

CHENNAI METRO RAIL LIMITED



SINGLE PACKET SYSTEM

NIT No. **CMRL/PHASE II/P2C3/Geo-01/2018**

NAME OF WORK:

“Detailed Geotechnical Investigation by Drilling Bore holes and collecting and testing the samples and submission of Geotechnical reports from MADHAVARAM MILK COLONY to PATTALAM of Corridor-3 (Total Length = 8.04 KM (CH: (-95.00) to CH:7947.00)) for UNDER GROUND section of Phase II Chennai Metro Rail Limited”

***Director Projects
Chennai Metro Rail Limited***

(THIS TENDER DOCUMENT IS NOT TRANSFERABLE)

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SECTION I

FORM OF TENDER

CHENNAI METRO RAIL LIMITED

TENDER FORM

Tender for the work of:

- (i) “Detailed Geotechnical Investigation by drilling bore holes, collecting and testing of samples and submission of comprehensive report for Phase-II works (Part-I) of M/s CHENNAI METRO RAIL PROJECT”.
- (ii) To be submitted by 11.00 Hrs. on 06.03.2018 AT Admin Building, CHENNAI METRO RAIL OFFICE CHENNAI
- (iii) To be opened in presence of tenderers who may be present at 11.30 Hrs. on 06.03.2018 in the office of CMRL

Issued to / Downloaded by _____ (Contractor)

Signature of officer issuing the documents (If Issued by CMRL)

Designation _____

Date of Issue _____

Tender Notice No. CMRL/PHASE II/ P2C3/Geo-01/2018

FORM OF TENDER

Date:

To:

Director Projects,
Chennai Metro Rail Limited
Administrative Building, CMRL Depot,
Poonamallee High Road,
Koyambedu, Chennai – 600107.

1. I/ We have read and examined the Notice Inviting Tender and Instructions to Tenderer, General Rules and Directions, Conditions of Contract, Clauses of Contract like, Special Conditions of Contract, Technical Specifications and Schedule of Quantities contained in the Tender Document for the work.
2. I / We hereby tender for the execution of the work specified in 'Schedule of Quantities' within the time specified, and in accordance in all respects as per 'Conditions of Tender', 'Special Conditions of Contract & Specifications' and 'Conditions of Contract' so far as applicable.
3. Should this Tender be accepted, I / We undertake to commence the work within 7- days of issue of Letter of Acceptance or any other day as specified therein for the work subject to the availability of Site and further undertake to complete and deliver the whole of the Works comprised in the Contract within 08 months from the date of Letter of Acceptance.
4. We agree to keep the tender open for 90 (Ninety) days from the due date of submission thereof and not to make any modifications in its terms and conditions
5. A sum of Rs. 14,80,000/- (Rupees Fourteen Lakhs and Eighty thousand only),is hereby forwarded in the form of Deposit at call receipt of a Scheduled Bank guaranteed by the Reserve Bank of India / Banker's cheque / Demand Draft / Fixed Deposit Receipt as the Earnest Money.
6. If I/ We withdraw my / our tender within the Validity period of 90-days from the due date of submission thereof or make many modifications in the Terms and Conditions of the Tender which are not acceptable to the Employer, then the Employer shall, without prejudice to any other right or remedy, be at liberty to forfeit the Earnest Money absolutely.
7. On issue of Letter of Acceptance by the Employer I / We agree that the said Earnest Money shall be retained by the Employer towards retention money / performance security to execute all the work referred to in the Tender document upon the Terms and Conditions contained or referred to therein and to carry out such deviation as may be ordered at the rates to be determined in accordance with the provisions of Contract.

8. I/ We hereby agree that I/ We shall sign the Formal Agreement with the Employer within 30-days from the date of issue of Letter of Acceptance. In case of any delay, I/We agree that we shall not submit any Bill for Payment till the Contract Agreement is signed.
9. I/ We hereby declare that I/We shall treat the tender documents and other records connected with the work as secret / confidential documents and shall not communicate information derived there from to any person other than a person to whom I/ We am/ are authorized to communicate the same or use the information in any manner prejudicial to the safety rights of the Employer.
10. I/ We hereby declare that I/We have not laid down any condition / deviation to any Condition of Tender in the Technical and / or Financial Bid. I/We agree that in case any condition is found to be quoted by us in the Technical and / or Financial Bid, my /our Tender may be rejected and my/ our Earnest Money forfeited in full.
11. I/ We understand that the Employer is not bound to accept the lowest or any tender he may receive. I/We also understand that the Employer reserves the right to accept the whole or any part of the tender and I/We shall be bound to perform the same at the rates quoted.
12. I am / We are signing this Tender offer in my / our capacity as one / those authorized to sign on behalf of my/ our company/ as one holding the Power of Attorney issued in my favour as Lead Member by the Members of the Joint Venture. I/We enclose an attested copy of the Authority to Sign/ Power of Attorney.
13. I/ We declare that we have not been blacklisted or deregistered by any central / state government department Public sector undertaking or Metro Rail Corporations. Also none of our works have been rescinded by client after award of contract during last 5 years.
14. I/ We declare that we (any member in case of JV/consortium) have not have suffered bankruptcy/ insolvency during the last 5 years. (If otherwise, then the reasons and the details for the same need to be submitted).
15. I/ We in accordance with GCC Sub-Clause & Appendix to Bid, plan to subcontract the following key activities or parts of the works to the following sub-contractors.

Name of Sub Contractor	Address	Key activity	Tentative Amount of the sub activity

(If no part to be sub contracted, indicate “none”)

16. Attached herewith are the following:
 - i) Income Tax and Sales Tax clearance certificates for the **last three years** issued by the appropriate authority:

ii) Demand Draft for **Rs.**.....towards cost of Bid documents in case purchased in the counter.

iii) Bid Security for **Rs. 14,80,000/-** in the form of:

a) Demand Draft (*Furnish details of the Demand Draft*).....

b) Chalan (*Furnish details of the Chalan*).....

17. Attached to this letter are copies of original documents defining:

- i) The Bidder's legal status;
- ii) The principal place of business;
- iii) The place of incorporation (for Bidders that are corporations) or the place of registration and the nationality of the owner (s) for Bidders that are partnerships or individually owned firms).

18. The Chennai Metro Rail Limited and its authorized representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents and information submitted in connection with this Bid, and to seek clarification from our bankers and clients regarding any financial and technical aspects. This Prequalification Bid Submission Sheet will also serve as authorization to any individual or authorized representative or any institute referred to in the supporting information to provide such information deemed necessary and requested by the Chennai Metro to verify statements and information provided in this Bids, or with regard to the resources, experience and competence of the Bidder.

19. The Chennai Metro Rail Limited and its authorized representatives may contact the following persons for further information:

Name, Telephone and Fax No. of person

General and Management Information	
Personnel	
Technical Enquiries	
Financial Enquiries	

20. Appended to these Bids, we give details of the participation of each party, including capital contribution and profit/ loss agreements, to the joint Venture or associations. We also specify the financial commitment in terms of the percentage of the value of the/ each contract, and the responsibilities for execution of the/each contract.
21. I/ We confirm that all the Annexure (A to F) & Appendix (1 to 16) as required under this contract are filled and signed.
22. We confirm that in the event that we submit bid, that as well as any resulting contract will be:
 - i) Signed so as to legally bind all partners jointly and severally; and
 - ii) Submitted with a Joint Venture agreement providing the joint and several liabilities of all partners in the event the contract is awarded to us.
23. The undersigned declare that the statement made and the information provided in the duly completed Bids are complete, true, and correct in every detail.

Seal & Signature of Authorized Person/s of bidder

Date

Name

Name of Firm

Postal Address

Witness:

Signature:

Date

Name

Address

Check List

Bidder shall check the submission of relevant details and documents as mandated in the tender document, before submission of bids.

S No	Description	Tenderer's Response YES / NO												
1	<p>Clause No 25.0 of (ITT) Tender Security Amount (Earnest Money Deposit) of INR 14,80,000/- (Rupees Fourteen Lakhs Eighty Thousand only) is enclosed?</p> <p>The Tender Security Amount (Earnest Money Deposit) shall be either in the form of Demand Draft or an irrevocable Bank Guarantee drawn from any Public Sector Bank in favor of Chennai Metro Rail Limited payable at Chennai.</p>													
2	<p>Total monetary value of construction work performed for each of the last five years</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Year</td> <td></td> </tr> <tr> <td style="text-align: center;">2016—2017</td> <td></td> </tr> <tr> <td style="text-align: center;">2015 - 2016</td> <td></td> </tr> <tr> <td style="text-align: center;">2014 – 2015</td> <td></td> </tr> <tr> <td style="text-align: center;">2013 – 2014</td> <td></td> </tr> <tr> <td style="text-align: center;">2012 -- 2013</td> <td></td> </tr> </table>	Year		2016—2017		2015 - 2016		2014 – 2015		2013 – 2014		2012 -- 2013		
Year														
2016—2017														
2015 - 2016														
2014 – 2015														
2013 – 2014														
2012 -- 2013														
3	<p>Clause No 11.0 of (ITT) Whether proof for having achieved a minimum Average Annual Turnover during the last 5 years ending 31st March of the previous financial year (2012-2013, 2013 - 2014, 2014 - 2015, 2015 – 2016 , 2016 - 2017) in the Geo Technical Investigation field should be at least of Rs.250 Lakhs is enclosed.</p>													

S No	Description		Tenderer's Response YES / NO
	Year 2016—2017 2015 - 2016 2014 – 2015 2013 – 2014 2012 -- 2013		
4	Clause No 8 (ITT). Whether proof for Tender Experience of having successfully completed similar works during last 5 years (2012 - 2013, 2013 - 2014, 2014 - 2015, 2015 – 2016, 2016 - 2017) for Centre Government of India / State Government Department / Government undertaking in India should be either of the following: a). Three similar completed works costing not less than the amount Rs. 3.3 Crores. b). Two similar completed works costing not less than the amount Rs. 4.12 Crores. c). One similar completed works costing not less than the amount Rs. 6.6 Crores. Is enclosed? ““Similar Work” means similar works like Geotechnical Investigations and submission of comprehensive report.		
	Year 2015 - 2016 2014 – 2015 2013 – 2014 2012 - 2013 2011 - 2012		
5	Clause No 28 (ITT) & Appendix 12 Equipment Capabilities. (i) Minimum requirement of plants and equipment. 1. Auger / Clayx Wash Boring – 12 Nos 2. Hydraulic Rig – 04 Nos 3. All required Lab Equipment		

S No	Description	Tenderer's Response YES / NO
	(iii) Tenderer should give an undertaking that the above equipment's will be purchased / hired for the project if not Owned or submit MoU / undertaking from such lab.	
6	Annexure B of (ITT) Technical Personnel Required	
	1. One Team Leader with M.Tech (Geo Tech) with Minimum 10 years' Experience in Geotechnical works.	
	2. One Lab Incharge with M.Tech (Geo Tech) with Minimum 08 years' Experience in handling all laboratory tests for Geotechnical works.	
	3. One Structural Engineer with M.Tech (Structures) with Minimum 05 years' Experience in co-relating Geotechnical test results for structural works	
	4. Two Field Engineers with M.Tech/B.Tech (Civil) with Minimum 10/05 years' experience 'respectively to supervise over all investigations and sampling.	
	5. One Geologist MSC (Geology) with Minimum 10 years' experience in geotechnical works	
	6. Six Nos Junior Engineer with Diploma/B.Tech (Structures) with Minimum 03 years' Experience in Geotechnical works.	
	7. One number of Safety Engineer with Diploma in Safety with minimum 3 years of Experience in handling Geo Technical works.	
	Consent letter and attested copy of degree / diploma certificate and experience letters to be attached.	
7	Clause No. 9 (ITT) Audited Balance Sheet for the Last Five Years Attested copies to be attached.	
8	Clause No. 9 (ITT) Company should be making profits for atleast three years out of last five years.	

S No	Description	Tenderer's Response YES / NO
9	Clause No. 10 (ITT) Company should have positive net worth.	

This Check List is only illustrative and not exhaustive. Hence the bidder is requested to go through the entire document and submit all relevant documents and details.

NOTE:

1. Copies of the documentary evidence to be furnished in support of the prequalification requirements should be submitted with due attestation by the competent authority.
2. The tenderers should furnish the original documents when called for at the time of tender evaluation to verify the copies of documentary evidence furnished along with the pre-qualification documents.
3. The audited balance sheet /profit and loss account etc., to be furnished by the tenderer should be properly endorsed by the auditors as verified with reference to the particulars furnished by the individual and found to be correct.

SECTION II

NIT & APPENDICES



**CHENNAI METRO RAIL LIMITED
CHENNAI 600107, INDIA**

NIT No: CMRL/PHASE II/ P2C3/Geo-01/2018

“National Competitive Bidding”

CMRL invites sealed Percentage Rate Tender through **National Competitive Bidding (NCB)** under Single stage single envelope with initial filter (Technical & Financial) for the works as detailed below:

1	Name of work	Tender No. P2C3/Geo-01/2018-“Detailed Geotechnical Investigation by Drilling Bore holes and collecting and testing the samples and submission of Geotechnical reports from MADHAVARAM MILK COLONY to PATTALAM of Corridor-3 (Total Length = 8.04 KM (CH: (-95.00) to CH:7947.00)) for UNDER GROUND section of Phase II Chennai Metro Rail Limited”.
2	Tender Security Amount (EMD)	INR 14.8 Lakhs. (Rupees Fourteen Lakhs and Eighty Thousand only). Bidders must provide their GST registration details.
3	Tender validity	90 days from the date of submission of bid
4	Validity of Tender Security Amount	28 Days beyond Tender validity period (118 days) i.e., valid up to 02/07/2018 or later
5	Duration of Contract (Completion period of the work)	08 months
6	Tender Documents on sale	From 05/02/2018 to 05/03/2018 (between 10:00 hrs. to 17:30 hrs.) on working days only.
7	Cost of Tender Documents (Non-refundable)	<ol style="list-style-type: none"> The Tender documents can be downloaded from the internet, if so desired (see below for website details). There will be a non-refundable Tender submission fee of Rs.24,000/- (Rupees Twenty Four Thousand only) including GST in the form of Demand Draft in favour of Chennai Metro Rail Limited payable at Chennai to be submitted along with bid. A hard copy of the complete tender documents is available on payment of non-refundable fee Rs.30,000/- (Rupees Thirty Thousand only) including GST from CMRL office in the form of Demand Draft in favour of Chennai Metro Rail Limited payable at Chennai.
8	Pre-bid Meeting	15/02/2018 at 11:00 hours in the CMRL Conference Room Address: Chennai Metro Rail Limited, Administrative Building, CMRL Depot, Poonamallee High Road, Koyambedu, Chennai 600 107 Tel No.044-2379 2000; Extn: 22347; Mobile No. 9445868300 Fax No.044-2379 2200, Email id: agmcm@cmrl.in
9	Last date of seeking clarification	19/02/2018 (Upto 14:00 hrs)
10	Last Date of issuing addendum for pre- bid	22/02/2018
11	Date and Time of submission of Tender	06/03/2018 upto 11:00 hrs at office of the Additional General Manager (Contract Procurement) / CMRL, Address as mentioned in item No.8 above
12	Date and Time of opening of Tender (At the place of submission)	06/03/2018 at 11:30 hrs at office of the Additional General Manager (Contract Procurement) / CMRL, Address as mentioned in item No.8 above
13	Authority and place of purchase of Tender Documents with Contact Details	Office of the Additional General Manager (Contract Procurement)/ CMRL , Address as mentioned in item No.8 above
14	Bidders barred from bidding for this work	The bidder or JV partner have not abandoned any contract executed for Government Metro Rail Corporation during the last 10 years and none of the contracts executed by the bidder or JV partner have been terminated by the Government Metro Rail Corporations in last 10 years prior to this bid submission.
14	Website from which Tender Documents and any additional information can be downloaded	www.chennai-metro-rail.org

FORM - 1

REQUIREMENTS UNDER GENERAL CONDITIONS OF CONTRACT (GCC)

Sl. No.	DESCRIPTION	REF TO CLAUSE NO.	REQUIREMENT
1	Amount of Performance Security	Sub-Clause 15 of GCC	7.5% of the Contract Price in types and proportions of currencies in which the contract price is payable. In the event of variations during the execution of the contract which result in payments to the Contractor over and above the contract price, the Performance Security shall be adjusted in accordance with clause 4.2 of GCC.
2	Amount of Third Party Insurance	Sub-Clause 23 of GCC	One percent (1%) of the Value of the Total Contract Price for any one incident, with number of incidents unlimited.
3	Latest 'date for commencement' of the Works	Sub -Clause 30 of ITT and Sub – Clause 51 of GCC	Date given in LOA or Date of issue of Letter of Acceptance
4	'Time for completion' of the work	Sub -Clause 30 of ITT	08 months from the date of issue of Letter of Acceptance
5	Liquidated Damages	Annexure A of ITT	Rs 10,000 Per day on Non Achievement of Each Key date.
6	Limit of Liquidated Damages	Sub-Clause 56 of GCC	10% of Contract Value
7	Contract Key Dates	Annexure A of ITT	Refer Appendix 2 B of the Employer's Requirement volume 3, Page Appendices 2C-1
8	Mobilisation and Machinery advance	Sub-Clause 3.0 of SCC	Mobilisation advance of 10% of the Contract value (in two instalments) shall be provided to the Contractor. Advances shall carry an interest rate of 10 % per year. The value of Bank Guarantee shall be at 110% of the respective advances sought for.
9	Percentage of Retention Money	Sub-Clause 15.3 of GCC	5% of IPC
10	Limit of Retention Money	Sub-Clause 15.3 of GCC	2.5% of Contract Value
11	Insurance cover for Contractor's All Risk and other requirements as specified in the GCC	Sub-Clause 23 of the GCC	100% of the Total Contract Price.**

12	Period in which all insurances have to be effected	Sub-Clause 23 of the GCC	Within 3 weeks from the “date of commencement”
13	Name and Address of the Contractor		(Tenderer to Complete)
14	Name and Address of Employer	NIT	Chennai Metro Rail Ltd. Administrative Building, CMRL Depot, Poonamallee High Road, Koyambedu, Chennai – 600107.

Name:

Date:

Seal Signature of Authorized Signatory of Bidder

FORM - 2

G. Bid Data Sheet

Instructions to Tenderer (ITT) Clause Reference	Bid Data
	A. General
1.1	Detailed Geotechnical Investigation by Drilling Bore holes, collecting and testing the samples and submission of Geotechnical reports from MADHAVARAM MILK COLONY to PATTALAM of Corridor-3 (Total Length = 8.04 KM (CH: (-95.00) to CH:7947.00)) for UNDER GROUND section of Phase II (Part-I) Chennai Metro Rail Limited”.
11	The bidder should have achieved a minimum Average Annual Turnover during the last 5 years ending 31st March of the previous financial year (2012 – 2013, 2013 - 2014, 2014 - 2015, 2015 – 2016, 2016 - 2017) in Geotechnical Works.
8	<p>Tender Experience of having successfully completed similar works during last 5 years (2012 - 2013, 2013 - 2014, 2014 - 2015, 2015 – 2016, 2016 - 2017) for Centre Government of India / State Government Department / Government undertaking in India should be either of the following:</p> <ul style="list-style-type: none"> a). Three similar completed works costing not less than the amount Rs. 3.3 Crores. b). Two similar completed works costing not less than the amount Rs. 4.12 Crores. c). One similar completed works costing not less than the amount Rs. 6.6 Crores. <p><i>Similar Work” means similar work defined as similar works shall Geotechnical works and submission of comprehensive reports</i></p>
28	<p>The essential equipment to be made available for the contract by the successful bidder shall be:</p> <p>(ii) Minimum requirement of plants and equipment.</p> <ol style="list-style-type: none"> 1. Auger / Clayx Wash Boring – 12 Nos 2. Hydraulic Rig – 04 Nos 3. All required Lab Equipment

	Tenderer should give an undertaking that the above equipment's will be purchased/ hired for the project (if awarded).																																								
Annexure - B	The minimum Key personnel required for the work																																								
	<table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Position</th> <th>Minimum Qualification</th> <th>Number</th> <th>Total Experience</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Team Leader</td> <td>M.Tech (Geotech)</td> <td>1</td> <td>10</td> </tr> <tr> <td>2</td> <td>Structural Engineer</td> <td>M.Tech (Structures)</td> <td>1</td> <td>5</td> </tr> <tr> <td>3</td> <td>Lab Incharge</td> <td>M.Tech (Geotech)</td> <td>1</td> <td>8</td> </tr> <tr> <td>4</td> <td>Geologists</td> <td>MSc (Geology)</td> <td>1</td> <td>10</td> </tr> <tr> <td>5</td> <td>Field Engineer</td> <td>DCE (Civil)/ B.Tech</td> <td>2</td> <td>5</td> </tr> <tr> <td>6</td> <td>Junior Engineer</td> <td>DCE (Civil)</td> <td>6</td> <td>3</td> </tr> <tr> <td>7</td> <td>Safety Engineer</td> <td>DCE (Safety)</td> <td>1</td> <td>3</td> </tr> </tbody> </table>	Sl. No.	Position	Minimum Qualification	Number	Total Experience	1	Team Leader	M.Tech (Geotech)	1	10	2	Structural Engineer	M.Tech (Structures)	1	5	3	Lab Incharge	M.Tech (Geotech)	1	8	4	Geologists	MSc (Geology)	1	10	5	Field Engineer	DCE (Civil)/ B.Tech	2	5	6	Junior Engineer	DCE (Civil)	6	3	7	Safety Engineer	DCE (Safety)	1	3
	Sl. No.	Position	Minimum Qualification	Number	Total Experience																																				
	1	Team Leader	M.Tech (Geotech)	1	10																																				
	2	Structural Engineer	M.Tech (Structures)	1	5																																				
	3	Lab Incharge	M.Tech (Geotech)	1	8																																				
	4	Geologists	MSc (Geology)	1	10																																				
	5	Field Engineer	DCE (Civil)/ B.Tech	2	5																																				
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10	Audited Balance sheet for the last 5 financial years. Attested copies to be attached.																																								
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9	Company should be making profits for atleast three years out of last five years.																																								
	B. Bidding Documents																																								
16	The number of copies of the Bid to be completed and returned shall be <i>ONE</i>																																								
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	The number of copies of the Bid to be completed and returned shall be <i>ONE</i>																																								
18	The rates and prices quoted by the Bidder shall not be subject to adjustment during the performance of the Contract																																								
4	The period of Bid validity shall be 90 days after the deadline for Bid submission specified in the Bid Data sheet.																																								
25	The amount of Bid Security shall be Rs. INR 14,80,000/- (Rupees Fourteen Lakhs Eighty Thousand only) as provided in the Invitation to Bid or other forms as per conditions of contract]																																								

	D. Submission of Bids
16	The address for the purpose of Bid submission is <i>Director (Projects), Chennai Metro Rail Limited, Admin Building, CMRL Depot, Poonamallee High Road, Koyambedu, Chennai –600107, Tamil Nadu, India.</i>
30.3.8	The deadline for submission of bids shall be <u>06/03/2018</u> up to 11.00 Hrs
	E. Bid Opening and Evaluation
16	The opening of the Prequalification Bid shall take place at the Office of <i>Director (Projects), Chennai Metro Rail Limited, Admin Building, CMRL Depot, Poonamallee High Road, Koyambedu, Chennai –600107, Tamil Nadu, India.</i>

APPENDIX – 1

DECLARATION BY THE BIDDER/ TENDERER

I/We _____ hereby declare that
I/We am/ are not in any way related to any officer who is in charge of
..... or having control of this work.

I/We agree that if, at any stage, it is found that this declaration is untrue, the bid security/
performance security paid by me/ us will be forfeited and the contract entered will stand
cancelled at the risk and cost of contractor.

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF THE TENDERER

Date:

APPENDIX – 2

QUALIFICATION INFORMATION

Sl. No	Questions	Answers to be furnished by the bidder
1	Name of Firm	
2	Nationality	
3	Head Office Address Postal Telex No Fax No. E-Mail	
4	Type of Organization Individual Partnership Incorporated company	
5	Year & place of establishment	
6	Give brief description of field/ areas in which you have executed work. Please furnish details and particulars of such works in the relevant formats attached.	
7	Are you registered with any other Government/ Department / Public undertaking (if yes, give details)	
8	What are your sources of finance (Please give details of bank reference – certificate from bank endorsing your financial stability and certificate to substantiate other sources)	
9	Give the last five years account with auditor's reports, balance sheet, profit and loss account, and income tax clearance certificate.	

Sl. No	Questions	Answers to be furnished by the bidder
10	How much is your paid up capital How much is your working capital How much is your annual turnover for the last five years (Give separately for each year) How much is your net income for the last five years (Give separately for each year)	
11	Do you intend to associate any other organisation for the works, which you are bidding? If so, give full particulars of that organization separately under each head of questionnaire and forms	
12	Formats (enclosed may filled) Details of Engineers & Managerial Personnel Details of machinery and equipment owned by the Company List of Machinery & equipment that company proposes to take on rent and use for the work Present activities in which your firm is engaged as a Main contractor (last five years) Present activities in which your firm is working in Joint Venture (last five years) Material Testing facilities available with the firm	

Note: In the case of Joint venture/ consortium/ group, the lead bidder shall submit the answers as per the above questionnaire pertaining to each firm in the group.

SIGNATURE OF AUTHORIZED SIGNATORY
 ON BEHALF OF THE TENDERER
 Date:

APPENDIX – 3

LIST OF EQUIPMENTS PROPOSED TO DEPLOY FOR THE WORK

(To be filled by the Bidder)

Sl. No.	Particulars	Capacity	Number	Own/ Lease/ Rent

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF THE TENDERER

Date:

APPENDIX - 4

LIST OF KEY PERSONNEL PROPOSED TO DEPLOY FOR THE WORK

Sl. No	Name	Position	Qualification	Years of Experience in the relevant field

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF THE TENDERER

Date:

APPENDIX - 5

DETAILS OF ASSOCIATES AND THEIR RESPONSIBILITES

(Applicable in case of Laboratory testing arrangements are tied with another party)

Sl. No.	Name & Address of Sub Contractor	Responsibility	Value of work to be Sublet

SIGNATURE OF AUTHORIZED SIGNATORY

ON BEHALF OF THE TENDERER

Place:

Date:

APPENDIX – 6

GENERAL INFORMATION ABOUT THE TENDERER

A. TENDERER INFORMATION SHEET		
Tenderer's Legal Name		
Legal status of the Tenderer	Sole Proprietorship Firm / Partnership Firm / Private Limited Company / Public Limited Company / Joint Venture / Consortium (Please tick one)	
In case of JV/Consortium, Legal name of each partner with percentage participation (also provide information of each member in separate sheet (page 2 of 2))	Legal Name of JV/Consortium member	% participation
	1.	
	2.	
	3.	
Lead member of JV/Consortium		
Tenderer's legal address in India, telephone numbers, fax numbers, email address for communication		
Tenderer's authorized signatory (name, designation, address, contact no.)		
Tenderer's authorized representative (name, designation, address, contact no.)		
<p>FOLLOWING NEEDS TO BE SUBMITTED BY THE TENDERER: (by each member in case of JV/consortium)</p> <ul style="list-style-type: none"> a) Affidavit in case of Proprietary firm. b) Partnership Deed in case of partnership firm. c) Memorandum & Article of Association in case of a Public/Private limited company. d) In case of JV/Consortium, MoU/Agreement (duly notarized) entered into by the joint venture / consortium members, containing intended percentage participation, nomination of Lead Member and division of responsibility to clearly define the work of each member etc. e) Authorization/POA in favour of authorized signatory of tenderer to sign the tender, and also in favour of authorized representative of each member in case of JV/Consortium. <p>Note: Tenderer's authorised representative shall be deemed to have authority of the tenderer to receive and deliver any correspondence and attend meetings with CMRL related to the tender.</p>		

B. JV/CONSORTIUM MEMBER INFORMATION	
MEMBER – 1	
JV/Consortium Member's Legal Name	
Legal status of the Member	Sole Proprietorship Firm / Partnership Firm / Private Limited Company / Public Limited Company (Tick any one)
Member's country of constitution	
Member's legal address, telephone numbers, fax numbers, email address)	
Member's authorized representative (name, designation, address)	
MEMBER – 2	
JV/Consortium Member's Legal Name	
Legal status of the Member	Sole Proprietorship Firm / Partnership Firm / Private Limited Company / Public Limited Company (Tick any one)
Member's country of constitution	
Member's legal address, telephone numbers, fax numbers, email address)	

SIGNATURE OF AUTHORIZED SIGNATORY
 ON BEHALF OF TENDERER

Date:

APPENDIX - 7

WORK EXPERIENCE

NAME OF THE TENDERER (CONSTITUENT)

MEMBER IN CASE OF JV/CONSORTIUM):

1. Name of work	
2. Agreement / contract No.	
3. Client	
4. Scope / Nature of work	
5. Date of start	
6. Stipulated date of completion	
7. Actual date of completion	
8. Total value of work done on completion (up to <u>31.03.2017</u> in case of works in progress)	
A. Value of Work Done in Geo Technical Investigation works.	
9. Ref to client's completion certificate	

NOTE:

1. Separate sheet shall be used for each member in case of JV/Consortium.
2. Attach copies of the audited balance sheets, including all related notes, income statements for the last three audited financial years, as indicated above.
3. All such documents reflect the financial data of the tenderer or member in case of JV/Consortium, and not that of sister or parent company.
4. ***In case the work is executed for private client, copy of work order, bill of quantities, bill-wise details of payment received certified by C.A., T.D.S certificates for all payments received and copy of final/last bill paid by client shall be submitted.***

*Similar nature of works means work related to Geotechnical investigation including core drilling through overburden/rocky strata including lab tests and submission of comprehensive report with recommendation.

Note

(i) In support of having completed above works attach attested copies of the completion certificate from the owner companies indicating the name of work, the description of work done by the bidder, date of start, date of completion (contractual & actual), value of contract as awarded and as executed by the bidder and value of material supplied free by the client. When the owner company is a private one, the Certificate from the Company must be supported by TDS Certificate issued by the Company.

1. (II) INFORMATION MUST BE FURNISHED ON ONLY WORKS CARRIED OUT BY THE BIDDER IN HIS OWN NAME. WORKS CARRIED OUT, AS A PARTNER IN THE JOINT VENTURE SHALL NOT BE INCLUDED IN THIS PERFORMA.

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF TENDERER

Date:

APPENDIX- 8

FINANCIAL DATA
(FINANCIAL STANDING)

Tenderer's legal name

Date

.....

JV/consortium Member's legal name.....Page of pages

Each Tenderer or member of a JV must fill in this form separately

(All figures are Indian Rupees in crores)

S.N.	Description	Financial Data for Latest Last 5 Years (Indian Rupees)				
		Year 2012-13	Year 2013-14	Year 2014-15	Year 2015-16	Year 2016-17
1.	Total Assets					
2.	Current Assets					
3.	Total External Liabilities					
4.	Current Liabilities					
5.	Annual Profits Before Taxes					
6.	Annual Profits After Taxes					
7.	Net Worth [= 1- 3]					
8.	Working Capital [=2 - 4]					
9.	Return on Equity					
10	Annual turnover (from Geo Technical Investigation Works)					
11	Gross Annual turnover					

Attach copies of the audited balance sheets, including all related notes, income statements for the last five audited financial years, as indicated above, complying with the following conditions.

1. Separate sheet shall be used for each member in case of JV/Consortium.
2. All such documents reflect the financial data of the Tenderer or member in case of JV, and not sister or parent company.
3. Historic financial statements shall be audited by Statutory Auditor of the Company under their seal & stamp and shall be strictly based on Audited Annual Financial results of the relevant period(s). No statements for partial periods will be accepted.
4. **Historic financial statements must be complete, including all notes to the financial statements.**

5. Return on Equity = Net Income / Shareholders Equity

Return on Equity = Net Income is for the full fiscal year (before dividends paid to common stock holders but after dividends to preferred stock).

Shareholders equity does not include preferred shares.

The above Annexure shall be duly certified by Chartered Accountant / Company Auditor under his signature & stamp.

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF TENDERER

Date:

APPENDIX -9

FINANCIAL DATA

(GEOTECHNICAL WORK DONE DURING THE LATEST LAST FIVE FINANCIAL YEARS)

NAME OF THE TENDERER (CONSTITUENT

MEMBER IN CASE OF JV/CONSORTIUM) :

(All figures are Indian Rupees in crores)

Sl. No.	DESCRIPTION	Financial Data for Last 5 Audited Financial Years				
		<u>Year</u> <u>2012-13</u>	<u>Year</u> <u>2013-14</u>	<u>Year</u> <u>2014-15</u>	<u>Year</u> <u>2015-16</u>	<u>Year</u> <u>2016-</u> <u>17</u>
1	2	3	4	5	6	7
	Total value of <i>Geotechnical Investigation work done as per audited financial statements</i>					

NOTE:

1. Separate sheet shall be used for each member in case of JV/Consortium.
2. Attach attested copies of the Audited Financial Statements of the last five financial years as Annexure.
3. All such documents reflect the financial data of the tenderer or member in case of JV/Consortium, and not that of sister or parent company.
4. The financial data in above prescribed format shall be certified by Chartered Accountant / Company Auditor under his signature & stamp

The above financial data will be updated to **31.03.2017** price level assuming 5% inflation for Indian Rupees every year.

SIGNATURE OF AUTHORIZED SIGNATORY
 ON BEHALF OF TENDERER

Date:

APPENDIX 10

Proforma for submission of Credit Facility

This is to certify that M/s. _____ is a reputed company with a good financial standing and solvent to the extent of Rs. _____.

Signature of Authorized Signatory

Name

Date

Seal and Address of Bank

APPENDIX- 11

Proforma for Submission of Past Contractual Performance

(Affidavit on non-judicial stamp paper of Rs. 10/- duly attested by Notary/ Magistrate)

This is to certify that We, M/s _____, in submission of this offer confirm that:

- i) We have not made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements.
- ii) We do not have records of poor performance such as abandoning the work, not properly completing the contract, inordinate delay in completion, litigation history or financial failures.
- iii) Business has never been suspended / banned with us by the central / State Government Department/ Public Sector Undertaking or Enterprise of Central / State Government / Metro Rail Corporations.
- iv) We have submitted all the supporting documents and furnished all the relevant details as per prescribed format.
- v) The information and documents submitted with the tender by us are correct and we are fully responsible for the correctness of the information and documents submitted by us.

SIGNATURE OF AUTHORIZED SIGNATORY
ON BEHALF OF TENDERER

Date:

APPENDIX- 12

Certificate confirming the availability of machinery and equipment

This is to certify that I/We shall deploy the essential machinery and equipment as specified in the tender, if I/We am/are awarded the work of “Geotechnical Investigation including drilling of 150 mm / NX size vertical boreholes, laboratory testing of soil & rock samples and submission of comprehensive reports for the proposed new alignment for Phase II of Chennai Metro Rail Project as per the details indicated below. I/We agree that the equipment indicated below is the minimum essential for the project execution and in addition to these, other machinery and equipment necessary to complete the work successfully and in time, shall also be deployed by me/us.

Item of Equipment	NO's	Condition (new/good/ poor) not available	Owned
Field Equipment			
Calyx Wash boring / Tripod with Winch Machine	12		
Hydraulic Rotary rig with Double tube/Triple Tube core drilling	04		
Testing Equipment to carry out field tests			
Lab equipment			
ii. ALL Lab equipment owned / owned by other agency with whom MoU/ Association/ Undertaking to carry out all lab tests			

SIGNATURE OF AUTHORIZED SIGNATORY
 ON BEHALF OF TENDERER

Date:

Appendix -13

STAFFING SCHEDULES AND ORGANISATION CHART

1. We hereby confirm to deploy the minimum manpower with prescribe qualifications and experiences as detailed in Annexure-B of ITT
2. We also confirm to deploy manpower required for safety as per General instructions and as per the Tender requirements.

SIGNATURE OF AUTHORIZED SIGNATORY ON
BEHALF OF TENDERER
Date:

Note: The Tenderer shall provide a complete Staffing Schedule and Organisation Chart he proposes for the work which has to satisfy the requirement of item 1 & 2 above.

APPENDIX 14

UNDERTAKING FOR CORRUPT & FRAUDULANT PRACTICE

It is confirmed and declared that we, or any of our associate, have not been engaged in any fraudulent and corrupt practice and that no agent, middleman or any intermediary has been, or will be, engaged to provide any services, or any other items of work related to the award and performance of this contract and no agency commission or any payment which may be construed as an agency commission has been, or will be, paid and that the tender price will not any such amount.

SIGNATURE OF AUTHORIZED SIGNATORY ON
BEHALF OF TENDERER

Date:

NOTE:

1. In case of JV/Consortium, the undertaking shall be submitted by each member of the JV/Consortium.
2. The undertaking shall be signed by authorized signatory of the tenderer or constituent member in case of JV/Consortium.

APPENDIX 15

TENTATIVE PROJECT IMPLEMENTATION PROGRAMME

The Tenderers are requested to submit only simple bar chart programmes showing the achievement of different Key Dates. Non-submission of this bar chart shall be one of the rejections for Technical bid.

SIGNATURE OF AUTHORIZED SIGNATORY ON
BEHALF OF TENDERER

Date:

APPENDIX 16

DECLARATION

I/We have downloaded the Tender forms from the Internet site www.tenders.tn.gov.in or www.chennaietrorail.gov.in and I/we have not tampered / modified the tender forms in any manner. In case, if the same is found to be tampered / modified, I/we understand that my/our tender will be summarily rejected and the Tender Security deposited will be forfeited and I am/we are liable to be banned from doing business with CMRL and/or prosecuted.

SIGNATURE OF AUTHORIZED SIGNATORY ON
BEHALF OF TENDERER

Date:

SECTION III

INSTRUCTION TO TENDERER

INSTRUCTIONS TO TENDERER

1. GENERAL

- i. All work proposed for execution by contract will be notified in a form of Notice Inviting Tender and Instructions to Tenderers (NIT & ITT) issued to the Contractors who apply for the same.
- ii. This form will state the work to be carried out, as well as the date for submitting and opening tenders and the time allowed for carrying out the work, the amount of Earnest Money to be deposited with the tender, the amount of the Performance Guarantee to be deposited by the successful tenderer or to be deducted from bills towards the same. Copies of the specifications, designs and drawings and any other documents required in connection with the work signed for the purpose of identification by the officer inviting tender shall also be open for inspection by the Contractor at the office of officer inviting tender during office hours during the period mentioned in the NIT and ITT.
- iii. The tender must be signed by the person / persons competent to sign as indicated in the NIT and ITT. Same stipulations will also apply in the case of Receipt for payments made on account of work to the successful Contractor who has signed the Contract Agreement.

1.1 SCOPE OF WORK

It is proposed to carryout Geotechnical investigation by way of vertical drilling at 360 Nos. bore holes in soil/all types of rock to maximum depth of 40m, conducting laboratory tests including submission of report for “Geotechnical Investigation for the proposed Chennai Metro Rail Corridors.

Note: The Whole work can be converted into stages as per requirement of the project. No extra claims by Agency against remobilization of staff and equipment will be entertained.

GENERAL: The work mainly comprises of detailed Geo-Technical Investigation along the proposed Metro corridors for phase II of Chennai Metro Rail project. A detail of tentative corridors is as shown under in the key plan enclosed.

Sl.No.	Description of Corridor
1	Corridor - 3 : Madhavaram Milk Colony To Pattalam – 8.04 Km

The above corridor is given just for tentative idea and so is subjected to change. The work will be done at site for the corridor as per instruction of Engineer-in-charge.

The Scope of Work under this tender is to carry out Geo-Technical Investigation / including survey for locating boreholes along the alignment at every 25m interval. The depth of bore holes shall be to a maximum depth of 40m or as directed by the Engineer in charge.

2. Instruction to the Tenderers regarding Tender Documents downloaded from Internet:

Tender Documents can be downloaded from the internet and printout is to be taken on A4 or appropriate size papers and details are to be entered by the Tenderers at various locations in the document. It is advisable that the downloaded Tender Documents are printed through laser printer only. The submission of Xerox or photocopies of the Tender Documents is prohibited.

- a. Tenderers are free to download the Tender Documents at their own risk, for the purpose of perusal as well as for using the same as Tender Documents for submitting their offers. A Master copy of the Tender Document is available in the CMRL office. After award of the Contract, an Agreement will be prepared based on the Master copy of the Tender Documents. In case of any discrepancy between the Tender Document downloaded from the internet and the master copy, the latter shall prevail and will be binding on the Tenderers. No claim on this account will be entertained.
- b. Tenderers are advised that there is a non-refundable submission fee payable; refer to NIT.
- c. The following declaration should be signed by Tenderers, who have downloaded the Tender Documents from the internet, when submitting their Tender.

3. Form of Tender

The Form of Tender shall be completed and signed by a duly authorised and empowered representative of the Tenderer. If the Tenderer comprises a partnership, consortium or a joint venture the Form of Tender shall be signed by a person who is duly authorised by each member or participant thereof or by authorized signatory of each member. Signatures on the Form of Tender shall be witnessed and dated. Copies of relevant powers of attorney shall be attached.

4. Tender Validity

The offer by bidder should be valid for a period of 90 days from date of opening of the tender. Tenderers are requested to give unconditional offers. A conditional offer, having financial repercussions, is liable to be rejected. The tenderer not willing to quote or unable to carryout work, should return this offer along with schedule of quantities with a regret letter giving reasons for their inability to do so.

5. Pre-Tender Meeting

Pre-Tender meeting shall be held on the date and location given in the Key details of NIT. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage. The tenderer is requested to submit any question in writing or by facsimile, to reach the Employer not later than the last date of seeking clarification as mentioned in key details of NIT. Any modification of the Tender Documents which may become necessary as a result of the Pre-Tender meeting shall be made available by the Employer exclusively through the issue of an Addendum.

6. Late or Delayed Tenders

- 6.1 Tenders must be received by the Director Projects, in CMRL office at the address, date and time specified in the Notice of Invitation to Tender. Tender received before the time of opening but after due date and time of receipt of tenders is 'Delayed' tender and those received after the start of opening are 'Late' tenders.
- 6.2 The Employer shall not consider any Bid that arrives after the deadline for submission of Bids, in accordance with NIT. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late / delayed, rejected, and returned unopened to the Bidder.
- 6.3 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with NIT, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

7. Eligible Tenderers

This is an Open National competitive bidding (local) and all companies, corporations, partnership firms, consortium or Joint Ventures who are involved in execution of this type of work and those who fulfil the financial soundness and work experience criteria and other requirements laid down in this document are eligible to participate. The Tenderers are advised to refer Instructions to Tender regarding the required Qualification of the Tenderer, Eligibility Criteria - Work Experience, Financial Standing, and other requirements.

8. Eligibility Criteria:

8.1 Work Experience: The Tenderers will be qualified only if they have completed work(s) during last Five (5) years ending 31.03.2017 as given below:

- 8.1.1. The bidder should have satisfactorily completed in its own name at least one work of similar nature of minimum value of Rs. 6.60 Crores (Rupees Six Crores and Sixty Lakhs only) or Two works of similar nature of minimum value of Rs. 4.12 Crores (Rupees Four Crores and Twelve Lakhs only) or Three works of similar nature of minimum value of Rs. 3.30 Crores (Rupees Three crores and Thirty Lakhs only) during the last five years prior to the date of submission of the bid.
- 8.1.2 Works completed prior to the cut-off date shall not be considered. A weight age of 5% (Compounded annually from the date of completion of the work to the submission of the bid) shall be given for equating the works of the previous years to the current year.
- 8.1.3: The works completed before 05.03.2012 for such tender shall not be considered. Similar nature of works means work related to Geotechnical investigation including core drilling through overburden/rocky strata including lab tests and submission of comprehensive report with recommendation.
- 8.2 Only such work will be considered which are 100% physically completed in all respect for which the completion certificate to be furnished.
- 8.3 The bidder shall submit the details of such completed works as per the format at Appendix-7 of NIT. In support of having completed these works, the firm should submit copies of the completion certificates from the owner companies indicating the name of work, the description of work done by the bidder, the value of contract executed by the bidder, date of start, date of completion.
- 8.4 Documentary proof such as completion certificates from client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be submitted. The offers submitted without this documentary proof shall not be evaluated.

9. Profitability

- 9.1: Profit before Tax should be Positive in last 3 (three) years. The profitability of the tenderer should have been positive in at least 3 years in the last five years ending 31.03.2017.
- 9.2: In case of JV/consortium, the profit before tax of the lead member of the JV/consortium will be considered. The Profitability of only lead member shall be evaluated. The tenderer shall submit necessary documents in proof of it.

- 9.3: The bidder should submit attested copies of auditor's report along with audited balance sheet and profit and loss statement for the last five financial years as per the format at Appendix-8 of NIT. In case the firm is profit making for the last three financial years continuously, the bidder may submit the above document for last three financial years only.

10. Net Worth

Net worth of Tenderer during last audited financial year should have been positive (+). In case of JV/consortium, the net worth of each member should have been positive (+).

11. Annual Turnover:

- 11.1: Bidder in its own name should have achieved a minimum average annual financial turnover of Rs. 2.50 Crores (Two Crores and Fifty lakhs) in any one of the last five years i.e. for 2012-2013 to 2017-2018. A weightage of 5% per year (compounded annually) shall be given to bring the financial turnover of the previous years to the price level of the current financial year. The average annual turnover from Geotechnical works of last five financial years should be > Rs. 2.50 Crores (Two Crores and Fifty lakhs). In case of JV/consortium, the average annual turnover will be based on the percentage participation of each member.
- 11.2: Financial data for latest 5 years has to be submitted by bidders in years as per the format at Appendix-8 of NIT along with the audited Balance Sheets of last five years. If Audited Balance Sheet is not submitted, the application will be considered as Non-responsive.

12. TENDER DOCUMENTS

The Tender documents consist of:

Volume 1

- Form of Tender (FOT)
- Notice Inviting Tender (NIT)
- Instructions to Tenderers (ITT)
- Employer's Requirement and Appendices

Volume 2

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)

Volume 3

- Technical Specifications, Tender Drawings and Bill of Quantities (BOQ) / Pricing Documents

13. Amendment of Bidding Documents

At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Documents by issuing addenda. Any addendum issued shall be part of the Bidding Documents and shall be communicated in writing to all who have obtained the Bidding Documents from the Employer. If so specified, the Employer shall also promptly publish the addendum on the Employer's web page. To give Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may extend the deadline for the submission of Bids.

14. Cost of Bidding

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

15. Clarification of Bids and Contacting the Employer

From the time of Bid opening to the time of contract award, if any Bidder wishes to contact the Employer on any matter related to the Bid, it should do so in writing. To assist in the examination, evaluation, and comparison of Bids, the Employer may, at the Employer's discretion, ask any Bidder for clarification of the Bidder's Bid. The request for clarification and the response shall be in writing or by cable, telex, or facsimile, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids. Any effort by the Bidder to influence the Tender Inviting Authority in the Employer's Bid evaluation, Bid comparison or contract award decisions may result in the rejection of the Bidder's Bid.

16. Submission of Bids

Bidders should submit their bid before the last date of submission as given in the NIT in the tender box provided at Chennai metro rail Limited, Admin Building, CMRL Depot, Poonamalle High Road, Koyambedu, Chennai-600107, Tamilnadu. Tenders can also be submitted by post or courier, provided that the Tender Inviting authority shall not be responsible for any delay in transit in such cases.

16.1 Sealing and Marking of Bids

The Bid shall be submitted in single packet, addressing the Bid authority and it shall be in sealed cover super scribing cover No, Bid No, Name of work, list of enclosures, name and address of Bidder. The tender should be signed on each page by the contractor while submitting in sealed Packet. The Bid shall be submitted in 2 parts simultaneously, addressing the Bid authority and each part shall be in separate sealed covers super scribing cover No, Bid No, Name of work, list of enclosures, name and address of Bidder. The Bidders shall then put the two sealed envelopes into an outer envelope,

sealed, addressing the Bid authority, super scribing the name of work, list of enclosures, name and address of the Bidder.

i. Cover No.1- EMD and Cost of Bid Document (Volume I)

This cover should be marked as Cover number – 1, and shall contain payment Instrument with regards to Earnest Money Deposit and Cost of tender document to be submitted as required under terms of Contract

ii. Cover No.2 – Technical and Price Bid (Volume II)

This cover should be marked as Cover number – 2 and shall contain tender document and, Price Bid documents (Volume II).

The Bidder shall be responsible for properly super scribing and sealing the cover in Which the Bid is submitted and Bid inviting authority shall not be responsible for accidental / misplacement/premature opening of the covers that are not properly super scribed and sealed as mentioned in Clause 16.1

16.2 Bid Opening

The Bid will be opened at the time and date outlined in the Bid Data sheet, in the presence of Bidders/ authorized representatives who choose to attend. The Bidders names, and the presence or absence of Bid Security, and such other details as the Tender Inviting Authority may consider appropriate, will be announced by the Tender Inviting Authority at the opening.

The Bid marked as Cover no. 1 will be opened first and on presence of Bid Security (EMD), tender cost and meeting the required requirement as per ITT and NIT the second Cover marked as Technical and financial bid will be opened.

In case the bid security or Bid cost being absent or not meeting the requirement the cover No 2 marked as Technical and financial bid will not be opened and the entire bid will be rejected and returned to such bidder

On opening the second cover the Bidders names, the Bid prices, the total amount of each Bid and such other details as the Tender Inviting Authority may consider appropriate, will be announced at the opening. The Employer will prepare minutes of the Price Bid opening, including the information disclosed to those present.

17. Pricing Document

The Pricing Document is included as Bill of Quantities. The Tenderer shall complete the Pricing Document in accordance with the instructions given in Bill of Quantity. The Contractor shall quote only the overall percentage increase or decrease over the total Price indicated in the Bill of Quantities, without altering the rate of any particular item of Work.

18. Adjustment in Contract Price

The rates as per the accepted Bill of Quantities shall be applicable till the completion of the Work. It will not be varied. There shall be no adjustment or compensation for any rise or fall in costs to the Contractor. The rates in the accepted Bill of Quantities shall be deemed to include amounts to cover the contingency of such rise or fall in costs. It will be a fixed price Contract without any price variation since, the completion period is only 8 months.

19. Evaluation of Price Bids

19.1 Award Criteria for Multiple Contracts

CMRL is inviting 6 tenders simultaneously for Geotechnical works. Bidders are free to quote for either one or all the 6 packages. However, CMRL will award only maximum of two packages to a bidder. In case a bidder is lowest (L1) in more than two the packages, the award of third package to the bidder will be done to ensure the combined least cost to CMRL

19.2 Employer's Right to Accept any Bid and to Reject any or all Bids

- After negotiation with the tenderer and before passing the order accepting a tender as under sub-section (6) of section 10 of the Tamil Nadu Transparency in Tender Act, 1998 if the Tender Accepting Authority decides that the price quoted by such tenderer is higher by the percentage as may be prescribed over the schedule of rates or prevailing market price, he shall reject the Tender.
- The Tender Accepting Authority, before passing the order accepting a tender, may also reject all the tenders for reasons such as changes in the scope of procurement, new technologies or substantial design changes, lack of anticipated financial resources, Court orders, accidents or calamities and other unforeseen circumstances.

20. Discount

If the contractor offers discount /rebate in the total value of work, his bid price will be after calculating the total amount the discount / rebate amount that is to be deducted.

21. Rates to Include

The tendered rates for the works should be inclusive of all items of works required for the proper execution of the items (viz) watering, barricading, lighting, watching, safety arrangements in the interest of traffic, safeguarding the underground utility services etc, and no claim for extra payment on any score will be entertained.

22. Notification of Award and Signing of Agreement

The Bidder whose Bid has been accepted will be notified of the award by Tender Inviting authority prior to expiration of the Bid validity period by cable, telex, or facsimile confirmed by registered letter. This letter hereinafter and in the Conditions of Contract called the —Letter of Acceptance will state the sum that the Tender Inviting Authority will pay the Contractor in consideration of the execution, completion, of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the Contract Price). The notification of award will constitute the formation of the Contract, subject to the Bidder furnishing the Performance Security in accordance with GCC sub clause 15 and signing the Agreement in accordance with condition of contract.

The bidder shall have to enter into an agreement with the Tender Inviting Authority within 30 days from the date of receipt of letter of acceptance. The form of agreement will have to be stamped at the stamp office at the cost of the bidder as per format in Annexure-C of ITT.

23. Key Dates & Liquidated Damages

The Tenderer is to note the Key Dates as given in Annexure-A of ITT to be adhered strictly failing which Liquidated Damages as mentioned against each Key date shall be levied to the contractor. Prior to Date of Commencement, Key Dates will be converted to calendar dates. The Liquidated damages amount will be deducted from the running bills.

24. Payment Schedule

Payment for all the items in bill of Quantities shall be made on the basis of actually executed quantities.

25. EARNEST MONEY DEPOSIT

25.1: An amount of Rs. 14,80,000/- (Rupees Fourteen Lakhs and Eighty thousand only) must be accompanied as Earnest Money Deposit along with the Tender documents. The same can be deposited in the form of Demand Draft or Pay Order from any scheduled Bank/Nationalized Bank in favour of CHENNAI METRO RAIL Ltd, CHENNAI. Any tender document not accompanied with the required earnest money will be summarily rejected. The EMD of unsuccessful bidder shall be refunded after the finalization of contract and issuance of work order to successful bidder. The EMD of successful bidder to whom work is awarded shall be adjusted in retention money / performance guarantee security.

25.2: Earnest Money is liable to be forfeited in case of the following:

- On revocation of tender after opening of tenders but before the validity of the tender expires.
- On refusal to accept the work order after award of contract.
- If the work is not commenced on the stipulated date of start of the work is awarded to the contractor.

26. Tender Programme

- 26.1 The Tenderer shall submit with his Tender, a Tender Programme, which shall indicate how the Tenderer intends to organise and carry out the Works and achieve Stages and complete the whole of the Works by the appropriate Key Dates.
- 26.2 The Tender Programme shall be prepared in terms of weeks from the Date of Commencement of Works. A detailed Bar chart showing Machine/drilling rig wise showing plan to execute the work needs to be submitted as per the format given in Appendix-15 of NIT. The Tender Programme shall not in any event be construed as a submission of the Works Programme under Conditions of contract.
- 26.3 However, the Tenderer should note that he may be required to amplify, explain and develop his Tender Programme prior to award of Contract.

27. Staffing Schedule and Related Details

- 27.1: The Tenderer shall submit with his Tender a staffing schedule as per the format given in Appendix-13 of NIT containing the names, qualifications, professional experience and corporate affiliation of all proposed management personnel (above the level of shift supervisor) and specialists for this work. The submission shall include a provisional management structure and site organisation chart showing areas of responsibility, relative seniorities and lines of reporting. The proposed staffing plan shall be in conformity with the minimum requirement as specified in conditions of contract.
- 27.2: The Tenderer shall include proposed key personnel's Bio data to be deployed for this work, who is capable of carrying out drilling, field investigations and recording of strata with due observations.

28. Contractor's Equipment

- 28.1: The contractor shall deploy field equipment required to complete the work as per the schedule with minimum of numbers given in conditions of contract and also the laboratory facilities owned with or with the party who has given undertaking to carry out the lab tests.
- 28.2: The bidder should either have their own laboratory which is ISO certified or NABL accredited or the bidder must have an MOU/Association/Joint –venture, as the case may be, with an ISO certified or NABL accredited laboratory of repute for the approximate quantities indicated in tender document including the acceptable variation as per requirement during execution. The bidder should submit the proof for the same to show that their laboratory has been properly audited by the certified /accredited auditors. If the bidder fails to submit these documents along with bid, their tender shall be summarily rejected.

- 28.3 The equipment requirement shown in is only the minimum required and the tenderer shall mobilise sufficient equipment for completion of whole works within the stipulated time as no extra cost.

29. Site Familiarization Certificate

- 29.1: The Bidder, at the Bidder's own responsibility and risk, is encouraged to visit and examine the site of works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the works. The costs of visiting the site shall be at the Bidder's own expense. The tenderers should visit the work site, acquaint themselves with site conditions, approach roads, availability of materials, lead of materials, etc. and should submit the certificate.
- 29.2: The contractor is required to execute the work in stretches/areas which are made available to him and which may or may not be in continuous stretches. Decision of Engineer-in-charge shall Engineer be final in this regard and binding on the contractor. Contractor shall have no claim if the stretches/area are not available for execution. Also no extra time shall be permitted on this account.

30. OTHER TERMS AND CONDITIONS

- 30.1 The contractor shall comments the works within 7 Days of issue of Letter of Acceptance.
- 30.2 The contractor is excepted to complete the whole of the works within 8 months from the issue of Letter of Acceptance.
- 30.3 The following information should also be annexed with the tender:
- 30.3.1 The tenderer should submit the attested copy of Auditor's report along with balance sheet and profit and loss statement for the relevant financial year in which the minimum criteria is met. However, in case of non – availability of the same for the previous year, provisional audit reports of certified statements from the chartered accountant of the tenderer shall be accepted for tenders opened before 30th September of that year.
- 30.3.2 Even though the bidder may be qualifying the above criteria as per the records submitted by him, he shall be disqualified if he is found to have made misleading or false representation in the forms, statements and attachments submitted in proof of the qualification requirements. He is likely to be disqualified on the basis of:

- Records of poor performance such as abandoning the works, delay in completion, litigation history or financial failures etc.
 - The business having been suspended/ banned by any central/state Govt. or PSUs or Metro Rail Companies.
 - Having submitted all the supporting documents or not furnished the relevant details as per the prescribed format.
- 30.3.3 A declaration to the above effect in the form of an affidavit on stamp paper of Rs. 10/- duly attested by notary/Magistrate should be submitted as per enclosed format in Appendix-11 of NIT.
- 30.3.4 A solvency certificate (in original or attested copy) of minimum solvency of Rs. 4.12 Crores (Rupees Four Crores and twelve lakhs only) as per Appendix-10 of NIT from the bank is required to be submitted by the bidder.
- 30.3.5 The offers of the bidders, which do not meet the above mentioned criteria, are liable to be rejected without assigning any reason.
- 30.3.6 CMRL reserve the right to split the work and award the job to one or more agencies without assigning any reason whatsoever. Time is essence of the contract and CMRL reserves the right to award and/or split the work to other tenderers at the least quoted rates for that segment.
- 30.3.7: The acceptance of the tender will rest with CMRL who does not bind it to accept the lowest tender and reserves the right to reject any or all the tenders received, without assigning any reason. All tenders in which any of the prescribed conditions are not fulfilled or which are incomplete in any respect are liable to be rejected.
- 30.3.8: Last date for submission of the tender/Bid in the CMRL office is 11:00 Hrs on 06/03/2018.
- 30.3.9: The tenderers are advised to satisfy themselves by visiting the site to confirm about the prevalent site conditions, topography of the area, Geological formations etc. before quoting and submitting the tender to CMRL.
- 30.3.10: In the event of a discrepancy between description in words & figures quoted by a tenderer, the description in words (Rates written in words) shall prevail.
- 30.3.11: Party should submit the following latest and valid documents in duplicate
- a) Photocopies of affidavit from the Court regarding proof Proprietor (For Proprietary concern/firm).
 - b) Photocopies of Partnership deed in case of Partnership firm.
 - c) Photocopies of Power of Attorney in favour of the party's representative authorized to sign the document

SECTION IV

EMPLOYER'S REQUIREMENT

EMPLOYER’S REQUIREMENT

Annexure - A

KEY DATES

The drawings, reports, documents etc. shall be submitted by the contractor as per time frame/
 Key dates indicated below:

Key Date	Description	No. of Days from Commencement	Liquidated Damages charge On Non achievement of KD's
KD1	Submission of initial work programme, establishing site office and mobilisation of rigs as per the programme, tools equipment & machineries & Competent personal/Engineers	30 days	Rs 10,000 /- Per day
KD2	Completion of 25% of Bore hole	75 days	Rs 10,000 /- Per day
KD3	Completion of 50% of Bore hole& Submission of draft copy of Geo technical investigation report for 25 % of the Bore holes including lab testing completed at KD2	100 days	Rs 10,000 /- Per day
KD4	Completion of 75 % of Bore hole& Submission of draft copy of Geo technical investigation report for 50 % of the Bore holes including lab testing completed at KD3	130 days	Rs 10,000 /- Per day
KD5	Completion of 100% of Bore hole& Submission of draft copy Geo technical investigation report for 75 % of the Bore holes including lab testing completed at KD4	160 days	Rs 10,000 /- Per day
KD6	Overall completion of the works including back filling of Bore Holes and completion of all tests as specified in the contract.	190 Days	Rs 10,000 /- Per day
KD7	Preparation and submission of draft final report giving recommendations for type of foundation, analysis of bore logs & tests results along with SBC values and calculations in approved format.	220 Days	Rs 10,000 /- Per day
KD8	Preparation and submission of final report in four copies (soft and hard copy) giving recommendations for type of foundation, analysis of bore logs & tests results along with SBC values and calculations in approved format.	240 Days	Rs 10,000 /- Per day
KD9	Issuance of Performance Certificate	330 days	

Note: The Liquidated damages amount levied on Non achievement of KD's will be deducted from the running bills of the contractor.

Annexure - B

MINIMUM ORGANISATION STRUCTURE REQUIRED

Minimum level of supervision & qualification/ experience of site staff are as follows:

Sl. No	Key head	Qualification	Experience	No. of posts	Remarks
1.	Team Leader	M.Tech (Geo Tech)	10 yrs	1	To oversee the inputs of field, lab and to prepare report
2.	Structural Engineer	M.Tech (Geo Tech)	5 years	1	Required in connection with guiding the investigations to meet requirements of investigate to metro project
3.	Lab Incharge	M.Tech (Geo Tech)	08 years	1	To oversee all lab testing procedures and preparation of relevant reports.
4.	Field Engineer	M.Tech (or) B.Tech	M.Tech in Geotech with 5 yrsexp or B.Tech with 10 yrs exp.	2	To look after all field investigations and ensure proper sampling and transfer of samples to Lab for further testing.
5.	Geologist/Engineer Geologist	M.Sc., (Geology)	10 years	1	To oversee the investigation with field, lab for rock, earth resistance, and to assist in the preparation of report.
6.	Jr. Engineer	Diploma in Civil Engg.	3 years expin Geotech	6	To assist the Field Engineers and Lab In charge in the investigations.
7.	Safety Engineer	Diploma	investigation works	1	To ensure safety at site.

Key Personnel Requirement

1. Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated Contract Agreement
2. For this package, the Bidder must demonstrate that it has the personnel employed by them for the key positions that meet the following requirements. The figures indicated above are the minimum number of Project-Personnel required which are to be deployed as per the minimum level of supervision and qualification/experience of site-staff.
3. Other staff on requirement to carry out investigation at field and lab.
4. The Tenderer should note that all the key staff if not employed on site as per the Key personnel, there shall be a deduction of **INR 2 lakhs** for each month or part thereof for each key personnel, as determined by the Employer/ Engineer, whose decision shall be final and binding.

Annexure C

FORM OF CONTRACT AGREEMENT

This Agreement is made at Chennai on the _____ day of _____ **2018** Between Chennai Metro Rail Limited, Administrative Building, CMRL Depot, Poonamallee High road, Koyambedu, Chennai - 600107 hereinafter called “the Employer” of the one part and**(Name and Address of the Contractor)**hereinafter called “the Contractor” of the other part. Whereas the Employer is desirous that the Works should be executed, viz.**(Name of the contract)**hereinafter called “the Works” and has accepted a Tender by the Contractor for the execution and completion of such works and the remedying of defects therein.

This agreement is signed between (for and on behalf of the Employer) and on behalf of (for and on behalf of the Contractor).

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. These documents shall be signed by(for and on behalf of the Employer) and (for and on behalf of the Contractor).
 - a. The Contract Agreement (CA);
 - b. The Letter of Acceptance LoA); along with letters of clarifications, if any;
 - c. Letter of Clarifications on submitted Tender, if any;
 - d. Addenda to the Tender Documents;
 - e. Form of Tender (FOT);
 - f. BOQ/Payment schedule / Pricing Document;
 - g. NIT;
 - h. ITT;
 - i. The Special Conditions of Contract;
 - j. The General Conditions of Contract;
 - k. The Employer's Requirements
 - l. Technical Specifications and Drawings
 - m. The Contractor's Proposal if any; and any other document forming part of the Contract.

3. In addition the following documents shall form part of the agreement.
 - (i) Letter of Acceptance and Notice to Proceed bearing No. and date
 - (ii) Contractor's proposal submitted along with the tender.
 - (iii) Any other item as applicable.

4. The modifications to the tender documents communicated through the Addenda (... Numbers) dated respectively, issued to the tenderers at the time of tender have been incorporated in the consolidated contract documents. Copies of the Addendaare available with the Employer, Contractor and Engineer. As and when required, they could be referred to and in case of any discrepancy between the corrections/modifications incorporated in the consolidated contract documents and the Addenda, the provision of the Addenda shall prevail.
The Contractor has submitted Performance BG No. datedfor
(Rupees only) with validity up to issued by
and confirmed by the said Bank vide their letter dated in reference to CMRL letters dated

5. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the works by; i.e. 8 months from the date of issue of Letter of Acceptance, dated and remedy any defects therein in conformity in all respects with the provisions of the Contract.

6. 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 Total Contract Price of ` (Rupees Only) including all taxes, duties, levies, cess, GST, etc; being the sum stated in the letter of acceptance subject to such additions thereto or deductions there from as may be made under the provisions of the Contract at the times and in the manner prescribed by the Contract.

7. OBLIGATION OF THE CONTRACTOR

The contractor shall ensure full compliance with tax laws of India with regard to this contract and shall be solely responsible for the same. The contractor shall submit copies of acknowledgements evidencing filing of returns every year and shall keep the Employer fully indemnified against liability of tax, interest, penalty etc. of the contractor in respect thereof, which may arise.

8. JURISDICTION OF COURT

The Courts at Chennai shall have the exclusive jurisdiction to try all disputes arising out of this agreement between the parties.

IN WITNESS WHEREOF the parties hereto have caused their respective Common Seals to be hereunto affixed / (or have hereunto set their respective hands and seals) the day and year first above written.

For and on behalf of the Contractor

For and on behalf of the Employer

Signature of the authorized officer official

Signature of the authorized official

Name of the official

(i) (.....)
On behalf of

Name of the official
(.....)
.....

Stamp/Seal of the Contractor

Stamp/Seal of the Employer

By the Said

By the said

_____ Name

_____ Name

on behalf of the Contractor in the presence of:

on behalf of the Employer in the presence of:

Witness _____

Witness _____

Name _____

Name _____

Address _____

Address _____

Annexure D

Letter of Acceptance
[Insert letterhead paper of the Employer]

[Insert date]

To: *[Insert name and address of the Contractor]*

1. This is to notify you that your Bid dated *[insert date]* for execution of the *[insert name of the Contract and identification number, as given in the Contract Data]* for the Accepted Contract Price of the equivalent of *[insert amount in words and figures] [insert name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.
2. You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Annexure-E, Annex to the Employer's Requirement - Contract Forms, of the Bidding Documents
3. The completion period is 240 days from the date of issue of Letter of Acceptance (LoA).
4. This letter of acceptance will deemed to be an agreement till the formal agreement is executed.
5. The LOA is sent in duplicate, you may please return on copy duly signed immediately.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Annexure E

Performance Security

Demand Guarantee

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *Chennai Metro Rail Limited, CMRL Depot, Admin. Building, Poonamallee High Road, Koyambedu, Chennai 600 107*

Date: *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of *[insert name of the contract and brief description of the Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]([insert amount in words])*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for its demand or the sum specified therein.

This guarantee shall expire, no later than the *[insert the day]* day of *[insert month]*, *[insert year]*, and any demand for payment under it must be received by us at this office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

The Guarantor agrees to a one-time extension of this guarantee for a period not exceeding one year, in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.

[Signature(s)]

Annexure F

Mobilization Advance Payment

Demand Guarantee

(To be stamped in accordance with Stamp Act, if any, of the country of the issuing bank)

[Insert Guarantor letterhead or SWIFT identifier code]

Beneficiary: *Chennai Metro Rail Limited, CMRL Depot, Admin. Building, Poonamallee High Road, Koyambedu, Chennai 600 107*

Date: *[Insert date of issue]*

Mobilization Advance **GUARANTEE No.:** *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called “the Applicant”) has entered into Contract No. *[insert reference number of the contract]* dated *[insert date of the contract]* with the Beneficiary, for the execution of *[insert name of contract and brief description of Works]* (hereinafter called “the Contract”).

Furthermore, we understand that, according to the conditions of the Contract, an Mobilization Advance in the sum *[insert amount in figures]* (*[insert amount in words]*) is to be made against an Mobilization Advance payment.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*) upon receipt by us of the Beneficiary’s complying demand supported by the Beneficiary’s statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:

- (a) has used the Mobilization Advance payment for purposes other than the costs of mobilization in respect of the Works; or
- (b) has failed to repay the Mobilization advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary’s bank stating that the Mobilization advance payment referred to above has been credited to the Applicant on its account number *[insert number]* at *[insert name and address of Applicant’s bank]*.

The maximum amount of this guarantee shall be progressively reduced by the amount of the Mobilization advance payment repaid by the Applicant as specified in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that ninety (90) percent of the Accepted Contract Price, less provisional sums, has been certified for payment, or on the *[insert day]* day of *[insert month]*, *[insert year]*, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

The Guarantor agrees to a one-time extension of this guarantee for a period not exceeding one year, in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.

[signature(s)]

SECTION V

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GENERAL CONDITIONS OF CONTRACT
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50.0	Suspension of works
50.1	Protection during suspension of work
50.2	Cost incidental to suspension of work
50.3	Extension of time on account of suspension
50.4	Compensation for idle labour/plant due to extension of time
50.5	Contractor's option to ask for closure of Contract
	COMMENCEMENT AND DELAYS
51.0	Commencement of work
52.0	Programme of work
53.0	Possession of site
54.0	Way leaves
55.0	Access to site of work
55.1	Access for Engineer
55.2	Access Road
56.0	Delay and Extension of Contract period
56.1	Time to be essence and extension of time
56.2	Extension due to modifications
56.3	Delays not due to Employer/Contractor
56.4	Delays due to Employer/Engineer
56.5	Delays due to Contractor
56.6	Time to continue to be the essence of Contract
56.7	Engineer's decision on compensation payable being final

CLAUSE NO.	DESCRIPTION
	TERMINATION OF CONTRACT
57.0	Fore-closure or termination of Contract
57.1	Payment to Contractor on fore-closure or termination contract
57.2	Default of Employer
58.0	Rescission of contract due to death of Contractor /Partner
59.0	Determination of Contract due to Contractor's default
59.1	Conditions leading to determination of Contract
59.2	Entitlement of Employer
59.3	Non-exercise of power not to constitute waiver
	ALTERATIONS, ADDITIONS AND OMISSIONS
60.0	Modifications to Work
60.1	Authority to order modifications
60.2	Modification not to affect the Contract
60.3	Decision of Engineer to be final
61.0	Variation in quantity of items covered by the Bill of Quantities
62.0	Extra items not in the Bill of Quantities
62.1	Operation of extra items of work
62.2	Derivation of rates for extra items of work
62.3	Notice by Contractor
62.4	Provisional payment for extra item
62.5	Payment of extra items of work on the basis of actual expenditure
62.6	Decision of Engineer to be final and binding
63.0	Modifications to Contract to be in writing
	CHANGES IN COST
64.0	Price variation
65.0	Deleted
	PROCEDURE FOR CLAIMS
66.0	Claims
67.0	Lien in respect of claims in other Contract

CLAUSE NO.	DESCRIPTION
	CONTRACTOR'S EQUIPMENT, MATERIALS AND TEMPORARY WORKS
68.0	Plant & Materials supplied by the Contractor
68.1	Contractor's Plant/Material at Site to be exclusive to the work
68.2	Removal of construction plants/materials from site
68.3	Loss and damage to construction plants/materials
68.4	Assistance to Contract for re-export of plants
68.5	Assistance to Contractor for customs clearance
68.6	Rejection of any material/workmanship found defective at site
69.0	Temporary works
	MEASUREMENTS AND PAYMENTS
70.0	Measurements of work and payments
70.1	Quantity in Bill of Quantity only estimated quantity
70.2	Payment on actual measurements
70.3	Measurement of work at regular intervals
70.4	Measurement of works as per records and drawings
71.0	On-account payment
71.1	Procedure for on-account payment
71.2	Non-recording of measurements
71.3	On-account payment without prejudice
72.0	Final measurements and payments
	CERTIFICATES AND PAYMENT
73.0	Advance
74.0	Round off
75.0	Payments and Compliance with Tax Requirements.
75.1	Payment by NEFT/ RTG only
75.2	Tax Deduction at Source
75.3	Compliance to GST and othertax requirements.
76.0	Completion Certificate

CLAUSE NO.	DESCRIPTION
76.1	Time of completion
76.2	Notice by Contractor regarding completion of work
76.3	Completion Certificate not to absolve
77.0	Post payment audit
78.0	Cessation of Employer's liability
78.1	Unfulfilled obligations
79.0	Production of vouchers
80.0	Withholding of lien for sums claimed
81.0	Signature on Receipts for payments
	SPECIAL RISKS
82.0	Force Majeure
	SETTLEMENT OF DISPUTES
83.0	Settlement of disputes and arbitration
83.1	Dispute Resolution
83.2	Adjudication
83.3	Arbitration
83.4	No Suspension of work
83.5	Excepted Matters
	NOTICES
84.0	Notices
84.1	Notices to Contractor
84.2	Notices to Employer and Engineer
84.3	Change of address
84.4	Change in constitution of firm
	CURRENCY AND RATES OF EXCHANGE
85.0	Payment in foreign currencies

GENERAL CONDITIONS OF CONTRACT

1.0 DEFINITIONS

In the Contract, as hereinafter defined the following words and expressions shall have the meanings hereby assigned to them, except where the context requires otherwise.

- a. "Employer" means the Board of the Chennai Metro Rail Limited (CMRL), Chennai, a body corporate established by Companies Act 1956, acting through its Managing Director or any other officer so nominated by the Managing Director and shall include their legal successors and permitted assignees.
- b. "Engineer" means such persons, or firm, as may be appointed from time to time by the Employer, and notified in writing to the Contractor to act as Engineer for the purposes of the Contract, or any nominated officer of CMRL.
- c. "Engineer's Representative" means any Assistant of the Engineer, or any clerk of works, appointed from time to time by the Engineer under Sub-clause 4.2.
- d. "Contractor" means the individual, firm, company, corporation, Joint Venture, or consortium whether incorporated or not, who enters into the Contract with the Employer, and shall include his heirs, his executors, administrators, successors, legal representatives, as the case may be.
- ii) "Contractor's Agent" shall mean by Contractor the person or persons authorised under power of attorney duly empowered to take all actions relating to the work, as could be taken by the Contractor himself.
- iii) "Contractor's Representative" shall mean a person in supervisory capacity who shall be so declared by the Contractor and who shall be authorised to comply the instructions and to (clause 11.0) receive materials issued by the Engineer to the Contractor for works. He shall be capable of taking responsibility for proper execution of works.
- e. "Sub-Contractor" means the individual, Firm Company, Corporation, Joint Venture or Consortium, having direct contract with the Contractor and to whom any part of the Work has been sublet by the Contractor, with prior permission of the Engineer or Employer and shall include his heirs, his executors, administrators, successors, legal representatives, as the case may be.
- f. "Other Contractor" or "Others" means the individual, firm, Company, Corporation, Joint Venture or Consortium, employed by or having a contract directly or indirectly with the Employer otherwise than through the Contractor.
- g. "Tenderer or Bidder" means the individual, firm, Company, Corporation, Joint Venture or Consortium submitting a bid / tender.
- h. "Scheduled Bank" means a bank included in the second schedule to the Reserve Bank of India Act, 1934, or modifications thereto.
- i. "Contract" means the Contract Agreement with all documents mentioned in Clause 1.0 of "Instruction to Tenderers".

- j. “Tender or Bid” means the offer made by individual, Firm, Company, Corporation, Joint Venture or Consortium for the execution of the works.
- k. “Specification” means the specification referred to in the Contract and any modification thereof or addition thereto, as may from time to time be furnished or approved in writing by the Engineer.
- l. “Drawings” means maps, drawings, plans, tracings or prints thereof, calculations and technical information of a like nature provided by the Engineer to the Contractor or annexed to the Contract, and any modifications of such drawings and further drawings that may be issued by the Engineer from time to time or approved by the Engineer in writing. It includes such other drawings as are made from time to time and furnished by the Contractor and approved by the Engineer.
- m. “Bill of Quantities” means the priced and completed Bill of Quantities forming part of the Tender.
- n. “Contract Price” or “Contract Value” means the sum stated in the Letter of Acceptance, subject to such additions thereto or deductions therefrom as may be made under the provisions of the Contract.
- o. i) “Works” means the work to be executed in accordance with the Contract and shall include both Permanent Works and Temporary Works.
ii) “Permanent Works” means the permanent works to be executed, completed and maintained in accordance with the Contract.
iii) “Temporary Works” means all temporary and enabling works of every kind required for the execution and completion of the permanent works and the remedying of any defects therein.
- p. “Construction Plant” means all machinery, appliances or things of whatsoever nature, required for the execution, completion or maintenance of the works, but does not include material or other things, intended to form or forming part of the permanent works.
- q. “Site” means the land and / or other places on, under, in or through which the Works are to be carried out, and any other lands or places provided by the Employer for the purpose of the Contract.
- r. “Materials” means all equipment, components, fittings and other materials including raw materials required to execute and complete the work.
- s. “Test” means such tests as are prescribed in the specifications or by the Engineer or Engineer’s Representative, whether performed by the Contractor or by the Engineer or his Representative or any agency acting under the direction of the Engineer.
- t. “Approval or Approved” means approval in writing including subsequent written confirmation of previous verbal approval.
- u. “Period of Maintenance” means the specified period of maintenance from the date of completion of the work as certified by the Engineer and specified in the Contract. This period is also termed as “Defects Liability Period”.

- v. "Letter of Acceptance" means the letter from the Employer or the Engineer, or a person nominated by them on their behalf for this purpose, to the Contractor, conveying acceptance of the Tender, subject to any modifications agreed to between the parties and includes advance acceptance of the tender.
- w. i) "Month" means calendar month.
ii) "Day" means calendar day.
- x. "Terms and expressions not herein defined" shall have the meanings assigned to them in the "Indian General Clauses Act, 1897" or the Indian Contract Act or the Indian Sale of Goods Act or any other applicable Indian Law, as the case may be.
- y. "Contract" means the Contract Agreement, the Letter of Acceptance, the letter of tender, General Conditions of Contract, Special Conditions of Contract, the Employer's Requirements, the Tender, the Notice Inviting Tender, Instructions To Tenderers, the Contractor's Proposal, the Schedules, and such further documents which are listed in the Letter of Acceptance or Contract Agreement (if completed).
- z. "Contract Agreement" means the contract agreement referred to in Sub-Clause 1.4. It shall also include all subsequent modifications/ amendments to the Contract as a result of the communications or negotiation proceedings between the parties.
- aa. "Special Conditions of Contract" means any special conditions of contract issued by the Employer prior to submission of the Tender or negotiated and agreed in writing-by -the Employer and the Contractor prior to and conditional upon acceptance of the Tender.

2.0 HEADINGS AND MARGINAL NOTES AND INTERPRETATIONS

2.1 Headings and Marginal Notes

The top headings and marginal notes given in the Tender or Contract documents, are solely for the purpose of facilitating reference and shall not be deemed to be part thereof and shall not be taken into consideration in the interpretation or construction thereof or of the Contract.

2.2 Interpretation

Words importing persons or parties shall include firms, corporations and any organisation having legal entity. If there are any discrepancies among the various documents, the same shall be referred to the Engineer, who shall offer his clarification and interpretation. The same shall be final and binding.

3.0 SINGULAR, PLURAL AND GENDER

Words importing the singular only also include the plural and vice versa where the context requires. Similarly words importing masculine gender also include the feminine gender.

4.0 ENGINEER AND ENGINEER'S REPRESENTATIVE

4.1 Duties and Authority of Engineer

The Engineer shall carry out the duties specified or implied in the Contract including issue of instructions, decisions, certificates and orders, as are specified in the Contract, or necessary for the observance / administration of the Contract and expeditious and timely completion of the Work. Should the Engineer exercise any specific authority for which, as per the terms of his appointment, he has to obtain the approval of the Employer, the Contractor shall deem such approval to have been given by the Employer.

4.2 Duties and Authority of Engineer's Representative

The Engineer's Representative shall be responsible to the Engineer. His duties are to watch and supervise the Works and to test and examine any materials to be used or workmanship employed in connection with the Works. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract, nor, except as expressly provided hereunder or elsewhere in the Contract, to order any Work involving extra time or any extra payment by the Employer, nor to make any variation of or in the Works.

The Engineer may, from time to time, in writing delegate to the Engineer's Representative, any of the powers and authorities vested in the Engineer, and shall furnish to the Contractor and to the Employer, a copy of all such written delegations of powers and authorities. Only written instruction, decision or approval given by the Engineer's Representative to the Contractor within the terms of such delegation, but not otherwise, shall bind the Contractor and the Employer, as though it had been given by the Engineer. Provided always as follows:

- a. Failure of the Engineer's Representative or his assistants, to reject any work or materials shall not prejudice the authority of the Engineer or Employer thereafter, to reject such work or materials or plant and order the pulling down, removal or breaking up thereof. The Engineer's Representative shall have similar authority to reject any work or material or plant passed by his Assistants, appointed in terms of provision of Sub-clause 4.3 herein.
- b. If the Contractor shall be dissatisfied by reason of any instruction or decision of the Engineer's Representative, he shall be entitled to refer the matter to the Engineer, who shall thereupon confirm, reverse or vary such decision. The Engineer's Representative shall have similar authority to confirm, vary, or, reverse any instructions and decisions issued by his Assistants, appointed in terms of Sub-clause 4.3 herein.

4.3 Assistants to Engineer and Engineer's Representative

The Engineer or the Engineer's Representative may appoint any number of assistants to assist them. Their names, duties and scope of authority shall be notified to the Contractor, and they shall have the authority to issue instructions / give decisions to the extent of duties assigned and powers delegated to them.

4.4 Instructions in writing

Instructions given by the Engineer shall be in writing, provided that if for any reason the Engineer considers it necessary to give any such instruction orally, the Contractor shall comply with such instructions. Confirmation in writing of such oral instruction given by the Engineer, whether before or during or after carrying out of the instruction, shall be deemed to be an instruction within the meaning of this Sub-clause and the date of first instruction verbal or in writing shall be the date of such instructions.

5.0 ASSIGNMENT AND SUBCONTRACTING

5.1 Assignment of Contract

The Contractor shall not, without the prior consent of the Employer (which consent shall be at the sole discretion of the Employer), assign the Contract or any part thereof, or any benefit or interest therein or there under, otherwise than by:

- a. A charge in favour of the Contractor's bankers of any money due or to become due under the Contract, or
- b. Assignment to the Contractor's insurers (in cases where the insurers have discharged the Contractor's loss or liability) of the Contractor's right to obtain relief against any other party liable.

5.2 Subcontracting

The Contractor shall not subcontract the whole or part of the Works except where otherwise provided by the Contract. The Contractor shall not subcontract any part of the Works without the prior consent of the Engineer. Any such consent shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and defects of any Subcontractor, his agents, servants or workmen as fully as if they were the acts, defaults or defects of the Contractor, his agents, servants or workmen.

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

- a. the provision of labour, or
- b. the purchase of materials which are in accordance with the standards specified in the Contract, or
- c. the subcontracting of any part of the Works for which the Subcontractor is named in the Contract.

5.3 Assignment of Subcontractor's Obligations

In the event of a Subcontractor having undertaken towards the Contract in respect of the work executed, or the goods, materials, plant or services supplied by such Subcontractor, any continuing obligation extending for a period exceeding that of the Defects Liability Period or Maintenance Period under the Contract, the Contractor shall at any time, after the expiration of such period, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

5.4 Compensation for Breach

Any breach of the conditions under Sub-clauses 5.1 to 5.3 above shall entitle the Employer to rescind the contract under Clause 59.0 of these conditions and also render the Contractor liable to the Employer for compensation, in respect of loss or damage arising out of our ensuing from such cancellation.

5.5 Explanation on Subcontracting

Provided that always execution of the details of the works by petty contracts, or on piece work basis, under the personal supervision of the Contractor or his agent, shall not be deemed to be subcontracting under this clause.

5.6 No Change in the Responsibility of Contractor

Permission to assign, transfer or subcontract the work by the Contractor, shall not establish any contractual relationship between the assignee, transferee or the subcontractor and the Employer and shall not relieve the Contractor of any responsibility under the Contract.

5.7 Sub-Contractor/Vendor Warranty

In the event that a sub-contractor/vendor provides to the Contractor or any other sub-contractor a warranty in respect of Plant, Equipment, Materials or services supplied in connection with the Works, or undertakes a continuing obligation of any nature whatsoever in relation to such Plant, Equipment, Materials or services (including without limitation an obligation to maintain stocks of spare parts) extending for a period exceeding that of the Defects Liability Period. The Contractor shall immediately assign or obtain the assignment of the benefit of such warranty or obligation to the Employer.

If a sub-contractor/vendor has undertaken a continuing and assignable obligation to the Contractor for the work designed or executed, or Plant, Equipment, Materials, services supplied, by such sub-contractor/vendor, and if such obligation extends beyond the expiry of the Contract Period, the Contractor shall, upon the expiry of the Contract Period, assign the benefit of such obligation to the Employer for its unexpired duration.

5.8 Joint and Several Liability

If the contractor is (under applicable laws) a joint venture, consortium, or other incorporated grouping of two or more persons:

- a. these Persons shall be deemed to be jointly and severally liable to the Employer for the performance of the Contract;
- b. these Persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and
- c. the Contractor shall not alter its composition or legal status without the prior Consent of the Employer.

6.0 COMMUNICATIONS AND LANGUAGE OF CONTRACT

6.1 Communications to be in writing

All notices, communications, references and complaints by either party to the Contract shall be in writing and no notice, communication, reference or complaint not in writing, shall be recognized or be binding.

6.2 Language of Contract

The Contract document shall be drawn up in English. Supporting documents or literature may be in any other language, but an appropriate English translation duly authenticated thereof shall be provided. In case of inconsistency between the two, the English translation shall prevail.

7.0 LAWS GOVERNING THE CONTRACT AND CO-RELATION OF DOCUMENTS

7.1 Laws governing the Contract

The Contract shall be governed by the laws for the time being in force in India.

7.2 Co-relation of documents

The contract documents are complementary and what is called for by any one of them shall be as binding as if called for by all of them.

7.3 Ambiguities or discrepancies

In case of ambiguities or discrepancies, the same shall be clarified by the Engineer who shall thereupon issue to the Contractor instructions thereon and in such event the priority of the documents forming the Contract shall be as stated in the instruction to the tenderer / Special Conditions of Contract :-

8.0 SPECIFICATIONS AND DRAWINGS

8.1 Ownership

The Contractor shall keep at site in good order one copy of latest approved Specifications and Drawings and also such other contract documents as may be necessary and make them available to the Engineer or his Representative. All specifications and drawings shall remain the property of the Employer and shall not be used on other works and shall be returned by the Contractor to the Employer on completion of the works or on termination of the Contract.

8.2 Adherence to Specifications and Drawings

The works shall be executed in perfect conformity with the specifications and drawings of the Contract issued to the Contractor by the Engineer from time to time. If the Contractor does any work or part of work in a manner contrary to the specifications or drawings without the approval of the Engineer, he shall bear all the costs arising there from including dismantling and reconstruction strictly in accordance with the specifications and drawings and shall be responsible for all loss to the Employer. The Engineer shall have full power and authority to supply to the Contractor from time to

time such further drawings as may be needed for the proper and adequate execution and maintenance of the work. The term “Drawings” in this Sub-clause includes the drawings prepared by the Contractor and approved by the Engineer, as specified in the Contract.

8.3 Meaning and Intent of Specifications and Drawings

If any ambiguity arises as to the meaning and intent of any portion of the specifications and drawings or as to execution or quality of any work or material or as to the measurement of the Works, the decision of the Engineer shall be final and binding.

8.4 Contractor to provide information

The Contractor shall give information in writing to the Engineer whenever progress of the Works is likely to be delayed or disrupted.

9.0 COMPLIANCE WITH REGULATIONS AND BYLAWS

The Contractor shall comply with the provisions of any statute relating to the works, regulations and by-laws of any local authority and undertaking, including those controlling the utilities such as water supply, sewerage, telephones, power supply, etc., in whose area / jurisdiction the work is to be executed. The Contractor shall be bound to give all notices required by statute, regulations or by-laws, as aforesaid and to pay all fees and invoices payable to any authority or undertaking in respect thereof. It will be the responsibility of the Contractor to arrange for necessary clearances and approvals from such authorities and undertakings before the work is taken up.

10.0 OCCUPATION AND USE OF LAND

No land belonging to or in the possession of the Employer shall be occupied by the Contractor without the permission of the Engineer or the Employer. The Contractor shall not use, or allow the site to be used for any purpose other than that of executing the Works

11.0 REPRESENTATION AT WORKS SITE

The Contractor, shall, when he is not in a position to be present at the site of work place, keep responsible agent (s) there, during all working hours, who shall, on receiving reasonable notice, present himself / themselves to the Engineer, Engineer's Representative or their Assistants. The instructions and orders given by them to the Contractor's Agent (s) shall be deemed to have the same force, as if they had been given to the Contractor. Before absenting himself, the Contractor should furnish the name and address of his agent (s), for the purpose of this clause. Failure on part of the Contractor to comply with these provisions shall constitute a breach of Contract leading to action under Clause 59.0.

12.0 RELICS AND TREASURES

All gold, silver, coins, oil and other minerals of any description, and all precious stones of all kinds, treasures, antiques, fossils and other similar things, which shall be found in or at site, shall be the property of the Employer, and the Contractor shall duly

preserve the same to the satisfaction of the Employer, and shall from time to time deliver the same to such person or persons, as the Employer may appoint to receive the same.

13.0 EXCAVATED MATERIALS

The Contractor shall not sell or otherwise dispose off, or remove, any other substance or materials, which may be obtained from any excavation made for the purpose of the Works, or any building or produce existing at the site at the time of delivery of possession thereof. All such substances, materials, buildings and produce, shall be the property of the Employer; provided that the Contractor may with the permission of the Engineer use the same for the purpose of Works either free of cost or on payment of cost, as provided for under the Special Conditions of the Contract or in the absence of such conditions, at the sole discretion of the employer.

14.0 INDEMNITY BY CONTRACTOR

14.1 Indemnity against All Actions of Contractor

The Contractor shall hold and save harmless and indemnify the Employer, from and against all actions, suits, proceedings, loss, costs, damages, charges, claims and demands of every nature and description brought or recovered against the Employer, by reason of any act or omissions of the Contractor, his agent or his employees, in the execution of the Works or in the guarding of the same. All sums payable by way of compensation under any of these conditions, shall be considered as reasonable compensation payable to the Employer, without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

14.2 Indemnity against All Claims Of Patent Rights And Royalties

The Contractor shall hold and save harmless and indemnify the Employer, his officers, agents, servants and employees from and against all claims and proceedings, for or on account of infringement by the Contractor of copyright, any patent rights, design trademark or name, secret process, patented or unpatented invention, articles or appliances manufactured or used for or in connection with the Works and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. Except where otherwise stated, the Contractor shall pay all royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works.

14.3 Contractor's Warranty

The Contractor warrants to the Employer that:

- a. the Works will, when completed, comply in all respects with the Employer's Requirements, and the intended use of the Works;
- b. the Electrical and Mechanical Works have been manufactured, installed and otherwise constructed to the highest standards available using proven up-to-date good practice;
- c. the Works will, when completed, comply with enactments and regulations relevant to the Works;
- d. materials generally known to be deleterious or not in accordance with good

engineering practice have been neither selected nor incorporated in the Works, by the Contractor.

- e. The works when completed, comply with all the statutory requirements by the local, state and Central Government bodies.
- f. The transfer to the Employer of any warranty received from a sub-contractor/vendor for the Works shall be effected to the Employer at the time of Issue of the Performance Certificate.

15.0 PERFORMANCE GUARANTEE

15.1 Amount of Performance Guarantee

- i. Within 28 days of receipt of the Letter of Acceptance from the Employer, the successful tenderer shall furnish to the Employer a security towards performance of contract by him in the form of an unconditional bank guarantee for an amount of 7.5%(seven point five per cent) of the Contract value as specified in Conditions of Contract / instruction to the tenderer. The approved form provided in the “Instructions to Tenderers” shall be used for Bank Guarantee. The Bank Guarantee shall be from a public sector bank and shall be valid for a period of 90 days beyond “period of Completion of all works” as specified in the “Conditions of Contract”.
- ii. Failure of the successful tenderer to furnish the required Performance Guarantee shall be a ground for the annulment of the award of Contract and forfeiture of the tender security by the employer.

15.2 Release of Performance Guarantee

- i. The whole of the Performance Guarantee amount, shall be liable to be forfeited to the Employer at the discretion of the Employer, in the event of any breach of contract on the part of the Contractor or if the Contractor fails to perform or observe any of the conditions of Contract On due and faithful completion of the entire work, 1/3 (one third amount of PBG) of the Performance Guarantee amount shall be refunded to the Contractor, subject to the issue of Completion Certificate by the Engineer, in accordance with Clause 76.0 of these conditions. This shall not relieve the Contractor from his obligations and liabilities, to make good any failures, defects, imperfections, shrinkages or faults, that may be detected during the period of maintenance specified in the Special Conditions of Contract. The balance of the Performance Guarantee amount, i.e 2/3(Two third) amount of PBG shall become due and shall be paid to the Contractor, 3 (Three) months after the submission of the final report after rectification of any short comings in the report.
- ii. Provided always that, neither Performance Guarantee amount shall become due nor payable to the Contractor, unless all the stipulations of the Contract have been fulfilled by the Contractor and all claims and demands made by

the Employer for and in respect of damage or loss by, from or in consequence of the Works, but excluding the claims made by the Contractor on the Employer, have been finally satisfied.

15.3 Retention money

An amount of 2.5% towards retention money shall be deducted from the IPC's

15.4 Release of Retention money

Such an amount shall be returned on successful completion of the work after issue of **Final Payment Certificate**

16.0 INSPECTION OF SITE

- i. Deleted.
- ii. The Contractor shall also be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Tender, as to the form and nature thereof, including the sub-surface conditions, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works, the means of access to the Site and the accommodation he may require and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender or execution of work.

17.0 CONTRACTOR'S UNDERSTANDING

The Contractor shall be deemed to have satisfied himself, before tendering, as to the correctness and sufficiency of his Tender for the Works and of the rates and prices stated in the priced Bill of Quantities and the Schedule of Rates and Prices, if any, all of which shall, except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution of the Works.

18.0 GENERAL RESPONSIBILITY OF THE CONTRACTOR

The Contractor shall comply with the provisions of the contract and with due care and diligence execute and maintain the works and provide all labour therefor, and be responsible for supervision of all works, structural Plans and other things whether of temporary or permanent nature required for such execution and maintenance in so far as necessary for providing these, as is specified or as could be reasonably inferred from the Contract. The Contractor shall take full responsibility for the adequacy, stability and safety at site of all works, materials and methods of construction. The Contractor shall not be responsible except as may be expressly provided for in the tender or the General or Special Conditions of Contract for the design or specifications of permanent works or of any temporary works prepared and approved by the Engineer.

19.0 PROVISION OF EFFICIENT AND COMPETENT STAFF

The Contractor shall employ and keep on the works at all times efficient and competent staff to give necessary directives to his workers to see that they execute works in a safe and proper manner. He will provide the details of such staff comprising names, qualification, experience etc. The Contractor shall employ only such supervisors and workmen as are capable, careful, and skilled in their trade and calling. The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the works, any person employed by the Contractor in or for the execution of works or maintenance of works, who, in the opinion of the Engineer, misconducts himself or is incompetent or negligent in the proper performance of his duties or whose employment is otherwise considered by the Engineer to be undesirable and such person shall not be employed again in the works without the written permission of the Engineer. Any person so removed from the works shall be replaced by a competent substitute immediately.

20.0 Deleted

21.0 WORKS DURING NIGHT

Unless specifically provided in the Special Conditions of Contract, the Contractor shall carry out all works including during night subjected to restriction imposed by local authorities/police. Contractor shall make his own arrangement for sufficient illumination at site. Nothing extra will be paid for doing works at night

22.0 DAMAGE TO EMPLOYER'S PROPERTY, PRIVATE PROPERTY AND LIFE

The Contractor shall be responsible for all risks to the works and for trespass and shall make good, at his own expense, all loss or damage to the works themselves or to any other property of the Employer or the lives, persons and property of others from whatsoever cause in connection with works until they are taken over by the Employer; in case the Employer is called upon to make good any such costs, loss or damages, or to pay compensation (including that payable under the provisions of Workmen's Compensation Act or any statutory amendments thereof) to any person or persons sustaining damage as aforesaid by reason of any act, omission or negligence on the part of the Contractor the amount of any costs or charges (including costs and charges in connection with legal proceedings), which the Employer may incur in reference thereto, shall be charged to the Contractor. The Employer shall have the authority to pay or to defend or compromise any claim or threatened legal proceeding or in anticipation of legal proceedings being instituted consequent on the action or default of the Contractor, to take such steps as may be considered necessary or desirable to ward off or mitigate the effect of such proceedings, as aforesaid and recover the same from the contractor. Any sum or sums of money which may be paid and any expenses whether for reinstatement or otherwise which may be incurred and the propriety of any such payment, defence or compromise, and the incurring of any such expenses shall not be called in question by the Contractor.

23.0 INSURANCE

23.1 Requirements

Before commencing execution of Works, unless stated otherwise in the Special Conditions of Contract, it shall be obligatory for the Contractor to obtain at his own cost stipulated insurance cover under the following requirements:

- a. Contractor's All Risk and Third Party Cover.
- b. Liability under the Workmen's compensation Act, 1923, Minimum Wages Act, 1948 and Contract Labour (Regulation and Abolition) Act, 1970.
- c. Accidents to staff, Engineers, Supervisors and others who are not governed by Workmen's Compensation) Act.
- d. Damage to material, machinery and works due to fire, theft etc.
- e. Any other risk to be covered by Insurance as may be specified by the Employer in the Special Conditions of Contract.

23.2 Policy in joint names of Contractor and Employer

The policy referred to under Sub-clause 23.1 (a) above shall be obtained in the joint names of the Contractor and the Employer and shall inter-alia provide coverage against the following, arising out of or in connection with execution of Works, their maintenance and performance of the Contract.

- a) Loss of life or injury involving public, employee of the Contractor, or that of Employer and Engineer, labour etc.
- b) Injury, loss or damages to the Works or property belonging to public, Government bodies, local authorities, utility organisations, contractors, Employer or others.

23.3 Currency of Policy

The policies shall remain in force throughout the period of execution of the Works and till the expiry of the maintenance period. The Contractor shall whenever called upon, produce to the Engineer or his representative the various insurance policies taken by him as also the rates of premia and the premia paid by him to ensure that the policies indeed continue to be in force. If the Contractor fails to effect or keep in force or provide adequate cover in the Insurance policies mentioned in Sub-clause 23.1, or any other insurance he might be required to effect under the Contract, then in such cases, the Employer may effect and keep in force any such insurance or further insurance and the cost and expenses incurred by him in this regard shall be deductible from payments due to the Contractor or from the Contractor's Performance Guarantee.

24.0 SHEDS, STORES, YARDS

The Contractor shall at his own expense provide sheds, store-houses and yards in such situations and in such numbers as in the opinion of the Engineer are necessary for carrying on the works and the Contractor shall keep at each of such sheds, store-houses and yards sufficient quantity of materials and plant in stock as not to delay the execution of the Works with due expedition. The Engineer and the Engineer's representatives shall have free access to the said sheds, store-houses and yards at any time for the purpose of inspecting the stock of materials and plant so kept in hand. Any materials or plant which the Engineer may object to shall not be brought upon or used in the Works, but shall forthwith be removed from the sheds, store-houses or yards by the Contractor. The Contractor shall at his own expense provide and maintain any other land, space, plant or equipment necessary for execution of works for the scope of work under this contract and such expenses are deemed to have been taken into the contract price.

25.0 Deleted.

26.0 Deleted

27.0 ROADS AND WATER COURSES, OTHER UTILITIES ACCESS TO PREMISES AND SAFETY OF PUBLIC

- i. Existing road or water courses shall not be blocked, cut through, altered, diverted or obstructed in anyway by the Contractor, except with the permission of the Engineer. All compensation claimed for any unauthorised closure, cutting through, alteration, diversion or obstruction to such roads or water courses by the Contractor or his agent or his staff shall be recoverable from the Contractor by deduction from any sums which may become payable to him in terms of the Contract, or otherwise according to law.
- ii. During progress of work in any street or thoroughfare, the Contractor shall make adequate provision for the passage of traffic, for securing safe access to all premises - approached from such street or thoroughfare and for any drainage, water supply or means of lighting which may be interrupted by reason of execution of works and shall erect and maintain at his own cost barriers, lights and other safeguards as prescribed by the Engineer for the regulation of traffic, and provide watchman necessary to prevent accidents. The Works shall in such cases be executed day and night if so ordered by the Engineer and with such vigour that the traffic is impeded for as short a time as possible.
- iii. The Contractor shall be responsible for taking all precautions to ensure safety of the public, whether on public or Employer's property and shall post such look-out men as may, in the opinion of the Engineer, be necessary to comply with the regulations appertaining to the work and to ensure safety.
- iv. The work site shall be properly barricaded with reflective stickers and be provided with series / rope light indicators to glow during night. The barricading shall be as per the drawing given along with tender or as directed by the engineer.

28.0 USE OF EXPLOSIVES

Explosives shall not be used on the Works or on the Site by the Contractor without the permission of the Engineer and only in the manner and to the extent such permission is given. When explosives are required for Works, they shall be stored in a special magazine, to be provided by and at the cost of the Contractor, in accordance with the provisions of law on Explosives. The Contractor shall take all precautions in using the explosives and prevent damage to nearby structures and utilities. The Contractor shall also obtain necessary license for the storage and the use of explosives. All operations in which or for which explosives are employed shall be at the sole risk and responsibility of the Contractor and the Contractor shall indemnify the Employer in respect thereof.

29.0 Deleted.

30.0 CARE OF WORK

From the commencement of the Works until the date stated in the Certificate of Completion for the whole of the Works pursuant to Clause 76.0, the Contractor shall take full responsibility for the care thereof. Provided that if the Engineer shall issue a Certificate of Completion in respect of any part of the Permanent Works for which a separate date of completion is stipulated as provided for in Sub **Clause 76.2**, the Contractor shall cease to be liable for the care of that part of the Permanent Works from the date stated in the Certificate of Completion in respect of that part and responsibility for the care of that part shall pass to the Employer. Provided, further that the Contractor shall take full responsibility for the care of any outstanding work, which he shall have undertaken to finish during the Period of Maintenance. In case any damage, loss or injury shall happen to the Works, or to any part thereof, from any cause whatsoever the Contractor shall be responsible for the care thereof, the Contractor shall, at his own cost, repair and make good the same, so that on completion, the Permanent Works shall be in good order and condition and in conformity in every respect with the requirements of the Contract and the Engineer's instructions. The Contractor shall also be liable for any damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of completing any outstanding work or complying with his obligations under this contract.

31.0 EXTRAORDINARY TRAFFIC

31.1 Avoidance of Damage to Roads

The Contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his agents or sub-contractors and, in particular, 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 material from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such highways and bridges. Should any such damage or injury occur, the cost of rectification or

reconstruction thereof shall be borne by the Contractor and he shall indemnify the Employer fully against any claim on this account.

31.2 Special Roads

Save insofar as the Contract otherwise provides, the Contractor shall be responsible for and shall pay the cost of strengthening any bridges or altering or improving any road communicating with or on the routes to the Site to facilitate the movement of Contractor's plant or materials or execution of Temporary Works and the Contractor shall indemnify and keep indemnified the Employer against all claims for damage to any such road or bridge caused by such movement, including such claims as may be made directly against the Employer, and shall negotiate and pay all claims arising solely out of such damage.

31.3 Settlement of Extraordinary Traffic Claims

If, notwithstanding any damage occurs to any bridge or road communicating with or on the routes to the Site arising from the transport of materials or Plant, the Contractor shall notify the Engineer with a copy to the Employer, as soon as he becomes aware of such damage or as soon as he receives any claim from the authority entitled to make such claim. Where under any law or regulation the haulier of such materials or Plant is required to indemnify the road authority against damage, the Employer shall not be liable for any costs, charges or expenses in respect thereof or in relation thereto. In other cases the contractor shall negotiate the settlement and pay all sums due in respect of such claim and shall indemnify the employer in respect thereof and in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto. Provided that if and so far as any such claim or part thereof is, in the opinion of the Engineer, due to any failure on the part of the Contractor to observe and perform his obligations under the contract, then the amount, determined by the Engineer, after due consultation with the Employer and the Contractor, to be due to such failure shall be recoverable from the Contractor by the Employer and may be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor whenever a settlement is to be negotiated and, where any amount may be due from the Contractor, the Employer shall consult with the Contractor, before such settlement is agreed.

32.0 CONTRACTOR TO KEEP SITE CLEAR

During the progress of Works, the Contractor shall keep the Site free from obstructions and shall store neatly any construction plant and surplus materials and clear away and remove from site any rubbish or temporary works no longer required. On completion of the works, the Contractor shall clear away and remove from site all constructional plant, surplus material and temporary works. He should leave the whole of the site and Works in a clean, tidy and workman like condition to the satisfaction of the Engineer. Bentonite slurry, mud, water shall not be allowed to spill on to the pavements.

Failure to comply with GCC 32.0, a Penalty of 10,000 shall be levied on every such occasion.

33.0 EMPLOYER NOT TO PROVIDE QUARTERS FOR CONTRACTOR

No quarters shall be provided by the Employer for the accommodation of Contractor or any of his staff employed on Works. Where accommodation is provided to the Contractor at the Employer's discretion, recoveries shall be made at such rates, as may be fixed by the Employer, for full rent of the building, equipment therein as well as charges for electric current, water supply and conservancy.

34.0 LABOUR CAMP

34.1 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 crèche (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.

34.2 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 migration labour, and shall take all necessary precautions to ensure and preserve the health and safety of all staff, employed on the Works directly or through petty contractors or sub-contractor. Labour law compliance certificate is to be submitted by the contractor.

34.3 Preservation of Peace

The Contractor shall take requisite precautions, and use his best endeavours 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 sub-contractors and for preservation of peace and protection of the inhabitants and security of property in the neighbourhood of Works.

34.4 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 Engineer, the Engineer's Representative or the Medical staff of the Employer 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 the Employer, and the cost thereof recovered from the Contractor.

34.5 Outbreak of Infectious Diseases

- i. The Contractor shall maintain the Labour Camp in a sanitary condition taking all necessary precautions to protect the staff and labour from outbreak of infectious

diseases. He shall provide them with suitable prophylactics for the prevention of malaria, gastroenteritis, typhoid and other water-borne diseases.

- ii. The Contractor shall remove from his camp such labour and their families, who refuse protective inoculation and vaccination, when called upon to do so by the Engineer or the Engineer'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 his 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 Engineer, within the time specified in the Engineer's requisition, failing which the same may be done by the Employer and cost thereof recovered from the Contractor.

34.6 Medical Facilities at Site

The Contractor shall, at his own cost, provide First Aid and medical facilities, at the Site as may be prescribed by the Engineer, 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. He shall also tie up with local medical hospital nearest to site and shall display them prominently at site on boards.

34.7 Use of Intoxicants

The sale of 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 his 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 Site in an intoxicated state or under the influence of drugs.

35.0 SAFETY PROVISIONS

35.1 Safety of Labour

The Contractor shall, at his own expense, arrange for the safety provisions as required by any Law for time being in force, in respect of labour employed directly or indirectly for performance of the Works, and shall provide all facilities in connection therewith.

Safety precautions shall be as warranted by the particular type of work or those directed by the Engineer. Also, mere observance of these precautions shall not absolve the Contractor of his liability in case of loss or damage to property, or injury to or death of any person, including Contractor's labour, Employer's officers, agents or servants or any member of the public.

35.2 Safety of Works and Public

The Contractor shall provide and maintain at his own cost, all lights, guards, signage, banks man, signalmen, traffic marshals fencing and watching arrangements when and where necessary, or as required by the Engineer for the protection of the Works or

for safety and convenience of those employed on Works or of the public. It shall be the responsibility of the contractor to protect open excavations, bore holes, pits, pile holes etc., with appropriate means and in case works are above roads and costs towards such provisions are included in the contract price.

35.3 Recovery of cost from the Contractor

Should the Contractor fail to make provision as required in the preceding the Employer may provide necessary arrangements, the cost of which shall be recoverable from the Contractor.

36.0 RATES FOR ITEMS OF WORK TO BE ALL INCLUSIVE

The rates quoted in the tender and accepted shall be all inclusive for carrying out the work as per specification and drawings including temporary works as required. Nothing extra shall be payable over the quoted rates, notwithstanding any provision to the contrary in any law for the time being in force, save and except what is specifically provided in General conditions of contract or Special Conditions of Contract.

The employer under the rules of Government or by legislation may get some waivers or reliefs in some of the taxes, royalties, duties, cess octroi etc., for which the contractor may have to supply the documentary support towards proof of payment of the same to the employer on request

37.0 SUPPLY OF WATER AND ELECTRICAL POWER

Unless otherwise provided for in Special Conditions of Contract, the Contractor shall be responsible for arrangements to obtain supply of water, or electrical power, necessary for the Works. In the event the Employer is in a position to supply water or electrical power, or both, required for Works, such supply will be given only at one point near the Site. The cost of making necessary connections to the Employer's distribution system and laying of necessary pipe line, specials, valves, meter for water supply or the laying of underground / over ground conductor, circuit protection, electric power meters and transmission structures in case of electric power, shall be borne by the Contractor. The Contractor shall bear the cost of water and power supplied, the rates for which shall be determined and notified by the Engineer. The decision of the Engineer on such cost shall be final. Any increase in Water / Power tariff by supply agency with either prospective or retrospective effect shall be borne by the Contractor.

38.0 URGENT REPAIRS

If, by reason of any accident, or failure, or other event occurring to or in connection with the Works, or any part thereof or proximity thereof, either during the execution of the Works, or during the Period of Maintenance, any remedial or other work or repair shall, in the opinion of the Engineer or the Engineer's Representative, be urgently necessary for the safety of the Works, adjoining property, traffic, utility or public and the Contractor is unable or unwilling to do such work or repair at once, the Employer or the Engineer on behalf of the Employer may employ and pay other persons to carry out such work or repair, as the Engineer or the Engineer's Representative may consider necessary. If the work or repair so got done by the Employer is work which, in

the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, all expenses incurred by the Employer in so doing, shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor. Provided always that the Engineer or the Engineer's Representative, as the case may be, shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof in writing or verbally followed by a written confirmation of the same.

39.0 SETTING OUT

The Contractor shall be responsible for the true and proper setting out of the Works, in relation to the original points, lines and levels of reference given by the Engineer in writing and for the correctness, subject as above mentioned, of the positions, levels, dimensions and alignment of all parts or the works, and for the provision of all necessary instruments, appliances and labour, in connection therewith. If any time during the progress of Works, any error appears or arises in any part of the work, the Contractor, on being required so to do by the Engineer shall at once rectify such error, to the satisfaction of the Engineer or his representatives. The checking of any setting out, or of any line or level by the Engineer or his representative, shall not in any way relieve the Contractor of his responsibility for the correctness thereof, and the Contractor shall carefully protect and preserve all bench marks, sight rails, pegs and other things used in setting out the Works.

40.0 BORE HOLES AND EXPLORATORY EXCAVATION

Where the works are to be executed by the Contractor as per his own Designs, it will be the responsibility of Contractor to make bore holes or to carry out exploratory excavation at his cost. If at any time during the execution of the works, the Engineer shall require the Contractor to make out additional bore holes or to carry out additional exploratory excavation, the Contractor shall comply with the same and no extra amount will be payable on this account

41.0 ILLEGAL GRATIFICATION

41.1 Bribe, commission, gift or advantage

Any bribe, commission, gift or advantage given or offered by the Contractor directly or through his partner, agent or servant to any officer or employee of the Engineer or Employer, or to any person on their behalf, in relation to obtaining or the execution of this or any other Contract with the Engineer or the Employer, shall in addition to any criminal liability which he may incur, subject the Contractor to rescission of the Contract and all other Contracts with the Employer, and liability for payment of any loss or damage to the Employer, resulting from such rescission. The Employer 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 the Employer.

The Contractor shall not be due, nor shall be paid any compensation whatsoever for any loss, alleged or actual, suffered by him when the Contract is so rescinded.

The Contractor shall be liable to pay compensation for any loss or damage to the Employer resulting from such rescission and the Employer shall be entitled to deduct the amounts so payable from the money (s) due to the Contractor.

41.2 Settlement of dispute as to committing of such offence

If any question or dispute as to the committing of any such offence arises under Sub clauses 41.1, the same shall be settled by the Engineer, in such manner as he shall consider fit and proper, and his decision shall be final and binding.

41.3 Compensation to Contractor on rescission of Contract under this clause

In the event of rescission of Contract the Contractor shall not be entitled to any compensation whatsoever, except for the work done up to the date of rescission.

42.0 DISCLOSURE OF RELATIONSHIP

If the Contractor or any partner of the Contractor or Director of the Contractor's company is closely related to any of the Officers of the Employer or the Engineer, or alternatively, if any close relative of an officer of the Employer or the Engineer has financial interest / stake in the Contractor's firm, the same shall be disclosed by the Contractor at the time of filing his tender. Any failure to disclose the interest involved, shall entitle the Employer to rescind the Contract, without payment of any compensation to the Contractor.

43.0 CLEARANCE OF SITE ON COMPLETION

On completion of Works, the Contractor shall clear away and remove from site all constructional plant, surplus materials, rubbish and temporary works of every kind, and leave the whole of the site of work clean, tidy and in a workmanlike conditions to the satisfaction of the Engineer. No final payment in settlement of the accounts for Works shall be made or held to be due to the Contractor, till, in addition to any other condition necessary for such final payment, site clearance shall have been effected by him. Such clearance may be made by the Engineer through any other agency at the expense of the Contractor in the event of the Contractor's failure to comply with this provision within 7 days after receiving notice to that effect from the Engineer. Should it become necessary for the Engineer to have the site cleared at the expense of the Contractor, the Employer and / or the Engineer shall not be held liable, for any loss or damage to Contractor's property on the site due to such removal therefrom. Removal may be effected by means of public sale of such plant, materials and property or in such a manner as may be deemed fit and proper by the Engineer. All expenses on such removal / clearance shall be debitable to the Contractor as loans due from the Contractor to the Employer, and the Employer shall be competent to recover the same from Contractor's on-account or final bills, or from Performance Guarantee amount or from any other amount payable to the Contractor.

44.0 ENGAGEMENT OF LABOUR

44.1 Contractor to Provide Labour

The Contractor shall make his own arrangements for the engagement of all labour, except as provided otherwise in the Contract, and shall provide for their transport, housing and payment.

44.2 Deleted.

44.3 Employment of Labour below the Age of 18

The Contractor shall not employ children below the age of 18 or the age prescribed in any labour legislation, whichever is higher, as labourers, directly or through petty contractors or sub-contractors, for execution of the Work.

45.0 WAGES TO LABOUR

45.1 Wages under relevant laws

In dealing with labour and employees, the Contractor and his sub contractors(including piece rate and petty Contractors) shall comply fully with all laws and statutory regulations such as the Payment of Wages Act, 1936, the Minimum Wages Act, 1948, Workman's Compensation Act, 1923, The Contract Labour (Regulations and Abolition's) Act, 1970, Employer's Liability Act, 1938, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, Employees Provident Funds and Miscellaneous Provisions Act, 1952, Employees State Insurance Act, 1948, Equal Remuneration Act, 1976, Payment of Gratuity Act, 1972, Apprentices Act, 1965, Mines Act, 1952, and other laws or regulations framed by competent legislative authorities from time to time, as may be applicable. In accordance with the various Acts and regulations with all upto date amendments, the Contractor shall ensure that he and his subcontractors (including petty and piece rate contractors) observe strictly inter- alia the following:

- a. Wages paid are not less than those prescribed;
- b. Wages and other dues are paid regularly and in time;
- c. Liens / Licenses are obtained as required under any of the Acts or regulations;
- d. Maintain prescribed records, submit necessary statements to authorities concerned and display required notices; and
- e. take prompt action on any instructions/directions from the authorities under various labour laws.

45.2 Supply of Labour by the Contractor

If, the Contractor directly or through petty contractors or sub-contractors supplies any labour to be used wholly or partly under the direct orders and control of the Engineer or the Employer, whether in connection with any work being executed by the Contractor or otherwise for the purposes of the Employer, such labour shall, for the

purpose of this clause, be deemed to be persons employed by the Contractor,

45.3 Claim on account of violation of Labour laws

If any moneys shall, as a result of any instructions, directions or decisions from the Authorities or claim or application made under any of the labour laws or regulations, be directed to be paid by the Employer, such moneys shall be deemed to be moneys payable to the Employer by the Contractor and on failure of the Contractor to repay the Employer any moneys paid or to be paid by it as aforesaid within seven days after the same shall have been demanded, the Employer shall be entitled to recover the amount from any moneys due or accruing to the Contractor under this or any other Contract with the Employer. The Employer shall not be bound to contest any such claim or demand unless the Contractor makes a written request for it, the Contractor's reasons for contesting are considered reasonable by the Engineer and the Contractor deposits the full cost that the Employer may have to incur in contesting the case.

46.0 REPORT OF ACCIDENTS TO LABOUR

The Contractor shall be responsible for safety of all employees, employed by him on Works, directly or through petty contractors or sub-contractors, and shall report accidents to any of them, however, and wherever occurring on Works, to the Engineer or the Engineer's Representative, and shall make every arrangement to render all possible assistance and to provide prompt and proper medical attention. The compensation for affected Workers or their relatives shall be paid by the Contractor in such cases immediately in accordance with the Workmen's Compensation Act.

47.0 MATERIALS AND WORKMANSHIP

47.1 Material and workmanship as per specification

- i. All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, 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 may be selected and required by the Engineer.
- ii. Sources of materials being supplied shall be intimated to the Engineer and are subject to his approval. Materials that are not specified in the Contract document shall conform to the relevant Indian Standards or International standards as specified in the contract.

47.2 Supply of sample

All samples shall be supplied by the Contractor at his own cost as specified in the contract

47.3 Cost of test provided in Contract

The cost of carrying out any test shall be borne by the Contractor if such test is intended by or provided for in the Contract.

47.4 Cost of test not provided in Contract

If any test is ordered by the Engineer which is either:

- a. not so intended by or provided for in the Contract, or is not so particularised in the Contract, or
- b. though so intended or provided for is ordered by the Engineer to be carried out by an independent person at any place other than the Site or the place of manufacture or fabrication of the materials tested.

Then the cost of such test shall be borne by the Employer. If, however, the test shows the workmanship or materials not to be in accordance with the provisions of the Contract or the Engineer's instructions, then the cost of such test will be charged to the Contractor.

48.0 REMOVAL OF IMPROPER MATERIALS AND WORKS

- i. The Engineer shall have the authority to order in writing from time to time :
 - a. the removal from site within such time, as the Engineer may specify, any material, which in his opinion, is not in accordance with the Specifications and Conditions of the Contract.
 - b. the substitution of defective material by proper and suitable material; and
 - c. the removal and proper re-execution, notwithstanding any previous decision or interim payment thereof, of any work which in respect of materials or workmanship is not, in the opinion of the Engineer, in accordance with the Contract.
- ii. In case of default on the part of the Contractor in carrying out such order, the Employer shall be entitled to employ and pay other parties, to carry out the same, and all expenses consequent thereof or incidental thereto, shall be recoverable from the Contractor or may be deducted by the Employer from any money which may be due to the Contractor.

49.0 COVERING UP OF WORK

49.1 Examination of work before covering up

No work or part of work shall be covered up or put out of view, without the prior approval of the Engineer or the Engineer's Representative, and the Contractor shall

afford full opportunity for the Engineer or the Engineer's Representative, to examine and measure any work, which is to be covered up, and to examine foundations before the permanent work is placed thereon. The Contractor shall give due notice to the Engineer's Representative, whenever any such work or foundation is ready for examination, and the Engineer's representative shall without delay, attend for the purpose of examining and measuring such work or for the purpose of examining such foundations.

49.2 Cost of uncovering the work already covered up

The Contractor shall uncover any part or parts of the Works, or make openings in or through the same, as the Engineer may from time to time direct, and shall reinstate and make good such part or parts, to the satisfaction of the Engineer. If any such part or parts have been covered up, or put out of view after compliance with the requirement of Sub-clause 49.1 and the Works are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same, shall be borne by the Employer, but if the Works are found to be defective, all such costs shall be borne by the Contractor.

50.0 SUSPENSION OF WORKS

50.1 Protection during suspension of work

The Contractor shall, on the order of the Engineer, suspend the Works or any part thereof, for such time, and in such manner, as the Engineer may consider necessary, and shall during such suspension, properly protect and secure the Works so far as it is necessary in the opinion of the Engineer.

50.2 Cost Incidental to suspension of work

If such suspension is

- a. provided for in the Contract, or
- b. necessary for proper execution of Works or by reasons of weather condition or by some default on the part of the Contractor, or
- c. necessary for the safety of Works or any part thereof or
- d. necessary for the safety of adjoining public or other property or safety of the public or workmen or those who have to be at the site or
- e. to ensure safety and to avoid disruption of traffic and utilities, as also to permit fast repairs and restoration of any damaged utilities, the Contractor shall not be entitled to extra cost (if any), incurred by him, during the period of suspension of Work.

50.3 Extension of time on account of suspension

If suspension is ordered by the Engineer for reasons other than those mentioned in sub clause 50.2 and when each such period of suspension exceeds 14 days but does not exceed 30 days, at any one time, the Contractor shall not be entitled to extra costs, if any, incurred by him during the period of suspension of work, but the Contractor shall be entitled to such extension of time for completion of the work, as the Engineer may

consider proper, having regard to the period of such suspensions.

For any such suspension of work not exceeding 14 days at any one time, the Contractor will not be entitled to any extension of time for completion of the work except where specifically agreed to by the Engineer.

50.4 Compensation for idle labour / plant due to extension of time

If the suspension referred to exceeds 30 days, at any one time, the Contractor shall be entitled to extension of time for completion of the Works, as the Engineer may consider reasonable having regard to the periods of such suspension. He shall also be entitled to compensation on account of any idle labour / employees and idle plant / machinery, which could not be diverted for use elsewhere during the period of suspension. Every effort shall, however, be made by the Contractor, to direct these resources for use elsewhere. The compensation so payable, shall be calculated at the actual daily rate of wages payable to the employees / labour rendered idle, and 70% of the rate for hire charges for plant and machinery as assessed by the Engineer, (excluding cost of fuel and lubricants) plus an additional 15% above all these items, to cover overhead costs. The Contractor shall furnish documentary proof to the satisfaction of the Engineer on the numbers of employees/labour rendered idle, the period for which rendered idle and the daily rates of wages payable to them. Similarly he will also furnish details of the number of different types of Plant/Machinery rendered idle, the period for which rendered idle and the hire charges for the same. The daily record of such information shall be verified by Engineer at the end of the day. The decision of the Engineer shall be final on the amount of compensation payable on account of any idle labour/employees and idle plant/machinery. Recovery of installments towards all advances shall remain suspended during the period the suspension of work lasts, and no interest on advance shall be charged for the said period of suspension. However, if only a portion of the Works has been suspended, Engineer shall permit postponement of advance recovery and waiver of interest charges, only on the portion of advances as considered reasonable by him.

50.5 Contractor's option to ask for closure of Contract

If the suspension of the whole of the Works, or any part or group of the Works exceeds 90 days, the Contractor shall have the option to ask for closure of the Contract, or deletion from the Contract of that part of Works which has been suspended. In that event, the Contractor shall not be entitled to any compensation for damage or loss, alleged or actual and for loss of any profits anticipated.

51.0 COMMENCEMENT OF WORK

The Contractor shall commence the Works as soon as is reasonably possible after the receipt by him of a notice to this effect from the Engineer, within the time limit as specified in the "Instructions to Tenderers". Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.

52.0 PROGRAMME OF WORK

The Contractor shall, on receipt of letter of acceptance of his tender, or as soon as thereafter as possible, but not later than 15 days from the date of receipt of letter of acceptance, submit to the Engineer for his approval, a detailed programme, showing the order and procedure in which he proposes to carry out the work so as to complete the whole of the Works as per KD's mentioned in Conditions of Contract within the "Time for Completion" stipulated in "Instruction to Tenderers". Any requirement for completion of any part or parts of the Works before completion of the whole of the Works should be reflected in the programme. The Contractor shall, whenever required by the Engineer or the Engineer's Representative, also provide in writing for their information, a general description of the arrangements and method of deployment of labour and machinery which the Contractor proposes to adopt for the execution of the Works. If at any time it should appear to the Engineer that the actual progress of work does not conform to the approved programme, referred to above, the Contractor shall produce at the request of the Engineer, a revised programme showing modifications to the approved programme, necessary to ensure completion of the work within the time for completion stipulated in the Contract. The submission to and approval by the Engineer or Engineer's representative of such programme or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities or obligations under the Contract. The Engineer shall have full power and authority during progress of work, to issue such instructions as may be necessary for the proper and adequate execution and maintenance of the Work. The Contractor shall carry out and be bound by the same. The programme finally approved by the Engineer shall supersede the one submitted earlier with the Tender as per "Instruction to Tenderers".

53.0 POSSESSION OF SITE

Save insofar as the Contract may prescribe, the extent of portion of the Site of which the Contractor is to be given possession from time to time, and the order in which such portions shall be made available to him and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, on the Engineer's written order to commence the Works, give to the Contractor, possession of so much of the Site, as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the programme referred to in Clause 52 hereof, if any, and otherwise in accordance with such reasonable proposals of the Contractor as he shall, by written notice to the Engineer, make. The Employer will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due despatch in accordance with the said programme or proposals, as the case may be. If the Contractor suffers delay or incur extra cost as a result of failure on the part of the Employer to give possession of site in accordance with the terms of this Clause, the Engineer may on Contractor's request, grant extension of time for the completion of the Works and / or certify such sum, as in his opinion, shall be fair to cover the extra cost incurred, which sum shall be paid by the Employer to the Contractor Provided further that if the Employer is unable to give possession of the site for a small portion of the Works, the Employer, or the Engineer on his behalf, may delete the work at that site from the scope of the Contract and ask the Contractor to complete the rest of the work.

The Contractor shall complete the same within the time frame stipulated in the Contract without any extra payment. The decision of the Engineer as to extra cost as referred to above in this clauses shall be final.

54.0 WAYLEAVES

The Contractor shall bear all costs and charges, for special or temporary way leaves required by him, in connection with access to the Site. The Contractor shall also provide at his own cost, any additional accommodation outside the Site required by him for the purposes of the Works. Contractor shall indemnify the employer from any legal actions/ law and order issues arising out of the situations where he has hired such areas but intended for the work under this Contractor.

55.0 ACCESS TO SITE OF WORK

55.1 Access for Engineer

The Engineer or the Engineer's representative, shall, at all times have access to the Works and to all workshops and places, where work is being performed from where materials, manufactured articles or machinery are being obtained for the Works, and the Contractor shall afford every facility and every assistance in obtaining the right to such access.

55.2 Access Road

The Contractor shall provide necessary access roads to the site of work, from the nearest public thoroughfare / right of way, at his cost, unless otherwise provided for in the Contract and shall maintain the same in an appropriate condition to the satisfaction of engineer during the period of contract.

56.0 DELAY AND EXTENSION OF CONTRACT PERIOD

56.1 Time to be essence and Extension of Time

- i. The time allowed for execution and completion of the Works or part of the Works as specified in the Contract, in accordance with these conditions, shall be the essence of the Contract on the part of the Contractor. Subject to any requirement in the Contract as to completion of any portion or portions of the works before completion of the whole, the Contractor shall fully and finally complete the whole of the Works comprised in the Contract (with such modifications as may be decided by the Engineer in terms of Clause 60.0) by the date stipulated in the Contract or extended date in accordance with the Contract. In case of delay on the part of the Contractor, the Contractor shall pay as compensation an amount as provided herein. This is without prejudice to the right of the Employer to rescind the Contract in terms of Clause 59.0
- ii. As soon as it becomes apparent to the Contractor, that the Works and / or portions thereof (required to be completed earlier) cannot be completed within the period(s) stipulated in the Contract, or the extended periods granted, he shall forthwith inform the Engineer and advise him of the reason (s) for the

delay, as also the extra time required to complete the works and / or portions of work, together with justification thereof. In all such cases, whether the delay is attributable to the Contractor or not, the Contractor shall be bound to apply for extension in the period of completion of the whole works and / or portions thereof. This application shall reach the Engineer, at least 30 days before the stipulated or extended date of completion of the whole works or the stage completion date of any portion of the work. In case the Contractor fails to apply for the extension of Contract or fails to apply in time, the Engineer, shall, in the case of any subsequent delay in the completion of the whole and / or portion of works, be justified to hold that such delay is only due to the Contractor's failure or fault and shall take further action accordingly in terms of the Contract. Any reasons or circumstances resulting in delay in the completion of the work(s) even if they are not the result of the Contractor's failure or fault, shall not invalidate or vitiate the Contract.

56.2 Extension due to Modifications

If any modifications ordered by the Engineer or site condition actually encountered are such, that in the opinion of the Engineer the magnitude of the work has increased materially, then such extension of the stipulated date of completion may be granted, as shall appear to the Engineer to be reasonable.

56.3 Delays not due to Employer / Contractor

If the completion of the whole works (or part thereof which as per the Contract is required to be completed earlier), is likely to be delayed on account of:

- a. Any force majeure event referred to in Clause 82.0.
- b. Delay on the part of other Contractors or other parties engaged directly by the Employer on whose progress the performance of the Contractor necessarily depends.
- c. Any order of Court.
- d. Any other event or occurrence which, according to the Engineer is not due to the Contractor's failure or fault, and is beyond his control; the Engineer may grant such extension in period of completion of the work(s), as in his opinion is reasonable.

56.4 Delay due to Employer or Engineer

In the event of any failure or delay by the Employer or the Engineer, to hand over to the Contractor the possession of site necessary for execution of Works, or any part of the Works if different dates for handing over the site for different Works have been indicated in the Contract, or to give necessary notice to commence the Works, or to provide necessary Drawings or instructions or clarifications or to supply any material, plant or machinery, which under the Contract, is the responsibility of the Employer, then such failure or delay, shall in no way affect or vitiate the Contract or alter the character thereof; or entitle the Contractor to damages or compensation thereof but in any such case, the Engineer shall grant such extension or extensions of time to complete the work, as in his opinion is / are reasonable and any sums as determined under 50.4.

56.5 Delays due to Contractor

If the delay in the completion of the whole Works or a portion of the Works, for which an earlier completion period is stipulated, is due to the Contractor's failure or fault, and the Engineer feels that the remaining Works or the portions of Works can be completed by the Contractor in a reasonable and acceptable short time, then, the Engineer may allow the Contractor extension or further extension of time, for completion, as he may decide, subject to the following:

- a. Without prejudice to any other right or remedy available to the Employer on that behalf, by way of ascertained and liquidated damages, recover the sums that become due towards non achievement of KDs as stipulated in this contract for the delayed duration the Contractor is in default.
- b. If the delay relates only to a portion of the Works with a separate and earlier completion period, the Contract Value shall be restricted to the cost of that portion of the Works only.
- c. The total recovery on account of compensation shall be limited to 10% of the Contract Value of the Works, or the portion of the Works, as the case may be.

56.6 Time to continue to be the essence of Contract in spite of extension of time

It is an agreed term of the contract that notwithstanding grant of extension of time under any of the sub-clauses mentioned herein, time shall continue to be the essence of contract on the part of the Contractor.

56.7 Engineer's decision on compensation payable being final

The decision of the Engineer as to the compensation payable by the Contractor under this Clause shall be final and binding.

57.0 FORE-CLOSURE OF CONTRACT

57.1 Payment to Contractor on fore-closure of Contract

- i. The Employer shall be entitled to foreclose the Contract, at any time, should, in the Employer's opinion, the cessation of works becomes necessary, owing to paucity of funds or due to court orders or from any other cause whatsoever. Notice in writing from the Employer, of such fore-closure and reasons therefore, shall be conclusive evidence thereof and be binding on the Contractor. In such a case, the value of approved materials actually brought to the site and reasonably required to execute the Works during next three months, as per approved programme, and of Work done up-to-date by the Contractor, shall be paid for in full by the Employer, at rates specified in the Contract. If rates for any materials or items of work are not available in the Contract, these shall be fixed by the Engineer by taking into account market rates or by adopting the procedure set forth in sub-clause 62.2. In addition, a sum not exceeding 2% (two per cent) of the value of the work remaining

incomplete on the date of closure (i.e. total stipulated value of Contract less the value of works actually done in terms of Contract and paid for and less the cost of materials at site taken over by the Employer and paid for as aforesaid), shall be payable to the Contractor, to allow for expenditure incurred on preliminary site work, not fully covered by payments effected and for transportation of Contractor's tools, plants and materials, scaffolding and shuttering, etc. as also labour and other personnel back to his depot, notwithstanding whether the sum actually spent by the Contractor on all these items is more or less than the amount paid under this Clause. The Contractor shall have to pay back unrecovered portion of advances made to him, together with accrued interest thereon. In case the Contractor defaults, the Employer shall be entitled to recover the amounts from any payment due to the Contractor, or from the Performance Guarantee amount or by encashing the Bank Guarantees given by the Contractor for securing the advances. This is without prejudice to other remedies available to the Employer.

ii. Provided further, that any reduction of quantities against individual items of the Contract, merely as a variation when the work is executed, shall not constitute foreclosure of Contract in terms of this clause, and no compensation whatsoever as per this clause will be due or payable to the Contractor on that account.

57.2 Default of Employer

i. In the event of the Employer:

- a) failing to pay to the Contractor the amount due under any certificate of the Engineer, within ninety days after the same shall have become due under the terms of the Contract, subject to any deduction that the Employer is entitled to make under the Contract, or
- b) becoming bankrupt or,
- c) being a company, going into liquidation
- d) The Contractor shall be entitled to issue a notice to the Engineer, with a copy to the Employer, stating that he shall be terminating the Contract after 30 days of receipt of the notice by the Engineer, for reasons stated in the notice. If within the said period of 30 days, the Engineer notifies the Contractor with a copy to the Employer, that the reasons stated in the notice of the Contractor are not valid or that the alleged reasons of default of the Employer have been remedied and no longer exist, then the Contractor shall not be entitled to terminate the Contract.

58.0 RESCISSION OF CONTRACT DUE TO DEATH OF CONTRACTOR / PARTNER

If the Contractor is an individual or a sole proprietary concern, and the individual or the sole proprietor dies, or if the Contractor is a partnership concern and one of the partners dies, in that case unless the Employer is satisfied that the legal representative of the individual Contractor or of the sole proprietor, as the case may be, or in the case of a partnership firm, all surviving partners, are capable of carrying out

and completing the Contract, the Employer shall be entitled to rescind the Contract as to its incomplete part. In that event, the Employer shall not be liable to pay any compensation to the legal heirs of the deceased Contractor and / or to the surviving partners of the Contractor's firm, on account of such cancellation of Contract. The Engineer's decision, as to whether the legal representatives of the deceased Contractor or surviving partners of the Contractor firm can or cannot carry out and complete the Contract, shall be final and binding on the parties. Provided further that the legal representatives of the Deceased Contractor the surviving partners, shall also not be liable to pay any damages actually suffered by the Employer, in respect of incomplete part of the Contract. Any liability incurred by the deceased Contractor, or by the deceased partner of the contracting firm, before his death, shall be recovered from the legal representatives of the deceased Contractor or from the surviving partners of the said contract firm as the case may be

59.0 DETERMINATION OF CONTRACT DUE TO CONTRACTOR'S DEFAULT

59.1 Conditions leading to determination of Contract

- (i) If the Contractor,
 - a) Becomes bankrupt or insolvent or
 - b) makes arrangements with or assignment in favour of his creditor, or agrees to carry out the Contract under a committee of inspection of his creditors or
 - c) being a Company or Corporation goes into liquidation by a resolution passed by the Board of Directors / General body of the shareholders or as a result of Court order (other than voluntary liquidation for the purpose of amalgamation or reconstruction); or
 - d) has received execution order by Court levied on his goods or property on the Works, or
 - e) assigns or sublets the Contract or any part thereof otherwise than as provided for under conditions of this Contract, or
 - f) abandons the Contract, or
 - g) persistently disregards instructions of the Engineer or contravenes any provisions of the Contract, or
 - h) fails to adhere to the agreed programme of work or fails to complete the Works or parts of the Works within the stipulated or extended period of completion, or is unlikely to complete the whole Work or part thereof within time because of poor record of progress; or
 - i) fails to remove materials from the Site, or pull down and replace work, after receiving notice from the Engineer to the effect that the said materials or Works have been condemned or rejected, or
 - j) fails to take steps to employ competent and/or additional staff and labour, or
 - k) fails to afford the Engineer or his representative proper facilities for inspecting the Works or any part thereof, or

- l) suppresses or gives misleading information while submitting the tender, then and in any such case, the Engineer or the Employer shall be entitled, after giving 7 days' notice in writing, under his hand or under the hand of the Engineer, to rescind the Contract, as a whole or in part or parts (as may be specified in such notice).
- (ii) In such a case of rescission, the Employer may adopt either or both of the following courses:
- a) Take possession of the site and any materials, constructional plants, implements, stores, etc. thereof, and carry out the whole or part of the Work from which the Contractor has been removed by the employment of the required labour and materials, the cost of which shall include lead, lift, freight, supervision and / or incidental charges.
 - b) Measure up whole or part of the Work from which the Contractor has been removed, and get it completed by another Contractor; and the manner and method in which such work is to be completed, shall be entirely at the discretion of the Engineer whose decision shall be final.
- (iii) In case of sub para (g), the Engineer at its sole discretion may terminate only part of the Contract also by taking out some part of the total scope of work and may complete or arrange for any other entity through the process of open/ limited / single tender or by calling quotations, to do so at the risk and cost of the Contractor.

59.2 Entitlement of Employer

In both cases described in sub-clause 59.1(ii) above, the Employer shall be entitled to:

- a) forfeit the whole or such portion of the Performance Guarantee amount and other BGs for mobilization advance, as the employer may consider fit, and
- b) recover from the Contractor the cost of carrying out the balance work in excess of the sum which he would have been paid according to the certificate of the Engineer, if the works had been carried out and completed by the Contractor under the terms of Contract. Such certificate shall be final and binding upon the Contractor. The amount to be recovered may be deducted by the Employer from any monies then due or which, at any time thereafter, may become due to the Contractor alone or jointly under this or any other Contract or otherwise.

59.3 Non-exercise of power not to constitute waiver

Provided always that in case any of the powers conferred upon the Employer by Sub-clause 59.1 and Sub-clause 59.2 above, shall have become exercisable, and the same may not have been exercised, the non-exercise thereof shall not constitute waiver of any of the conditions thereof. Any such powers shall, notwithstanding, be exercisable in the event of any future case of default by the Contractor for which his liability in the past or future shall remain unaffected.

60.0 MODIFICATIONS TO WORK

60.1 Authority to order modifications

The Engineer acting on behalf of the Employer, shall be competent by an order in writing to enlarge or extend, diminish or reduce the Works or make any alterations in their design, character, position, site, quantities, dimensions or in the method of execution or in the combination or use of materials for the execution thereof and to order any additional works to be done or any work not to be done and save as provided under Sub-clause 62.2 the Contractor will not be entitled to any compensation for any reduction, but will be paid only for the actual amount of work done and for approved materials supplied at site up to the date of intimation of such reduction, diminution or alteration.

60.2 Modification not to affect the Contract

The enlargement, extension, diminution, reduction, alterations or additions, referred to in Sub-clause 62.1 of this clause shall in no degree affect the validity of the Contract, but shall be performed by the Contractor as provided therein and be subject to the same conditions, stipulations, obligations and rates as if they had been originally and expressly included and provided for in the schedules, specifications and drawings, and the amount to be paid therefor shall be calculated in accordance with accepted schedule of rates and other extra items of works at the rates, determined under Clauses 62.0 and 63.0 of these conditions. Provided that if the nature or amount of any variation relative to the nature or amount of the whole of the works shall be such that in the opinion of the Engineer, the rate for any item in the accepted Bill of Quantities is by reason of such variation rendered inapplicable, the Engineer shall fix such other rate, as in the circumstances, he shall consider reasonable and proper.

60.3 Decision of Engineer to be final

The decision of the Engineer under this clause shall be final.

61.0 VARIATION IN QUANTITY OF ITEMS COVERED BY THE BILL OF QUANTITIES

- i. The quantities of items shown in the Bill of Quantities are approximate, and liable to vary during the actual execution of the Work. The Contractor shall be bound to carry out and complete the stipulated work / group of works, irrespective of the variations in individual items or group of items, specified in the Bill of Quantities.
- ii. Such variations in quantities shall be paid for in the manner laid down below:
 - a) At the accepted rates of the Contract for variation in quantities to the extent of 25% on either side i.e. increase / decrease, except in the case of foundation works. Unless otherwise specifically provided for in the Bill of Quantities or elsewhere in the Contract, the variation of $\pm 25\%$ shall be applicable to a group of items, such as A, B and C under Bill of Quantities mentioned therein and not to individual items. In case of foundation works the rates shall be as per the accepted rates of the contract for any amount of variation.
 - b) In case the variation in the overall group of items as stipulated above, is

more than 25% on either side, the rate for such variations causing excess quantity beyond 25% shall be negotiated between the Engineer and the Contractor and mutually agreed rates arrived at. Provided further that:

- i) the limit of 25% variation shall not apply to items individually costing up to or less than 1% of the value of the original Contract Price. All variations under such items, shall be payable at the accepted rates of the Contract, notwithstanding magnitude of the variation up to an overall value of 2% of the Contract, for each such items. For variations exceeding the limit of an over all value of 2% of contract the rate for excess quantity beyond the value of 2% of the contract, shall be negotiated between the engineer and the contractor and mutually agreed rates arrived at.
- ii) in the case of foundation work, no variation limit applies and the Works shall be carried out by the Contractor on agreed rates irrespective of any variation.
- iii) in the case of earthwork, the variation limit of 25% shall apply to the gross quantity of earthwork and variation in the quantities of individual classifications of soil shall not be subject to this limit.
- iv) for items against which the quantity given is the Bill of Quantities is “if or as required”, there shall be no increase / decrease of rates, whatever be the quantity finally executed.
- v) the Contractor shall be bound to notify the Engineer atleast 7 days before the necessity arises for the execution of quantities of any items or group of items, as the case may be, in excess of 25%. In case mutually agreed rate between the Engineer and the Contractor is not arrived at, before the execution of such works, the Contractor shall have no claim to be entrusted with the execution of extra quantities, and the Engineer shall be free to get such additional quantities beyond 25% executed through any other agency. However, if the Engineer or the Employer so directs, the Contractor shall be bound to carry out any such additional quantities beyond 25% of the original quantities, and the disagreement or the difference regarding rates to be paid for the same, shall be settled in the manner laid down under the conditions for the settlement of disputes under Clause 83.0.

62.0 EXTRA ITEMS NOT IN THE BILL OF QUANTITIES

62.1 Operation of extra items of work

If any items of work not provided for in the accepted Bill of Quantities is to be operated, the Contractor on receipt of instructions from the Engineer, shall be bound to carry out such works at the rates to be decided as per Sub-clause 62.2

62.2 Derivation of rates for extra items of work

The rate of such items shall be derived, wherever possible, from rate for similar items

available in the Bill of Quantities of the accepted tender. In case this is not possible, the rate may be decided on the following basis:

- a. Cost of materials at current market rates, as actually utilised in the final finished permanent work, including a reasonable percentage for wastage and transportation.
- b. Cost of enabling works if any (unless provided for separately) worked out on the above basis but with less stringent quality specifications minus salvage value of serviceable material released after completion of work and cost of material released as scrap.
- c. Cost of labour actually used at the site of work at rates under Payment of Minimum Wages Act for the area of work for each category of worker, further enhanced by a percentage of 30% of the aforesaid rates to account for labour not directly utilised at Site and other ancillary and incidental expenses on labour.
- d. Hire charges for Plant & Machinery, scaffolding, shuttering, forms, etc., required to be used at the site of the work. The tools used by various trades shall not be counted as Plant & Machinery for this purpose.
- e. An amount of 15% of items (a), (b), (c) and (d) above to allow for Contractor's overheads, taxes, and profits. This percentage shall also apply to estimated cost of materials supplied free to the Contractor.

62.3 Notice by Contractor

In all cases where extra items of work are involved, for which there are no rates in the accepted Bill of Quantities, the Contractor shall give a notice to the Engineer, of at least 7 days before the need for their execution arises.

Such a notice shall not, however, be necessary if the Engineer has already instructed in writing to take up such an item of work. To decide the rate, the Engineer may ask the Contractor to furnish detailed analysis of the new rates on the lines mentioned in Sub-clause 64.2 above and / or attend a meeting with him to settle the rate. The Contractor shall be bound to furnish the requisite details and / or attend the meeting.

62.4 Provisional payment for extra item

In case the Contractor fails to so notify the Engineer in advance, wherever required, or having notified fails to attend the meeting after due notice for settlement of rates, or if mutually agreeable settlement of rates is not arrived at between the Engineer and the Contractor, the Contractor shall be bound to carry out the works at rates to be decided by the Engineer. In the absence of a finalised rate for a new item, the Engineer shall be free to certify a payment to the Contractor based on a provisional rate for the work done under the new item. This shall be subject to upward or downward adjustment after the rate is finalised by him for that item. Normally, no price variation clause shall be applicable to new rates not originally included in the Bill of Quantities.

62.5 Payment for extra items of work on the basis of actual expenditure

The Engineer may, however, alternatively decide to allow payment on the basis of actual expenditure incurred on day-work basis. In such a case, the Contractor shall

furnish to the Engineer, vouchers to prove the expenditure incurred. Before ordering material or hiring any plant etc., the Contractor shall get the quotations and rates accepted by the Engineer, if the same is not already provided in the Day work schedule of agreement. The Contractor shall furnish to the Engineer or his representative, a daily list (with name, occupation and shift time) of all workmen deployed on the work, in duplicate for checking and approval. The Contractor shall submit to the Engineer a priced statement of labour, material, plant, etc., actually used on the work, together with the output of work at the end of each calendar month and / or as soon as the work is completed. The payment for the new item of work will be certified by the Engineer based on this submission, duly providing for Contractor's overheads, taxes and profit as indicated in Sub-clause 64.2.

62.6 Decision of Engineer to be final and binding

The decision of the Engineer under this clause shall be final and binding.

63.0 MODIFICATIONS TO CONTRACT TO BE IN WRITING

In the event of any provisions of the Contract requiring to be modified after the agreement has been signed, the modifications shall be made in writing and signed by the Employer or the Employer's authorised representative and the Contractor or his authorised representative. Such modifications shall not be effective until the same have been signed by both the Parties. Any verbal or written arrangements for abandoning, modifying, extending, reducing or supplementing the Contract, or any of the terms therefor, shall be deemed to be provisional and shall not be binding on the Employer unless and until the same are incorporated in a formal instrument and signed by the Employer or his authorised representative and the Contractor or his authorised representative.

64.0 PRICE VARIATION

Price variation is not applicable for this contract or for any extended period of time thereof.

65.0 Deleted.

66.0 CLAIMS

The Contractor shall send to the Engineer's Representative once in every three months an account giving particulars, along with full details and justification, of all claims for any additional payment to which the Contractor may consider himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding three months. No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the Engineer shall be entitled to authorise payment to be made for any such work or expense, notwithstanding the Contractor's failure to comply with this condition, if the Contractor has, at the earliest practicable opportunity, notified the Engineer in writing that he intends to make a claim for such work.

67.0 LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS

Any money due to the Contractor either alone or jointly with others, including the Performance Guarantee amount returnable to him, may be withheld or retained by exercise of lien by the Employer, against any claim of the Employer or of any other branch, office, department or subsidiary of the Employer in respect of payment of a sum of money arising out of or under any Contract other than the present Contract made by the Contractor, alone or jointly with the Employer or any other branch, office, department or subsidiary of the Employer. It is an agreed term of Contract that the sums of money so withheld or retained under this clause by the Employer, shall be kept withheld or retained till the claims arising out of or under the other Contract, are either mutually settled or determined by the Arbitrator, or by the competent Court, as the case may be, and that the Contractor shall have no claim for interest or damages whatsoever on this account, or any other account, in respect of any sums of money withheld or retained, under this clause and duly notified to the Contractor.

68.0 PLANT AND MATERIALS SUPPLIED BY THE CONTRACTOR

68.1 Contractor's plants / material at site to be exclusive to the work

All Constructional Plant and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the 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 Site to another without the consent in writing of the Engineer.

68.2 Removal of construction plants / materials from site

Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant remaining thereon and any unused materials belonging to the Contractor.

68.3 Loss or damage to construction plants / materials

The Employer shall not at any time be liable for the loss or damage to any of the said Constructional Plant, Temporary Works or materials save as mentioned in Clause 30.0.

68.4 Assistance to Contractor for re-exports of plant

In respect of any Constructional Plant which the Contractor shall have imported for the purpose of the Works, the Employer may assist the Contractor, where required, in procuring any necessary Government consent for re-export of such Constructional Plant by the Contractor after the completion of the Works.

68.5 Assistance to Contractor for Customs clearance

The Employer may assist the Contractor, where required, in obtaining clearance through the Customs of Constructional Plant, materials and other things required for the Works. This shall not in any way dilute the Contractor's obligations and responsibilities under the Contract.

68.6 Rejection of any material / workmanship found defective at site

The operation of Clauses 48.0 and 70.0 hereof shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein nor shall it prevent the rejection of any such materials or workmanship at any time by the Engineer if the same is found to be defective and / or not conforming to the Contract and Specifications.

69.0 TEMPORARY WORKS

All temporary works necessary for the proper execution of the works shall be got done and maintained by the Contractor at his cost and subject to the consent of the Engineer shall be removed by him at his expense when they are no longer required and in such manner as the Engineer shall direct. In the event of failure on the part of the Contractor to remove the temporary works, the Engineer will cause them to be removed and cost as incurred for removal, supervision, and other incidental charges shall be recovered from the Contractor. No temporary huts or any other form of accommodation can be provided by the Contractor on the Employer's land for labour engaged by him for the execution of the works. The Contractor shall arrange for such accommodation by himself.

70.0 MEASUREMENTS OF WORK AND PAYMENTS

70.1 Quantity in Bill of Quantity only estimated quantity

The quantities set out in the accepted Bill of Quantities, are the estimated quantities of the Works, and they shall not be taken as the actual and correct quantities of the work to be executed by the Contractor, in fulfilment of his obligations under the Contract.

70.2 Payment on actual measurements

The Contractor shall be paid for the Works, at rates in the accepted Bill of Quantities of the Contract, and for additional and extra items of work at rates determined under Clauses 62.0 and 63.0 of these conditions, on the measurements taken by the Contractor or his Agent in the presence of the Engineer or Engineer's representative and certified by the engineer or engineers representative.

70.3 Measurement of work at regular intervals

Such measurements shall be taken of the work in progress from time to time, and at such intervals, as in the opinion of the Engineer, shall be proper, having regard to the progress of the work. On an agreed date and time, the Contractor or his authorised agent shall take the on-account or final measurements in the presence of Engineer or Engineer's representative, in the Measurement Books to be supplied by the Engineer. The Contractor or his authorised agent shall sign the result of the measurements, which shall also be signed by the Engineer or the Engineer's representative as an acknowledgement and acceptance of the accuracy thereof.

70.4 Measurement of works as per records and drawings

For the purpose of measuring such permanent works, as are to be measured by records and drawings, the Contractor shall prepare records and drawings month by

month of such work, and submit the same to the Engineer or Engineer's Representative for his agreement on such records and drawings.

The Engineer or the Engineer's Representative shall have the right to delete or correct any measurement if it is found at a later stage that the work is incomplete, defective and / or not conforming to the specifications.

71.0 ON ACCOUNT PAYMENT

71.1 Procedure for On-Account payment

The Contractor shall be entitled to be paid from time to time, by way of "On-account" bills, only for such Works, as, in the opinion of the Engineer, the Contractor has executed in terms of the Contract. Such payments shall normally be made once in a calendar month. The Contractor shall submit the on-account bills, by the date stipulated by the Engineer, in the prescribed Proforma, supported with measurements, jointly acknowledged and accepted in the measurement books. After preliminary scrutiny and certification by the Engineer, payment of 80% of the certified amount shall be made by the Employer within 14 days. The amount certified shall account for all deductions, including statutory deductions like sales tax, income tax, etc., recoveries for advances and any amounts due from the Contractor. The balance 20% shall be paid within 28 days, from the date of the preliminary certification of the bill by the Engineer. Such payments made by the Employer, shall not constitute any acceptance of the measurements or Bill of Quantities by the Employer and the Employer shall have the right to alter, modify, reduce or diminish the quantities or classification entered in the Measurement Books or bills. The Employer shall have right to recover any amount paid in the earlier bill from any subsequent bill and should the amount to be recovered be more than the amount of the subsequent Bill, the Contractor shall on demand from the Engineer or Employer immediately refund the extra amount to the Employer within 7 days, failing which he shall have to pay interest @ 10% per annum till the said extra amount is paid back by him.

71.2 Non-recording of measurements

The Engineer reserves the right not to entertain an on-account bill, when the work done during the period is insignificant or is less than 5% of the contract value work.

71.3 On-Account Payment without prejudice

'On account' payments made in respect of work; done or materials delivered by the Contractor, shall be without prejudice to the final accounts, (except where measurements are specifically noted in the measurement book as "final measurements" and have as such been signed by the Contractor), and shall not be considered by itself to be evidence of any facts, stated in or to be inferred from such payments or of any work done or materials supplied, or of the manner of its execution.

72.0 FINAL MEASUREMENTS AND PAYMENTS

i. Soon after the issue of the Completion Certificate, as per Clause 76.0 the Engineer shall have the final measurements taken, recorded and signed, as in the

case of interim measurements referred to in Clause 70.0. A joint account of any plant, equipment and materials issued by the Employer to the Contractor, shall also be prepared and signed jointly. Based on the final measurements and joint material and plant, equipment account statements, the Contractor shall submit a draft Final bill with supporting documentation, in the format prescribed by the Engineer. Within one months of receipt of the draft Final bill and of all information reasonably required for its verification, the Engineer shall determine the value of all matters to which the Contractor is entitled under the Contract, and issue his draft Final bill account to the Employer and the Contractor. The Contractor shall sign the Engineer's copy of the draft Final Bill Account in token of acknowledgement of the full and final value of the Works performed under the Contract, and based on that, submit promptly the Final Bill within 30 days of signing the draft final bill duly signed by him in the format desired by the Engineer, together with a "No Claim" certificate or a list of any unsettled claims in accordance with Clause 66.0. In case of Failure to submit the final bill within the stipulated period final bill shall be determined by the engineer and the same shall be an excepted matter

On receipt of the Final Bills, the Engineer shall promptly prepare and issue to the Employer the Certificate of Final Payment, confirming the amount due to the Contractor under the Contract. The Employer, shall, on receipt of the Certificate, arrange to make payment, subject always to any deductions under these presents, due to the Contractor, within a period of 15 days.

73.0 ADVANCES

Advances (if any) shall be granted as per Special Conditions of the Contract.

74.0 ROUND OFF

In calculating the amount each item due to the Contractor, in every certificate prepared for payment, sums of less than fifty paise shall be omitted and sums of fifty paise and more up to one rupee shall be reckoned as one rupee.

75.0 PAYMENTS AND COMPLIANCE WITH TAX REQUIREMENTS.

75.1 Payment by NEFT / RTG

Unless otherwise specified all payments to the Contractor shall be made by NEFT/RTG/ Cheque, but no Cheque will be issued for an amount less than Rs.1000/-. This stipulation, however, shall not apply to Final Invoices.

75.2 Tax Deduction at Source

Where there is a statutory requirement for Tax deduction at source, such deduction towards Income Tax and other Taxes as applicable will be made from the invoices payable to the Contractor at rates as notified by concerned authorities from time to time.

75.3 Compliance to GST and other tax requirements.

Please refer Special Conditions of Contract.

76.0 COMPLETION CERTIFICATE

76.1 Time of Completion

Subject to any provision in the Contract as to completion of any section of the Works before completion of the whole, the whole of the Works shall be completed in accordance with Clause 52 hereof, within the time limit stated in the “Instructions to Tenderers” or such extended time as may be allowed under Clause 56 thereof.

76.2 Notice by Contractor regarding completion of work

As soon as the work is completed, the Contractor shall give notice of such completion, whether of the whole of the Works, or of any part of the work, for which a separate date of completion is stipulated in the Contract, to the Engineer, and the Engineer, within 30 days of receipt of such notice, shall inspect the work and also arrange for carrying out of such tests as may be prescribed under the Contract. If the Engineer notices any incomplete item of work or any defect which is to be rectified by the Contractor, or if any part of or whole of the work fails to pass the specified tests, the Engineer shall furnish to the Contractor, the list of all such incomplete items of work, deficiencies, defects failure to pass tests, etc., and may refuse to issue a Certificate of Completion to the Contractor. Provided, however, that such certificate shall not be refused only on grounds of any minor defect in the work, required to be rectified by the Contractor in respect of Contracts wherein a specific defect liability period (maintenance period) is provided for. If in the opinion of the Engineer, the work shall have been satisfactorily completed and shall have satisfactorily passed final test or tests that may be prescribed, the Engineer shall issue a Certificate of Completion, showing the date of completion in respect of Work and the defect liability period if any (i.e. the maintenance period), shall commence from the date of such certificate. Provided that the Engineer may issue such a certificate with respect to any part of the Works, before the completion of the whole of the Works or with respect to any specific substantial part of the work which has been so completed and / or used by the Employer. When any such certificate is given in respect of a part of the work, such part shall be considered as completed and the defect liability period (Maintenance period) of such part, shall commence from the date of such certificate.

76.3 Completion Certificate not to Absolve

The Certificate of Completion of works referred to in Sub-clause 76.2 above, shall not absolve the Contractor from his liability to make good defects, imperfections and shrinkages or faults, which may appear during the defect liability period (period of maintenance) specified in the Contract, arising in the opinion of the Engineer from materials or workmanship being not in accordance with Drawings or Specifications or instructions of the Engineer. These shall be amended and made good by the Contractor at his own cost. In case of default on the part of the Contractor, to so make

good the defects or deficiencies, the Engineer may employ labour, plant and machinery and materials or appoint another agency or Contractor, to amend and make good such defects, imperfections, shrinkages and faults, and all expenses consequent thereto and incidental thereto, shall be borne by the Contractor and shall be recoverable from any moneys due to the Contractor under the Contract including the Performance Guarantee amount or from any moneys payable to the Contractor by the Employer, under any other Contract, or as a debt due.

77.0 POST PAYMENT AUDIT

It is an agreed term of the Contract, that the Employer reserves to himself the right to carry out a post payment audit and / or technical examination of the Works, and the Final bill including all supporting vouchers, abstracts, etc., and to make a claim on the Contractor for the refund of any excess amount paid to him, if as a result of such examination, any over-payment to him is noticed to have been made in respect of any work done or claimed to have been done by the Contractor, under the contract. If any under-payment is noticed, the same shall be paid by the Employer to the Contractor. Such payments or recoveries, however, shall not carry any interest.

78.0 Cessation of Employer's Liability

The Employer shall not be liable to the Contractor for any matter, arising out of or in connection with the Contract, or the execution of the Works, unless the Contractor shall have made a claim in writing in respect thereof within 60 days from the date of completion of the Works.

78.1 Unfulfilled obligations

Notwithstanding the issue of performance Certificate, the Contractor and the Employer, shall remain liable for the fulfilment of any obligation included under the provision of the Contract, prior to the issue of the performance Certificate, which remain unperformed at the time such certificate is issued, and for the purpose of determination of the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties hereto.

79.0 PRODUCTION OF VOUCHERS

i. The Contractor shall, whenever required by the Engineer, produce or cause to be produced for examination by the Engineer, any quotation, invoice, cost or other account books, vouchers, receipts, letters, memoranda or any copy of or extract from any such documents and also furnish information and returns, as may be required, relating to the execution of this Contract or relevant for verifying or ascertaining the cost of execution of this Contract or ascertaining the materials supplied by the Contractor are in accordance with the specifications laid down in the Contract. The Engineer's decision on the question of relevancy of any documents, information or returns shall be final and binding on the parties.

ii. If any part or item of the work is allowed to be carried out by a sub-contractor, assignee or any subsidiary or allied firm, the Engineer shall have power to secure the

books of such sub-contractor, assignee or any subsidiary or allied firm through the Contractor, and shall have power to examine and inspect the same. The above obligations are without prejudice to the obligations of the Contractor under any statute, rules or orders.

80.0 WITHHOLDING AND LIEN FOR SUMS CLAIMED

i. The Employer shall have lien over all or any moneys that may become due and payable to the Contractor under these presents, and / or over the deposit of Performance Guarantee or other amount or amounts made under the Contract and which may become payable to the Contractor, under the condition in that behalf herein contained, in respect of any debt or sum that may become due and payable to the Employer by the Contractor, either alone or joint with others, either under this or under any other Contract or transaction of any nature whatsoever between the Employer and the Contractor.

ii. And further, unless the Contractor pays and clears immediately on demand any claim of the Employer, the Employer shall at all times be entitled to deduct the amount of the said claim from the moneys, securities and / or deposits which may have become or will become payable to the Contractor under these presents, or under any other Contract or transaction whatsoever between the Employer and the Contractor even if the matter stands referred to Arbitration. Provided further that if the Contractor does not accept any such claim, the amount deducted shall be treated as having been withheld only till the claim is mutually settled or determined by the Arbitrator or by the competent court of law. The Contractor shall have no claim for any interest or damages whatsoever in respect of any amounts withheld or treated as withheld under the lien referred to above and duly notified as such to the Contractor.

81.0 SIGNATURE ON RECEIPTS FOR PAYMENTS

Every receipt of payment which may become payable, or for any Performance Guarantee amount which may become returnable to the Contractor, under this Contract, shall, if signed in the partnership name by anyone of the partners of a Contractor firm, or by a person holding a power of attorney, if the Contractor is a limited (private / public) company, be a good and sufficient discharge to the Employer in respect of moneys or security amount purported to be acknowledged thereby. In the event of death of any of the Contractor's partners during the currency of the Contract, it is hereby expressly agreed that every receipt by any one of surviving Contractor's partners, shall, if so signed as aforesaid, be a good and sufficient discharge as aforesaid, provided that nothing in this Clause shall be deemed to prejudice or affect any claim, which the Employer may hereafter have against the legal representatives of any Contractor's partner so dying, for or in respect of breach of any of the conditions of the Contract. Provided also that nothing contained in this clause shall be deemed to prejudice or affect the respective rights and obligations of the Contractor's partners, or of the legal heirs/representatives of any deceased contractor/partner interests.

82.0 FORCE MAJURE

If, at any time during the currency of the Contract, the performance in whole or in part by either party of any obligation under this Contract shall be prevented or delayed by reasons of any war, hostilities, invasion, acts of public or foreign enemies, rebellion, revolution, insurrection, civil commotion, sabotage, large scale arson, floods once in 50 year cycle, earthquake, large scale epidemics, nuclear accidents, any other catastrophic unforeseeable circumstances, quarantine restrictions, any statutory rules, regulations, orders or requisitions issued by a Government department or competent authority or acts of God (hereinafter referred to as “event”) then, provided notice of the happening of such an event as given by either party to the other within 21 days of the occurrence thereof.

a. Neither party shall be reason of such event be entitled to terminate the Contact or have claim for damages against the other in respect of such non-performance or delay in performance.

b. The obligation under the Contract shall be resumed as soon as practicable after the event has come to an end or ceased to exist.

c. If the performance in whole or part of any obligation under the Contract is prevented or delayed by reason of the event beyond a period mutually agreed to if any, or 90 days, whichever is more, either party may at its option terminate the Contract.

d. In case of doubt or dispute, whether a particular occurrence should be considered an “event” as defined under this clause, the decision of the Engineer shall be final and binding.

e. Works that have already been measured shall be paid for by the Employer even if the same is subsequently destroyed or damaged as a result of the event. The cost of rebuilding or replacing any work that has been measured, shall be borne by the Employer.

f. If the Contract is terminated under this Clause, the Contractor shall be paid fully for the work done under the Contract, but not for any defective work or work done which has been destroyed or damaged before its measurement. The Employer shall have the option to take over any plant and material lying at site, at rates provided for in the Contract, failing that, as per rates which are determined to be fair and reasonable by the Engineer.

g. If neither party issues notice regarding the event within 21 days of its occurrence, the said event shall be deemed not have occurred and the Contract will continue to have effect as such.

83.0 SETTLEMENT OF DISPUTES AND ARBITRATION

83.1 Dispute Resolution:

Negotiation and Amicable Settlement: In the event of any dispute in connection with or arising out of this Agreement between the parties (“Disputes”), the parties shall firstly attempt to amicably resolve such disputes through the highest level of negotiations and discussions.

83.2 Adjudication:

- I. If any dispute between the parties is not resolved through negotiations and amicable settlement, either party shall give notice in writing to the other party of its intention to refer such dispute to Adjudication.
- II. The sole-member Adjudicator shall be nominated by the Managing Director of the Employer at his discretion. He may also be an officer of CMRL, not below the rank of General Manager, but one who has not dealt with the subject contract or disputed matter. The remuneration of the Adjudicator shall be fixed by the Managing Director of the Employer and shall be shared by both the parties. The Adjudicator shall reach a decision within 30 days or such period as agreed between the parties from the date of reference of the dispute.
- III. If either party is dissatisfied with the Adjudicator's decision, then the party, on or before 30 days on receipt of such decision, shall notify the other party of its dissatisfaction, and its intention to refer the dispute to Arbitration, failing which the decision of the Adjudicator shall be final.

83.3 Arbitration:

The dispute so referred shall be settled by Arbitration and the parties agree on the following procedure for appointing the Arbitrator / Arbitrators:

- I. In case the value of the disputed claim and counter claim is Rs.5 crore or less: The dispute shall be referred to a Sole-Member Arbitral Tribunal. Such Sole-Member shall be nominated by the party seeking arbitration from the List of Arbitrators, maintained by the Employer, consisting of independent persons to be nominated as Arbitrators, who shall meet with the requirement relating to the independence or impartiality of arbitrators referred to in the Fifth and Seventh schedules, read with Section 12, sub-sections (1) (a), (b) and (5) of the Arbitration and Conciliation Act, 1996 as amended by the Arbitration and Conciliation (Amendment) Act 2015.
- II. If the party seeking Arbitration is the Contractor, such proposal shall be addressed to the Employer and the Employer shall, within fifteen days from the date of receipt of such proposal, send the List of Arbitrators maintained by the Employer, referred in clause 3.1 above, to the Contractor. The Contractor shall nominate an arbitrator from the List within fifteen days from the date of receipt of the List from the Employer. If the party seeking Arbitration is the Employer, it shall forward such proposal to the Contractor along with the nomination of an Arbitrator from the List referred to in clause 3.1 above.
- III. If either party fails to nominate the arbitrator within the prescribed time limit, as mentioned above, then such other party, after the expiry of the prescribed time limit, has the right to nominate the Arbitrator from the said List on behalf of the party failing to nominate.
- IV. In case the value of the disputed claim and counter claim is more than Rs.5 crore: The dispute shall be referred to an Arbitral Tribunal comprising of three members. Either Party may propose to the other Party for referring the dispute to Arbitration. If the proposal is initiated by the Contractor, such proposal shall be addressed to the Employer and the Employer shall, within fifteen days from the date of receipt of such

proposal, send the List of Arbitrators maintained by the Employer, referred to in clause 3.1 above, to the Contractor. The Contractor shall nominate an arbitrator from the List within fifteen days from the date of receipt of the List from the Employer. The Employer shall nominate its Arbitrator from the said list within 15 days thereafter.

- V. If the proposal for referring the dispute to Arbitration is made by the Employer to the Contractor, it shall forward such proposal to the Contractor along with the nomination of its Arbitrator from the said List. The Contractor shall, within fifteen days of receipt of the List from the Employer, nominate its arbitrator from the List.
- VI. If either party fails to nominate its Arbitrator within the prescribed time limit as mentioned above, after the nomination by the other party, then such other party, after the expiry of the prescribed time limit, has the right to nominate the arbitrator from the said List, on behalf of the party failing to nominate.
- VII. The two arbitrators nominated by the Contractor and the Employer as above, shall appoint the Presiding Arbitrator from the List referred in clause 3.1 above, by mutual consultation among themselves, within 15 days of the appointment of the second Arbitrator.
- VIII. If no consensus is reached within 15 days regarding the appointment of the Presiding Arbitrator, either party may apply to the Designated Court referred to in the Arbitration and Conciliation Act, 1996 as amended by the Arbitration and Conciliation (Amendment) Act 2015 for the appointment of the Presiding Arbitrator.
- IX. The Parties agree that the selection and nomination of Arbitrators from the List should be based on the nature and subject matter of dispute to be adjudicated upon, that is, the nominated Arbitrators shall have sufficient knowledge and experience to decide upon the disputed matter. In case of three-Member Arbitral Tribunal, it shall also be ensured by the nominating parties/ Arbitrators, as the case may be, that at least one member of the Tribunal shall be a legal professional with a minimum of 20 years of experience.
- X. In the event of an arbitrator dying, neglecting or refusing to act or resigning or being unable to act for any reason, it shall be lawful to appoint another arbitrator in place of the outgoing arbitrator in the manner aforesaid.
- XI. Subject to the aforesaid, the Arbitration and Conciliation Act, 1996, as amended from time to time and the rules thereunder and any statutory modifications thereof for the time being in force shall be deemed to apply to the arbitration proceedings under this clause.
- XII. The venue of the arbitration shall be Chennai. The cost of Arbitration including the fees of the Arbitrator shall be borne equally by both the parties.
- XIII. The Courts at Chennai shall have exclusive jurisdiction in respect of all disputes between the parties arising out of this agreement.

83.4 No suspension of work

The reference to arbitration shall proceed notwithstanding that Works shall not then be or be claimed to be complete, provided always that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reasons of arbitration being conducted

during the progress of Works. Neither party shall be entitled to suspend the work to which the dispute relates on account of arbitration and payments to the Contractor shall continue to be made in terms of the Contract.

83.5 Excepted Matters

The following clauses/ matters are excepted which are not Arbitrable. Clause 8.2, 8.3, 26, 35.2, 42, 46, 50.4, 60.0 and 82.01

84.0 NOTICES

84.1 Notice to Contractor

All certificates, notices, written orders or letters, to be given by the Employer or the Engineer to the Contractor, shall be deemed to have been served, if the same are delivered to the Contractor or his authorised agent, or delivered or left at or posted to the given address of the Contractor or Contractor's agent or Contractor's Registered Office or principal place of business. Such documents shall be deemed to have been received on the day they are left or delivered, or in the case of postal transmission, on the day they would ordinarily have reached but not exceeding 7 days from the date of posting inclusive of day of posting, in any case.

The Contractor shall, on award of the Contract, furnish to the Engineer, the name, designation, address and telephone, telex and telefax numbers of his agent referred to in Clause 11.0.

84.2 Notice to Employer and Engineer

All notices to be given to the Employer or to the Engineer, under the terms of the Contract, shall be served by sending by post or telex or telefax, or by delivering the same, to the respective addressees nominated for this purpose.

84.3 Change of Address

Either party may change the nominated address by prior written notice to the other party, and the Engineer may do so by prior written notice to both the parties, viz. The Employer and the Contractor.

84.4 Change in Constitution of Firm

In case the Contractor is a partnership firm, any change in the constitution of the firm shall forthwith be notified by the Contractor to the Engineer as also to the Employer.

85.0 PAYMENT IN FOREIGN CURRENCIES

This shall be as stipulated in the Special Conditions of the Contract.

SECTION VI

SPECIAL CONDITIONS OF CONTRACT

SPECIAL CONDITIONS OF CONTRACT

1. Priority Of documents

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the documents, the Engineer shall issue any necessary clarification or instruction to the Contractor, and unless otherwise specified in the Special Conditions of Contract, the priority of the documents shall be as follows:

- a. The Contract Agreement (CA);
- b. The Letter of Acceptance (LoA); along with letters of clarifications, if any;
- c. Letter of Clarifications on submitted Tender, if any;
- d. Addenda to the Tender Documents;
- e. Form of Tender (FOT);
- f. BOQ/Payment schedule / Pricing Document;
- g. NIT;
- h. ITT;
- i. The Special Conditions of Contract;
- j. The General Conditions of Contract;
- k. The Employer's Requirements
- l. Technical Specifications and Drawings
- m. The Contractor's Proposal; and

Any other document forming part of the Contract

2. CLIMATIC CONDITIONS

The work site is at Chennai and tenderers must acquaint themselves about the city traffic climatic and other conditions before submitting the tender. The Employer shall in no way be responsible on this account

3. Programmes

- i. The Contractor shall prepare and submit to the Engineer the proposed Initial Programme and Works Programme showing how the Contractor will execute the Works to ensure completion of the Key Dates for various activities.
- ii. The Engineer on receipt of a programme shall inform the Contractor in writing within 21 days after receipt of the above information; that the programme has received his consent; or that the programme is rejected, in which case reasons for such rejection shall be given; or that further information is required to clarify or substantiate the programme or to satisfy the Engineer as to its reasonableness, or that the programme has received his consent subject to incorporation of comments attached to the Notice of No Objection.
- iii. Provided that if none of the above actions is taken within the 30 day period, the Engineer shall be deemed to have given consent to the programme submitted.
- iv. In the event of a programme being rejected, or deemed to have been rejected, the Contractor shall, within 21 days thereafter, submit a revised programme taking

account of the reasons given for the rejection or incorporating further information requested by the Engineer, as the case may be.

- v. If the Engineer feels that there is a significant deviation between the actual or anticipated progress of the Works and the Works programme, the Engineer may require the Contractor to submit a revised/modified programme to ensure timely completion of Whole of Works or a Key Date or a milestone. The Contractor shall submit such revised programme within 14 days of the Engineer instruction or within such other time as the Engineer will allow in writing.
- vi. Unless and until an amended version has the consent of the Engineer, the existing programme shall remain as the Works Programme for all purposes of the Contract.
- vii. Consent by the Engineer to a Works Programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract, nor in the event that a Works Programme indicates that a Key Date has not or will not be met, constitute any form of acknowledgement that the Contractor is or may be entitled to an extension of time in relation to such Key Date or a Mile Stone.

4. Cash Flow Estimate:

The Contractor shall furnish to the Engineer, a detailed cash flow estimate in respect of the works, within 15 days from the Commencement Date. This shall be up-dated and submitted every two months thereafter, until the completion of the works. The Contractor shall prepare and submit his detailed Programme of Work so as to achieve key dates of various activities.

5. Accidents at Work Sites:

For any accident taking place at work sites due to failure of equipment, collapse of temporary works, non-provision of protective measures at excavation sites, workmen or members of public getting injured or killed, toppling of cranes, trailers, trucks, trolleys etc., electrocution cases or any other mishap taking place at sites or away from work sites where contractor's plants and machineries are involved, the sole responsibility for such accident will devolve on the main Contractor only and not on sub-contractors and he shall be liable to be charged for criminal negligence, in addition to penalties. No liabilities whatsoever will devolve on CMRL or CMRL's employees on this count. CMRL also reserves the right, depending on the severity and seriousness of the accident, to blacklist the Contractor or Sub-Contractor for a period found appropriate and necessary.

6. Samples for Testing:

- i. Samples shall be of sufficient size and in accordance with relevant Standards to carry out all specified tests.
- ii. Samples taken on the Site shall be selected by, and taken in the presence of, the Engineer and shall be suitably marked for their identification. An identification marking system should be evolved at the start of works in consultation with the Engineer.

- iii. Samples shall be protected, handled and stored in such a manner that they are not damaged or contaminated and such that the properties of the sample do not change.
- iv. Samples shall be delivered by the Contractor, under the supervision of the Engineer, to the specified place of testing.

7. Testing

- i. The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests shall be carried out in the Contractor's laboratory, unless otherwise permitted or required by the Engineer. Where the laboratory is not appropriately equipped and/or staffed for some tests, or if agreed to by the Engineer, tests may be carried out in other laboratories provided that:
 - a. they are accredited for the relevant work to a standard acceptable to the Engineer; and
 - b. Particulars of the proposed laboratory are submitted to the Engineer for his consent.
- ii. In-situ tests shall be done in the presence of the Engineer reserves the right to inspect all the facilities and testing before certification.
- iii. Equipment, apparatus and materials for in-situ tests and laboratory compliance tests carried out by the Contractor shall be provided by the Contractor. The equipment and apparatus shall be maintained by the Contractor and shall be calibrated before the testing starts and at regular intervals as permitted by the Engineer. The equipment, apparatus and materials for in-the situ tests shall be removed by the Contractor as soon as practicable after the testing is complete.

8. Records of Tests

- i. Records of in-situ tests and laboratory compliance tests carried out by the Contractor shall be kept by the Contractor on the Site and a report shall be submitted to the Engineer within seven (7) days, or such other time stated in the Contract or in the Quality Assurance Programme, after completion of each test. In addition to any other requirements, the report shall contain the following details:
 - a. location of the batch from which the samples were taken or location of the part of the Works;
 - b. place of testing;
 - c. date and time of tests;
 - d. weather conditions in the case of in-situ tests;
 - e. technical personnel supervising or carrying out the tests;
 - f. size and description of samples and specimens;
 - g. method of sampling;
 - h. properties tested;
 - i. method of testing;
 - j. readings and measurements taken during the tests;
 - k. test results, including any calculations and graphs;
 - l. specified acceptance criteria; and
 - m. other details stated in the Contract.

- ii. Reports of tests shall be signed by the site agent or his assistant, or by another representative authorised by the Contractor.
- iii. If requested, records of tests carried out by the Employer's staff or by the Engineer shall be given to the Contractor.

9. Mobilisation Advance

10% of the Accepted Contract Price is payable as mobilization advance in the currencies and proportions in which the Accepted Contract Price is payable.

1. First instalment of 25% of the Advance Payment shall be paid after the contract is signed and the required bank guarantee in the specified format from Public Sector Banks is submitted.
2. After submission of proof of mobilization of all key personnel required for the project, the second instalment of 25% shall be paid.
3. Last instalment of 50% shall be paid on the complete mobilization of all Plant and Machinery (P&M) at site as stated in Contract agreement which shall be substantiated by documentary proof within 30 days. Failure to do so shall result in recovery to such amount.

The mobilization advance payments for mobilization and for plant and machinery will carry an interest rate of 10% per annum. All Advances shall be recovered by the time 85% of the work is completed.

10. Compliance to GST and other tax requirements.

Add following below Clause 75.30

The Contractor shall ensure full compliance with tax laws of India with regard to this Contract and shall be solely responsible for the same. He shall submit copies of acknowledgements evidencing filing of returns every year and shall keep the Employer fully indemnified against liability of tax, interest, penalty etc., of the Contractor's in respect thereof, which may arise. The Contractor shall maintain complete records in respect of payments made for taxes, duties octroi and other levies payable to various authorities and shall advise the Employer of the complete details of such payments every month, which shall be enclosed with the Monthly Progress Report. These records shall remain open for inspection by the Employer or the Engineer at any time and shall be made available to them as and when required.

In case the Employer or subject works or any component thereof is entitled to or receives approval for exemption, refund waiver or reimbursement in any of the taxes applicable to the Contract, including but not limited to the Basic Custom Duty, GST, the Contractor shall follow the due process and obtain such exemption/ refund/ reimbursement of such taxes etc., from the concerned authority. The Contractor shall arrange for the remittance of the refund so obtained to the Employer immediately. Alternatively, the Employer at its discretion may instruct the Contractor to submit all the documentary evidence of having paid the taxes to enable the Employer to claim the refund from statutory authorities. The Contractor will forthwith comply with any of the above requests of the Employer and in case of the failure of the Contractor, the amount of refund, whether estimated or actual, shall be recovered by the Engineer from the

amounts due for payment to the Contractor as debt due from the Contractor. The Contractor should also pass on the benefit of GST to the Employer as per the Anti-Profiteering Rule 2017.

1. The Contractor shall provide valid certificates required under the GST Act and rules made there under. Until such certificate is submitted and accepted, no payment, including release of any advance payment, shall be made by the Engineer to the Contractor
 - a. Changes in Cost Due to Change in law
 - b. For the purpose of this clause. Law refer to laws or Government Policies relating to taxes and duties (relating to taxes, including law on Custom Duty) for the time being in force in India.
 - c. "Change of Law" means the occurrence or coming into force of the following, at any time after the Base date:
2. Any new tax or change in the rate of any existing tax / duty if so related to the works, which is imposed after the due date of submission of tender and which impacts the performance of the contractor with increased cost or which results in extra financial gains to the contractor due to decreased cost in execution of works.
3. Such additional or reduced cost shall be certified by the Engineer after examining records provided by the Contractor and shall be paid by or credited to the Employer as the case may be Subject to sub-clause 10.5 below:
4. Notwithstanding the foregoing, such additional or reduced cost shall not be separately paid or credited, if, the same shall have been taken into account under any other clause of the Contract;
5. No addition or reduction in cost due to any changes in any other Law will be allowed by the Employer, except for the changes due to
 - a) Any new tax introduced and / or changes in the existing tax rates.
 - b) Changes in rate of Customs Duty as compared to the rate existing on the base date; and
 - c) Change in the rate of GST as compared to the rate existing on the base date.

SECTION VII

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

1. GENERAL

This specification covers all the technical requirements for a detailed “Geotechnical investigation and submission of a detailed Geotechnical report”. The detailed geotechnical investigation shall be carried out to provide the designer with sufficiently accurate information both general and specific about the substrata profile and relevant soil and rock parameters at site on the basis of which the foundation for various structures can be designed rationally.

2. SCOPE of Work

2.1 Activities to be performed under this tender are as follows:

- i) Drilling of 150mm dia bore holes in soil by Auger / calyx rig or wash boring, in weathered rock or Strong Rock up to a maximum depth of 40m using TC/diamond/impregnated diamond bits and hydraulic/ rotary drilling rig by wash boring method as per the directions of Engineer-in-charge and as detailed in Technical Specifications and Schedule.
- ii) After successful completion of the bore hole, all the drilled bore holes need to be filled back with Sand.
- iii) Work site needs to be barricaded all the time to ensure safety during work.
- iv) Conducting Standard Penetration Tests in bore holes at every 3.0m starting from first sample at 1.5m depth or at the change of stratum as per IS: 2131.
- v) Collection of undisturbed soil samples from bore holes at every 3m interval or change of strata as per IS: 2132.
- vi) Recording of water table level in the bore holes after completion of boring.
- vii) Conducting in-situ permeability tests in Rocky strata and all other types of soils.
- viii) In case of drilling in rock double tube / triple core barrel shall be used to get the core recovery (CR) and RQD (Rock Quality Designation) and recording RQD/CR values.
- ix) Shear test shall be tri-axial for soft soils & mixed soils. Direct shear shall be resorted to sand samples.
- x) Conduct all necessary laboratory tests on all samples collected (Soil & Rock) as per Schedule and Technical Specifications as per relevant IS codes along with submission of test reports.
- xi) Wherever tests are to be done on rock it shall be UCS to the best possible extent.

- xii) Wherever soft strata are expected, if necessary, field vane shear test may be conducted.
- xiii) Contractor will show all the borehole locations on the topo survey plan and plot the lithological profile showing various strata of soil, rock, water table, N Values and lab parameters.
- xiv) Contractor will mark the borehole location on ground as per survey plan and plotting the same in alignment plan.
- xv) Lithological profiles will be made with reference to the reduced levels recorded at every bore hole. All the levels of samples, field test and change of strata shall be as per reduced levels. For the purpose of reduced levels information on temporary bench marks (TBM's) will be provided by employer at every one KM along the alignment.
- xvi) Preparation of bore logs and location plan of boreholes on computer by using suitable Software.
- xvii) Submission of draft report including Geological logs, lab test results & foundation analysis in 2 copies and final report in 4 copies.
- xviii) Preparation of report summarizing the details of soil/rock classifications, analysis of test data and recommending the type of foundations to be adopted with design calculations for the proposed Elevated and UG corridor of phase II for Chennai metro rail limited duly highlighting the design criteria and design methodology and different groups of soil strata encountered.

The work shall include mobilization of all necessary equipment, providing necessary engineering supervision and technical personnel, skilled and unskilled labours, arranging water for drilling etc as required to carry out the entire field investigation as well as laboratory investigation, analysis and interpretation of test data, results collected and preparation of detailed geotechnical report including specific recommendations for the type of foundations and the allowable safe bearing capacity for different sizes of foundations at different Founding strata for the various structures like pile capacity, raft, open foundation.

The contractor shall make his own arrangements for locating the co- ordinates and position of bore holes, trial pits and other field tests as per the drawings/sketches supplied to him and for determining the reduced levels at these locations with respect to a single bench mark indicated by the engineer-in-charge. Two established reference lines will be indicated to him. The contractor has to provide at the site all the required survey instruments to the satisfaction of the engineer-in- charge so that the work can be carried out accurately according to the specification and drawings.

All the field data shall be recorded in the Proforma recommended in Indian Standard Codes and the field records shall be counter signed by the engineer-in-charge. The contractor shall submit four copies of the field bore-logs to the engineer-in-charge soon after the completion of each bore hole. All the investigations are to be carried out by the contractor as per the

priority requirements of the engineer- in-charge.

The contractor shall intimate the engineer-in-charge giving reasons if any additional specific tests he consider necessary to be carried out duly considering local sub-soil conditions before starting of such tests.

Whenever the contractor is unable to extract undisturbed samples he should immediately inform the engineer-in-charge. In such a case payment for boring charges shall be subject to the engineer-in-charge being satisfied that adequate effort has been made to extract undisturbed samples.

All the laboratory test data shall be recorded in the proforma recommended in the Indian Standard Codes and a copy of these shall be sent to the engineer-in-charge every week during the progress of laboratory testing. Whenever desired during the progress of work the owner/engineer-in-charge may be present at the laboratory where the contractor is arranging for execution of the laboratory tests.

The contractor shall interact with the engineer-in-charge to get acquainted with the different type of structures envisaged and in assessing the load intensities on the foundations for the various structures of the project in order to enable him to make specific recommendation for the depth & type of foundation and the allowable bearing pressure. The contractor shall submit detailed geotechnical report after incorporating the comments (if any) on the draft report.

The entire field as well as laboratory investigation work shall be supervised by Key personnel as mentioned in conditions of contract. A geologist shall also be deputed at site during investigation whenever rock drilling is undertaken. The scheduling of laboratory tests, analysis and interpretation of test results, drafting of report and recommendations shall be carried out by Key personnel as mentioned in conditions of contract.

3. TENDER DRAWING

The Geotechnical Investigation Layout Drawing indicating the tentative location of the bore holes and field tests/areas to be investigated for locating the project shall be issued by CMRL at the time of issuing LOA for specific project/before commencement of work at site . The location, extent and depth of bore holes & field tests/area(s) indicated in the drawing shall be subject to change that may be necessary during actual execution of the work. No claim whatsoever shall be entertained for differences between the location, extent and depth/area(s) etc of soil tests indicated on the construction drawings and those actually done as per instruction of Engineer at site. The work shall be carried out as per the instructions of the engineer-in-charge.

The bidder is supposed to be acquaint with working conditions in all the mentioned states within the country and the nature, type, scope of work and involvement. The rates quoted shall remain firm during the entire period of execution till completion of the work and any additional claim for lack of knowledge shall not be entertained.

4. GENERAL REQUIREMENTS

In areas which have already been developed, the contractor shall take advantage of existing local knowledge, record of trial pits, bore holes etc in the vicinity and the type of foundations adopted and behaviour of existing structures particularly those of similar nature to the ones proposed for this project.

The contractor shall make use of information gathered from quarries, unlined wells, cuttings from nearby areas etc. The general topography of the nearby areas will often give some indication about the variation of the soil conditions which are likely to exist.

The contractor shall gather data regarding the removal of overburden by excavation, erosion or landslides in the areas which may give an idea of the amount of reconsolidation that the soil strata has undergone. Similarly data regarding recent fills shall also be studied to determine the characteristics of the fill as well as the original strata.

The water level in streams and water courses if any in the neighbourhood shall be noted. Reliable information regarding ground water level shall also be gathered from water level in the nearby wells.

The contractor shall make enquiries and verify regarding earlier use of the site which can have important bearing on its suitability for the proposed structures. This is important particularly in areas where there have been underground works e.g. worked out ballast pits, quarries, old brick fields, mines, mineral workings etc. The possibility of damage to the structures, sewers, conduits and drainage system by subsidence shall also be investigated.

It is essential that the equipments/instruments are properly calibrated at the commencement of the work so that they represent true values and submit the test reports to the engineer-in-charge. If the engineer- in-charge so desires, the contractor shall arrange for having the instruments tested in presence of the engineer at an approved laboratory at the contractor's cost and the test reports shall be submitted to the engineer-in-charge. When blasting with explosives is involved, agency/contractor shall arrange statutory clearances and also the portable magazine for storing/carrying the explosives.

The investigation shall be comprehensive enough to enable engineer in charge to estimate and determine the following:

- i) Engineering properties of soil/rock.
- ii) The location and extent of rock layer and other weak features.
- iii) Soft pockets if any under the hard founding strata.
- iv) The geological features like type of rock, fault, fissures etc.
- v) Ground water table.
- vi) Artesian condition, if any.
- vii) The depth and existence of scour.
- viii) The bearing capacity for foundation.
- ix) Probable settlement and probable differential settlement of the foundation.

The following basic information is required for rock exploration:

- i) Depth of rock strata and its variation over a site.
- ii) Whether isolated boulder or massive rock formation.
- iii) Extent and character of weathered zone.
- iv) Joint frequency in the rock.

The measurement shall be recorded from the reduced level of ground surface up to the depth of boring/drilling. No payment shall be made for the depth of penetration of SPT sampler beyond the last boring rod during the last SPT.

Classification of strata as soil, boulder, soft rock or hard rock shall be on the basis of strata pth, physical condition, length of pieces of core, joints, colour of water residue, weathering and evidence of disturbance, drop of drilling/cutting bits shall be carefully noticed and entered in the drilling log.

Boreholes of 150 mm diameter shall be drilled in soil overburden by rotary drilling. In the boreholes, standard penetration test (only for vertical bore holes) and collection of 100mm diameter undisturbed soil samples shall be performed alternately at an interval of 1.5m. The disturbed soil samples collected from split spoon sampler shall be kept in the polythene bags and the undisturbed soil samples shall be properly sealed with wax and then transported to the laboratory for testing. The SPT shall be performed as per IS: 2131. Drilling, protective handling, Labelling of samples and maintenance of site records shall be in accordance with IS: 1892. When boulder / rocky strata are met with, diamond core drilling shall be done with NX size diamond bit and at least double tube core barrel. If required, even triple tube core barrel shall be used to ensure proper core recovery in friable rock mass. The core recovery and RQD shall be recorded for every borehole while drilling in rock. SPT shall be conducted at an interval of 3 m in bouldery and highly weathered/jointed rock masses having core recovery less than 60% even if there is refusal. The number of blows and the corresponding penetration shall be recoded & the same shall be correlated with the properties of rock mass, which will give valuable information.

5. Codes and Standards

Drilling of boreholes sampling and other investigations are required to be carried out in accordance with specifications of relevant codes of Bureau of Indian Standards as given below:

- IS:1080 Code of practice for design and construction of simple spread foundations
- IS:1498 Classification and identification of soils for general engineering purposes
- IS:1892 Code of practice for subsurface Investigation for foundation.
- IS:1904 Code of practice for design and construction of foundations in soils:
General requirements.
- IS:2131 Method of standard penetration test for soils
- IS:2132 Code of practice for thin walled tube sampling of soils
- IS:2720 Method of test for soils (Relevant parts)
- IS:2809 Glossary of terms relating to soil dynamics

IS:2911 Code of practice for design and construction of pile foundations (Relevant parts)
IS:2950 Code of practice for design and construction of raft foundation (Part-I)
IS:4078 Code of practice for indexing and storage of drill cores
IS:8009 Code of practice for calculation of settlement of foundation (Part-I&II)
IS:8763 Guide for undisturbed sampling of sand
IS:8764 Method for determination of point load strength index of rocks
IS:9143 Method for determination of unconfined compressive strength of rock materials.
IS:9179 Method for preparation of rock specimen for laboratory testing
IS:9640 Specifications for split spoon sampler
IS:4453 Code of practice for exploration by pits, trenches, drifts and shafts
IS:4464 Code of practice for presentation of drilling information and core description in foundation investigation
IS:5249 Method of test for determination of in-situ dynamic properties of soil
IS:5313 Guide for core drilling observations
IS:6403 Code of practice for determination of allowable bearing pressure shallow foundation
IS:6935 Method of determination of water level in a bore hole
IS:11229 Specifications for shear box testing of soils
IS:12070 Code of practice for design and construction of shallow foundations on rocks
IS:2720 Part-IV Grain size Distribution
IS:2720 Part-V Atterberg Limits
IS:2720 Part Natural Moisture Content
IS:2720 Part-II Natural Dry Density
IS:2720 Part-XI Shear Parameters
IS:2720 Part-XV Consolidation Characteristics.
IS:4078 Code of practice for indexing & storage of drill cores.
IS:2131 Method for standard penetration test.
IS:1892 Code of practice for sub surface investigation for foundations
IS:6926 Diamond core drilling site investigation for river valley projects
IS:5313 Guide for core drilling observation.
IS:4464 Code of practice for presentation of drilling information and core description in foundation investigation.
IS: 5529 (Part-I & Part-II) Code of practice for in-situ permeability tests in overburdened rock respectively.
BIS: 6926 Diamond core drilling site investigation for river valley projects.
BIS: 2113 for Rock drilling.

All standards, specification and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.

Wherever Indian Standards are mentioned, in lieu of the same, relevant International Standards like ASTM may also be used.

Any other relevant codes & specifications as decided by Engineer-in-charge may also be used.

6. FIELD INVESTIGATIONS – IN SOIL

6.1 Mobilization

- i) The work shall include mobilization of all necessary equipment's, hydraulic drilling rig, straight drilling rods, separate drilling rods for SPT, pump capable to produce constant pressure etc. and arranging water for drilling and required manpower for the work etc.,
- ii) Providing required necessary engineering supervision and technical personnel, along with skilled and unskilled labours, required to carry out the entire field as well as laboratory investigation, analysis and interpretation of test data collected and preparation of a geotechnical report.
- iii) Contractor to mobilize 12 Nos of Calyx or Wash boring rigs and 04 Nos of rotary drilling machines.

7. BORING

7.1 General Requirements

- a) Boreholes shall be taken at specified locations to obtain information about the sub-soil profile, its nature and strength and to collect soil samples for strata identification and conducting laboratory tests. The minimum diameter of the bore shall be 150mm and boring shall be carried out in accordance with the provisions of IS: 1892 as per this specified here.
- b) All bore holes shall extend up to depths as detailed or as directed by the Engineer. If the strata with Standard Penetration Test (SPT) 'N' Value greater than 100 with characteristics of rock is met with, prior to the specified depth, the bore hole shall be advanced further by chiselling. Chiselling shall be continued for a maximum depth of 20cm or up to 2 hours whichever is earlier. During chiselling rock fragments shall be collected. Identification of rock strata shall be on the basis of visual examination of SPT sample and rock fragments. After it is established that rock is met with, borehole shall be advanced further by drilling in rock and core shall be collected. When the bore hole is terminated in soil strata, an additional Standard Penetration Test shall be carried out at the termination depth. Termination of all Bore holes should be by written permission of Engineer incharge only.
- c) Casing pipe shall be used in the borehole to support its sides when a side fall is suspected to occur inside the borehole. When casing pipe is used, it shall be ensured that its bottom end is at all times less than 150mm above the bottom of the borehole and not below the level at which the test has to be conducted or sampling has to be done. In case of cohesion less soils the advancement of the casing pipe shall be such that it does not disturb the soil to be tested or sampled. The casing shall be advanced by slowly turning the casing pipe and not by driving.

- d) In-situ tests shall be conducted or undisturbed samples (UDS) shall be collected in the bore holes at regular intervals and at change of strata or as decided by the Engineer Representative, disturbed samples shall be preserved for conducting various identification tests in the laboratory. Water table in the borehole shall be carefully recorded and reported. No water/ drilling mud shall be added while boring above ground water table. For cohesion less soil below water table, the water level in the bore hole shall at all times be maintained slightly above the water table.
- e) The bore hole shall be cleaned using suitable tools up to the depth of testing or sampling, ensuring that there is minimum disturbance of the soil at the bottom of the bore hole. The process of jetting through an open tube sampler shall not be permitted. In cohesive soils, the bore hole may be cleaned using a bailer with a flap valve. Gentle circulation of drilling fluid shall be done when rotary mud circulation boring is adopted.
- f) Before the desired exploration depth is reached or it is found that even after chiselling (in cases where hard strata is met with N value > 100) where conventional boring has become impossible any further, or on meeting the rock, further exploration shall be carried out drilling in such strata using hydraulic rotary drilling as per para 4.5 upto the required depth of exploration as directed by the engineer-in-charge.
- g) On completion of the bore hole, including the borehole in which special tests are conducted, contractor shall backfill all the bore holes upto complete satisfaction of client. If the contractor does not backfill the bore hole within desired period to avoid any mishap, an amount of Rs.50,000/- per bore hole subject to minimum of 5% of contract value will be deducted as penalty. The contractor shall also submit photo of each bore hole after its completion (back filling).
- h) Contractor shall be responsible for safety of road workers, pedestrian environment along the alignment.

7.2 Auger Boring

Auger boring can be adopted in soft to stiff cohesive soils above water table. Augers shall be of helical or post hole type, which may be manually or power operated. While boring care shall be taken to minimize the disturbance to the deposits below the bottom of the borehole. The cuttings brought up by the auger shall be carefully examined in the field and the description of all the strata shall be duly recorded in the field bore log as per IS: 1498. No water shall be used while auger boring.

7.2.1 Shell and Auger Boring:

Shell and Auger boring can be used in all types of soil free from boulders. For Cohesion less soil below ground water table, the water level in the bore hole shall always be maintained at or above the ground water level. The use of Chisel bit shall be permitted in hard strata with SPT-N value greater than 100. Chisel bits may also be used to extend

the borehole through local obstruction such as old construction, boulders, rocky formations etc. All other requirements in cause Auger Boring shall apply for this type boring also.

8. Percussion Drilling

This method can be adopted in soil with gravel and boulders when the boring has to be done with a faster rate. This method consists of breaking of the strata by repeated blows from a chisel or drilling bit and bailing out the debris at intervals by adding water into the borehole. This method is not suitable for careful and very reliable sampling operation because of the disturbance caused during boring. This method shall not be adopted unless otherwise specified or permitted by the engineer-in-charge.

9. Rotary Mud Circulation Drilling

This method can be used in all types of soil below water table. In this method boring can be done by rotating the bit fixed at the bottom of the drill rod. Proper care shall be taken to keep a firm contact between the bit and the bottom of the borehole. Bentonite or mud laden fluids shall be used as the drilling fluid to serve as their protective surface inside the borehole.

10. Rotary Mud circulation Boring:

This method can be used in all types of soil below water table. In this method boring shall be done by rotating the bit fixed at the bottom of the drill rod. Proper care shall be taken to keep firm contact between the bit and the bottom of the bore hole Bentonite mud shall be used as the drilling fluid to prevent caving in of the bore hole sides. Use of percussion tool shall be permitted in hard clays and dense sandy deposits.

11. STANDARD PENETRATION TEST

This test shall be conducted in all types of soil deposits met within a bore hole, to find the variation in the soil stratification by correlating with the number of blows required for unit penetration of standard penetrometer. This test shall be conducted at 3.0m interval starting from first sample at 1.5 m depth or at the change of strata as per IS : 2131. The starting depth of performing SPT shall be between 1.0 and 2.0m depth below ground level. This depth shall be staggered in alternate boreholes. The depth interval between the top levels of Standard Penetration Test and next undisturbed sampling shall not be less than 1.0m. The specifications for the equipments and other accessories, procedure for conducting the test, presentation of test results and collection of the disturbed soil samples shall conform to IS: 2131.

SPT shall be conducted by driving a standard split spoon sampler in the bore hold by means of a 63.5 kg hammer having a free fall of 0.75m. The sampler shall be driven using the hammer and for 450mm. While driving the number of blows for every 150mm penetration and the penetration for every 50 blows shall be recorded. The number of blows for the last 300mm drive shall be reported as N value. This test shall be discontinued when the blows count is equal to 100 at the penetration shall be recorded.

Refusal shall be considered to be met with when the blow count is equal to or greater than 100. At the location where the test is discontinued the penetration and the number of blows shall also be reported. On extracting the sampler, soil entrapped in the sampler shall be taken out and representative soil sample shall be preserved as disturbed sample in polythene bags to prevent loss of fines. Sufficient quantity of disturbed soil samples shall be collected from the split spoon sampler for identification, and laboratory testing. The sample shall be visually classified and recorded at the site and shall be properly preserved and labeled for future identification.

Bent rods and damaged/ defective nipples shall not be used for the test and shall be replaced immediately by proper ones. Centering spacers shall be used at every 6 meters or at smaller intervals in depths to reduce the effect of whipping of rods. Samples collected in process of conducting S.P.T. shall be preserved as disturbed sample. Graphs shall be drawn for each penetration test. Collection of undisturbed samples and conducting S.P.T. tests will be done alternatively.

12. SAMPLING

12.1 General

- a) Sufficient number of soil samples shall be collected for reliable estimation of soil properties. The samples collected shall be either disturbed or undisturbed. Disturbed soil samples shall be collected for field identification and conducting tests such as sieve analysis, index properties, specific gravity, chemical analysis, etc. Undisturbed samples shall be collected to estimate the strength and settlement properties of the soil.
- b) All the accessories required for sampling and the method of sampling shall conform to IS: 2132. All the disturbed and undisturbed samples collected in the field shall be classified at the site as per IS: 1498.
- c) All the samples shall be identified with date, borehole or trial pit number, depth of sampling, etc. it is also essential to mark an arrow pointing towards the top surface of the sample. Care shall be taken to keep the undisturbed soil samples and box samples vertically with the arrow directing upwards mimicking the sample on its natural state. The tube samples shall be properly trimmed at both ends and sealed with molten paraffin wax at both ends immediately after extracting the samples from the bore hole and suitably capped on both sides.
- d) When contractor fails to collect the undisturbed soil sample at specified depth the reason for the same shall be indicated in the bore log and the bore hole shall be advanced by 0.5m. Subsequently for cohesion less soil Standard Penetration Test shall be performed and for very soft cohesive soil field vane shear test shall be performed.
- e) Precaution shall be taken to ensure that there shall not be any change in moisture content and disturbance of the soil samples and they shall be placed in a temporary store at the end of the day's work. All the samples shall be kept

over a bed of sand, jute bags, saw dust, etc. and covered over on top with similar material. The bed and top cover shall be kept moist till they are properly packed in wooden boxes. Contractor shall be responsible for packing and transporting of all the samples from site to the laboratory after sampling with proper protection against loss and damage.

- f) All the samples shall be packed in wooden boxes using sand, saw dust etc. all around the samples before transportation to laboratory for testing.

12.2 Collection of Disturbed sample

- a) Disturbed soil samples shall be collected in bore holes at change of strata to provide complete description of soil profile and its variation. Jar samples weighing approximately 10N shall be collected in bore holes at 0.5m below ground level and at every identifiable change of strata to supplement the boring records. Samples shall be immediately stored in air tight or polythene bags and labeled with bore hole number and depth for onward transmission to the laboratory. These samples shall be sent to the laboratory immediately after the boring is complete. All S.P.T. samples shall also be similarly preserved.
- b) In elevated areas, if superficial material is available in plenty, then bulk samples from a depth of about 0.5m below ground level shall be collected to establish all the required properties to use it as fill material. Disturbed samples weighing about 250N shall be collected at shallow depths and immediately stored in polythene bags as per IS: 1892. The bags shall be sealed properly and they shall be kept, in wooden boxes.

12.3 Collection of Undisturbed Samples

In each bore hole undisturbed soil sample shall be collected as per relevant IS codes from Clayey/Sandy/ Silty strata at regular intervals of 3m or at every change of strata as directed by the Engineer. The starting depth of collection of UDS shall be between ground level and 1.0m below ground level and as decided by the Engineer. The starting depth shall be staggered in alternate boreholes. In cohesive soils collection of UDS shall be preferred in place of SPT. The depth interval between the top level of undisturbed sampling and standard penetration test shall be at least 0.5m. Undisturbed samples shall be 100mm dia thin walled steel samplers of about 0.5m length with built in tapered cutting edge at the driving end with penetration being restricted to 450mm length. Samples shall be collected in such a manner that the structure of the soil and its moisture content do not get altered. The specifications for the accessories required for sampling and the sampling procedure shall conform to IS: 1892 and IS: 2132. Undisturbed sampling in sand shall be done using compressed air technique mentioned in IS: 8763. Thin walled sampler shall be used to collect undisturbed samples by pushing the tube into the soil. The sampling tube shall have a smooth finish on both surfaces and minimum effective length of 450mm. The area ratio of sampling tubes shall be less than 12.5%. However, in case of very stiff soils, area ratio up to 20% shall be permitted.

12.4 Undisturbed sampling in cohesive soil

Undisturbed samples in soft to stiff cohesive soils shall be obtained using thin walled sampler. In order to reduce the wall friction, suitable precautions such as oiling the surfaces shall be taken. The bore hole shall be cleaned and the depth of sampling below the ground level shall be noted. The sampler shall then be attached to the bottom of the boring rods and lowered in to the borehole. The sampler shall be pushed in to the clay layer by hand or by jacking and soil sample of specified length shall be collected without disturbing the soil. The distance by which the sampler penetrates in to the soil strata shall be checked. Care being taken to ensure that the sampler is not driven too far as this will compress the soil. The sampler shall be rotated to break the core at the bottom of the sample and then steadily drawn up.

12.5 Undisturbed sampling using Piston sampler

Undisturbed samples in very loose saturated sandy and silty soils and very soft clays shall be obtained by using a piston sampler consisting of a sampling cylinder and piston system. In soft clays and silty clays, with water standing in the casing pipe, piston sampler shall be used to collect undisturbed samples. During this method of sampling expert supervision is called for.

The interior surface of the sampler shall be smooth, clean and corrosion resistant. Its cutting edge and the ring seals shall be inspected for wear and rejected if worn. Check shall be done to ensure that the moving parts of the sampler function freely before the sampler is lowered in to the bore hole. While pushing the system in to the soil and till the beginning of the sampling operations, the bottom of the piston shall be flush with the cutting edge of the sampler. At the depth of sampling, the piston should be fixed relative to the ground and the sampler cylinder shall be independently pressed down smoothly and continuously in to the ground. If an obstruction is met, the sampler shall be withdrawn and another sample taken after the obstruction is removed.

Accurate measurements of the depth of sampling, height of sampler, stroke and length of sample recovery shall be recorded. After the sampler is pushed to the required depth, both the sampler cylinder and piston system shall be drawn up together ensuring that there shall not be any disturbance to the sample which shall then be protected from changes in moisture content.

12.6 Undisturbed sampling in cohesion less soils

Undisturbed samples in cohesion less soil shall be obtained as per the procedure given in IS: 8763. Compressed air sampler shall be used to take samples of cohesion less soil below water table. Precautions shall be taken to clear the bore hole before sampling. Thin walled tube samples of 60mm internal diameter shall be used. The height and other dimensions of the sampler shall be recorded

before use. Proper care shall be taken to clear the bore hole before sampling. Thin walled tube samples of 60mm internal diameter shall be used. The height and other dimensions of the sampler shall be recorded before use. Proper care shall be taken to maintain the water level slightly above the ground water table before and during sampling operations. Immediately after the sample is obtained, the ends of the sample shall be waxed and capped to avoid moisture content changes.

13. Relaxation during Sampling

- a) The Sampler shall be pushed into the soil and driving of sampler shall be resorted to only when it cannot be pushed into the soil. This shall be done only with the permission of the Engineer and all the details about the same shall be recorded into the bore logs.
- b) In clays when N value is above 50, undisturbed samples may be replaced by standard penetration test.
- c) On completion of the borehole, the Contractor shall backfill the entire borehole by sand or as directed by the Engineer. Holes in superficial deposits shall be filled to within 1.0 m of ground level using the arising excavated material. The remaining 1.0 m shall be back – filled using a selected material from the rising in order that the ground is restored to its original condition.

14. GROUND WATER

The methods as per IS: 6935 shall be adopted for determining the ground water table in bore holes and as per the instructions of the Engineer.

In case any variation in the ground water level is observed in any specific boreholes, then the water level in these bore holes shall be recorded daily during the course of the field investigation. Levels in nearby wells, streams, etc. if any shall be noted whenever these readings are taken. Levels in nearby wells, streams etc if any shall also be noted whenever these readings are taken. If so called for, observation wells shall be drilled for the purpose of long term studies on the fluctuation in ground water levels and pressure. Either stand pipe or piezometer shall be installed at the specified depths in the selected previously drilled bore holes or specially drilled bore holes for this purpose as per the specification and instructions of the engineer-in-charge. Daily water level readings shall be recorded immediately following the installation upto the time of leaving the site. At the end of field work, these installations shall be handed over in satisfactory working condition to the engineer-in-charge without disturbing their position so that the owner can continue further observations.

Stand pipes and piezometers shall consist of 19mm internal diameter rigid unplasticised (UPVC) tubing. All the joints in the tubing shall be made of coupling sleeves. The top of UPVC tubing shall be enclosed in a 75mm diameter galvanised steel pipe of 1.5m

length having a galvanised steel screw cap with well greased threads and the caps shall be tightened such that it would be impossible to loosen by hand. The lower end of the pipe shall have four legs of 6mm thick and 100mm long and welded to have projection of 25mm. The pipe shall be sealed into the ground with cement grout so that it does not rotate. The top end of the pipe shall project about 300mm above ground level unless otherwise specified by the engineer-in-charge. The perforated tubing for the porous element shall be surrounded by a response zone of well graded sand from 500mm below to 150mm above the lower end of the stand pipe or piezometer and the bore hole above the response zone shall be back filled with natural soil or well graded sand.

15. Stand pipe

Stand pipes shall be installed to measure the water level in soils with high permeability such as sand and gravel. The stand pipe shall consist of a perforated tubing attached to the bottom of the UPVC tubing. The perforated tube shall be 150mm long having perforations of diameter not greater than 1mm.

16. Piezometers

Piezometers shall be installed to measure the pore pressures in soil with medium to low permeability. Piezometer shall consist of a porous filter attached to the bottom of the UPVC tubing. The filter shall be 300mm in length and shall be placed in the bore hole and sealed at top and bottom by grouting. Hydraulic piezometers with double line are to be used to remove the air trapped in the system.

17. Sub-Soil Water Samples

- a) Sub-soil water samples shall be collected for carrying out chemical analysis. Representative samples of ground water shall be addition of water to aid boring or drilling. Water samples shall not be collected when bentonite slurry or mud has been used for drilling operations. If water has been added for drilling purpose of if ground water has been diluted by surface rain water, then the bore hole shall be dewatered and water allowed to raise from which the sample may be taken.
- b) The sampling apparatus shall be such that the water at the desired depth can be collected directly without any disturbance and any change in the concentration of the constituents like dissolved gases, etc. Under agitation shall be avoided. An ordinary suction pump with its suction end inserted up to the required depth in the bore hole shall be used for this purpose.
- c) The sample shall be collected in a clean vessel and allowed to settle so that the supernatant liquid can be poured in to a clean well raised glass or polythene bottle. Sufficient quantity and number of samples shall be collected to carry out the chemical analysis and sent to a laboratory in airtight bottles with proper labelling. Chemical analysis of water samples shall include determination of pH

value, turbidity; sulphate, carbonate, nitrate and chloride, presence of organic matter and suspended solids.

- d) In some cases constituents may be mixed and analyzed later as specified in file specific test methods. Chemical preservatives may be added to the sample for cases as specified in the test methods/IS codes. This shall only be done if analysis cannot be conducted within an hour of collection and shall have the prior written permission and approval of the Engineer.

18. IN-SITU PERMEABILITY TEST

- i) In-situ permeability test shall be conducted to determine the water percolation capacity of overburden soil. This test shall be performed inside the bore hole at specified depths or in each layer or as per the directions of the Engineer. The type of test shall be either pump in or pump-out test depending on the subsoil and ground water conditions. Pump in test shall be conducted whether ground water in bore hold exist or not, pump-out test (optional) shall be conducted to obtain data for dewatering purposes when ground water is met in the bore hold. The specifications for the equipments required for the test and the procedure of testing shall be in accordance with ARE: 5529, Part-I. When it is required to carry out the permeability test for a particular section of the strata above the ground water table, bentonite slurry shall not be used while boring.

ii) **Pump-in-Test**

Pump-in-test shall be conducted in the bore hole by allowing water to percolate into tile soil. Choice of the method of testing shall depend on the soil permeability and prevailing ground water level. Only clear water shall be used for conducting the test before conducting the test, the bore hole shall be cleaned. Water shall be allowed to percolate through the test section for sufficient period of time to saturate the soil before starting the observation.

a) **Constant Head Method (in bore hole)**

This test shall be conducted in bore holes where soil has a high permeability; water shall be allowed in to the bore hold through a metering system ensuring gravity flow at constant head so as to maintain a steady water level in the bore hold. A reference mark shall be made a convenient level which can be easily seen the casing pipe to note down the fluctuations of water level. The fluctuations shall be counteracted by varying the quantity of water flowing in to the bore hole. The elevation of water shall be observed at every 5 minute interval. When three consecutive readings show constant value, the necessary observations such as flow rate, elevation of water surface above test depth, diameter of casing pipe, etc. shall be made and recorded as per the proforma recommended in IS: 5529, Part-I, Appendix-A.

b) Falling Head Method (in bore hole)

This method shall be adopted for soils of low permeability and when can stand without casing. The test section shall be sealed by the bottom of the bore hole and a packer at the top of the test section. If the test has to be conducted an intermediate section of a pre-bored hole then, double packers shall be used. Access to the test section through the packer shall be by means of a pipe which shall extend to above the ground level. Water shall be filled into the pipe up to the level marked just below the top of the pipe and water allowed to drain into the test section. The water level in the pipe shall be recorded at regular intervals as mentioned in IS: 5529, Part-I, Appendix-B. The test shall be repeated till Constant records of water level are achieved.

19. Percolation Test (In Trial Pit)

Percolation test shall be conducted in trial pit in areas where water/effluent is stored/discharged in ground level tanks. The loss of water due to percolation into the soil shall be estimated by the soil absorption capacity.

19.1 Pump-Out Test

This test shall be carried out at site to determine the co-efficient of permeability of soil below water table . This test shall be conducted by continuous pumping out of water from a well so as to maintain a steady water level at the desired depth in the well. The fluctuations in the water level shall be counteracted by varying the quantity of water pumped out of the well. The specification for the equipments & accessories required for performing the test, the procedure of testing, field observations and reporting of results shall conform to IS: 5529, Part-1. The well shall be of 400mm in diameter to be installed with a 250mm diameter perforated GI/MS pipe. Observation pipes of 50mm diameter shall be installed at regular intervals along three radial lines extending from the well at 120 degrees to each other. Length of these pipes shall depend upon the ground level, estimated depth of lowering the ground water and the distance from the well. Sufficient number of observation pipes shall be installed along each of the radial lines so as to assess the zones of influence due to dewatering. Draw down depth in the well shall be as specified in the drawing.

20. TRIAL PIT:

Trial pits shall be of 3m x 3m size so as to permit easy access for visual examination of walls of the pit and to facilitate sampling and in-situ testing operations.. Trial Pits are for identification of utilities before boring. If any utilities found, the bore hole shall be shifted nearby as directed by the Engineer-in-charge. Any damage to the utilities should be borne by contractor's against risk and cost.

Pits shall be excavated upto a maximum depth of 4m below ground level or as per the directions of the engineer-in-charge. Precautions shall be taken to ensure the stability of pit walls including provision of shoring if necessary as per IS: 4453. Precautions shall be taken to prevent surface water draining into the pit. Arrangements shall be made for dewatering if the pit is extended below water table. Trial pits shall be kept dry and a ladder shall be provided for easy access to the bottom of the pit. In-situ tests shall be conducted and undisturbed samples shall be collected immediately on reaching the specified depth so as to avoid substantial changes in moisture content of the subsoil. Arrangements shall be made for barriers, protective measures and lighting necessary for the period the pits remain open.

A note on the visual examination of soil strata shall be prepared. This should include the nature, colour, consistency and visual classification of the soil, thickness of soil strata, thickness of expansive soil & ground water table if any etc.

Un disturbed samples shall be collected at 1m, 2m, 3m depth and at the termination depth in all the pits.

21. Chunk Samples

In cohesive soils, undisturbed samples of regular shapes shall be collected. The samples shall be cut and trimmed to a size of 0.3m x 0.3m x 0.3m. A square area of 0.35m x 0.35m shall be marked at the centre of the levelled surface at the bottom of the pit. Without disturbing the soil inside the marked area, the soil around this marking shall be carefully removed upto a depth of 0.35m. The four vertical faces of the soil block protruding at the centre shall be trimmed slowly so that its size reduces to 0.3m x 0.3m. Wax paper cut to suitable size shall be wrapped uniformly and covered with two layers of thin cloth over all the five exposed surfaces of the soil block and sealed properly using molten wax. A firmly constructed wooden box of size 0.35m x 0.35m x 0.35m (internal dimensions) with the top and bottom open shall be placed around the soil block and held such that its top edge protrudes just above the surface of the block. The space between the soil block and the box shall be filled uniformly and tightly with moist saw dust. The top surface shall also be covered with saw dust before nailing the wooden lid to cover the box firmly taking care that the soil block is not disturbed. The area of contact between the bottom portion of the block and the ground shall be reduced slowly by removing soil in small quantities using small rods so that the block can be separated from the ground slowly without disturbance. After inverting the wooden box along with the soil block, the bottom portion shall be trimmed and covered with wax paper, cloth and to be sealed with molten wax. A wooden lid shall be nailed to the box after providing proper saw dust cushion below it. An arrow mark shall be made on the vertical face of the wooden box to indicate the top surface of the sample along with the location, date and depth of sampling.

a) Tube Samples

Undisturbed tube samples may also be obtained by means of 100mm diameter sampling tubes with a cutting edge. The sampler shall be slightly oiled or greased inside and

outside to reduce friction. The sampler shall be pushed into the soil and while doing so soil around the tube shall be carefully removed. In case it is not possible to push the sampler it may be driven by light blows from a "monkey".

In case it is not possible to collect undisturbed samples in the pit, in- situ density of soil shall be determined by sand replacement method. The specification, equipments, accessories etc required for the test and the procedure of testing shall be in accordance with IS: 2720, Part-XXVIII. No separate payment shall be made for this test.

After the completion of the test, sampling and visual examination, the pit shall be suitably backfilled as directed by the engineer-in-charge. Unless otherwise specified excavated soil shall be used for this purpose.

22. Vane Shear Test

Field vane shear test shall be performed inside the borehole to determine the shear strength of cohesive soils, especially of soft and sensitive clays which are highly susceptible to sampling disturbance. This test shall be conducted by advancing a four winged vane of suitable size (75mm or 100mm diameter as per the soil condition) into the soil upto desired depth and measuring the torque required to rotate the vane. The specification for equipment & accessories required, the test procedure and field observations etc shall be as per IS: 4434. This test may also be conducted by direct penetration from the ground surface. If the cuttings at the test depth in the bore hole show any presence of gravel, sand, shells, decomposed wood etc which are likely to influence the test results substantially, the test at that particular depth may be omitted with the permission of the engineer-in-charge. However the test shall be conducted at a depth where these obstructions cease to occur. On completion of the test the results shall be reported in an approved Proforma as specified in IS: 4434, Appendix-A.

23. Static Cone Penetration Test

Static cone penetration test shall be conducted to know the soil stratification and to estimate the various physical and engineering properties of soil. The cone penetrometer shall be advanced by pushing and the static force required for unit penetration shall be determined. The test shall be conducted using a 200kN capacity mechanically operated equipment upto the specified depth or refusal whichever is earlier. For this test, 'refusal' means meeting a very hard strata which cannot be penetrated at the rate of at least 0.3cm/sec even when the equipment is loaded to its full capacity. The specification for the equipment and accessories required for performing the test, test procedure, field observation and reporting of results shall conform to IS : 4968, Part-III. At the ground level, preboring upto 0.5m depth shall be permitted if the overlying stratum is very hard. No extra payment shall be made on account of this preboring. Continuous record of the penetration resistance shall be maintained.

24. Dynamic Cone Penetration Test

Dynamic cone penetration test shall be conducted using Bentonite slurry by driving a standard size cone attached to the bottom of a string of drill rods. The test shall be conducted upto the specified depth or refusal whichever is earlier. Refusal shall be

considered when the blow count exceeds 150 for 300mm penetration. The specification for the equipment and accessories required for performing the test, test procedure, field observations and reporting of results shall conform to IS:4968, Part-II. The driving system shall comprise of a 650N weight having a free fall of 0.75m. The cone shall be of 65mm diameter provided with vents for continuous flow of bentonite slurry through the cone and rods in order to avoid friction between the rods and soil. On completion of the test, the results shall be presented as a continuous record of number of blows sqm or as directed by the engineer-in-charge. Under each loading stage, record of 'time vs settlement' shall be kept as specified in IS:1888.

In case of cohesive soils, each load increment shall be maintained until the settlement is less than 0.02mm/minute or 6 hours whichever is later. Dial gauge readings for settlement shall generally be taken at 1, 2.25, 4, 6.25, 9, 16, 25, 60, 90 and 120 minutes from the start of each stage of loading. Thereafter the readings shall be taken at hourly interval upto a further 4 hours and at two hours interval thereafter for another 6 hours.

Other than cohesive soils, each stage loading shall be maintained for a minimum duration of one hour or till the settlement rate reduces to 0.02mm/minute whichever is later. No extrapolation of settlement rate from periods less than one hour shall be permitted. The final loading shall be maintained for 24 hours. During unloading, reading of dial gauge shall be recorded for each stage of unloading.

Loading shall be carried out in stages as specified above till one of the following conditions occur.

- i. Failure of soil under the plate i.e. the settlement of the plate at constant load becomes progressive and reaches a value of 40 mm or more.
- ii. Load intensity of 800 kN/sqm is reached without failure of the soil.
- iii. Backfilling of the pit shall be carried out as per the directions of the engineer-in-charge. Unless otherwise specified the excavated soil shall be used for this purpose.

25. Cyclic Plate Load Test

This test shall be carried out to determine the dynamic soil properties required for the analysis of foundation subjected to dynamic loads. This test shall be conducted on similar lines as the ordinary plate load test with an addition that unloading shall also be done before each stage of loading.

After each stage of loading, the load shall be removed in a minimum of two stages and as directed by the engineer-in-charge. After each stage of reduction of load, dial gauge readings and settlements shall be taken for atleast one hour until the readings stabilize. Thereafter the next loading stage shall commence. Recording and analysis of test data shall be as per IS: 5249.

26. Field California Bearing Ratio Test

This test shall be carried out to obtain the properties of soil required for the design of roads. The equipments and accessories required for carrying out the test, test procedure, recording of observations and presentation of results shall conform to IS: 2720 part XXXI. The test locations and depth shall be as specified in the drawings or as directed by the engineer-in-charge.

27. Electrical Resistivity Test

This test shall be conducted to determine the electrical resistivity of soil required for designing safety grounding system for the entire power plant area. The specification for the equipments and other accessories required for performing the test, test procedure and reporting of field observations shall conform to IS:3043. The test shall be conducted using Wenner's four electrode method as specified in IS:1892, Appendix-B2. Unless otherwise specified, at each test location the test shall be conducted along two perpendicular lines parallel to the co-ordinate axes. On each line a minimum of 8 to 10 readings shall be taken by changing the spacing of the electrodes from an initial small value of 0.5m upto a distance of 10m.

28. Seismic Refraction Test

This test shall be carried out to establish the rock and soil profiles of varying density. The dynamic shear modulus of the soil shall also be obtained from the results of this test. The specification for the equipments and other accessories, procedure for carrying out the test, recording and analysis of results and their presentation shall conform to IS: 1892.

This test shall be carried out by inducing shock waves into the soil by striking a plate placed on the ground surface with a hammer. The shock waves shall be picked up through geophones placed on the ground surface at regular intervals in line with the plate along a straight line. The time elapsed before the waves reach the geophones shall be recorded to an accuracy of one millisecond or better.

The distance between the shock point and the geophones shall be increased to cover a wider area. Alternatively, multiple geophones shall be used simultaneously using multiple channel seismograph to record the arrival time and intensity of waves reaching the geophones. The spacing of geophones shall be 5m. As the distance between geophones and the shock producing point are increased, the time lapse for the waves passing through different underlying strata and reaching the geophone shall be recorded. The wave forms shall be recorded for each test using multiple channel seismograph.

The test shall be conducted along traverses in two orthogonal directions as specified in the drawing or as directed by the engineer- in-charge. During testing, proper care shall be taken to avoid disturbance caused due to the movement of vehicles or other working operations around the test location. The type of wave (compression or shear) shall be analysed properly using the data recorded during the test.

29. Cross Hole Shear Test

This test shall be generally carried out in accordance with IS: 13372 to establish the dynamic elastic properties of soil and rock. In this test, the seismic waves are to be picked up in two adjacent receiver boreholes. The spacing of boreholes shall be determined so as to obtain good results. The boreholes shall be uncased in the portion carrying the geophones. However it should be kept filled with water or drilling mud in order to ensure perfect contact between the borehole wall and the geophone. In case of cased hole preferably a low velocity material such as a high impact PVC should be used for casing and it is essential that it should be well grouted behind in order to make an intimate contact with the soil. The charge shall be installed within the depth as specified and the waves shall be picked up from the geophones installed at required depths in receiver boreholes. Knowing the travel time from shot hole to receiver hole and corresponding distance, the velocity of the waves is determined which enables to estimate dynamic elastic modulus, shear modulus and Poisson's ratio. In each receiver borehole multiple geophones shall be provided at 2m interval (with starting depth as 3m below ground level) to cover the depth and various strata as specified. Intensity of the waves shall be recorded by multiple channel seismograph.

30. Pressure meter Test

This test shall be conducted in bore holes at desired depth to obtain the in-situ stress-strain characteristics and strength parameters of soil/rock layer by measuring the deformation of the probe at different pressures of the volume meter. The location and depth of the test shall be as given in the drawing or as per the directions of the engineer-in-charge.

All precautions shall be taken to ensure a smooth bore hole of required diameter with minimum disturbance to the surrounding soil. In soft, loose and sensitive soils, the bore hole shall be predrilled deeper than the testing depth for enough so that the cuttings settling at the bottom of the bore hole shall not interfere with the test.

The equipment shall be calibrated for pressure losses (membrane correction/air calibration) and volume or radius changes (line calibration/thick wall rigid steel cylinder test) before starting of test and at regular intervals as per the manufacturer's specification.

Maximum value of pressure correction shall not be more than 50% of limit pressure. The total volume losses in the system shall not exceed 0.5% of the static probe volume per 100kPa. Volume correction may be neglected in soil if it is less than 0.1% of probe volume per 100 kPa.

The test shall be performed by expanding a cylindrical probe to obtain a pressure vs volume or pressure vs radius curve as specified in IS:1892. The probe may be of Ax, Bx or Nx size. However the size of the borehole shall be compatible to the size of pressure meter probe. Hose pipe connecting the probe with the surface unit shall be of flexible tubing of single or coaxial type. The equipment should be able to reach a maximum pressure of 5000kPa for testing in soil and 8000kPa for testing in rock. The accuracy of measuring device shall be such that a change of 0.2% of static probe volume or 0.1% of probe radius is measurable as specified in IS:1892.

The probe shall be lowered down to the required depth as soon as the boring is completed so as to limit the expansion of soil due to release of stresses. The probe shall be held by a clamping device ensuring that it is not located at the interface of two different soil/rock layers.

The pressure shall be increased in atleast 20 equal stages as directed by the engineer-in-charge. At each stage the pressure shall be maintained for a period of atleast 60 seconds and volume reading shall be taken for 7 to 14 minutes. The volume of water sent into the probe during this period shall be measured upto an accuracy of 0.01cum. In case the water level in the volume meter drops rapidly, it is necessary to close the volume meter valve quickly so that the reservoir does not empty and allow air or gas into the tubing.

The test shall be carried out in stages till one of the following conditions occur.

- a. The volume of the probe is doubled
- b. Ultimate failure of soil/rock occurs
- c. Load intensity of 5000kPa for soil and 8000kPa for rock is reached without failure.

If the shape of uncorrected pressure vs volume curve drastically varies from the ideal test curve, the test shall be repeated at no extra cost to the owner at a different depth as decided by the engineer-in-charge.

31. FIELD INVESTIGATION – ROCK

31.1 ROCK DRILLING

i) General Requirements

Conventional Diamond core drilling equipment may be used for drilling vertical holes as directed by In-Charge (actual depth to be ascertained based on foundation size, formation level and ground conditions). The size of core in the upper portion of rock shall be HX/HQ, if required, which should be continued to as much depth as possible. But it may be required to be reduced to NX/NQ after certain depth. Unlike some types of drilling, the aim of core drilling is not to make a hole, but to retrieve a core sample a long solid cylinder of rock that geologists can analyze to determine the composition of rock under the ground.

Rock drilling shall be carried out as per BIS-6926/or ASTM D2113. Quality drilling is important in maintaining a reasonable straight vertical hole and nearly circular cross section. The rotary drilling machine shall also be capable of drilling angular holes where required by the prevailing geological site conditions. For meaningful interpretation of the orientation of the geological features, suitable core orientation procedures shall be employed during investigation. Only hydraulically operated drilling rigs shall be used with good quality compatible drill rods. Sufficient number of spare parts shall be readily available at the site for maintenance of drilling rig, drilling rods, pump sets etc. The core barrel employed for rock drilling shall be HX/HQ or NX/NQ size double tube,

longitudinally split inner tube for good rock and triple tube, longitudinally split inner tube for poor rock with diamond core bit.

ASTM D 5434 shall be broadly used for the preparation of field logs providing the following minimum information:

- a) Project Identification, borehole number, location, start and end dates of boring completed, drill rate and elevation of the location.
- b) Rock type with description of colour, texture/structure, rock strength, change in rock stratum, ground water level.
- c) Core Recovery, RQD, discontinuities spacing, joint condition, orientation, dip of strata, cavities, fissures, the occurrence of seams, gouge material.

Orientation of Joints in recovered cores from inclined holes shall be reported w.r.to core axis. Rock Quality Designation (RQD) measurement shall be done as per BIS 11315 part XI and/or ASTM D6032. Core recovered from the borehole shall be appropriately marked, photographed and carefully preserved in core boxes and transportation of the same shall be as per ASTM D 5079.

A core drill string is a series of connected long hollow tubes (called rods or pipes), with a barrel at the end connected to a special cutting bit at the bottom of the hole. As the drill moves further into the earth, the driller adds rods on to the end, lengthening the drill string.

Different bits are used depending on the type of rock to be drilled. There are two characteristics of bits the pieces of cutting material and the surrounding material, called the matrix. Bits are self-sharpening; as a bit is used, the matrix gradually wears away to expose more of the cutting material.

For hard rock, diamonds are used in a soft matrix, so that plenty of cutting material is exposed. For softer rock, a less expensive cutting material (e.g. tungsten carbide chips) can be used, with a harder matrix so that the bit lasts longer. The driller determines the type of bit to be used depending on the drilling conditions.

As the driller rotates the drill string, downward pressure and abrasion from the bit cuts into the rock, pushing core into the core barrel. This process creates a lot of friction and heat, so a flushing medium is used to cool the bit, lubricate the core, remove the loose bits of rock (called the cuttings), and help stabilize the hole. Water, soluble oil or drilling mud can be used.

Drilling in rock shall be done at specified locations or as per the directions of the Engineer-in-charge. Before commencing drilling, it shall be proved that characteristics of rock have been met with. The starting depth of drilling in rock shall be certified by the Engineer. The portion drilled in rock shall be backfilled with cement and sand (1:3) grout. The drilling information shall be recorded in proper proforma.

ii) Equipment

For conventional drilling, VOL 35/VOL 90 or equivalent hydraulic rigs suitable for appropriate depth may be used up to a depth of 200m.

- a) Core drilling shall be done by rotary motion using diamond bit. The feed or thrust to the drilling bit shall be actuated by hydraulic type. The equipment or set up shall be capable of recovering 75% of the drilled volume. The rotary core drilling equipment and procedure for drilling shall conform to IS:6926. The equipment shall be provided with necessary facilities to regulate the spindle speed bit pressure and water pressure during core drilling to get good core recovery.
- b) Drilling shall be carried out with HX/HQ or NX/NQ size diamond tipped drill bits or impregnated diamond bit depending on the type of rock encountered. Double tube swivel core barrel or Type B conforming to IS: 6926 shall be used to ensure good core recovery and to pick up cores from all layers of rock. Suitable core catches shall be used to ensure continuous and good core recovery. For ensuring maximum core recover in weak rocky formation, triple tube core barrel including split type core barrel shall be used.

iii) Procedure

- a) The drilling fluid shall be clean water. Circulation of the drilling fluid shall be started before the core barrel reaches the bottom of the hole to prevent cuttings or sludge from entering the core barrel at the start of coring. Drilling fluid shall be circulated continuously down the hollow rods and the sludge conveying the rock cuttings to the surface shall be collected. Bentonite as drilling fluid will be used only when warranted with the specific approval of the Engineer in charge.
- b) When drilling through soft/weathered/fractured rock water circulation must be reduced so as to avoid shattering/breaking the core.
- c) The rotational speed of the bit (spindle speed) the amount of downward pressure applied on the bit (bit pressure) and water pressure shall be suitably adjusted and properly monitored so that the core is collected with least disturbance and avoid shearing of the core from its base Bit-speed, bit pressure, water pressure for the type of bit for various rocks type shall be as given in Appendix A of IS: 6926.
- d) In general, the drilling run shall be of 1.5m length, however this can be increased to 3.0m provided the core recovery is observed more than 80% in two successive 1.5m drill runs and on approval from Engineer. In exceptional cases where core recovery is poor, drill run shall be of 0.75m in length. If the core recovery is less than 20% then SPT shall be performed before commencing the next drill run.

- e) If at any time a blocking of the bit or grinding of the core is indicated, the core barrel shall be immediately withdrawn from the borehole regardless of the length of drill run completed.

iv) Observations

- a) As drilling is an important process, it is of utmost importance that complete observation should be made during a drilling operation. Accurate record of progress of drilling shall be kept by the drilling in-charge.
- b) The colour of return water at regular intervals, the depth of which any change of colour of return water is observed; the depth of occurrence and amount of flow of hot water, if encountered, shall be recorded.
- c) The depths through which a uniform rate of penetration was maintained, the depth at which marked change in rate of penetration or sudden fall of drill rod occurs, the depth of which any blockage of drill bit causing core loss, if any shall be recorded.
- d) Any heavy vibration or torque noticed during drilling should be recorded together with the depth of occurrence.
- e) Special conditions like the depth at which grouting was done during drilling, presence of artesian conditions, loss of drilling fluid observation of gas discharge with return water etc., shall also be observed and recorded.
- f) During drilling operation, observation on return water rate of penetration etc. shall be recorded in the proforma as given in IS: 5313, Appendix-A.
- g) The sludge obtained during each run shall be collected separately, dried and packed in polythene bags with proper numbering.
- h) Causes of poor core recovery shall be carefully examined and correlated with speed of drilling, excessively mud laden return drill water, shear zones, clay seams etc.
- i) Data from the driller's daily records and geologist's field log shall be edited interactively for preparation log.
- j) Results of in-situ permeability tests etc. shall be furnished in log sheet for each individual hole in specified standard format of Bureau of Indian Standards.
- k) Other special conditions, which may be peculiar to individual cases during drilling operation, shall be recorded.

32. Core Samples

- a) The field logging of rock core samples obtained from the borehole will be done by competent professional engineering geologist.
- b) Core samples shall be extracted by the application of a continuous pressure at one end of the core with the barrel held horizontally without vibration. Friable cores shall be extracted from the barrel directly into a suitable sized half round plastic channel section. Care shall be taken to maintain the direction of extrusion of sample same as that while coring to avoid stress reversal.
- c) Immediately after withdrawal from the core barrel the Cores shall be placed in a tray and transferred into boxes specifically prepared for the purpose. The boxes shall be made from seasoned timber or any other durable material and shall be indexed on top of the lid as per IS: 4078. The cores shall be numbered serially and arranged in the boxes in a sequential order. The description of the core samples shall be recorded as per IS: 4464. Where no core is recovered. It shall be recorded as specified in the continuous record of core recovery and RQD to be mentioned in the bore log as per IS: 11315 Part-II.

The basic information for the standard basis geo-technical description of rocks shall cover (a) degree of weathering (b) discontinuity spacing (c) Strength (d) grain size (f) Texture (g) Structural condition, the mineralogy of the grains and cementing material (h) Rock name and supplementary adjectives, if any, special features like major joint planes fractures/laminations, faults, etc. shall also be indicated.

33. PERMEABILITY TEST

- a) **Lugeon Test:** The test setup of Lugeon Test is similar to Injection Fall off test, except that there is no fall off phase. The test section shall be isolated with set of packer and pressurized by a series of rising pressure steps followed by a series of symmetrical decreasing pressure steps. During each pressure step, the pressure must be kept as constant as possible. The duration of each step of stabilized pressure shall be 10 min. The injected volume of water must be recorded precisely every minute for each stabilized pressure.

In-situ permeability/Lugeon test will be conducted in the boreholes at desired interval of 3m in each borehole. The examination of cores from holes gives only a general idea of the physical condition of the rocks constituting the foundation media. Water percolation tests/lugeon tests if performed in the boreholes are of significance in interpreting the drilling data and in supplementing the information with regard to permeability characteristics. Determination of permeability or rock mass is of greatest significance in assessing the problem of seepage. It is therefore considered necessary to perform the Lugeon/permeability tests. These tests shall be performed in bedrock as outlined in IS: 5529 Part-II for rock (1983). The Lugeon test comprises the measurement of the volume of water that can escape from an uncased section of boreholes in a given time under a pressure. The flow is confined between two packers in the double packer test or

between one packer and bottom of the borehole in a single packer test. For computing Equivalent Permeability in Lugeons, the water percolation test in each test section of 3m will be carried out at five test pressures, three in increasing order and two in decreasing order. These tests can be used to assess the amount of grout that rock will accept and to obtain a measure of the amount of fracturing of rock and to decide on the seepage control measures.

Permeability test shall be conducted in bed rock inside the drilled hole by pumping in water under pressure to determine the percolation capacity of the rock strata. This test shall be conducted in encased and ungrouted sections of the drill hole and the use of bentonite slurry drilling is strictly prohibited. Clear and clean water shall be used for the purpose of both drilling and testing. The equipments required and the procedure to be followed for conducting the test shall be either 1.5m or 3.0m as per field conditions and the directions of the Engineer. The levels of water table, if any, in the drill hole shall be recorded and the drill hole shall be cleaned before starting the test. Depending upon the depth of the test section, single packer or double packer method shall be adopted. Care shall be taken to see that all joints and connections are water tight during the test.

- b. **Single Packer method:** This method shall be adopted when the bottom elevation of the test section is the same as the bottom of the drill hole and where it is considered necessary to know the permeability value during drilling itself. This test shall be useful where the full length of the hold cannot stand encased or up ground. The packer shall be fixed at the top level of test section such that only the test section lies below the packer. Water shall then be pumped through a pipe into the test section under a required pressure and maintaining it till a constant quantity of water intake is observed. The amount of water percolating through the hole shall be recorded at every 5 minutes intervals. The test shall be repeated by increasing the pressure at regular intervals upto a pressure limit as specified in IS:5529, Part-II. The details and observations during the test shall be suitably recorded in a proforma recommended in IS: 5529, Part-II Appendix B.
- c. **Double Packer method:** This method shall be used when the permeability of an isolated section inside a drill hole is to be determined. Packers shall be fixed both at the top and bottom of the test section such that their spacing is exactly equal to the length of the test section. The test shall then be conducted as specified in IS.

34. LABORATORY INVESTIGATION

34.1 Essential Requirements

All laboratory tests shall be conducted in an approved laboratory using approved apparatus complying with the requirements and specifications of Indian standards or other approved standards for this class of work. It shall be checked that the apparatus are in good working condition before starting the laboratory tests. Calibration of all the instruments and their accessories shall be done carefully and precisely.

Depending on the type of sub strata encountered, appropriate laboratory tests shall be conducted on soil and rock samples collected in the field. Laboratory tests shall be scheduled and performed by a qualified and experienced personnel who are thoroughly

conversant with the work and as directed by the Engineer incharge. Tests indicated in the schedule of items shall be performed on soil, rock and water samples as per relevant IS codes. One copy of all the laboratory test data records shall be submitted to the owner progressively every week. Laboratory tests shall be carried out concurrently with field investigation since initial laboratory test results could be useful in planning the later part of field work. A schedule of laboratory tests shall be established by the contractor and the same shall be submitted and got approved by the engineer-in-charge before starting of laboratory tests.

All samples whether undisturbed or disturbed shall be extracted, prepared and examined by a competent personnel properly trained and experienced in soil sampling, examination, testing and in using the apparatus as per the specified standards.

Undisturbed soil samples retained in liners or seamless tube samplers shall be taken out without causing any disturbance to the samples using suitably designed sample extruder preferably hydraulic just prior to actual testing. If the extruder is horizontal, proper support shall be provided to prevent the sample from breaking. For screw type extruders the pushing head shall be free from the screw shaft so that no torque is applied to the soil sample in contact with the pushing head. For soft clay samples, the sample tube shall be cut by means of a high speed hacksaw to specified test length and placed over the mould before pushing the sample into it with a suitable piston.

While extracting a sample from a liner or tube care shall be taken to see that its direction of movement is the same as that during sampling to avoid stress reversal.

On all undisturbed soil samples tested for bulk density, water content, grain size distribution, liquid limit and plastic limit tests shall also be performed.

On all rock samples tested for unconfined compression test, bulk density and water content tests shall also be performed.

After completion of all tests, a summary of test results for each soil and rock sample shall be presented in a proforma as enclosed in Annexure-A & B respectively. Chemical test results on soil and water samples shall be furnished in a tabular form separately.

35. Laboratory Tests:

The laboratory tests shall be carried out progressively during the field work after sufficient numbers of samples have reached the laboratory in order that the test results of the initial bore holes can be made use of in planning the later stages of the field investigation and quantum of Laboratory tests.

All samples brought from field, whether disturbed or undisturbed shall be extracted prepared and examined by competent technical Personnel and the test shall be carried out as per the procedures laid out in the relevant I.S. Codes.

Following laboratory tests have to be carried out:

35.1 Soil Samples:

- i. Natural Moisture content & NDD.
- ii. Atterberg Limits.
- iii. Specific Gravity.
- iv. Particle size distribution including Hydrometer analysis.
- v. Triaxial Shear test.
- vi. Consolidation tests.
- vii. Direct Shear Test.

35.2 Rock Samples:

- i. Water Absorption
- ii. Porosity
- iii. Specific Gravity
- iv. Uniaxial Compressive Strength
- v. Point Load Index
- vi. Abrasion
- vii. Hardness

35.3 Chemical Test: Chemical Analysis of soil and water samples for determination of Ph value, Chloride, Sulphate, Nitrate and Organic matter.

35.4 Water samples from a few bore holes shall be taken and chemical analysis shall be done for sulphate, chloride content and pH value, particularly to determine the aggressiveness to concrete, steel and GI pipes. Care shall be taken to ensure that they are not diluted with rain or surface water during recovery from the boreholes. Similarly, a few soil samples shall be chemically tested to determine the sulphate contents and other aggressive components

36. Cohesive Soil:-

Particle size analysis shall be done on all clayey and sandy samples. Both sieve and hydrometric analysis shall be conducted and gradation curves shall be plotted to show the particle size distribution.

37. Grain size Distribution:

Grain size distribution to be done to classify soil as gravel, sand, silt and clay as per IS2720 part IV-1985. This test shall be performed on both and disturbed as well as undisturbed soil samples. The percentage by weight of soil passing through each sieve shall be calculate and soil to be classified as per IS1498-1970.The soils are classified according to their size in mm.

38. Hydrometer analysis:

The smallest sieve commonly used in grain size analysis has an opening of 0.075mm. Since the soil samples obtained containing particles finer than 75 μ , grain size analysis of materials finer than 75 μ (i.e. a combination of silt and clay) has to be made by Hydrometer analysis or wet mechanical Analysis.

39. Atterberg Limits:

In order to classify the soil, Liquid and plastic limit tests shall be conducted on all cohesive soils for classification purposes per IS 2720 (Part V) 1985 and for predicting engineering properties. The limits, called consistency limits of Atterberg limits are to be determined by this test and accordingly the clay, silt and also the organic soil are to be classified as low, intermediate or highly plastic by plotting the results from Casagrande plastics chart. Shrinkage limit shall also be determined for a few soil samples.

40. Shear Tests

Shear tests shall be conducted on the undisturbed samples. A few unconfined Compression tests shall be conducted on clayey samples but the majority of Clayey samples in undrained condition shall be subjected to triaxial tests. The Cohesion values and angle of internal friction are to be determined either by Mohr's circle or by any other method. Particular attention shall be paid for conducting triaxial tests, each of which shall be done on a minimum of 3 specimens. Specimens shall be prepared by trimming and not by pushing small tube in a large tube.

41. Triaxial compression test:

The drainage condition of a sample is generally the deciding factor in choosing particular type of Triaxial test in laboratory. The purpose of carrying out a particular test is to simulate field condition as far possible. Any of the three types of triaxial compression tests are to be conducted in a laboratory depending upon drainage condition viz. a) Unconsolidated undrained Test, b) Consolidated Undrained or quick Test, c) Consolidated Drained or slow Test. The samples are to be tested for determination of "C" and " ϕ " values by Mohr's circles.

42. Box Shear test:

In order to determine the shear properties of soil samples, Box shear tests need to be conducted as per IS: 2720 (Part XIII-1986). The samples are to be tested for determination of "C" and " ϕ " values by Mohr's circles.

43. Consolidation Tests

A few consolidation tests shall be carried out on undisturbed samples of clayey soil, to estimate the settlement of foundation from "e-log p" curves, compression index - C_c and coefficient of consolidation – C_u. Consolidation test shall be done in manner that will not allow

the sample to swell. In Order to determine the compressibility characteristics of the soil samples, one dimensional consolidation test has to be conducted as per IS 2720 (Part XV)-1986. From the test data, void ratio vs pressure curve has to be plotted on a semilog graph paper. This curve has to be used in the computation of compression index C_c and settlement.

44. Cohesion less Soil

All the above laboratory tests are to be conducted on cohesionless soil except the Hydrometer Analysis, Atterberg Limit and Consolidation tests.

45. Swelling Test

For soils of expansive nature, swelling tests on a few samples shall be selected for conducting swelling test to determine swelling pressure and magnitude.

46. LABORATORY INVESTIGATION-ROCK

46.1 Specific Gravity, Void Ratio, Water Content:

The tests on rock are to be conducted and values are to be reported as per codal provision.

46.2 Uniaxial Compressive Test, Point Load Test:

While conducting strength tests on rocks, presence of any fault, fissure etc. is to be noted and reported. The tests are to be conducted according to the standard code.

47. Salient Test Requirements

Remoulded soil specimen whenever desired shall be fully reworked at field density and natural moisture content. For conducting CBR test and triaxial test for dyke/road material the sample shall be remoulded to 95% of standard proctor density.

Triaxial shear test shall be conducted on undisturbed soil samples saturated by the application of backpressure. Only if the water table is at sufficient depth such that chances of its rising to the base of the footing are meagre or nil, the triaxial tests shall be performed on the specimens at natural moisture content. Each test shall be carried out on a set of three test specimens from one sample at cell pressures equal to 100, 200 and 300 kN/sqm or as required depending on the soil conditions.

Effective stress triaxial shear test shall be consolidated undrained with pore water pressure measurement. The test shall be conducted at cell pressures of 100, 200 and 300 kN/sqm ensuring complete consolidation at each stage.

Direct shear test shall be conducted on undisturbed soil samples. The three normal vertical stresses for each test shall be 100, 200 and 300 kN/sqm or as required depending on the soil conditions.

Consolidation test shall have loading stages of 10, 25, 50, 75, 100, 200, 400 and 800 kN/sqm. Rebound curve shall be recorded for all the samples by unloading the specimen at the in-situ stress of the specimen. Additional rebound curves shall also be recorded whenever desired by the engineer-in-charge.

Chemical analysis of sub-soil shall include determination of pH value, carbonate, sulphate (both S03 and S04), chloride and nitrate contents, organic matter, salinity and any other chemicals harmful to the foundation material. The contents in soil shall be indicated as percentage.

Chemical analysis of sub-soil water sample shall include the determination of the properties such as colour, odour, turbidity, pH value and chemical contents such as carbonate, sulphate (both S03 and S04), chloride, nitrate, organic matter and any other chemicals harmful to the foundation material. The contents such as sulphate etc shall be indicated as ppm by weight.

The laboratory CBR test shall be performed on undisturbed or on remoulded sample as per the drawing or as directed by the engineer-in-charge in soaked and unsoaked conditions.

48. QUALITY OBJECTIVE AND PRESENTATION OF DATA

48.1 The objective of the drilling investigation is to obtain maximum core recovery at all times and this shall be the aim of the contractor. This section relates to the recovery of cores obtained during drilling in materials required to be cored. Unless instructed by the engineer, continuous core recovery or sampling shall at all times be striven for. In the event of unsatisfactory core recovery being prevalent the following shall apply:

- i) Should poor core recovery result from poor equipment and/or drilling technique and/or inexperienced drill operators the contractor shall ensure that improved equipment is brought to the site, a different drilling technique is employed, a more experienced driller is employed or a combination of these remedies is used. No extra payment shall be made on this account, nor shall unsatisfactory work be paid for.
- ii) Where loose, friable or other problematic material which is unable to be satisfactorily retained in the core barrel is encountered, the contractor shall determine what should be done to improve core recovery, such as the use of triple tube barrels etc.
- iii) The contractor may reduce the length of successive drill runs until satisfactory core recovery is obtained.
- iv) In case of any dispute, the decision of the Engineer In charge of CMRL with regard to the above shall be final.
- v) When core is extracted from the core barrel, this shall be carried out as follows in such a way to minimize disturbance of the core:

- a. With minimal hammering on the barrel.
 - b. Over a tarpaulin to ensure that no core/fragments is lost.
 - c. To ensure that the sequence of the core is maintained.
 - d. No breakage of core either intentional or due to wrong methodology of drilling shall be allowed.
- 48.2** Core samples shall be extracted by the application of continuous pressure at one end of the core with the barrel held horizontally without vibration. Friable cores shall be extracted from the barrel directly into a suitably sized half round plastic channel section. Care shall be taken in maintaining the direction of extrusion of sample as the same as that while coring to avoid stress reversal.
- 48.3** Immediately after withdrawal from the core barrel, the cores shall be placed in a tray and transferred into boxes specially prepared for the purpose. The boxes shall be made by the contractor from seasoned timber or any other durable material and shall be indexed on top of the lid as per IS : 4078. CMRL will not make any extra payment for the supply of core boxes. The cores shall be numbered serially and arranged in the boxes in a sequential order. The description of the core samples shall be recorded as per IS: 4464. These core boxes shall be kept properly at a suitable place arranged by the contractor as near to the work site as possible so that these are readily available during inspection of site by the officials of CMRL.
- 48.4** The basic information for the description of rocks shall cover:
- i) Identification of type of rock encountered - Igneous, Metamorphic or Sedimentary with rock nomenclature; Hard, Medium Soft or Decomposed; Geological structure – viz massive, slightly faulted or folded, moderately faulted or folded, intensely faulted or folded
 - ii) CR and RQD percentage
 - iii) Strike and Dip orientations of bedding/foliation/joint planes and their relative orientation with respect to hill slope, bridge axis etc.
 - iv) Spacing of discontinuities such as very wide, wide, moderate close or very close.
 - v) Condition of discontinuities such as persistence (continuity); separation (aperture); Roughness (state also if surfaces are stepped undulating or planar); filling (Gouge) – viz type, thickness, seepage; condition of wall rock of discontinuities such as un-weathered, slightly weathered, highly weathered, completely weathered or residual soil;
 - vi) Ground water condition
 - vii) General remarks and additional data such as major faults (specifying locality, nature and orientations); Colour of minerals, grain-size & shape, structural condition, the mineralogy of grains, cementing material gouge material etc.

48.5 On completion of bore hole the contractor shall submit a geological log of borehole furnished duly signed with the information as described above in accordance with the relevant code of Bureau of Indian Standard. The geological logging is required to be carried out by competent Engineering Geologist of contractor.

48.6 After completion of field work & lab. testing, detailed GT report including logs of boreholes, lab test results with graph, analysis of data, soil/rock profile with geotechnical recommendations shall be submitted to engineer incharge.

49. REPORT

The report shall include but not limited to the following:

A plan showing the locations of the exploration work i.e. bore holes, dynamic cone penetration tests, trial pits. Plate load test etc. b) Bore Logs: Bore logs of each bore holes clearly identifying the Stratification and the type of soil stratum with depth. The values of Standard Penetration Test (SPT) at the depths where the tests were conducted on the samples collected at various depths shall be clearly Shown against that particular stratum. Test results of field and laboratory tests shall be summarized strata Wise as well in combined tabular form. All relevant graphs, charts tables, diagrams and photographs, if any, shall be submitted along with report. Sample illustrative reference calculations for settlement, Bearing capacity, pile capacity shall be enclosed. Recommendations: The report should contain specific recommendations for the type of foundation for the various structures envisaged at site. The Contractor shall acquaint himself about the type of structures and their functions from CMRL.

The observations and recommendations shall include but not limited to the following:

- a. Geological formation of the area, past observations or historical data, if available, for the area and for the structures in the nearby area, Fluctuations of water table etc.
- b. Recommended type of foundations for various structures. If piles are recommended the type, size and capacity of pile and groups of piles shall be given after comparing different types and sizes of piles and pile Groups.
- c. Allowable bearing pressure on the soil at various depths for different Sizes of the foundations based on shear strength and settlement characteristics of soil with supporting calculations.
- d. Minimum factor of safety for calculating net safe bearing capacity shall be taken as 3.0 (three). Recommendation of liquefaction characteristics of soil shall be provided.
- e. Recommendations regarding slope of excavations and dewatering Schemes, if required.
- f. Comments on the Chemical nature of soil and ground water with due regard to deleterious effects of the same on concrete and steel and recommendations for protective measures.
- g. If expansive soil is met with, recommendations on removal or retainment of the same under the structure, road, drains, etc. shall be given. In the latter case detailed

specification of any special treatment required including specification of materials to be used, construction method, equipment to be deployed etc. shall be furnished. Illustrative diagram of a symbolic foundation showing details shall be furnished.

- h. Recommendations for additional investigations beyond the scope of the present work, if considered such investigation as necessary.
- i. In case of foundation in rocky strata, type of foundation and recommendation regarding rock anchoring etc. should also be given.

50. General

On completion of all the field and laboratory works, the contractor shall submit a draft report containing geological information of the region, procedure adopted for investigation, field observations, summarized test data, conclusion and recommendations. The report shall include detailed bore logs, sub-soil sections, field test results, laboratory observations and test results in both tabular as well as graphical forms, practical and theoretical considerations for the interpretation of test results, the supporting calculations for the conclusions drawn etc. Initially, the contractor shall submit three copies of the report in draft form for the owner's review.

After review of the draft report, the employer's comments will be intimated to the contractor. The contractor shall incorporate the comments and after getting the amended draft report approved, five copies of the detailed final report shall be submitted along with one set of reproducible of the graphs, tables etc. Any expenditure on account of redrafting, finalising the report etc shall be deemed to have been included in the quoted rates.

The detailed final report based on field observations, in-situ and laboratory tests shall encompass theoretical as well as practical considerations for foundation of different type of structures envisaged in the area under investigation. The contractor shall acquaint himself about the type of structures, foundation loads and other information required from the engineer-in-charge.

51. Data to be furnished

The report shall also include but not be limited to the following.

- a. Plot plan showing the location and reduced levels of all field testse.g. bore holes, trial pits, plate load tests etc properly drawn to scale and dimensioned with reference to the established grid lines Geological information of the area such as geomorphology, geological structure, lithology, stratigraphy and tectonic faults, seismicity of the region and site, core recovery and rock quality designation etc.
- b. Past observations and historical data if available for the area or for other areas with similar soil profile for similar structures in the surrounding areas.

- c. True cross section of all individual boreholes and trial pits with reduced levels and co-ordinates showing the classification and thickness of individual stratum, position of ground water table, various in-situ tests conducted and samples collected at different depths and the rock stratum if met with.
- d. Set of longitudinal and transverse soil/rock profiles connecting various bore holes in order to give a clear picture of the variation of the subsoil strata as per IS: 6065.
- e. Water level contours and rock level contours
- f. Plot of standard penetration test 'N' values (both uncorrected and corrected) with depth for identified areas.
- g. Results of all field tests in tabular as well as in graphical forms.
- h. Results of all laboratory tests summarised (i) for each sample as well as (ii) a consolidated table giving the layer-wise soil and rock properties . All the relevant charts, tables, graphs, figures, supporting calculations, conclusions and photographs of representative rock cores and trial pits shall be furnished.
- i. For all triaxial shear tests, stress vs strain diagrams as well as Mohr's circle envelopes shall be furnished. If back pressure is applied for saturation, the magnitude of the same shall be indicated. The value of modulus of elasticity 'E' shall be furnished for all tests along with relevant calculations.
- j. For all consolidation tests the following curves shall be furnished.

e vs log P e vs P and Compression vs log t or square root of t (depending upon shape of the plot for proper determination of coefficient of consolidation)

The point showing initial condition (e₀, P₀) of the soil shall be marked on the curves.
- k. Values of compression index, coefficient of volume compressibility etc shall be furnished. The procedure adopted for calculating the compression index from the field curve and settlement of soil strata shall be clearly specified. The time required for 50% and 90% primary consolidation along with secondary settlement if significant shall also be calculated.

For pressure meter tests, the following shall be furnished.

- a. Calibration record including description of membrane and sheath on probes, dimensions of thick walled cylinder, length of flexible tubing, calibration curves and temperature etc.
- b. Drilling record including borehole number, method of making borehole, log with soil type and condition, depth of water table in the borehole, weather and temperature etc.
- c. Test record including type of test, date and time, depth of centre point of probe, volume readings at 30 and 60 second elapsed time and corresponding pressure readings and notes on any deviation from standard test procedure etc.
- d. Field pressure meter, creep and air calibration curves indicating P_o , P_f and P_i . Corrected pressure meter and creep curves indicating P_o , P_f , P_i along with calculation for the corrections.
- e. Values of cohesion, angle of internal friction, pressure meter modulus, shear modulus and co-efficient of sub-grade reaction along with sample calculations. Calculation for allowable bearing pressures and corresponding total settlements for shallow foundations and load carrying capacity calculation of piles in various modes etc
- f. Analysis and discussion of test results.

52. Recommendations

Recommendations shall be given areawise duly considering the type of soil/rock, structure, foundation type and ground water table etc in the area. The recommendations shall include but not be limited to the following.

- a. Type of foundation to be adopted for various structures duly considering the sub strata characteristics, water table, total settlement permissible for the structures and equipments, minimum depth and width of foundation etc.
- b. For shallow foundations the following shall be indicated with comprehensive supporting calculations.
- c. Net safe bearing pressure for isolated square/rectangular footings and continuous strip footings of sizes 1, 2, 3, 4 & 5m at different founding depths of 1, 2, 3, 4 & 5m below ground level considering both shear failure and settlement criteria giving reasons for the type of shear failure adopted in the calculation.
- d. Net safe bearing pressure for raft foundation of widths greater than 6m at 2, 3, 4 & 5m below ground level considering both shear failure and settlement criteria.

- e. Modulus of sub-grade reaction and modulus of elasticity from plate load test results along with time-settlement curves and load- settlement curves in both natural and log-log graph.
- f. If piling is envisaged the following shall be furnished with comprehensive supporting calculations.
- g. Types of piles and reason for recommending the same duly considering the sub strata characteristics.Suitable founding strata for the pile.
- h. Estimated length of pile for 500 kN (400mm dia.), 750kN (450mm dia.), 1000kN (500mm dia.) and 4500kN (1070mm dia.) capacities. End bearing and frictional resistance shall be indicated separately. Safe lateral and tensile load carrying capacities of pile with supporting calculations.
- i. Magnitude of negative skin friction if any.
- j. Coefficient of permeability of various sub-soil and rock strata based on in-situ permeability tests.
- k. Cone resistance, frictional resistance, total resistance and settlement analysis for different size of foundations.
- l. Electrical resistivity of sub-soil based on electrical resistivity tests including electrode spacing vs cumulative resistivity curves.
- m. Dynamic soil properties such as dynamic shear modulus and Poisson's ratio etc from cross-hole shear and seismic refraction tests and coefficient of elastic uniform compression from cyclic plate load tests.
- n. Suitability of the soil for construction of roads and embankments, their stable slopes for shallow and deep excavations, active and passive earth pressures, earth pressure at rest and modulus of elasticity as a function of depths for the design of underground structures etc.
- o. Suitability of locally available soils at site for filling and back filling purposes.
- p. If expansive soil is met with, then recommendation on removal or retainment of the same under the structures/roads etc shall be given. In the latter case, detailed specifications of any special treatment required including specification for materials to be used, construction method, equipments to be deployed etc shall be furnished.
- q. Protective measures based on chemical nature of soil and ground water with due regard to the potential deleterious effects on concrete, steel and other building materials etc. Remedial measures for sulphate attack and acidity shall be dealt in detail.

- r. Susceptibility of sub soil strata to liquefaction in the event of earthquake. If so, recommendation for remedial measures.
- s. Identification of any other potential geotechnical problems & their remedial measures.
- t. Description of measures required for erosion control.
- u. Identification of corrective measures required for the improvement of sub surface conditions such as removal of poor sub soil/material and in-situ densification etc. If ground improvement is recommended then its detailed specification, specification for the materials to be used, construction method, equipments to be deployed etc shall be furnished.

53 RATES & MEASUREMENTS

53.1 RATES

The item of work in the schedule of quantities describes the work very briefly. The various items of the schedule of quantities shall be read in conjunction with the corresponding sections in the technical specification including amendments and additions if any. For each item in the schedule of quantities, the bidder's rates shall include all the activities covered in the description of the items as well as for all necessary operations in details described in the technical specification.

No claims shall be entertained if the details shown on the released for construction drawings differ in any way (e.g. location and depth of tests, number of tests etc) from those shown on the tender drawings.

The unit rates quoted shall include minor details which are obviously and fairly intended and which may not have been included in these documents but are essential for the satisfactory completion of the work.

The bidders quoted rates shall be inclusive of providing all equipments, men, materials, skilled and unskilled labours, making observations, establishing the ground level and coordinates at location of each bore hole, test pit etc by carrying levels from one established bench mark and distances from one set of grid lines furnished by the engineer-in-charge. Also no extra payments shall be made for conducting the standard penetration tests, collection, packing and transportation of all the samples and cores, recording of all results and submitting them in approved formats etc.

The quoted rates for trial pits/plate load tests/ cyclic plate load tests shall be inclusive of dewatering and backfilling etc.

The quoted rates for drilling in rock shall satisfy the requirements as furnished in specification.

The rates quoted for conducting pump out test shall be inclusive of boring a well of 400mm diameter, providing and installation of perforated GI/MS pipes and observation pipes etc .

The rates quoted for conducting cross hole shear test shall be inclusive of necessary boring, providing PVC pipes, grouting, geo- phones, backfilling the holes after completion of testing etc.

The rates quoted for laboratory tests shall include preparation of samples, performing tests, recording, analysis and submission of data etc.

The bidder shall submit a scheme showing the arrangement and equipment proposed to be used for conducting the site work along with rates. However the minimum number of staff and equipment to be deployed /mobilised for site works shall be as per Conditions of contract

Note:-

Address of laboratory along with list of equipment's available shall be specified along with the submission of tender documents. If the tests are planned to be carried out from other agencies then contractor shall provide an undertaking the same duly mentioning the name of agencies.

Employer reserves the right to inspect the lab before Issue of LOA.

53.2 MEASUREMENTS

All measurements shall be in SI Units. Length shall be measured in metres (m) correct to two places of decimals. Areas shall be worked out in square meters(Sqm) and volume in cubic meters(Cum) rounded off to two decimals.

Certain tests have to be conducted in the bore holes and trial pits etc. Such bore holes and trails pits etc shall be measured once only and not again just because the tests are conducted therein.

The depth of penetration due to SPT at the bottom of bore hole shall not be considered for the measurement of bore hole depth.

Pits shall be measured in Cum.

Coring in rock with diamond bit shall be measured in length(metre) correct to two places of decimal for the actual cored length satisfying the criteria of specification.

53.3 Payment:

- a. Contractor should be registered with the concerned department of Employees Provident Fund Organisation (EPFO). No payment shall be released to the contractor until and unless the contractor submits the registration certificate and up to date receipt of provident fund.

- b. At the time of submission of IPA/Final bill a certificate shall be submitted by the contractor certificate regarding up to date clearance of payment to his/their sub-contractors, vendors, suppliers, labour contractor etc. if any.
- c. The rate quoted by the tenderers will remain firm till completion of the entire work the work rate should be Exclusive of GST statutory levies and duties, Transit insurance, etc. of Central, State, Local bodies, etc. and charges for materials, labour, all lead, lift, ascent, descent, crossing of road/railway line including to and fro cost of transportation of soil boring/rock drilling instruments from any place to geotechnical investigation site. GST if applicable will be paid separately on production of documents.
- d. Contractor must submit attested copy of valid GST certificate attested GST Registration Certificate along with the tender.
- e. Agency should submit the GST Registration Number & Certificate along with the tender document. Under Section 194 of the Income Tax Act, 1961, deduction of necessary Income Tax Act 194 will be made from bills for carrying out the work under this contract.

54 INSPECTION BY CMRL REPRESENTATIVE:

CMRL's representative shall have the right at all times of supervise the contractor's work and instruct the contractor and the contractor shall execute the work as per the instructions without any lapse of time.

The CMRL representative posted at site should sign the bore logs and the contractor or his authorized representative must sign on the same as a token of his acceptance of the entire details therein.

The field records for the preliminary and detailed exploration shall contain the date when the boring was made, the location of the boring with reference to a permanent system of co-ordinates and the reduced level of the ground surface with respect to a permanent bench mark per bore logs should also include elevation at which the water table and the upper boundary of each of the successive soil/rock strata were encountered.

The measurement shall be recorded from the reduced level of boreholes up to the depth of boring/drilling. No payment shall be made for the depth of penetration of SPT sampler beyond the last boring rod. All boreholes shall be terminated only in presence of CMRL representative.

The CMRL representative posted at site should sign the bore logs and the contractor or his authorized representative must sign on the same as a token of his acceptance of the entries made care shall be taken in handling and labelling of samples so that they are received in a fit state for that examination and testing and can be correctly identified as obtained from a specified trial pit or boring.

Colour Photographs (in soft copy) of the rock core obtained shall be taken after stacking the same in the wooden boxes specially made for the purpose with proper identification.

The photographs in two copies are to be submitted along with the bore log. No extra payment will be made for the photographs and core boxes.

All the works shall confirm to the standard specification of IS/IRS/IRC as will be applicable, specification.

All laboratory instruments should have valid calibration certificate and should be NABL certified.

55 Tools and Labours:

In case any workman is found incompetent or otherwise undesirable by the CMRL representative at site, he should not be allowed to work under the contractor. In this matter, they should opinion of the CMRL representative will be final and binding on the contractor.

Labour, equipment, tools, plants and machineries, etc. as may be required for executing the work in a modern and workman-like manner as per specification are to be arranged by the successful tenderer to execute the work and no extra payment will be made for this purpose.

56 Safety at Site:

The contractor shall maintain in a readily accessible place first aid appliance including an in adequate supply of sterilized dressing and sterilized cotton wool. The appliances shall be placed under the charge of responsible person who shall be readily available during working hours.

In the event of any accident at the work spot, if it is established by the enquiry by CMRL that the accident occurred wholly or partly due to any act tantamount to negligence on part of the contractor, he shall render himself liable for all damages and also legal proceedings.

57 Traffic Management Plan

The Contractor shall develop a detailed Traffic Management Plan for the work under the contract. The purpose is to develop a Traffic Management Plan to cope with the traffic disruption as a result of construction activities by identifying strategies for traffic management on the roads and neighbourhoods impacted by the construction activities. The Contractor shall implement the Traffic Management Plan throughout the whole period of the Contract.

The Contractor shall manage the vehicular and pedestrian right of way during the period of construction. The Contractor shall take account of the need to maintain essential traffic requirements, as these may influence the construction process.

Where it becomes necessary to close a road or intersection, or supplementary lanes are required to satisfy the traffic demands, traffic diversion schemes to adjacent roadways shall be developed with quantitative justifications. The Contractor shall co-ordinate with all relevant authorities.

SECTION VIII

PRICE BID / BILL OF QUANTITIES

PREAMBLE TO BILL OF QUANTITIES

1. Rates include mobilization all and every equipment, ancillaries and everything required for these works to site unless provided for elsewhere and including distance travelled and allowance for difficulties of access all and everything
2. Setting up at location includes provision of stable working platform or otherwise to suit the type of test this item applies to.
3. Rate for boring and drilling includes provision of clean water or clean water with additives as approved and usage of compatible rods, core barrels and drill and core bits to suit the ground conditions and delivery of rock cores including core boxes and delivery of samples to the laboratory
4. Rates for sampling include proper packing, storage and delivery of samples to the laboratory.
5. Rates for undisturbed samples includes usage of proprietary sample tubes (Double and triple barrel) without burrs or seams and used without adapters, sealing, storage and safe delivery.
6. Standard Penetration test includes usage of proper rods, split spoon as per Method statement, Technical specifications and sample description in accordance with Method statement, and packing, storing and transporting.
7. Rate for field test includes all types set up and required equipment used to provide reliable test results.

PRICE BID					
Name of work :	Detailed Geotechnical Investigation by Drilling Bore holes and collecting and testing the samples and submission of Geotechnical reports From MADHAVARAM MILK COLONY to PATTALAM of Corridor-3 (Total Length = 8.042 KM (Chainage -95.00 - 7947.00)) for UNDER GROUND section of Phase II Chennai Metro Rail Limited.				
BILL OF QUANTITIES					
SCHEDULE	DESCRIPTION	QTY.	UNIT	ESTIMATED RATES	ESTIMATED AMOUNT in Rs.
A					
1	Exploratory Vertical drilling of Boreholes 150mm dia through all kinds of soils and weathered/soft rock with adequate / suitable equipment, tools and tackles for depths measured below existing ground level including mobilization, setting up boring rig, shifting of rig from one borehole to another and demobilization of the same and refilling the boreholes with sand and reinstating surface.				
i)	0m to 10m	3500	Mtr.	929	3,251,500
ii)	10m to 20m	3500	Mtr.	1161	4,063,500
iii)	20m to 30m	10	Mtr.	1509	15,090
iv)	30m to 40m	10	Mtr.	1858	18,580

2	Exploratory drilling of Boreholes down to required depth,drilling of 150mm diameter boreholes in all type of soils except hard rock and large boulders (boulder core more than 30cm), including refilling, reinstating surface and disposing off surplus material including use of mechanical rigs with power operated winches as well as percussion / chieselling tool for advancing through occasional seams of hard strata to be employed where necessary in River bed area including standing/flowing water upto 2m depth with all necessary arrangements				
	0m to 10m	10	Mtr.	4065	40,650
	10m to 20m	10	Mtr.	4646	46,460
	20m to 30m	10	Mtr.	5227	52,270
	30m to 40m	10	Mtr.	5807	58,070
3	Drilling NX size through Hard Rock using TC bit/ diamond bit / Impregnated diamond bit upto 40m depth.				-
i)	0m to 10m	10	Mtr.	4065	40,650
ii)	10m to 20m	500	Mtr.	4646	2,323,000
iii)	20m to 30m	3000	Mtr.	5227	15,681,000
iv)	30m to 40m	3500	Mtr.	5807	20,324,500
4	Collecting undisturbed soil samples in 100mm dia 450mm long thin walled tube sampler at every 3m interval or as directed by the engineer, from boreholes including provisions of air tight containers for packing and labelling incl. transportation the samples to laboratory. Piston sampler shall be used for extracting undisturbed samples where necessary. Samples shall be collected as per IS 2132	1845	No.	3485	6,429,825
5	Conducting standard penetration tests as per IS:2131-1981 at 3.0 M interval or as directed by the engineer and collecting the disturbed sample. Packaging and labeling the same.	3687	No.	581	2,142,147
6	Conducting Field In situ Vane shear test for soil as per IS 4434 at required strata or as directed by engineer	100	No.	11615	1,161,500

7	Collection of Water Samples at intervals as decided by the engineer	360	No.	1162	418,320
8	Conducting Electrical resistivity Tests as per latest codes to investigate upto 50 m depth.	100	No.	30000	3,000,000
9	In situ Permeabilty test at every 5m depth or as decided by the Engineer as per relevant IS Code				
	(i) Soil	1440	No.	2500	3,600,000
	(ii) Rock (Double packer)	1440	No.	2500	3,600,000
B					
1	Grain size Analysis without Hydrometer (Sieve Analysis)	3687	No.	232	855,384
2	Hydrometer analysis including Grain size analysis	1845	No.	494	911,430
3	Bulk density ,dry density and moisture content on UD samples	1845	No.	232	428,040
4	Specific gravity of soil	185	No.	203	37,454
5	Conducting Chemical analysis to determine contents of sulphates,Sulphites, chlorides, pH value and organic matter contents on				
	(i) Soil Samples	185	No.	465	85,793
	(ii) Water Samples	185	No.	610	112,545
6	Atterbergs limits	1845	No.	348	642,060
7	Shrinkage Limit	185	No.	232	42,804
8	Free Swelling Index	185	No.	232	42,804
9	Swell Pressure Test	185	No.	500	92,250

10	Direct shear test, Box shear test	554	No.	465	257,378
11	Triaxial compressive strength test giving full test results including mohr circle, stress - strain curve, etc.				-
	(a) Un-consolidated undrained test (UU).	369	No.	1161	428,409
	(b) Consolidated Undrained test (CU) on clay samples giving relevant information as per IS-2720-XV-1986	185	No.	3000	553,500
12	Unconfined compressive strength test on clay soil samples as per IS:2720 - X - 1973 for each BH.	738	No.	522	385,236
13	consolidation test by Odeometer as per relevant IS	1080	No.	465	502,200
C					-
1	Density Test & Specific Gravity test	650	No.	232	150,800
2	Water Absorption & Porosity test	650	No.	58	37,700
3	Hardness index test on rock samples	325	No.	1161	377,325
4	Abrasivity Index test on Rock samples	325	No.	436	141,700
5	Unconfined compressive strength test on saturated (7 Days) Rock samples	650	No.	174	113,100
6	Point Load index Test on rock samples	650	No.	1162	755,300
7	Modulus of Elasticity test	65	No.	3485	226,525
8	Petrographic analysis on rock samples	200	No.	10000	2,000,000

D	Preparation and submission of Report in four copies (soft and hard copy) giving recommendations for type of foundation, analysis of borelogs & tests results along with SBC values and calculations in approved format for every 2 Km alignment including stations. 60% of the LS amount shall be released on submission of draft report and balance 40% on submission of final report. Amount will be paid on Pro rata basis based on the KM of work completion and submission of report	LS	No.	2000000	2,000,000
	60 % for Draft Report				
	40 % for Final Report				
E	Any other items as per Indian Railway Unified Standard Scheduled of Rates - 2011 for Southern railway as corrected upto the date of opening of tenders, likely to be operated which are not covered under above items. Note: Tenderer shall quote % above, below & at par the SR-USSR 2011 rate.		LS		5,000,000
F	Total Amount (Schedule A to E) in Rs				82,446,798
G	percentage (%) above or below to be quoted by the tenderer over total amount i.e on (F)				
H	Total Amount to be quoted by Tenderer				
I	ADD GST @ 18% on the quoted Amount				
J	Total Amount Quoted by tenderer including GST				

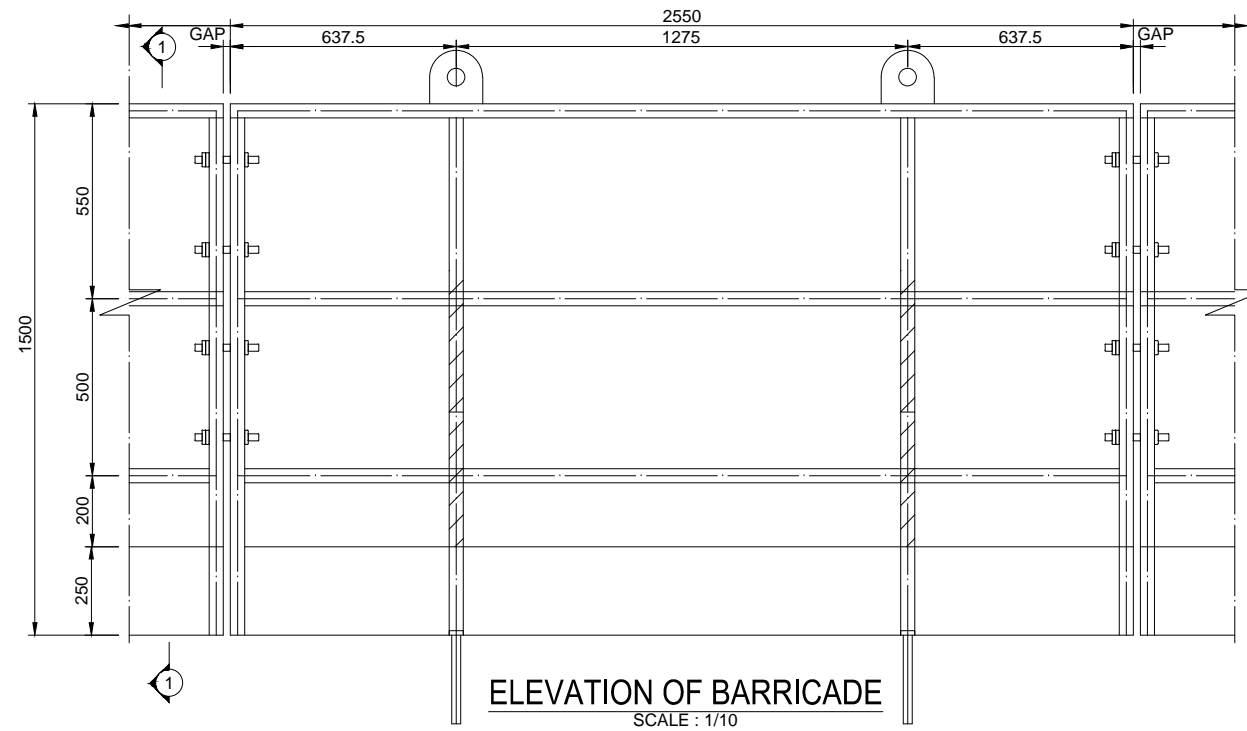
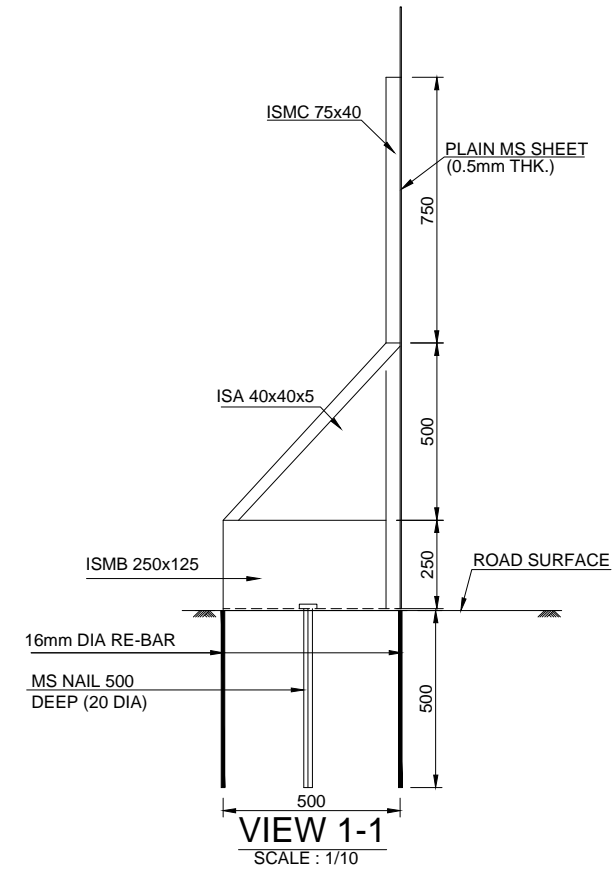
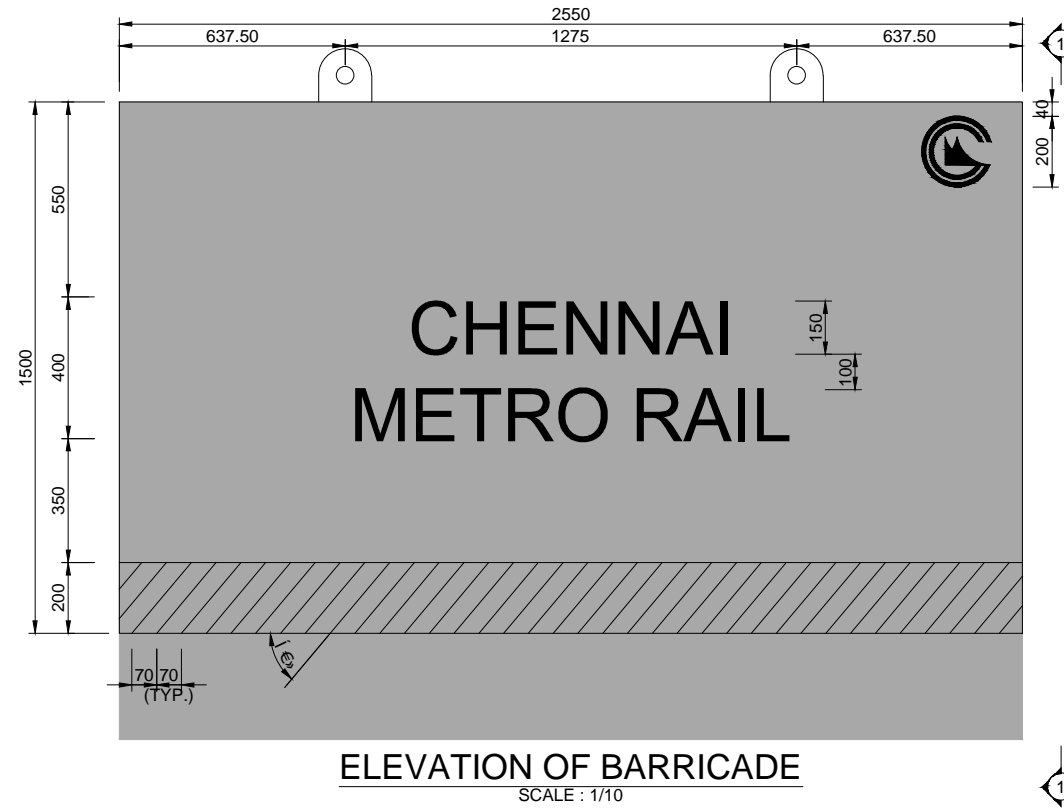
Note :-

1. Tenderer is requested to quote only percentage above or below on the total contract price without GST i.e on (F)
2. **Evaluation of the tender will be done excluding GST, based on the amount at Row H**
3. GST paid by tenderer will be reimbursed on submission of proof of payment towards GST.
4. While Quoting GST tenderer to consider Input Tax credit available.

SECTION IX

TENDER DRAWINGS

NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS.

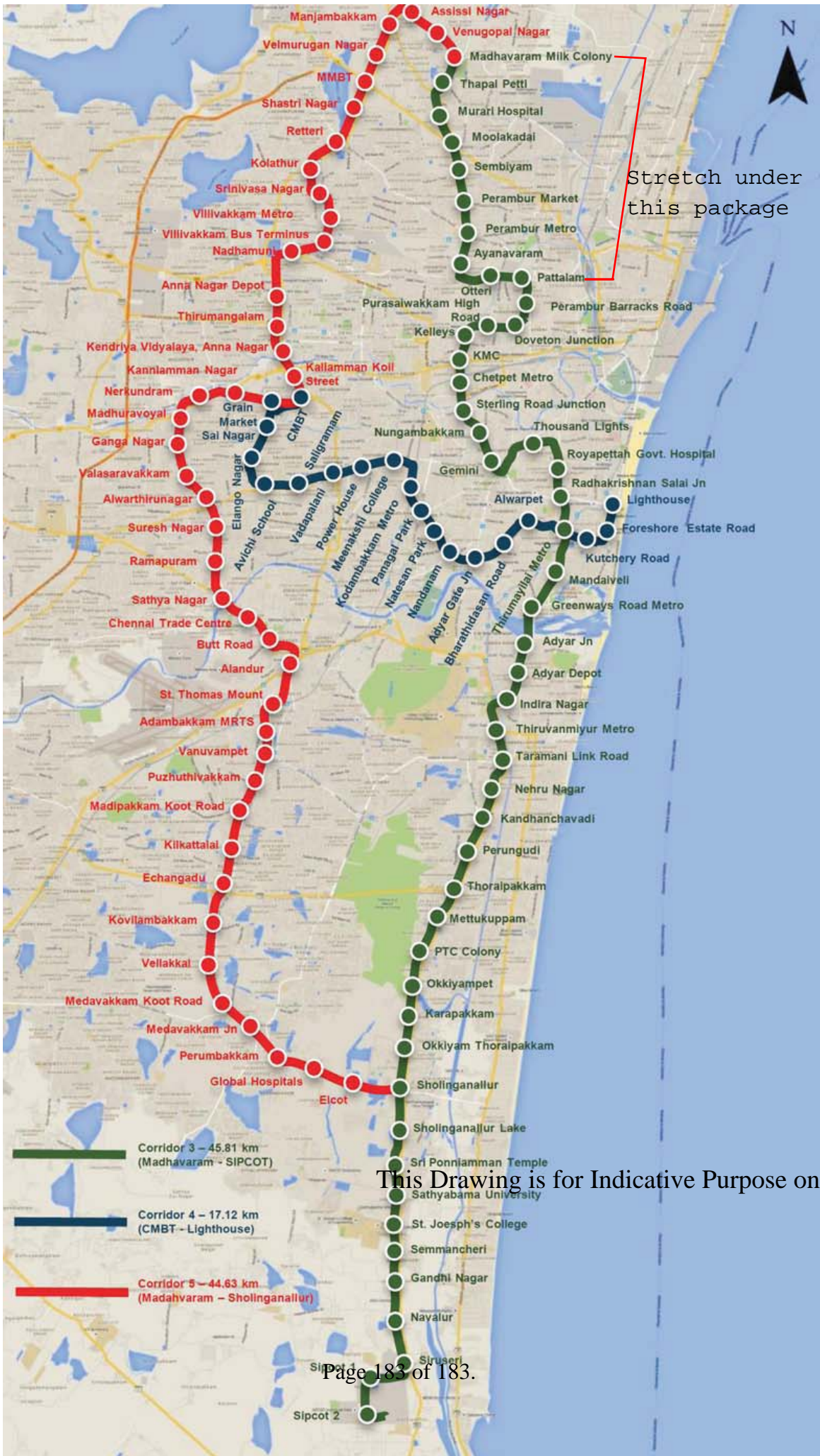


This Drawing is for Indicative Purpose only
TENDER DRAWINGS

IT IS CERTIFIED THAT THIS DOCUMENT HAS BEEN DESIGNED AND CHECKED IN ACCORDANCE WITH DDC QUALITY ASSURANCE PLAN			PROJECT TITLE GEOTECHNICAL INVESTIGATION WORKS CMRL - PHASE II	
PREPARED	FULL NAME	SIGNATURE	DRAWING TITLE BARRICADE DETAILS	
DRAWN BY				
DESIGNED BY				
CHECKED BY			SCALE AS SHOWN DATE OF ISSUE [REDACTED] STAGE TENDER DRAWING	
APPROVED BY			DRG.NO.	REV. A0

EMPLOYER
CHENNAI METRO RAIL LTD.
ADMINISTRATIVE BUILDING,
CMRL DEPOT, POONAMALLEE HIGH ROAD,
KOYAMBEDU, CHENNAI - 600107 (INDIA)

REV.	PARTICULARS	DRN.	CHD.	VER.	DATE
A0	TENDER DRAWINGS				06.02.2018



Stretch under this package

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