoke Detectors for Fire Protective Signaling Systems
3.	UL 864	Control Units for Fire Protective Signaling Systems
4.	UL 268A	Smoke Detectors for Duct Applications
5.	UL 521	Thermal Detectors for Fire Protective Signaling Systems
6.	UL 228	Door Closers-Holders for Fire Protective Signaling Systems
7.	UL 464	Audible Signaling Appliances
8.	UL 38	Manually Activated Signaling Boxes
9.	UL 346	Water flow Indicators for Fire Protective Signaling Systems

10.	UL 1481	Power Supplies for Fire Protective Signaling Systems
11.	UL 1076	Proprietary Burglar Alarm Units and Systems
12.	UL 1971	Visual Notification Appliances

Equivalent European standards shall be acceptable in lieu of UL standards.

C. National Building Code – 2005

D. Local Fire Codes

5. DRAWINGS

The Drawings which may be issued with tenders, are diagrammatic only and indicate arrangement of various systems and the extent of work covered in the contract. These Drawings indicate the points of supply and of termination of services and broadly suggest the routes to be followed. Under no circumstances shall dimensions be scaled from these Drawings. The architectural/ interiors drawings and details shall be examined for exact location of equipment, electrical points & fixtures.

The tenderer shall follow the tender drawings in preparation of his shop drawings, and for subsequent installation work. He shall check the drawings of other trades to verify spaces in which his work will be installed.

Maximum headroom and space conditions shall be maintained at all points. Where headroom appears inadequate, the tenderer shall notify the Architect / Consultant / Owner's site representative before proceeding with the installation. In case installation is carried out without notifying, the work shall be rejected and tenderer shall rectify the same at his own cost.

The tenderer shall examine all architectural, structural, plumbing, HVAC and other services drawings and check the built works before starting the work, report to the Owner's site representative any discrepancies and obtain clarification. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Architect/Consultant/ Owner's site representative without additional cost to the Owner's.

6. SPECIFICATIONS

The Specifications shall be considered as part of this contract. The Drawings indicate the extent and general arrangement of power distribution, location of lighting the fixtures, controlling switches, wiring system, cabling and earthing. These drawings are essentially diagrammatic. The Drawings indicate the point of termination of conduit runs and broadly suggest the routes to be followed. The work shall be installed as indicated on the Drawings. However, any change found essential to coordinate the installation of this work with other trades shall be made without any additional cost to

the Owner's. The data given herein and on the Drawings is as exact as could be secured, but its complete accuracy is not guaranteed. The drawings are for the guidance of the tenderer, exact locations, distances and levels shall be governed by the site conditions and the Architectural & Interior layouts.

7. SHOP DRAWINGS

7.1 All the shop drawings shall be prepared on computer through AutoCAD System based on Architectural Drawings, site measurements and Interior Designer's Drawings. Within eight weeks of the award of the contract, tenderer shall furnish, for the approval of the Architect/ Consultant, two sets of detailed shop drawings of all equipment and materials including layouts for all conduit layouts, distribution panels, switch boards, cabinets, special pull boxes, cable trays and any other requirement to be fabricated or purchased by the tenderer.

7.2 These shop drawings shall contain all information required to complete the Project as per specifications and as required by the Architect/Consultant/ Owner's site representative. These Drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other tenderers. Each shop drawing shall contain tabulation of all measurable items of equipment/materials/works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings.

Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer strictly from the manufacturers listed in Appendix-IV.

When the owner makes any amendments in the above drawings, the tenderer shall supply two fresh sets of drawings with the amendments duly incorporated along with check print, for approval. The tenderer shall submit further six sets of shop drawings to the Owner's site representative for the exclusive use by the Owner's site representative and all other agencies. No material or equipment may be delivered or installed at the job site until the tenderer has in his possession, the approved shop drawing for the particular material/ equipment/installation.

7.3 Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow owner ample time for scrutiny. No claims for extension of time shall be acceptable due to his failure to produce shop drawings at the right time, in accordance with the approved programme.

7.4 Manufacturers drawings, catalogues, pamphlets and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labelled, indicating the specific services for which material or

equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.

7.5 Samples of all materials like conduits, accessories, switches controls, control wires etc shall be submitted to the Owner's site representative prior to procurement. These will be submitted in two sets for approval and retention by Owner's site representative and shall be kept in their site office for reference and verification till the completion of the Project.

7.6 Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the tenderer of the responsibility or requirement to furnish material and perform work as required by the contract.

7.7 Where the tenderer proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, wiring or any other part of the mechanical, electrical or architectural layouts; all such re-design, and all new drawings and detailing required therefore, shall be prepared by the tenderer at his own expense and gotten approved by the Owner's site representative.

7.8 The tenderer shall extend full cooperation to HVAC and other engineering services tenderer in preparation of his coordinated services drawings. He shall issue floppies and hard prints of his shop drawings to HVAC and other engineering services tenderer well in advance to complete the co-ordinated services drawings in accordance with schedule prepared by the Owner's site representatives. Where the work of the tenderer has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Owner's site representative, the tenderer shall prepare composite working drawings and sections at a suitable scale, not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Tenderer installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the Owner's.

8. ACCESSIBILITY

The Tenderer shall verify the sufficiency of the size of the shaft openings, clearances in cavity walls and suspended ceilings for proper installation of his ducting and piping. His failure to communicate insufficiency of any of the above shall constitute his acceptance of sufficiency of the same. The Tenderer shall locate all equipment which must be serviced, operated or maintained in fully accessible positions. The exact location

and size of all access panels, requiring attendance, shall be finalized and communicated in sufficient time, to be provided in the normal course of work. Failing this, the Tenderer shall make all the necessary repairs and changes at his own expense. Access panel shall be standardized for each piece of equipment / device / accessory and shall be clearly nomenclature / marked.

9. MATERIALS AND EQUIPMENT

All materials and equipment shall conform to the relevant Indian Standards and shall be of the approved make and design. Makes shall be strictly in conformity with list of approved manufacturers as per Appendix - III.

The Tenderer shall be responsible for the safe custody of all materials and shall insure them against theft or damage in handling or storage etc. A list of items of materials and equipment, together with a sample of each shall be submitted to the Owner's site representative within 15 days of the award of the contract. Any item which is proposed as a substitute, the tenderer shall state the credit, if any, due to the Owner's. In the event the substitution is approved, all changes and substitutions shall be requested in writing and approvals obtained in writing from the Owner's site representative.

10. MANUFACTURERS INSTRUCTIONS

Where manufacturer has furnished specific instructions, relating to the material and equipment used in this project, covering points not specifically mentioned in these documents, such instructions shall be followed in all cases.

11. COMPLETION CERTIFICATE

On completion of the electrical installation a certificate shall be furnished by the Tenderer countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local, state/central govt./ municipal / fire authorities concerned.

12. INSPECTION AND TESTING

The Owner's may carry out inspection and testing at manufacturer's works for this contract. No equipment shall be delivered without prior written confirmation from Engineer. All expenses related to testing shall be to tenderer account. Tests on site of completed works shall demonstrate the following among other things.

That the equipment installed complies with specification in all respect and is of the correct rating for the duty and site conditions.

That all items operate efficiently and quietly to meet the specified requirements.

That all circuits are correctly protected and that protective devices are properly co-ordinated.

That all non-current carrying metal parts are properly and safely grounded in accordance with the specification and appropriate Codes of Practice.

The tenderer shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the Owner's and shall provide test certificate signed by a property authorised person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the Owner's at tenderer's expenses unless otherwise called for.

If it is proved that the installation or part thereof is not satisfactorily carried out then the tenderer shall be liable for the rectification and resetting of the same as called for by the Owner's decision as to what constitutes a satisfactory test shall be final.

The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere. All tests shall be carried out by a test house approved by the Owner's.

Tenderer / Contractor is responsible for satisfactory operation of entire electrical installation detailed in this tender although item may have been inspected at manufacturer's works.

13. COMPLETION DRAWINGS

Upon the completion of the work and before issuance of certificate of virtual completion the tenderer shall submit to the Owner's's site representative four sets of layout drawings in progressive manner for individual systems drawn at approved scale indicating the complete wiring system as installed. Drawings shall be prepared on AUTO-CAD (latest version). Along with the hard copies, the tenderer shall submit copies of all drawings on floppies/CD. These drawings must provide:

a. Panel layouts, as installed single line diagram & control wiring.

b. Cable Trays layout with number and size of cables installed.

c. Run and size of conduits, inspection, junction and pull boxes.

d. Number and size of conductors in each conduit with phase identification.

e. Location and rating of sockets and switches controlling the lighting and power outlets.

f. Location and details of distribution boards/panels, mains, switches along with phase balancing details.

g. A complete wiring diagram as installed and single line diagrams showing all connections in the complete electrical and security system.

h. Location of all earthing stations, route and size of all earthing conductors manhole.

i. Layout and particulars of all LT cables.

j. Instruction, maintenance and operation manuals including maintenance schedule for all equipment. Testing & commissioning reports of all electrical equipment.

14. OPERATING INSTRUCTION & MAINTENANCE MANUAL

14.1 GENERAL

Upon completion and commissioning of part electrical & LV system the contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract. This shall be supplementary to manufacturer's operating and maintenance manuals. These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 4 year period of maintenance of each equipment.

The Contractor shall provide operating instructions and maintenance data books for all equipment and materials furnished under this Division as well as assist the Commissioning Agent in compiling and consolidating O&M information during the development of the site specific Commissioning Plan.

The Contractor shall deliver two (2) initial copies of the operation and maintenance manuals in accordance with the subcontractor Scheduling Procedures to the Owner and Engineer for review. The initial copies shall contain all the information available at the time of submission.

The Contractor shall thereafter Submit six (6) final copies of operation and maintenance manuals to the Owner and Engineer for review at least ten (10) weeks before Final Review of the Project. Assemble all data in a completely indexed volume or volumes in three ring binders and identify the size, model and features indicated for each item. The binders shall have the Project Name and Logo printed on the outside of the binders. Re-submittals of these final six (6) copies of the "Final Review" operation and maintenance books and two (2) electronic CD-RW recordable rewrite compact disc shall be delivered to the Owner upon Final Completion of the Project

The vendor / manufacturer shall supply complete operations and maintenance manuals in accordance with the following requirements:

a. The operations and maintenance manual documentations shall be presented in a heavy duty white binder or equivalent at the time of original submission, and record manuals within four weeks of integrated delivery of equipment to the site.

b. The binder shall have a cover page depicting the system(s) covered by the manual, Owners name, site location, and date.

c. The binder shall contain a detailed table of contents page delineating all major sections of the manual. Each section of the manual shall have an Avery narrow tab type divider placed between sections (properly labelled) to ensure easy access. The major sections of the manual shall include:

Include the following information where applicable:

i. Manual index

ii. Specification Section reference number and index.

iii. Description of the work carried out / installed.

iv. Operating instructions.

v. Maintenance instructions including procedures for preventive maintenance.

vi. Trouble shooting charts.

vii. Type and routine test certificates of major items.

viii. Equipment and/or material model number and serial numbers.

ix. Identifying name, mark number, plan/drawings tagging, etc.

x. Locations of major equipment (where several similar items are used, provide a list).

xi. Manufacturer's catalogue literature including model, type, style, complete standard factory operations manual, brand name data, etc.

xii. Installation manual

xiii. Detailed sequences of operation for all operating modes

xiv. Supplier, dealer, distributor, vendor and service organizations including phone, fax and email addresses and name of contact person.

xv. "Final Review" or approved submittals.

xvi. Dimensional drawings with equipment weights

xvii. List of spare parts recommended for normal service requirements.

xviii. List of Spare parts purchased as part of this project,

xix. Performance curves and data including part load curves were applicable.

xx. Wiring and interlock wiring diagrams in both system and ladder formats.

xxi. Motor ratings and actual loads.

xxii. Assembly and disassembly instructions with exploded view Drawings where available.

xxiii. Manufacturer's recommended operation and maintenance instructions with all non-applicable information deleted.

xxiv. Trouble shooting diagnostic instructions where available.

xxv. Sequences of operation.

xxvi. Copy of all warrantees and guarantees.

xxvii. Copy of all factory and field test reports.

xxviii. Completed Functional Test sheets.

xxix. Completed Pre-functional check lists

xxx. Copies of all "Data" Sheets

Items required for inclusion in the operations and maintenance manuals that cannot be provided four weeks after delivery of equipment to the site are expected to be submitted within two weeks of completion of the work in a format for insertion into the binder under a pre-fabricated tab that is identified in the table of contents (i.e. The site acceptance test may not be complete at the time this manual is required for submission, in this case the manufacturer shall submit the manual with this section empty, upon completion of the site acceptance testing the forms for this testing will be supplied (punched for the binder).

All documents shall be submitted electronically using CD in a dedicated sleeve within the binder.

SPECIAL CONTROL SYSTEM O&M MANUAL REQUIREMENTS

In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

14.1.1 Three hard copies, as well as on disk in latest Word format, of the controls training manuals in a separate manual from the O&M manuals.

14.1.2 Operation and Maintenance Manuals in hard copy as well as on disk in latest Word format, containing:

a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.

b. Full as-built set of control drawings (refer to submittal section above for details).

c. Full as-built sequence of operations for each piece of equipment.

d. Full print out of all schedules and set points after testing and acceptance of the system.

e. Full as-built print out of software program.

f. Electronic copy on disk of the entire program for this facility.

g. Marking of all system on the as-built floor plan and electrical drawings with their control system designations. (obtain a disk of as-built and coordination drawings from the electrical contractors)

h. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.

j. Control equipment component submittals, parts lists, etc.

k. Warranty requirements.

l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

14.1.3 The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

a. Sequences of operation

b. Control drawings

c. GA drawings of panels

d. Lighting & Power details

e. Sensors and switches

f. Program setups (software program printouts)

14.2 REVIEW AND APPROVALS

Review of the commissioning related sections of the O&M manuals shall be made by the Owner's representative and by the Commissioning Agent.

15. COMPOSITE CONTROL WIRING DIAGRAM REQUIREMENT

As required by the construction schedule developed by the Construction Manager, this Contractor, along with all other Division Contractors, shall furnish to the BMS Contractor, the project specific wiring and interlock requirement diagrams from the equipment shop drawings for those items of equipment where there is joint wiring interface responsibility. These wiring and interlock diagrams will be furnished to allow the BMS Contractor to prepare project specific composite control wiring diagrams that will detail how equipment furnished by the multiple Contractors shall be interconnected to provide fully functioning interrelated systems, including the life safety system, for the overall project.

The items for which the wiring and interlock diagrams shall be furnished shall include but not be limited to lighting relays and/or contactors for the remote control of or by lighting systems, electronic meters, the Fire Detection, Alarm and Communication (Class E) System, the Security System, etc.

The wiring diagrams furnished to the BMS Contractor shall indicate those terminals and field devices which will be provided for the use of the BMS Contractor(s) to define the control interconnection to allow the interrelated systems to function as specified and as required by all applicable Codes. The BMS Contractor shall add to these drawings, those connections they will make for the control and/or monitoring of the lighting, electronic meters, and other items of equipment. The completed diagram shall include all line and low voltage wiring between control devices, control relays, sensors, controllers, switches, the Fire Command Station, the Security System, the Building Management System, etc.

One diagram shall be provided for each item or piece of equipment. Diagrams shall be suitable for insertion in a three-ring -binder. The BMS Contractor shall complete the preparation of the composite control wiring diagrams and shall return them to the appropriate Contractors within six (6) weeks of receiving them. The Contractors shall verify that the wiring added to the drawings is correct and can be accommodated. If necessary, corrections shall be made by the BMS Contractor. This process shall be completed prior to commencement of work on the particular piece of equipment or in

the area within which the equipment is located.

The intent of this requirement is that single composite drawings shall be available for each item of equipment indicating the wiring that shall be installed in its entirety including interlocks. Any omissions or errors noticed by the Contractors shall be brought to the attention of the Engineer immediately.

Each conductor termination on the composite wiring diagram shall be suitably identified by a termination number or symbol. In addition, each conductor termination shall be suitably indexed to identify the termination location of the other end of the wire.

All internal wiring of panels (in detail) shall be included in the composite wiring diagram. For such items as motor starters, etc., all jumpers added or removed shall be clearly indicated as being "added" or "removed".

The composite wiring diagrams shall include description of the interlock sequence of operation. The description shall include complete identification of each item shown (relay, lighting controller, etc.), and each item's exact operation shall be related to the interlock sequence.

This Contractor and their Subcontractors shall coordinate the work of this Division with the requirements of the work of all other Division Contractors as to the need for terminal strips, etc., required by them to interface with and/or control equipment furnished under this Division.

18 OPERATING INSTRUCTIONS AND TRAINING

This Contractor shall be responsible for the training of Owner personnel for both the equipment and systems this contractor installs as well as responsible to participate in the training of all systems that interface with the work of other Contractors and Vendors. The Contractor shall, in addition to start up services, provide factory trained specialists to supervise commissioning and instruct the Owner's operators during operating instruction periods.

In addition, the manufacturer of the pre-purchased equipment shall furnish the services of factory trained specialists to instruct the Owner's operators as set forth in the specifications and the pre-purchased documents. The operating instruction periods shall be as defined in pre-purchase documents. This contractor shall provide all labor and assistance required to properly execute all aspects of the requirements set forth for training.

Training shall consist of a minimum numbers of hours as listed below (minimum of 4 hours if not shown) of Owner instructions. Days shall not be defined as 8 hour periods, shall not be consecutive, and are separate and apart from start-up and commissioning. This shall consist of both classroom and in-the-field training. All training materials and a training curriculum unique to this project will be presented to the Owner 2 months in

advance of the on-site training. Training will commence only after the approval of the curriculum and agenda by the Owner and the Commissioning Agent. The Owner may wish to videotape the on-site training.

The Contractor shall commence no instruction period until all requirements of this section are met and the Owner has issued his written acceptance of the contractor's submitted agenda, starting time and Schedules.

The Construction Manager shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

The electrical contractor shall provide the Commissioning Agent with a plan at least two months before the planned the following outline:

i. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

ii. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

iii. Include a review of all systems using the simplified system schematics, riser, and one-line drawings.

iv. Include a review of all as-built drawings.

v. Basic engineering principals of operation for each piece of equipment

vi. Performance of equipment under different environmental and operating conditions.

vii. Equipment submittal data and performance curves.

viii. Equipment construction.

ix. Equipment safeties and alarms.

x. Equipment alarm and program settings

xi. Operation limitations/ restrictions

xii. Operation modes/ (response-action format)

xiii. Failure modes / (response-action format)

xiv. Maintenance modes /(response-action format)

xv. Control power and appurtenance.

xvi. Include field walk-throughs to locate all concealed devices, review valve, duct and pipe tagging method, review equipment locations and tagging.

xvii. Discussion of relevant health and safety issues and concerns.

xviii. Discussion of warranties and service contracts.

xix. Common troubleshooting problems and solutions.

xx. Location of all plans and manuals in the facility.

xxi. Discussion of any peculiarities of equipment installation or operation.

xxii. Demonstration of all electronically transmitted data and graphics.

xxiii. Sources for replacement parts/equipment and emergency service.

19. PARTIAL ORDERING

Owner through the Consultant/ Construction manager reserves the right to order equipment and material from any and all alternates, and /or to order high side and /or low side equipment and materials or parts thereof from one or more tenderers.

20. TOOLS AND TACKLES

The Tenderer shall provide and install all necessary hoists, ladders, scaffolding, tools and tackles, all transport for labour and materials and plant necessary for the proper execution and completion of the work to the satisfaction of the Owner's site representative.

1.1 TESTING AND COMMISSIONING

All the necessary comprehensive tests shall be performed to the approval and satisfaction of the Engineer – In-charge /Owners representative at the completion of installation. Before the commencement of acceptance testing, the installation shall be in a state of practical completion and shall have completed all of the preliminary testing and adjusted the equipment to its proper running order.

A full ten (10) days' notice of his readiness for carrying out acceptance tests shall be given to the Engineer – In-charge /Owners representative.

Prior to the date of giving such notice a complete details schedule of the tests to be carried out shall be submitted to the Engineer – In-charge /Owners representative for his approval and alterations and additions to the schedule are required to be made.

Notwithstanding his approval of the testing schedule the Engineer – In-charge /Owners representative may at any time before or during the testing period direct further tests to be carried out that he considers necessary. Any variation to the programme for the testing period shall be at the discretion of the Engineer – In-charge /Owners representative.

Upon completion of all above tests, four (4) sets of the test results shall be submitted for the Project Manager approval. All test reports submitted shall be endorsed by all parties witnessing the test including the contractor's and manufacturer's Qualified Personnel.

No acceptance tests shall be carried out except in the presence of the Project Manager or their authorised representatives appointed for the purpose.

The Contractor shall provide at his own cost all materials, including electric power, instrument test set, fuel, lubricants and other consumable, Load Bank required for the tests(load bank shall be provided by owner) and adjustments of the equipment and for carrying out the acceptance tests and any re-tests that may be necessitated by failure of the installation or by any other causes within his control.

The Contractor shall ensure that the fuel supplied for use in acceptance tests is part of a batch for which certified test data is available. Two copies of the test certificate shall be supplied to the Project Manager prior to the commencement of tests.

During the testing period the Contractor shall appoint a qualified personal to carry out the checking and testing the testing instrument (equipment which are to be used for the test) including accurately calibrated test equipment for checking the accuracy of gauges and instruments forming part of or supplied with the installation.

1.2 CABLE COMPARTMENTS

Cable compartment of adequate size shall be provided in the Distribution panels for easy clamping of all incoming and outgoing cables entering from the top/bottom. Adequate supports shall be provided in cable compartment to support cables.

1.3 MOULDED CASE CIRCUIT BREAKER (MCCB)

MCCB shall be Current Limiting and comprise of Quick Make - break switching mechanism, preferably Double Break Contact system, arc extinguishing device and the tripping unit shall be contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses.

All MCCB's shall be capable of defined Variable overload adjustment. All MCCB's upto 250 Amps shall have thermal magnetic releases and above 250 amps shall have microprocessor based release with adjustable magnetic short circuit pickup. Wherever MCCB with earth fault protection is required, the protection shall be an integral part of

the release with adjustable magnetic short circuit and earth fault protection with time delay.

The trip command shall override all other commands. MCCB shall employ maintenance free contact system and shall minimise the let thru' energies and capable of achieving discrimination upto full short circuit capacity of downstream MCCB. The manufacturer shall provide both discrimination tables and let thru energy curves.

The breaking capacity of MCCB's shall be as asked for in the schedule of quantities. The breaking capacities specified will be ICU=ICS i.e type-6. Co-ordination as per IEC-60947-2, 1989/ IS 13947-2, 1997.

The MCCB's shall be provided with rotary handle operating mechanism. The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to Disconnection as per the IS/IEC indicating the true position of all the contacts. In case of 4 pole MCCB the neutral shall be defined and capable of offering protection. Frame sizes of MCCBs shall be of following standard sizes.

	MCCB Rating	**Frame Size**
i.	100 amps & below 100 amps	100 amps
ii.	More than 100 amps upto 160 amps	160 amps
iii.	More than 160 amps upto 250 amps	250 amps
iv.	More than 250 amps upto 400 amps	400 amps
v.	More than 400 amps upto 630 amps	630 amps

The breaking capacities of MCCB's are mentioned panel wise. MCCB's shall be of following standard ratings

	MCCB Rating	**Frame Size**
i.	25 KA & below	25 KA
ii.	Above 25 KA upto 35 KA	35 KA
iii.	Above 35 KA upto 50 KA	50 KA
iv.	Above 50 KA upto 70 KA	70 KA

All MCCB shall be provided in the thermal magnetic releases upto 250 amps rating.

1.4 MINIATURE CIRCUIT BREAKER (MCB)

Miniature Circuit Breaker shall comply with IS-8828-1996/IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCB's shall be classified (B, C, D ref IS standard) as per their Tripping Characteristic curves defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar.

1.5 MOTOR PROTECTION CIRCUIT BREAKER (MPCB)

Motor circuit breakers shall conform to the general recommendations of standard IEC 947 - 1,2 and 4 (VDE 660, 0113 NF EN 60 947-1-2-4, BS 4752) and to standards UL 508 and CSA C22-2 N°18.

The devices shall be in utilization category A, conforming to IEC 947-2 and AC3 conforming to IEC 947-8.MPCB shall have a rated operational and insulation voltage of 690V AC (50 Hz) and MPCB shall be suitable for isolation conforming to standard IEC 60947-2 and shall have a rated impulse withstand voltage (Ump) of 6 kV.

The motor circuit breakers shall be designed to be mounted vertically or horizontally without derating. Power supply shall be from the top or from the bottom. In order to ensure maximum safety, the contacts shall be isolated from other functions such as the operating mechanism, casing, releases, auxiliaries, etc, by high performance thermoplastic chambers.

The operating mechanism of the motor circuit breakers must have snap action opening and closing with free tripping of the control devices. All the poles shall close, open, and trip simultaneously. The motor circuit breakers shall accept a padlocking device in the "isolated" position.

The motor circuit breakers shall be equipped with a "PUSH TO TRIP" device on the front enabling the correct operation of the mechanism and poles opening to be checked.The auxiliary contacts shall be front or side mounting, and both arrangements shall be possible.The front-mounting attachments shall not change the breaker surface area. Depending on its mounting direction the single pole contact block could be NO or NC.All the electrical auxiliaries and accessories shall be equipped with terminal blocks and shall be plug-in type.The motor circuit breakers shall have a combination with the downstream contactor enabling the provision of a perfectly co-ordinated motor-starter. This combination shall enable type 1 or type 2 co-ordination of the protective devices

conforming to IEC 60947-4-1.Type 2 co-ordination shall be guaranteed by tables tested and certified by an official laboratory: LOVAG (or other official laboratory).The motor circuit breakers, depending on the type, could be equipped with a door-mounted operator which shall allow the device setting.The motor circuit breakers shall be equipped with releases comprising a thermal element assuring overload protection and a magnetic element for short-circuit protection.In order to ensure safety and avoid unwanted tripping, the magnetic trip threshold (fixed) shall be factory set to an average value of 12 Ir.

All the elements of the motor circuit breakers shall be designated to enable operation at an ambient temperature of 60°C without derating.The thermal trips shall be adjustable on the the front by a rotary selector.The adjustment of the protection shall be simultaneous for all poles.Phase unbalance and phase loss detection shall be available.Temperature compensation (-20°C to +60°C)

1.6 POTENTIAL FREE CONTACTS

Potential free contacts shall be provided for connection to Building Automation System in panels indicated in Schedule of Quantities.

1.7 INDICATING PANEL

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB.

1.8 TESTING

Testing of panels shall be as per following codes:

i. IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.

ii. IS: 13947 : 1993 Degree of protection

iii. IS: 5578 & 11353:1985 Arrangement of bus bars.

1.9 WIRING

In wiring a distribution panel it shall be ensured that total load of various distribution panel and/or consuming devices are divided evenly between the phases and number of ways as per SLD and approved drawings. All wires shall be FRLS and minimum size of PVC insulated copper conductor wires shall be minimum 6.5 sq. mm.

1.1.1 Low Voltage Plug and Socket Connector

A twenty pin plug and socket connection along with flexible leads shall be provided to connect control instrumentation and interlock circuits on the breaker truck and in the

panel. The plug and socket assembly shall be suitably interlocked with the truck positions like service and test/isolated position

2. EXTERNAL/STREET LIGHTING POLES

2.1 Galvanized Octagonal Poles

2.1.1 Design

The Octagonal poles shall be designed to withstand the maximum wind speed of 169 KM / Hr. as per IS 875. The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole and the same shall meet the requirement of BS : 5649 Part VI 1982.

2.1.2 Pole Shaft

The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding. The welding of pole shaft shall be done by submerged Arc Welding (SAW) process.

All octagonal pole shafts shall be provided with the rigid flange plate of suitable thickness with provision for fixing 4 foundation bolts. This base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside. The welding shall be done as per qualified MMAW process approved by Third Party Inspection agency.

2.1.3 Door Opening

The octagonal poles shall have door of approximate 500 mm length at the elevation of 500 mm from the Base plate. The door shall be vandal resistance and shall be weather proof to ensure safety of inside connections. The door shall be flush with the exterior surface and shall have suitable locking arrangement. There shall also be suitable arrangement for the purpose of earthing.

The pole shall be adequately strengthened at the location of the door to compensate for the loss in section.

2.1.4 Material

Octagonal Poles	HT Steel Conforming to grade
S355JO Base Plate	Fe 410 conforming to IS 226 / IS
2062 Foundation Bolts	EN.8 grade

2.1.5 Welding

The welding shall be carried out confirming to approved procedures duly qualified by third party inspection agency. The welders shall also be qualified for welding the

octagonal shafts.

2.1.6 Pole Sections

The Octagonal Poles shall be in single section (upto 11 mtr). There shall not be any circumferential weld joint.

2.1.7 Galvanization

The poles shall be hot dip galvanized as per IS 2629 / IS 2633 / IS 4759 standards with average coating thickness of 70 micron. The galvanizing shall be done in single dipping.

2.1.8 Xing Type

The Octagonal Poles shall be bolted on a pre-cast foundation with a set of four foundation bolts for greater rigidity.

2.1.9 Top Mountings

The galvanized mounting bracket shall be supplied along with the Octagonal Poles for Installation of the luminaries.

2.1.10 Manufacturing

The pole manufacturing & galvanizing unit shall be ISO 9001 : 2000 & ISO 14001 certified to ensure consistent quality & environmental protection.

2.1.11 Service Window

A service window of the size 150 mm x 100 mm shall be provided in the base of the pole to allow access to electrical connections and terminations. It shall be covered with MS plate and proper rubber gaskets shall be provided to prevent any ingress of water etc..

2.1.12 Electrical Connections

Four way connectors shall be provided along with Slide lock and 1 no. 6 amps Sp MCB including 2.5 sqmm PVC insulated copper conductor wires from the terminal block to the fixture and 2 nos. 32 mm dia GI sleeves of suitable length shall be provided upto the service window. An earth boss is provided on the control plate along with connectors and interrupters.

Galvanized Octagonal Poles Dimensions

HEIGHT	TOP DIA (A/F)	BOTTOM DIA (A/F)	SHEET THICKNESS	BASE PLATE DIMENSIONS (LxBxT)	FOUNDATION BOLT			
					BOLT SIZE (NO. x DIA)	PITCH CIRCLE DIA (PCD)	BOLT LENGTH (MM)	PROJECTED BOLT LENGTH
(mtr)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)

3	70	130	3	200 x 200 x 12	4 x 16 Dia	200	450	80
4	70	130	3	200 x 200 x 12	4 x 16 Dia	200	450	80
5	70	130	3	200 x 200 x 12	4 x 16 Dia	200	600	80
6	70	130	3	220 x 220 x 12	4 x 20 Dia	205	600	100
7	70	130	3	220 x 220 x 12	4 x 20 Dia	205	700	100
8	70	135	3	225 x 225 x 16	4 x 20 Dia	210	750	100
9	70	155	3	260 x 260 x 16	4 x 24 Dia	250	750	125
10	70	175	3	275 x 275 x 16	4 x 24 Dia	270	750	125
11	90	210	3	300 x 300 x 20	4 x 24 Dia	300	750	125
12	90	240	3	320 x 320 x 20	4 x 24 Dia	325	850	125

3. TESTING

3.1 General

At the completion of the work, the contractor shall carry out the pre-commissioning as well as commissioning checks as given below on the entire installation and records be maintained for reference of any statutory authority, Client or their representatives.

Pre - Commissioning Checks

Note - Pre- Commissioning checks are to be carried out by Electrical contractor in presence of Project Management Team.

Sr. No.	Component	Points to be checked
1	HT \ LT Cables	♦ Cable identification tags are provided at both ends. ♦ Cable entry in all equipment is through proper sized glands. ♦ Cable termination is made by proper crimping type lugs. ♦ Connections are properly tightened. ♦ Not more than two conductors are connected on any one side of terminal. ♦ IR values of the circuit are measured and recorded.

2	Earthing	♦ The resistance value of each earth electrode are measured and recorded. ♦ Total resistance of earthing system should be as per the design value and in any case, shall not be more than 1 Ohm as per IS-3043. ♦ Continuity test for earth continuity conductors with ELV tester.

Sr. No.	Component	Points to be checked

commissioning Checks

Note –Commissioning checks are to be made in following sequence starting from Transformer / DG to main panel to last light fitting. All results of testing and observations are to be preserved for record and reference by any statutory authority.

Sr. No.	Component	Points to be checked
3.	Earthing	♦ Check if all earth electrodes in earth pits for it's correct installation and connection to earth grid. ♦ Check if all protective conductors from the earth electrodes to grid and from grid up to all electrical equipment are made correctly. ♦ Remove the protective conductor / grid connection with earth electrode and measure earth electrode resistance by using earth megger. ♦ Repeat above procedure for all electrodes. ♦ Ensure that total earth resistance of the installation is less than 1 mega- ohms.

A P P E N D I X – I

LIST OF APPROVED MAKES FOR EQUIPMENT & MATERIALS

The list of approved makes is given below for reference purpose and the bidder may choose as appropriate. However, the successful bidder shall have to take prior approval of NATIS for such items listed below and its makes.

S. No.	Details of Materials / Equipment	Manufacturer's Name
A.	**MEDIUM VOLTAGE EQUIPMENT**	
1.	LT Panel / Capacitor Panel / Busduct and	CPRI Approved panel manufacturer the profile to be approved by client before manufacturing.
2.	Main Distribution Panel, Sub- Main Distribution Panel and Motor Control Centre	CPRI Approved panel manufacturer and the profile to be approved by client before manufacturing. Ie-SD Electrical, Salind, Tricolite etc.

3.	Final	Distribution	Board Legra nd Hager ABB Schneider Electric (MG)
4.	Air Circuit Breaker (3/4 Pole)		Schneider Electric (Master Pact NW) ABB (E-Max) L&T (U-Power) Siemens (3WL)
5.	Moulded Case Circuit Breaker (MCCB)		Schneider Electric (Compact) Larsen & Toubro (Dsine) ABB (T – Max) Siemens (3VL)
6.	Motor Protection Circuit Breaker(MPCB)		Legrand Hager (L&T) ABB Schneider Electric (MG)
7.	Miniature Circuit Breakers (MCB)		Legrand Hager (L&T) ABB, Grate- white Schneider Electric (MG)
8.	Power/Aux. Contactor / Capacitor Duty Contactor		Schneider Electric (MG) - Telemechnaic L&T –MNX ABB-A range Siemens-Sinext

9.	Change Over Switch	Larsen & Toubro C & S HPL – Socomec
10.	Control Transformer/Potential Transformers	Kappa G&M Automatic Electric Matrix Pragati
11.	Current Transformer (Epoxy Cast Resin)	Kapp a G& M Automatic Electric Matrix Pragati
12.	Protection Relay	
	a. Numeric Type	ABB AREVA L & T Schneider Electric Siemens
	b. Electromagnetic Type	ABB Arev a Larsen & Toubro
13.	Indicating Lamps LED type and Push Button	Vaishno Electricals Larsen & Toubro (ESBEE) Schneider Electric Siemens
14.	Overload relays with built in Single Phase preventer	
15.	a. Electronic Digital Meters (A/V/PF/Hz/KW/KWH) with LED Display	Schneider Electric (MG) - Telemechnaic L&T -MNX ABB-A range Siemens-Sinext

		Conzerv (Schneider) Larsen & Toubro Schneider Electric Secure
16.	Static Power Meter & Logger (SPML) With RS 485 port	Conzerv (Schneider) Secure L&T
17.	Automatic Power Factor Correction Relay (Numeric Type)	Areva L&T Conzerv Ducati Siemens
20.	PVC insulated XLPE aluminium/copper conductor armoured MV Cables upto 1100 V grade	KEI Poly-cab Universal Havells
21.	LT Jointing Kit / Termination	Birla-3M Raychem Mahindra Safe Kit
22	Cable Glands Double Compression with earthing links	Braco Comet (Comex) Hex Brass
23	Bimettalic Cable Lug	Braco Comet Dowell's (Biller India) Hex Brass (Copper Alloy India)
24.	PVC insulated copper conductor stranded flexible wires	L&T Skytone KEI Polycab, Great-white

25.	Mettalic / GI Conduit (ISI approved)	AK G BE C
26.	Lead Coated Flexible GI Conduit	PLICA India Pvt. Ltd. Flexicon
27.	PVC Conduit & Accessories (ISI approved)	AKG BEC
	a) Switch & Socket	Clipsal (Opal Series) Crabtree, Great-white Legrand (Mosaic) Wipro (NorthWest)

S. No.	Details of Materials / Equipment	Manufacturer's Name
28.	Industrial Socket	
	a. Splash Proof	Clipsal Gewiss Legrand Neptune Balls Schneider Electric Havells
	b. Metal Clad	Clipsal Gewiss Legrand Neptune Balls Schneider Electric Havells
29.	Ceiling Fan	Crompton Greaves Havells Orient Usha bajaj

30.	Lighting Fxiture	
	a. Incandescent / Halogen / PL / Metal Halide) / Fluorescent	GE, Glair Phili ps Wipr o
	b. External Lighting Fixture	Bajaj Electricals Ltd. Glair, Philips
	c. Aviation Obstruction Light (LED Type)	Acto s Baja j,gla ir Bina y
31.	Selector Switch, Toggle switch	Kaycee Salzer (Larsen & Toubro)
32.	Timer	ABB GE Power Control Larsen & Toubro Legrand Schneider Electric Indo asian
33.	Cable Trays (Factory Fabricated) / Raceways	Profab Engineer OBO Betterman Needo

S. No.	Details of Materials / Equipment	Manufacturer's Name
34	Lightning Protection System (Early Streamer Emission Type)	LPI Alltec
35.	Terminal Block/Connector	Elmex Connectwe ll Wago Dowells
1.	M.S. Pipe upto 150 MM Dia.	Jindal Tata Steel Appolo
2.	MS PIPES above 150 mm dia factory rolled	Tata Steel Jindal Lalit Steel Mukut Steel SAIL

A P P E N D I X – II- LIST OF INDIAN STANDARDS (IS)

IS : 5578 & 1984	Rotating electrical machine
IS : 8623 –1993 (Part –I)	PVC insulated Electric cable for working voltage up to and including 1100 volts.
	Code of practice for electrical wiring and installation
	PVC insulated (Heavy Duty) electric cables for working voltages up to and including 1100 volts.
	Stationary cell & batteries, lead acid type.
	Glossary of items for electrical cables and conductors
	Danger notice plates.
	Code of practice for earthing.
	Flexible steel conduits for electrical wiring.
	Boxes for the enclosure of electrical accessories.
	Guide for safety procedures and practices in electrical work.
	Guide for marking of insulated conductors
	Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200 V D C.

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Technical Conditions of Contract (TCC)

The Technical Conditions of Contract contains the following Sections:

Section 11 – Drawings

SECTION-11- DRAWINGS

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

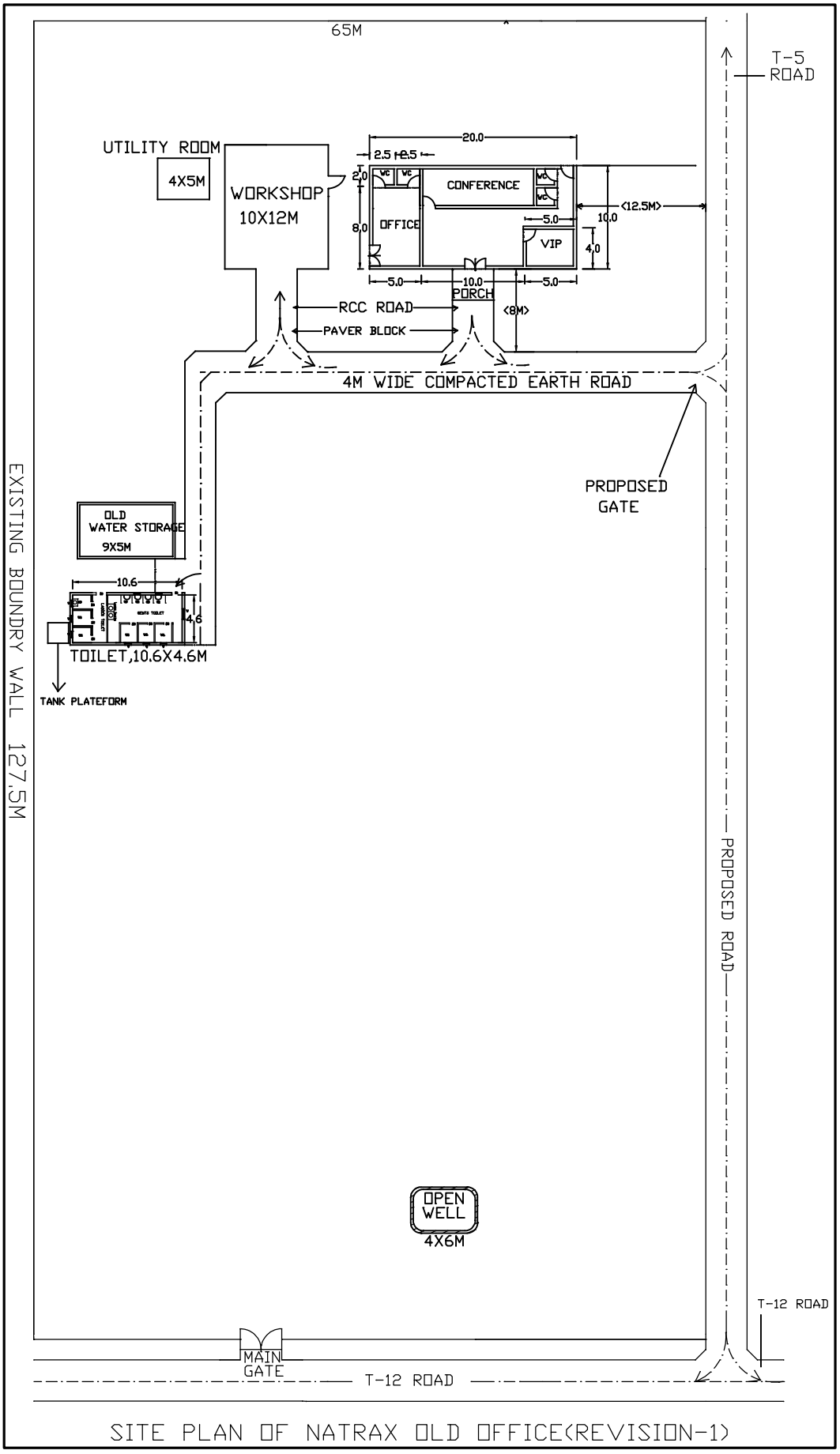
Phone: +919893892310, Fax – 07292-256101

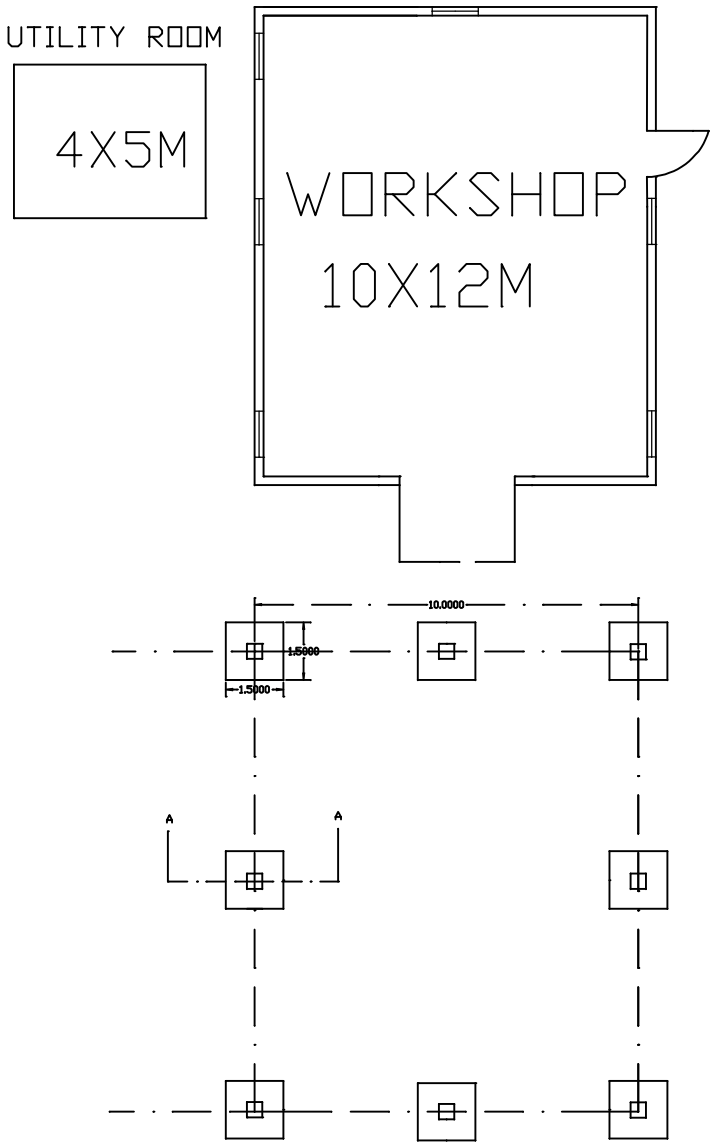
SECTION-11- DRAWINGS

"Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P."

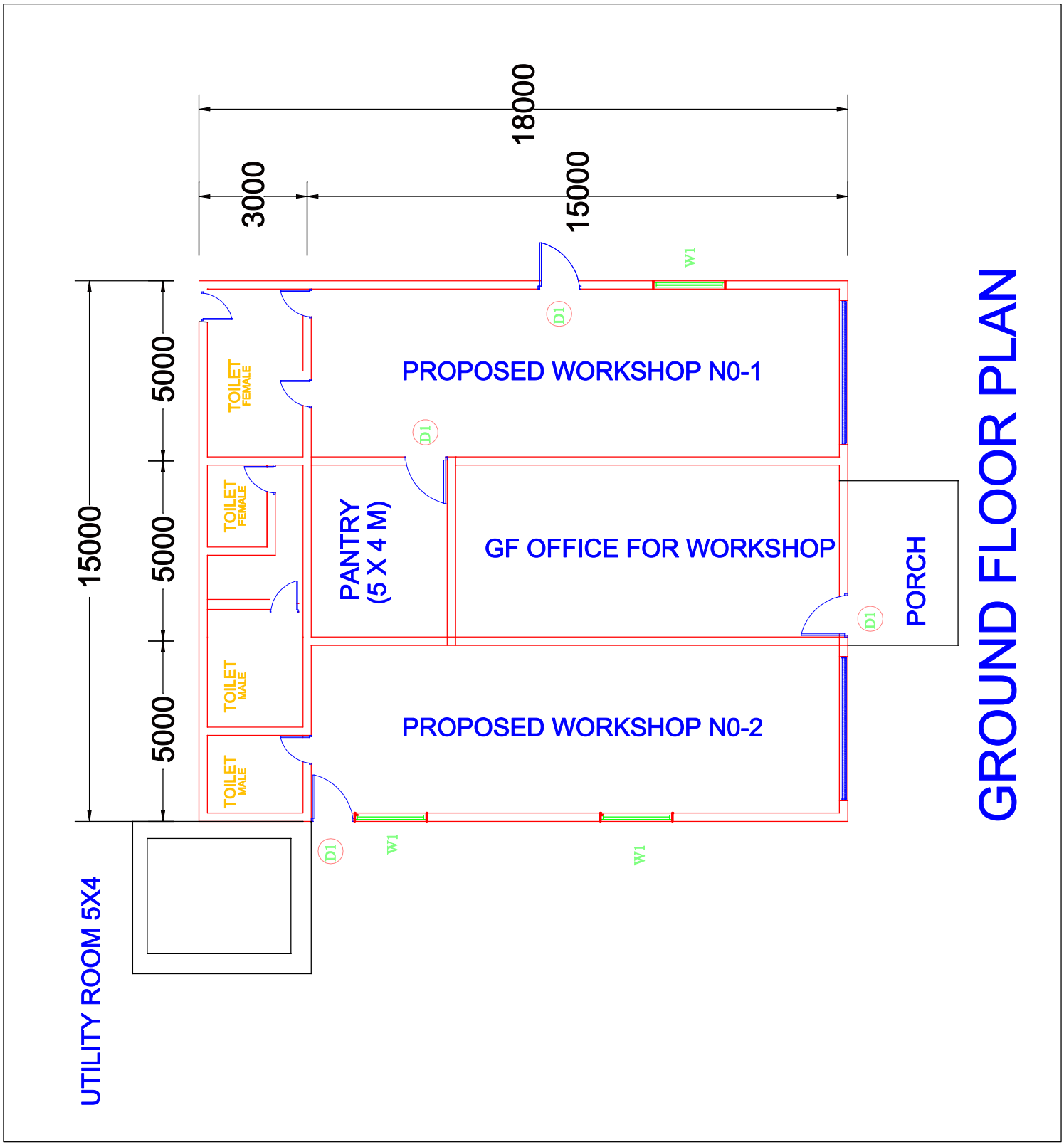
Drawings –

enclosed


65M
T-5
ROAD
UTILITY ROOM
4X5M
WORKSHOP
10X12M
20.0
2.5
2.5
2.0
8.0
WC
WC
CONFERENCE
OFFICE
VIP
5.0
5.0
10.0
4.0
<12.5M>
10.0
5.0
10.0
5.0
PORCH
RCC ROAD
PAVER BLOCK
<8M>
4M WIDE COMPACTED EARTH ROAD
PROPOSED
GATE
OLD
WATER STORAGE
9X5M
10.6
4.6
TOILET,10.6X4.6M
TANK PLATEFORM
EXISTING BOUNDRY WALL 127.5M
PROPOSED ROAD
OPEN
WELL
4X6M
T-12 ROAD
MAIN
GATE
T-12 ROAD
SITE PLAN OF NATRAX OLD OFFICE(REVISION-1)



PLAN OF NEW SHED AT OLD SITE OFFICE


18000
3000
15000
15000
5000
5000
5000
W1
D1
PROPOSED WORKSHOP N0-1
TOILET FEMALE
TOILET FEMALE
PANTRY (5 X 4 M)
GF OFFICE FOR WORKSHOP
PORCH
TOILET MALE
TOILET MALE
PROPOSED WORKSHOP N0-2
UTILITY ROOM 5X4
GROUND FLOOR PLAN

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

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Section 12 – Forms for Technical & Commercial Queries

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Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

Section 12 -Forms for Technical & Commercial Queries

TECHNICAL QUERIES Pertaining to Tender No. NATRAX/PROC/C&I/25/110R				
Sr. No.	Reference to the Tender Document	Subject	Query	Clarifications of NATRAX

COMMERCIAL QUERIES Pertaining to Tender No. NATRAX/PROC/C&I/25/110R				
Sr. No.	Reference to the Tender Document	Subject	Query	Clarifications of NATRAX

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310, Email: a.prabhakar@natrip.in; anuj.kumar@natrip.in website: www.natrax.in

NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX-Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Financial Bid

The Technical Conditions of Contract contains the following Sections:

Section 13 – Financial Proposal Submission Form

Financial Proposal Submission Form

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

SECTION 13- Financial Proposal Submission Form

(To be Executed on Letterhead of the Bidder)

FINANCIAL PROPOSAL SUBMISSION FORM

[*Location, Date*]

To: The Head Procurement& stores
National Automotive Test Tracks (NATRAX),
NH-52, Old Agra- Mumbai Highway,
Near to Pithampur Flyover,
Post Khandwa (Near Pithampur),
Dist. Dhar (M.P.)-454774

Dear Sir,

We, the undersigned, offer to provide the contract services in accordance with your **Tender No. NATRAX/PROC/C&I/25/110R** and our Technical Bid, dated……
Our attached Financial Bid includes the price in the format for financial bid provided (BOQ) as part of tender documents. The **total price of our offer** is INR_____ (in figures and words) and includes all the deliverables under this tender as per our Technical Bid.

The above total bid price includes a price discount/rebate (if any) of ……. % (in figures and words) OR INR……(in figures and words).

We hereby declare that all the information and statements made in this Bid is true and complete in all respects and is as per the guidelines and terms & conditions laid down in the tender document. We further understand that our financial bid is subject to scrutiny/arithmetical checks and any information which is found false or is not as per the guidleines and terms & conditions of the tender document may lead to our disqualification.

Our Financial Bid shall be binding upon us subject to the modifications resulting from Contract negotiations, up to expiration of the validity period of the Bid.

We understand NATRAX has right to accept or reject our Bid or split the works among the bidders for the purpose of award, as per its discretion.

Yours sincerely,

Authorized Signature [*In full*]: _____

Authorized Signature [*In initials*]: _____

Name and Title of Signatory: _____

Name of Firm: _____

Address: ____

[Note : To be signed in blue ink]

Tender Document

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. NATRAX/PROC/C&I/25/110R

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra-Mumbai Highway, Near to Pithampur Flyover, Post Khandwa (Near Pithampur, Dist. Dhar (M.P.).Phone: +91-9893892310,
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NATIONAL AUTOMOTIVE TEST TRACKS

TENDER DOCUMENTS

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

Tender No. – NATRAX/PROC/C&I/25/110R

Cover Page- Financial Bid

The Technical Conditions of Contract contains the following Sections:

Section 13 – Bill of Quantities (BoQ)

Bill of Quantities (BoQ)

National Automotive Test Tracks (NATRAX)

NH-52, Old Agra- Mumbai Highway, Near to Pithampur Flyover,

Post Khandwa (Near Pithampur)

Dhar District, Madhya Pradesh-454774

Phone: +919893892310, Fax – 07292-256101

TENDER DOCUMENT

Section 14 Summary of Bill of Quantities (BOQ)

Construction, Modification and upgradation of Old Site Office at NATRAX- Pithampur, Dhar District, M.P.

TENDER NO. NATRAX/PROC/C&I/25/100R

Sr. No.	Particular	Amount in figure	Amount in words
Part I	CIVIL CONSTRUCTION WORK		
Schedule A	CIVIL WORK		
Schedule B	PLUMBING AND SAINATORY WORK		
Schedule C	Fabrication Works		
Schedule D	Painting works		
	Sub Total (Part I)		
Part II	ELECTRICAL WORKS		
	Sub Total (Part II)		
	Grand Total (Part I + Part II)		

Seal & Signature: _____

Dated: _____

Name of Representative: _____

Name of Bidder: _____

Address: _____

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
	PART-A, CIVIL WORK						
1	2.2	Clearing grass and removal of the rubbish upto a distance of 50 m outside the periphery of the area cleared.	Sqm	131			
2	2.6	Earth work in excavation (Removable of BC soil) by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth. 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m, disposed earth to be levelled and neatly dressed.	Cum	425			
3	2.24	Filling available excavated earth (excluding hard rock/Ordinary rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	Cum	210			
4	4.1.1.3	PCC 1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size). M15 Grade	Cum	47			
5	2.27	Supplying and filling in plinth with local approved sand under floors including, watering, ramming consolidating and dressing complete.	Cum	27			
6	5.27	Providing and laying in position ready mixed concrete (RMC) of M-25 grade for reinforced cement concrete work, using cement content as per approved design mix and manufacturedin fully automatic batching plant andtransported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering, shuttering, finishing					
	5.27.1	All work up to plinth level	Cum	111			
		All work above the plinth level	Cum	37			
7	12.26	Providing concrete gola 1:2:4	Metre	40			
8	5.9	Centering and shuttering including strutting propping etc and removal of form for					
	5.9.2.1	All work up to plinth level	Sqm	216			
	5.9.2.2	All work above the plinth level	Sqm	165			
9	6.13	Providing half brick masonry with well burnt chimney bricks in bull patent trench kiln manufactured by ghol process crushing strength not less than 40 kg /cm2 and water absorption not more than 15% in superstructure above plinth level and up to floor two level.(1:4)	Sqm	197			
10	6.7.1.2	Brick work with fly ash lime bricks (FaLG Bricks) conforming to IS:12894-2002, in super structure above plinth level up to floor twolevel in :Having 100 kg / cm2 average compressive trength .Cement mortar 1:6 (1 cement : 6 sand)	Cum	76			
11	13.1	15 mm cement plaster on the rough side of single or half brick wall of mix 1:6 (1 cement :6 sand)	Sqm	1192			
12	5.16.6	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level. For lintal beam RCC plate form ,floor ans others work(TMT Fe 500)	Kg	16783			
13	11.66	Providing and laying factory made machine pressed precast cement concrete interlocking paver block of any shape and size conforming to IS:15658- 2006 and ISI marked of 60 mm thickness, M-30 grade with grey cement and pigment all as specified. Made by block making machine with strong vibratory compaction, laid in	Sqm	91			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
		required colour andpattern over and including 50mm thick compacted bed of stone dust, filling the jointswith sand etc. all complete as per thedirection of Engineer-in					
14	10.14	Steel work in built up M.S. tubular section (round, square or rectangular hollow tubes etc.) trusses/frame work etc. including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete(Design and build in contractors scope)	Kg	4558			
15	10.1	Structural steel work using M.S. flats, angles, channels I-section, H-section etc. riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete	Kg	3813			
16	11.5	Providing and fixing Ceramic glazed wall tiles 300x450 mm or more (having thickness 6 to 7 mm) of 1st quality conforming to IS: 15622 of approved make in all Colours& shades, except burgundy, bottle green, black laid on 12mm thick bed of Cement Mortar 1:3 (1 Cement: 3 sand)preprad same day when mortar is still green jointed with grey cement slurry @3.3 kg per sqm including pointing the joints with white cement and matching pigments etc., complete.	Sqm	385			
17	11.53	Providing and laying anti skide vetrifide Glazed Ceramic floor tiles 300x300 mm or more (having thickness 9 to 10mm) of 1st quality conforming to IS : 15622 of approved make in all colours white, ivory, grey, fume red brown laid on 20mm thick cement mortar 1:4 (1 Cement : 4 sand) including grouting the joints with white cement and matching pigments etc., complet	Sqm	144			
18	11.78.1.1	Providing and laying vitrified floor tiles 600x600mmMulti/Double charged (Minimum top layerthickness 2.0mm) Neno Polished self design, indifferent size with water absorption less than0.05%and conforming to IS:15622 of approved make in all colours& shades, quality/ premiumquality in flooring laid on 12mm thick cementmortar 1:4(1cement :4sand) including grouting thejoints with white cement and matching pigments etc. complete					
		Size 600X600 mm thickness 9-10 mm	Sqm	192			
19	11.30.2.1	Providing and fixing 18 mm thick gang saw cut, mirror polished,premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills , facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish & chasing in to the tiles wall etc. complete at all levels.Granite of any colour and shade	Sqm	47			
20		Repairs to plaster (Enternal & external work)	Sqm	108			
21	11.67	Providing Epoxy flooring self leveling typeon strong base in desired colour/design as approved by Engineer-in-Charge. Resin for epoxy is to be of floor grade type i/c appropriate hardner and filler material. with 5 year defect liability period (This item is to be used only for operation theaters in hospitals) 1 mm thick	Sqm	381			
22	15.6.3	Demolishing brick work manually/ by mechanical means including stacking ofserviceable material and disposal of unserviceable material within 50 metres leadas per direction of Engineer-in- Charge	Cum	61			
23	15.3	Demolishing RCC work manually bymechanical means including stacking of steel bars and disposal of unserviceable materials within 50 meters lead as per direction of Enginer-in -charge	Cum	25			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
24	13.41	Providing and applying white cement based putty of average thickness 1 mm, of approved brand and anufacturer, over the plastered wall surface to prepare the surface even and smooth complete. (Patches work)	Sqm	1329			
25	13.46	Wall painting with plastic emulsion paint of approved brand and manufacture to give an even shade: One or more coats on old work.					
26		Painting wall with plastic emulsion paint (Old work)	Sqm	1329			
27	13.64	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: One or more coats on old work.					
		Painting with synthetic enamel paint (Old work)	Sqm	252			
28	13.52	Finishing walls by any mechanical or manual means with Acrylic Smooth exterior paint (Economy Exterior) of required shade including all scaffolding. New work (Two or more coat applied @1.67ltr/10sqm over and including one coat undiluted exterior waterproofing coating @ 2.39 litre/10 sqm with crack bridging ability of upto 0.5mm on horizontal surfaces with an elongationof 150% and water proofing of upto 3 bars on vertical surface	Sqm	629			
29	9.19.1	Providing and fixing ISI marked flush door shutters conforming to IS: 2202 (Part I)nondecorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with,35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws vertical grains or cross bands and face veneers on both faces of shutters	Sqm	35			
30	9.1	Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia and length (hold fast lugs or dash fastener shall be paid for separately).	Cum	2			
31	9.169	Providing and fixing factory made single extruded PC(Wood Polymer Composite) solid door/window/ceosetory windows and other frames/chowkhat comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (woodpowder/ rice .husk/wheat husk) and non toxic additives (maximum toxicity indexof 12 for 100 gms) fabricated with miter joints after applying PVC solvent cement	RM				
	9.169.1	Single rebate (75 mmx50 mm) for toilet door frame		57			
32	9.169.2	Single rebate (100mmx50 mm) for toilet door frame		21			
33	9.17	Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid plain flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice .husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum	Sqm				
34	9.170.2	28 mm thickWPC (Wood polymer composite) solid plaain flush door shutter		18			
35	9.170.3	30 mm thickWPC (Wood polymer composite) solid plaain flush door shutter		8			
36	21.13	Providing and fixing Brass 100 mm mortice latch and lock with 6 levers without pair of handles(best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	Each	3			
				PART-A TOTAL Rs.			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
	PART-B	**PLUMBING AND SAINATORY WORK**					
37	17.59	Providing & fixing unplaticised rigid PVC moulded ttings/accessories for unplaticised rigid PVC soil and waste pipes confirming to IS 13592 Type A including jointing with seal ring leaving 100 mm gap for thermal expansion.					
	17.59.1	**Coupler**					
		75mm	Each	9			
		110 MM	Each	8			
38	17.59.3	**Single tee with door**					
		75x75x75 mm	Each	6			
		110x110x10mm	Each	5			
39	17.59.4	**Single tee without door**					
		75x75x75 mm	Each	6			
		110x110x10mm	Each	6			
40	17.59.5	**Bend 87.50**					
		75 mm bend	Each	9			
		110mm bend	Each	7			
41	17.6	Providing & fixing unplaticised PVC clips of approved design to unplaticised PVC soil and waste pipesby meanse of bombay nails of required length.					
	17.60.1	75 mm	Each	6			
	17.60.2	110 mm	Each	6			
42	17.5	Providing and fixing white vitreous china extended wall mounting water closet of size 780x370x690 mm of approved shape including providing and fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/6 litre (adjustable to 4 litre/8 litres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete	Each	4			
43	25.2	Providing and fixing white vitreous china pedestal type Anti germ Fluoro-Polymer Coated Water Closet with soft closing seat cover, and 7.2 litre Low level slim dual flushing, PP (Poly Propeline) made 80 mm thick concealed flushing cistern, flushing capacity 3 litre/6 litre, with all fittings and fixtures complete including cutting and making good the wall and floors wherever required.	Each	7			
44	18.28	Providing and placing on terrace (at all floor levels) polyethylene water storage tank ISI ;12701 marked with cover and suitable locking arrangement and making necessary holes for inlet ,outlet and overflow pipe etc. Circular tank	Per litter	4000			
45	17.11	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require:White Vitreous China Wash basin size 630x450 mm with a pair of 15 mm C.P. brass pillar taps 630x450 mm					
		630x450 mm with pairof 15 mm CP bras pillar tap	Each	10			
46	17.75	Providing and fixing CP brass soapdish of approved quality and make	Each	9			
47	17.74	Providing and fixing CP brass towelring of approved quality and make 200mm dia rin	Each	6			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
48	25.13.1	White Vetrious China Anti germ Fluoro-Polymer Coated Urinal Size 480 X 300X740 mm with 15mm Brass made pressmatic auto closing concealed urinal flush valve with wall flange (Decol technology, 400000 operation warranted). (Premium Range)	Each	6			
49	17.76	Providing and fixing PTMT 15 mm Urinal spreader size 95x69x100 mm with 1/2" BSP thread and shapes. Weighing not less than 60 gms	Each	5			
50	18.35	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:893115 mm nomina	Each	8			
51	18.46	Providing and fixing PTMT urinal cock of approved quality and colour. 15 mm nominal bore, 80mm long. 42 mm high and 30mm wide with BSP female threads weighing not less than 48 gms	Each	6			
52	17.80.2	Bottle trap 38mm single piece moulded with height of 270mm, effective length of tail pipe 260mmfrom the centre of the waste coupling 77mm breadth with 25mm minimum water seal, weighting not less than 263gms.	Each	9			
53	18.61	Providing and fixing 8 mm dia C.P. / S.S. Jet with flexible tube upto 1 metre long with S.S. triangular plate to Eureopean type W.C. of quality and make as approved by Engineer - in -charge.	Each	9			
54	17.67	Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	Sqm	3			
55	17.70.1	Providing and fixing toilet paper holder :C.P. brass	Each	8			
56	17.58	Providing and fixing unplasticised Rigid PVC soil and waste pipes conforming to IS: 13592 Type B including jointing with seal ring conforming to IS : 5382 leaving 10mm gap for thermal expansion. Singlesocketed pipes for working pressureof 4 kg/sqcm. (minimum wall thickness 3.2mm					
	17.58.1	75 mm diameter	Metre	25			
	17.58.2	110 mm diameter	Metre	32			
57	17.64.1.2	Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete. 40 mm dia	Each	14			
58	18.6	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe withclamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge. Internal work - Exposed on wall					
	18.7.1	15 MM nominal outer dia pipe (External)	RM	30			
59	18.6.2.1	25 MM nominal outer dia pipe (External)	RM	31			
60	17.14.1.2	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS 13983 with C.I. brackets and stainless steel plug 40 mm including painting of fittings and brackets, cutting and making good the walls wherever required :	Each	1			
		510x1040 mm bowl depth 225mm.					
61	18.31	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 :18.49.1 15 mm nominal bore	Each	12			
62	18.34	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved make conforming to IS:8931. 18.52.1 15 mm nominal bore	Each	16			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
63	17.61	Providing & fixing unplaticised PVC Trap of self cleaning design complete including cost of cutting and making good the wall & floors.					
		100 mm inlet & 75 mm out let	Each	10			
64	12.32	Providing and fixing on wall face Rigid Unplasticised rigid PVC (upvc) Single socketed rain water pipes conforming to IS : 13592 Type A including jointing with seal ring conforming to IS : 5382 leaving 10 mm gap for thermal expansion.					
	12.32.1	75 mm dia	RM	2			
	12.32.2	110 mm dia	RM	59			
65	17.58	Providing & fixing unplaticised rigid PVC soil and waste pipes confirming to IS 13592 Type B including jointing with seal ring leaving 100 mm gap for thermal expansion single socketed pipes for working pressure of 4kg.sqcm					
	17.58.2	110 mm diameter minimum wall thickness 2.2 mm	RM	10			
66	18.13	CPVC gate valve provid ing and fixing with 25 mm dia	Each	12			
67	17.78.1	Providing &fixing CP brass grating of approved quality and make conforming to IS specification 75 mm					
		100 mm dia	Each	30			
68		Repairing of flashing systeran (WC)	Each	4			
69	18.14	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete					
		15 mm dia	Each	22			
		20 mm dia	Each	4			
	18.14.3	25 mm dia	Each	3			
				PART-B TOTAL Rs.			
	PART-C	Fabrication Works					
70	15.21	Dismantling steel work manually/ by mechanical means in built up sections with span upto 10 meter and hieght 5 meter without dismembering and stacking within 50 metres lead as per direction of Engineerin-Charge	Kg	630			
71	22.3	Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of applying cement slurry @ 4.4 Kg/sqm mixed with water proofing compoundf applying blown or residual bitumen applied hot at 1.7 Kg. per sqm of area. d) and 400 micron thick PVC sheet. conforming to IS 2645 in recommendedproportions including roundingoff junction of vertical and horizontal surface.	Sqm	27			
72	4.27.2	Labour charge for Trimix vacuum dewatering process for concrete and cost of fixing, removing of "C" Channel formwork including using vacuum dewatering machine machine finished as directed including light brooming and curing including making construction joint by cutting of joint of by using of concrete cutter machine.150 mm thick	Sqm	194			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
73	10.06	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete including the cost of providing and fixing necessary 27.5cm long wire springs manufacturedfrom high tensile steel wire of adequate strength conforming to I.S. 4454- part-1 and M.S. top cover of required thickness for rolling shutters. 10.6.1 1.25 mm thick top cover 80x1.25mm M.S. laths with 1.25 mm thick top cove	Sqm	32			
	10.7.1	Exceeding 10.00 sqm and upto 16.80 sqm in the area.	Sqm	15			
	10.9	Providing and fixing ball bearing for rolling shutters	Each	8			
74	11.73	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opcharge (length of finished kerb (.3x.2x0.75 mm)	Cum	3			
75	9.66.1	Providing and fixing ISI marked stainless steel tower bolt black finish, (Barrel type) with necessary screws etc. complete :S.S. tower bolt- 250x10 mm	Each	18			
	9.66.2	200x10 mm	Each	33			
76	9.69.1	Providing and fixing ISI marked stainless steel handles with necessary screws etc. complete :S.S. handles-125 mm	Each	50			
77	9.65.1	Providing and fixing ISI marked stainless steel sliding door bolts with nuts and screws etc. complete:S.S. sliding door,300x16 mm	Each	16			
78	9.65.2	250x16 mm	Each	31			
79	9.76	Providing and fixing Stainless steel hanging type floor door stopper with necessary screws, etc. complete.(Doubble)	Each	32			
80	24.11	Providing and fixing precoatedgalvanised iron profile sheets (size, shape and pitch of corrugation as approved by Engineer-in-Charge) 0.50 mm + 0.05 %, total coated thicknesswith zinc coating 120 gsm as per IS: 277 in 240 mpa steel grade, 5-7 micronsepoxy primer on both side of the sheet and polyester top coat 15-18 microns.	Sqm	1198			
81	24.14.2	Providing and fixing PUF insulated continuous sandwich panels for roofs of total thickness not less than 30 mm made out from continue line method panel shall have pre coated GI sheet on both side of Polyurethane foam with external face being corrugated in shape for GI and PU foam both material.					
		PPGI sheet 0.35mm thick skin on both sides.	Sqm	301			
82	24.21.2	Supply and installation of termite proof, moisture/fire resistant cement bonded particle board confirming to IS: 14276: 1995 in wall panel on structure to form wall/partition wall on external face of the frame fixed the self-drilling/tapping screws/fasteners of approved make					
		12 mm thick	Sqm	20			
83	21.2.2	12 mm thick one side pre-laminated particle board (decorative lamination on one side and other sides balancing lamination) grade - 1 medium density flat pressed, three layer particle board FPT - I or graded wood particle board .	Sqm	6			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
84	21.6	Providing & fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tabular and sections / appriopriate Z sections & other sections of approved make confirming to IS: 733 and IS: 1285, fixed with rawel plugs and screws or with fixing clips, or with expansion hold fastnersincluding necessary filling up of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt etc. aluminium sections shall be smooth, rust free straight, mitred and joined mechanically wherever required including cleat angle, aluminium snap beading for glazing/panelling, C.P. brass / stainless screws, all complete as per architectural drawings and the directions of Engineer-in- charge. (Glazing & panelling to be paid for separately)					
		Power coated aluminium (minimum thickness of power coating 50 micron) for fixed portion	Kg	374			
85	21.3	Providing and fixing glazing in aluminium door, window, ventilator shutter and partitions etc. with PVC/neoprene gasket etc. complete as per the aechitectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item) with float glass panes of 5.50 mm thickness	Sqm	70			
86	9.94	Providing and fixing aluminium die cast body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 35 kg and door width upto 700 mm) with necessary accessories and screws etc. complete.	Each	14			
87	12.60.1	Providing and fixing tiled false ceiling of specified materials of size 595x595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections (galvanized @ 120 grams/ sqm, both side inclusive) consisting of main "T" runner with suitably space	Sqm	68			
88	8.7.1	Curtain Wall with Aluminium Composite Panel (ACP) Cladding, with open grooves for linear as well as curvilinear portions of the building, for all heights and all levels etc. including: a) Structural analysis and design and preparation of shopdrawings for pressure equalisation or rain screen principle as required, proper	Sqm	13			
89	9.43	Providing and fixing M.S. grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.	Kg	676			
90	10.24.3	Providing and fixing carbon steel galvanised (minimum coating 5 micron) dash fastener of 10 mm dia doublethreaded 6.8 grade (yield strength 480 N/mm2),counter sunk head, comprisingof 10 mm dia polyamide PA 6 grade sleeve, including drilling of hole in frame, concrete/ masonry, etc. as per direction of Engineer-in-charge.AT VDY lab and general storage building for 2 nos partition,Dimension no.10X120 mm	Each	38			
91	2.9.2	Excavating trenches of required width for pipes, cables, etc. including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m including getting out theexcavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : (No extra lift is payable if work is done by mechanical means) in all kinds of soil	Mtr	500			
		Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia. Including sand cutioning and protected by bricks					

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	**MPSOR-2024**	**Description of Item**	**Unit**	**Qty**	**Rates in figure**	**Rates in words**	**Amount in Rs.**
92		Providing, laying, Jointing & field testing of High Density Polyethylene pipes, (HDPE) confirming to IS 4984/ 14151/12786/ 13488 with necessary jointing material like mechanical connector or jointing pipes by heating to the ends of pipes with the help of Teflon coated electric mirror/ heater to the required temperature and then pressing the ends together against each other, to form a monolithic & leak proof joint by thermosetting process. It may be required to be done with Jacks/Hydraulic Jacks/ But fusion machine. (50mm & above fusion jointed & below 50mm mechanical jointed	Mtr	500			
		Pressure 6 Kg/cm including necessary fitting					
93	19.7.1	Providing and fixing squaremouth S.W. gully trap class SP1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70kg as per standard design :With well burnt bricks	Each	2			
94	19.9.1.1	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 sand) R.C.C. top slab with Cement Concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stoneaggregate 20mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 sand) finished with floating coat of neat cement and making channels in cement concrete	Each	1			
95	12.52	Supply & Application of Rockwool RB 2 slab 64kg /m3 , 50mm thick, with GI wire netting 24 SWG; fixing for NRC Value 1.00 for Acoustics, thermal & fire purpose conforming to and IS: 8133, IS: 8183 with tolerance of -2 + 6mm of RB slabs unfaced (Binder < 3.5%); conforming to IS:8183/ASTM C 612 latest edition with amendments.50 mm thick rock wool slab with GI wire	Sqm	639			
96		Providing and fixing precoated galvanised steel sheet roofing accessories 0.50 mm + 0.05 % total coated thickness, Zinc coating 120gsm as per IS: 277 in 240 mpa steel grade, 5- 7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self-drilling/ self-tapping screws complete including all type of flashing: Gutter	RM	26			
					PART-C TOTAL Rs.		
	PART-D	**Painting works**					
97	NS1	Painting : Painting of structural steel with preparing surface by wire brushing scraping chipping and rubbing etc complete Paint of approved manufacturer brand colour and shade to be used as per specifications at all elevation and as directed including supply of paint cleaning and preparing the surface scaffolding etc complete All primary and secondary member shall be supplied with factory applied one coat of zinc chromate red oxide primer finished with 2 coats of synthetic enamel paint applied at site	KG	8460			
98	NS2	HDPE Sheet of black colour (High density polyethylene sheet) 200 micron thickness should be free from wrinkles or any damage and hiles, With proper overlapping and using cold stick and as per site condition and as direction	Sqm	812			

Detailed BOQ Schedule A (CIVIL WORKS)							
Sr. No.	MPSOR-2024	Description of Item	Unit	Qty	Rates in figure	Rates in words	Amount in Rs.
99	NS3	Filling with local earth /moorum available insite barrow area with in any where in the campus (free from clay (in layer not exceeding 200 mm in depth reacking clods watering ,rolling each layer with 1/2 tonne rollar or wooden or steel fammers and rolling every 3rd and top most lare with power of minimum 8 tonnes and dressing up in embankment for road , flood bank marginal and guide bank etc lead up to 50 m and lift up to 1.5 m	Cum	379			
100	NS4	Acid wash in Ladies and Gents at Ground and First floor of CWS,Work shop no.13 including floor,wall,WC,Bash Basin.Total-42 No Toilet	Job work	4			
101	NS5	Falseing and floor repairing ,& removing of alumineum partition,floor tiles etc. complete	Job work	1			
102	NS6	Route Marker of Concrte pole size 100x100x 900 mm including supported by concreting including painting o on pole	Nos	30			
103	NS7	Repaire of main enterance gate (MS Steel including)eligment ,making of lock arrangement both side painting including supporting of steel column etc complete .	Job work	1			
				PART-D TOTAL Rs.			
		Total Part 1- (Schedule A+ B+C +D) Amount Rs.					

Part 2 Detailed BOQ for Electrical works:

DETAILED BOQ FOR ELECTRICAL WORKS (PART -2)						
S.No	DESCRIPTION OF ITEM	UNIT	QTY	Rates in figure	Rates in words	AMOUNT
1	Supply and fixing following way, three pole and neutral, pre-wired, sheet steel,MCB distribution board, 415 volt, on surface / resses,complete with loose wire box ,terminal block, duly pre-wired with suitable size FR PVC insulated copper conductor upto terminal block, tinned copper busbar, din bar, detachable gland plate, interconnectios, phosphatized and powder painted including earthing etc. as required.(but without MCB / RCCB / ISOLATOR)					
	6 way (4+ 18) , Legrand make or equivalent	No.	4			
2	Supply and fixing following way, single pole and neutral, prewirred, sheet steel,MCB distribution board,240 volt, on surface /resses,complete with loose wire box ,terminal block,duly prewired with suitable size FR PVC insulated copper conductor upto terminal block, tinned copper busbar, din bar, detachable gland plate, interconnectios, phosphatized and powder painted including earthing etc. as required.(but without MCB / RCCB / ISOLATOR)					
	4 way, Legrand make	No.	4			
3	Supply and fixing 6 amps to 32 amps rating, 240volts,'C' series, MCB suitable for lighting and other load of following pole in existing MCB DB complete with testing commissioning etc. as required.					

DETAILED BOQ FOR ELECTRICAL WORKS (PART -2)						
S.No	**DESCRIPTION OF ITEM**	**UNIT**	**QTY**	**Rates in figure**	**Rates in words**	**AMOUNT**
	Single Pole	No.	**40**			
4	Supply and fixing following rating, TPN 440volts, 'C' series, MCB in existing MCB DB complete with connections testing and commissioning etc. as required.					
	63 amps	No.	**8**			
5	Supply and fixing following rating, double pole, 240volts, 'C' series, MCB in existing MCB DB complete with connections testing and commissioning etc. as required.					
	40 amps	No.	**8**			
6	Supply, installation, testing and commissioning of 30 amps c curve 4 Pole MCB with industrial socket in polycarbonate enclosure of approved make design.	No.	**8**			
7	Wiring for light point / fan point / exhaust fan point / call bell point with 1.5 sqmm FR PVC insulated, copper conductor cable in surface / recessed steel conduit,with modular type switch, modular plate, suitable size GI box along and earthing the point with 1.5 sqmm FR PVC insulated copper conductor single core cable etc as required.conductor cable in surface / recessed steel conduit,with modular type switch, modular plate, suitable size GI box along and earthing the poin					
	Group C	Pt.	**32**			
8	Wiring for light/power plug with 2x4 sq mm FR PVC insulated copper conductor single core cable in surface/recessed steel conduit alongwith 1 No 4 sq mm FR PVC insulated copper conductor single core cable for loop earthing as required.	RM	**300**			
9	Wiring for light/power plug with 4x4 sq mm FR PVC insulated copper conductor single core cable in surface/recessed steel conduit alongwith 2 No 4 sq mm FR PVC insulated copper conductor single core cable for loop earthing as required.	RM	**300**			
10	Wiring for circuit/sub main wiring with the following sizes of FR PVC insulated copper conductor single core cable in surface / recessed steel conduit as required					
	i) 2 x 4 + 1X 4 sq. mm earth wire	RM	**230**			
11	Supplying and fixing of following sizes of M steel conduit along the accessories in surface / recess including painting ion case of surface conduit or cutting the wall and making good the same in case of recessed conduit as required for submain etc.					
	25mm	RM	**950**			
12	Supply and fixing of following sizes of modular type switches / sockets outlets on the existing modular plate and switch box including connection but excluding modular plate etc.of approved colour as required as per choice of Ei/C.					
a	Switch 6 amps one way	No.	**160**			
b	Switch 16 amps one way	No.	**32**			
c	6 amps 2/3 pin socket (shuttered)	No.	**40**			
d	6/16 amps 6 pin socket (shuttered)	No.	**46**			
13	Supply and fixing of following sizes of mobile sockets outlets in polycarbonated box including connection .of approved colour as required					
	21 A , 2P Industrial Socket (IP 67)	No.	**20**			
14	Supply and fixing of of following sizes of modular cover plateswith base & box of approved colour complete as required and choice of EIC					
a	Two module plate	No.	**10**			

DETAILED BOQ FOR ELECTRICAL WORKS (PART -2)						
S.No	**DESCRIPTION OF ITEM**	**UNIT**	**QTY**	**Rates in figure**	**Rates in words**	**AMOUNT**
b	Three module plate	No.	**30**			
c	Four module plate	No.	**10**			
d	Six module plate	No.	**50**			
15	Earthing with copper earth plate 600mm x 600mm x 3.0mm thick including accessories and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal and salt) complete as required.	Set	**2**			
16	Earthing with GI earth plate 600mm x 600mm x 6.0mm thick including accessories and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal and salt) complete as required.	Set	**6**			
17	Providing & fixing of 25mm x 5mm GI strip in 40 mm dia GI Pipe from earth electrode as required.	RM	**245**			
18	Supply and drawing 6SWG GI wire for loop earthing in surface / recess	Mtr	**200**			
19	Providing & fixing of 25mm x 5mm Copper strip on surface or recess for earth connection as required.	Mtr	**90**			
20	Laying and fixing of following sizes of one number PVC insulated and PVC sheathed/XLPE Power cable of 1.1kv grade on surface or existing cable tray etc or in ground. Excluding exevation refilling etc. as required.					
a	Size not exceeding 35 Sq.mm.	Mtr	**800**			
b	Size exceeding 35 Sq.mm. but not exceeding 95 Sq.mm	Mtr	**200**			
21	Supply and making end termination with flame proof double compression brass gland and aluminium thimbles for XLPE insulated and PVC sheathed aluminium conductor cable of 1.1kv grade of the following sizes as required.					
a	3.5 core, 95 Sq.mm. AL Cable	Sets	**6**			
22	Supply and making end termination with brass compression gland and Copper thimbles for XLPE insulated and PVC sheathed copper conductor cable of 1.1kv grade of the following sizes as required.					
	4 core, 6 &10 Sq.mm. copper cable	Sets	**40**			
23	Fabricating and fixing of perforated MS cable trays including horizontal and vertical bends, reducers, tees, cross members and other accessories as required and duly suspenders and including painting with powder coating etx as required.					
	150 mm width x 50 mm depth x1.6 mm thickness	RM	**290**			
24	Supply and fixing of recessed mounting type Led light fixture, LED of 1 to 3 Watt each assembled on single MCPCB, having color temp upto 6500K & having 50000 burning hrs life with minimum @ L 70,system lumen output should be minimum with efficacy>100 lm/Watt LED driver PF> 0.95, THD < 20% & surge protection 4KV. The colour rendering index of LED light should be more than 70. Housing made of CRCA powder coated frame with glare free diffused polycarbonate cover. Submission LM 79-08/IS16106 (2012), IEC60598, IEC61347i/c connection wire, testing etc. to complete the job. 2' X 2', 36W, 3000-6500k LED luminiare 2' X 2', 36Watt, color temp 3000-6500k as required.	NO	**30**			

DETAILED BOQ FOR ELECTRICAL WORKS (PART -2)						
S.No	**DESCRIPTION OF ITEM**	**UNIT**	**QTY**	**Rates in figure**	**Rates in words**	**AMOUNT**
25	supply and fixing recessed mounting LED down lighter, LED of 1 to 3 Watt each assembled on single MCPCB, having color temp upto 6500K & having 50000 burning hrs. life with minimum @ L 70, system lumen output should be minimum with efficacy>100 lm/Watt. LED driver PF > 0.95, THD < 20% & surge protection 4KV. The colour rendering index of LED light should be more than 70. Housing made of pressure die cast aluminium/CRCA powder coated frame with glare free diffused polycarbonate cover. Submission LM 79- 08/IS16106 (2012), IEC60598, IEC61347i/c connection wire, testing etc. to complete the job..12 Watt, color temp 3000-6500k as required	No	**20**			
26	Supplying, erection and testing of approved make wall mounting fan oscillating type with base, blades, guard, speed regulator etc. AC 230-250 volts with connections and including raw bolt/anchor hole fastener etc. complete finished and as required. size-400mm **GEC/ CROMPTON/ HAVELS/ USHA /KHAITAN MAKE**	No	**20**			
27	300mm size Exhaust fan heavy duty with mounting frame, blades AC 230-250 complete connection and including, frame bolt/anchor hole fasteners etc. complete finished and as required. **GEC/ CROMPTON/ HAVELS/ USHA /KHAITAN MAKE**	No	**8**			
28	Erection of exhaust fan in position with required PVC sheathed cable, frame bolts etc. complete including connections.	No	**8**			
29	450mm size Exhaust fan heavy duty with mounting frame, blades AC 230-250 complete connection and including, frame bolt/anchor hole fasteners etc. complete finished and as required. **GEC/ CROMPTON/ HAVELS/ USHA /KHAITAN MAKE**	No	**6**			
	TOTAL PART 2 (ELECTRICAL WORKS)					

Seal & Signature: _____

Dated: _____

Name of Representative: _____

Name of Bidder: _____

Address: _____